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DEPARTMENT OF EDUCATION

PENNSYLVANIA
KEYSTONE EXAMS

TECHNICAL REPORT

ALGEBRA I, BIOLOGY, AND LITERATURE

2013

Provided by Data Recognition Corporation

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GLOSSARY OF COMMON TERMS

The following table contains some terms used in this technical report and their meanings. Some of these terms are used universally in the assessment community, and some of these terms are used commonly by psychometric professionals.

Term	Common Definition
Ability	In Rasch measurement, *ability* is a generic term indicating the level of an individual on the construct measured by an exam. For the Keystone Exams, as an example, a student's literature *ability* is measured by how the student performed on the Keystone Literature exam. A student who answered more items correctly has a higher *ability* estimate than a student who answered fewer items correctly.
Adjacent Agreement	*Adjacent agreement* is a score/rating difference of one (1) point in value usually assigned by two different raters under the same conditions (e.g., two independent raters give the same paper scores that differ by one point).
Alternate Forms	*Alternate forms* are two or more versions of a test that are considered exchangeable, for example, they measure the same constructs in the same ways, are intended for the same purposes, and are administered using the same directions. More specific terminology applies depending on the degree of statistical similarity between the test forms (e.g., parallel forms, equivalent forms, and comparable forms) where parallel forms refers to the situation in which the test forms have the highest degree of similarity to each other.
Average	*Average* is a measure of central tendency in a score distribution that usually refers to the arithmetic mean of a set of scores. In this case, it is determined by adding all the scores in a distribution and then dividing the obtained value by the total number of scores. Sometimes people use the word *average* to refer to other measures of central tendency such as the median (the score in the middle of a distribution) or mode (the score value with the greatest frequency).
Bias	In a statistical context, *bias* refers to any source of systematic error in the measurement of a test score. In discussing test fairness, *bias* may refer to construct-irrelevant components of test scores that differentially affect the performance of different groups of test takers (e.g., gender, ethnicity). Attempts are made to reduce bias by conducting item fairness reviews and various *differential item functioning* (*DIF*) analyses, detecting potential areas of concern, and either removing or revising the flagged test items prior to the development of the final operational form of the test (see also *differential item functioning*).
Constructed-Response Item	A *constructed-response* (*CR*) item—referred to by some as an *open-ended (OE)* response item—is an item format that requires examinees to create their own responses, which can be expressed in various forms (e.g., written paragraph, created table/graph, formulated calculation). Such items are frequently scored using more than two score categories, that is, polytomously (e.g., 0, 1, 2, 3). This format is in contrast to when students make a choice from a supplied set of answer options, for example, *multiple-choice* (*MC*) items which are typically dichotomously scored as right = 1 or wrong = 0. When interpreting item difficulty and discrimination indices, it is important to consider whether an item is polytomously or dichotomously scored.
Content Validity Evidence	*Content validity evidence* shows the extent to which an exam provides an appropriate sampling of a content domain of interest (e.g., assessable portions of Algebra I curriculum in terms of the knowledge, skills, objectives, and processes sampled).

Glossary of Common Terms

Term	Common Definition
Criterion-Referenced Interpretation	The *criterion-referenced score* is interpreted as a measure of a student's performance against an expected level of mastery, educational objective, or standard. The types of resulting score interpretations provide information about what a student knows or can do in a given content area.
Cut Score	A cut score marks a specified point on a score scale where scores at or above that point are interpreted or acted upon differently from scores below that point (e.g., a score designated as the minimum level of performance needed to pass a competency test). A test can be divided into multiple proficiency levels by setting one or more cut scores. Methods for establishing cut scores vary. For the Keystone Exams, three cut scores are used to place students into one of four performance levels (see also *standard setting*).
Decision Consistency	*Decision consistency* is the extent to which classifications based on test scores would match the decisions on students' proficiency levels based on scores from a second parallel form of the same test. It is often expressed as the proportion of examinees who are classified the same way from the two test administrations.
Differential Item Functioning	*Differential item functioning* is a statistical property of a test item in which different groups of test takers (who have the same total test score) have different average item scores. In other words, students with the same ability level but different group memberships do not have the same probability of answering the item correctly (see also *bias*).
Distractor	An incorrect option in a multiple-choice item (also called a foil).
Equating	The strongest of several *linking* methods used to establish comparability between scores from multiple tests. Equated test scores should be considered exchangeable. Consequently, the criteria needed to refer to a linkage as *equating* are strong and somewhat complex (equal construct and precision, equity, and invariance). In practical terms, it is often stated that it should be a 'matter of indifference' to a student if he/she takes any of the equated tests (see also *linking*).
Exact Agreement	*Exact agreement* indicates identical scores/ratings are assigned by two different raters under the same conditions (e.g., two independent raters give a paper the same score).
Field Test (FT) Items	The Keystone Exams use multiple test forms for each content area test. Each form is composed of *operational* (*OP*) items and *field test* (*FT*) items. An *FT* item is a newly developed item that is ready to be tried out to determine its statistical properties (e.g., see *p*-value and *Point-Biserial Correlation*). Each test form includes a set of *FT* items. *FT* items are not part of any student scores.
Frequency	*Frequency* is the number of times that a certain value or range of values (score interval) occurs in a distribution of scores.
Frequency Distribution	*Frequency distribution* is a tabulation of scores from low to high or high to low with the number and/or percent of individuals who obtain each score or who fall within each score interval.
Infit/Outfit	*Infit* and *outfit* are statistical indicators of the agreement of the data and the measurement model. *Infit* and *outfit* are highly correlated, and they both are highly correlated with the *point-biserial correlation*. *Underfit* can be caused when low-ability students correctly answer difficult items (perhaps by guessing or atypical experience) or high-ability students incorrectly answer easy items (perhaps because of carelessness or gaps in instruction). Any model expects some level of variability, so *overfit* can occur when nearly all low-ability students miss an item while nearly all high-ability students get the item correct.

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Term	Common Definition
Item Difficulty	For the Rasch model, the dichotomous *item difficulty* represents the point along the latent trait continuum where an examinee has a 0.50 probability of making a correct response. For a constructed-response item, the *difficulty* is the average of the item's step difficulties (see also *step difficulty*).
Key	The *key* is the correct response option or answer to a test item.
Linking	Linking is a generic term referring to one of a number of processes by which scores from one or more tests are made comparable to some degree. *Linking* includes several classes of transformations (*equating*, scale alignment, prediction, etc.). *Equating* is associated with the strongest degree of comparability (exchangeable scores). Other linkages may be very strong, but fail to meet one or more of the strict criteria required of *equating* (see also *equating*).
Logit	In Rasch scaling, *logits* are units used to express both examinee ability and item difficulty. When expressing examinee *ability*, a student who answers more items correctly has a higher *logit* than a student who answers fewer items correctly. *Logits* are transformed into *scale scores* through a linear transformation. When expressing item difficulty, *logits* are transformed *p*-value (see also *p*-value). The logit difficulty scale is inversely related to *p*-values. A higher *logit* value would represent a relatively harder item, while a smaller *logit* value would represent a relatively easier item.
Mean	*Mean* is also referred to as the arithmetic mean of a set of scores. It is found by adding all the score values in a distribution and dividing by the total number of scores. For example, the mean of the set {66, 76, 85, and 97} is 81. The value of a mean can be influenced by extreme values in a score distribution.
Measure	In Rasch scaling, *measure* generally refers to a specific estimate of an examinee's *ability* (often expressed as *logits*) or an item's difficulty (again, often expressed as *logits*). As an example for the Keystone Exams, a student's literature *measure* might be equal to 0.525 *logit*. Or, a Keystone Literature test item might have a *logit* equal to -0.905.
Median	The *median* is the middle point or score in a set of rank-ordered observations that divides the distribution into two equal parts; each part contains 50 percent of the total data set. More simply put, half of the scores are below the *median* value and half of the scores are above the *median* value. As an example, the *median* for the following ranked set of scores {2, 3, 6, 8, 9} is 6.
Module	On score reports, a *module* often refers to a set of items on a test measuring the same contextual area (e.g., Operations and Linear Equations & Inequalities in Algebra I). Items developed to measure the same reporting category would be used to determine the *module* score (sometimes called "subscale" score).
Multiple-Choice Item	*Multiple-choice item* is a type of item format that requires the test taker to select a response from a group of possible choices, one of which is the correct answer (or *key*) to the question posed (see also *constructed-response item*).
N-count	Sometimes designated as *N* or *n*, it is the number observations (usually individuals or students) in a particular group. Some examples include the number of students tested, the number of students tested from a specific subpopulation (e.g., females), and the number of students who attained a specific score. In the follow set {23, 32, 56, 65, 78, 87}, $n = 6$.
Operational Item	The Keystone Exams use multiple test forms for each content area test. Each form is composed of *operational* (*OP*) items and *field test* (*FT*) items. *OP* items are the same on all forms for any content area test. Student total raw scores and scaled scores are based exclusively on the *OP* items.

Glossary of Common Terms

Term	Common Definition
Percent Correct	When referring to an individual item, the *percent correct* is the item's *p-value* expressed as a percent (instead of a proportion). When referring to a total test score, it is the percentage of the total number of points that a student received. The percent correct score is obtained by dividing the student's raw score by the total number of points possible and multiplying the result by 100. *Percent correct scores* often used in *criterion-referenced interpretations* and are generally more helpful if the overall difficulty of a test is known. Sometimes *percent correct scores* are incorrectly interpreted as *percentile ranks*.
Percentile	*Percentile* is the score or point in a score distribution at or below which a given percentage of scores fall. It should be emphasized that it is a value on the score scale, not the associated percentage (although sometimes in casual usage this misinterpretation is made). For example, if 72 percent of the students score at or below a *scaled score* of 1500 on a given test, then the *scaled score* of 1500 would be considered the 72nd *percentile*. As another example, the *median* is the 50th *percentile*.
Percentile Rank	The *percentile rank* is the percentage of scores in a specified distribution that fall at/below a certain point on a score distribution. *Percentile ranks* range in value from 1 to 99. They indicate the status or relative standing of an individual within a specified group, by indicating the percent of individuals in that group who obtained equal or lower scores. An individual's *percentile rank* can vary depending on which group is used to determine the ranking. As suggested above, *Percentiles* and *percentile ranks* are sometimes used interchangeably; however, strictly speaking, a *percentile* is a value on the score scale.
Performance Level Descriptors	Performance level descriptors are descriptions of an individual's competency in a particular content area, which is usually defined as ordered categories (e.g., from "below basic" to "advanced") on a continuum. The exact labeling of these categories and narrative descriptions may vary from one assessment or testing program to another.
Point-Biserial Correlation	In classical test theory, *point-biserial correlation* is an item discrimination index. It is the correlation between a dichotomously scored item and a continuous criterion, usually represented by the total test score (or the corrected total test score with the reference item removed). It reflects the extent to which an item differentiates between high-scoring and low-scoring examinees. This discrimination index ranges from –1.00 to +1.00. The higher the discrimination index (the closer to +1.00), the better the item is considered to be performing. For multiple-choice items scored as 0 or 1, it is rare for the value of this index to exceed 0.5.
p-value	*P-value* is an index indicating an item's difficulty for some specified group (perhaps grade). It is calculated as the proportion (sometimes percent) of students in the group who answer an item correctly. *P*-values range from 0.0 to 1.0 on the proportion scale. Lower values correspond to more difficult items and higher values correspond to easier items. *P*-values are usually provided for multiple-choice items or other items worth one point. For open-ended items or items worth more than one point, difficulty on a *p*-value-like scale can be estimated by dividing the item mean score by the maximum number of points possible for the item (see also *Logit*).

Glossary of Common Terms

Term	Common Definition
Raw Score	*Raw score* (*RS*) is an unadjusted score usually determined by tallying the number of questions answered correctly or by the sum of item scores (i.e., points). (Some rarer situations might include formula-scoring, the amount of time required to perform a task, the number of errors, application of basal/ceiling rules, etc.). *Raw scores* typically have little or no meaning by themselves and require additional information like the number of items on the test, the difficulty of the test items, *norm-referenced* information, or *criterion-referenced* information.
Reliability	*Reliability* is the expected degree to which test scores for a group of examinees are consistent over exchangeable replications of an assessment procedure, and therefore considered dependable and repeatable for an individual examinee. A test that produces highly consistent, stable results (i.e., relatively free from random error) is said to be highly reliable. The *reliability* of a test is typically expressed as a *reliability coefficient* or by the *standard error of measurement* derived by that coefficient.
Reliability Coefficient	*Reliability coefficient* is a statistical index that reflects the degree to which scores are free from random measurement error. Theoretically, it expresses the consistency of test scores as the ratio of true score variance to total score variance (true score variance plus error variance). This statistic is often expressed as correlation coefficient (e.g., correlation between two forms of a test) or with an index that resembles a correlation coefficient (e.g., calculation of a test's internal consistency using *coefficient alpha*). Expressed this way, the *reliability coefficient* is a "unitless" index. The higher the value of the index (closer to 1.0), the greater the reliability of the test (see also *standard error of measurement*).
Scaled Score	*Scaled score* is a mathematical transformation of a raw score developed through a process called scaling. *Scaled scores* are most useful when comparing test results over time. Several different methods of scaling exist, but each is intended to provide a continuous and meaningful score scale across different forms of a test.
Spiraling	*Spiraling* is a packaging process used when multiple forms of a test exist and it is desired that each form be tested in all classrooms (or other grouping unit such as a school) participating in the testing process. This process allows for the random distribution of test booklets to students. For example, if a package has four test forms labeled A, B, C, & D, the order of the test booklets in the package would be: A, B, C, D, A, B, C, D, A, B, C, D, etc.
Standard Deviation	*Standard deviation* (*SD*) is a statistic that measures the degree of spread or dispersion of a set of scores. The value of this statistic is always greater than or equal to zero. If all of the scores in a distribution are identical, the standard deviation is equal to zero. The further the scores are away from one another in value, the greater the *standard deviation*. This statistic is calculated using the information about the deviations (distances) between each score and the distribution's mean. It is equivalent to the square root of the variance statistic. The *standard deviation* is a commonly used method of examining a distribution's variability since the *standard deviation* is expressed in the same units as the data.

Glossary of Common Terms

Term	Common Definition
Standard Error of Measurement	*Standard error of measurement* (*SEM*) is the amount an observed score is expected to fluctuate around the true score. As an example, across replications of a measurement procedure, the true score will not differ by more than plus or minus one standard error from the observed score about 68 percent of the time (assuming normally distributed errors). The *SEM* is frequently used to obtain an idea of the consistency of a person's score in actual score units, or to set a confidence band around a score in terms of the error of measurement. Often a single *SEM* value is calculated for all test scores. On other occasions, however, the value of the *SEM* can vary along a score scale. *Conditional standard errors of measurement* (*CSEM*) provide an *SEM* for each possible scaled score.
Standard Setting	Also referred to as performance level setting, *standard setting* is a procedure used in the determination of the cut scores for a given assessment. It is used to measure students' progress towards certain performance standards. Standard setting methods vary (e.g., modified Angoff, Bookmark Method), but most use a panel of educators and expert judgments to operationalize the level of achievement students must demonstrate in order to be categorized within each performance level.
Step Difficulty	*Step difficulty* is a parameter estimate in Master's *partial credit model* (*PCM*) that represents the relative difficulty of each score step (e.g., going from a score of 1 to a score of 2). The higher the value of a particular step difficulty, the more difficult a particular step is relative to other score steps.
Technical Advisory Committee	The *technical advisory committee* (*TAC*) is a group of individuals (most often professionals in the field of testing), that are either appointed or selected to make recommendations for and to guide the technical development of a given testing program.
Validity	*Validity* is the degree to which accumulated evidence and theory support specific interpretations of test scores entailed by the purpose of a test. There are various ways of gathering validity evidence.

PREFACE: AN OVERVIEW OF THE ASSESSMENTS

THE KEYSTONE EXAMS FROM 2008 TO PRESENT

COMPREHENSIVE GRADUATION COMPETENCY ASSESSMENT PROGRAM

In 2008, the Commonwealth of Pennsylvania initiated a comprehensive graduation competency assessment program. The goals of this program include the following:

- To provide a system that is aligned, focused, standards-based, accurate, universally applicable, and publicly accessible
- To develop, produce, distribute, administer (both online and paper/pencil), collect, score, analyze, track, and report results of graduation competency assessments for ten high school–level content areas: Algebra I, Algebra II, Biology, Chemistry, Civics and Government, English Composition, Geometry, Literature, U.S. History, and World History, with each area or course comprised of modules containing unique content
- To provide graduation competency testing opportunities for students three times each school year—spring, summer, and fall—with students permitted to retake modules until proficiency is achieved on each module
- To report graduation competency results under accelerated timelines
- To ensure validity and reliability of the assessment systems through technically sound test development and psychometric practices, detailed statistical analyses and research studies, and well-documented processes and quality procedures

The Keystone Exams, as the graduation competency assessments are named, are just one component of Pennsylvania's system of high school graduation requirements. Keystone Exams are designed to help school districts guide students toward meeting state standards—standards aligned with expectations for success in college and the workplace. In order to receive a diploma, students are also required to meet local district credit and attendance requirements and to complete a culminating project, along with any additional district requirements.

For graduating classes, students are to demonstrate successful completion of secondary-level course work in Algebra I, Biology, and Literature, in which the Keystone Exam served as the final course exam. Students' Keystone Exam scores counted for at least one-third of the final course grades.

Based upon Chapter 4 regulations, each Keystone Exam is designed in modules that reflect distinct, related academic content common to the traditional progression of course work. Students who do not score Proficient or above on a Keystone Exam module may choose to complete a project-based assessment for that module based upon other specific requirements.

Preface: An Overview of the Assessments

ASSESSMENT ACTIVITIES OCCURRING FROM 2010 TO PRESENT

The first assessment activities took place in the 2010–2011 school year. Prior to November 2010, there were no Keystone Exams assessment events. The table below outlines the field tests and operational exams administered during the 2010–11 school year.

Following the development of Assessment Anchors and Eligible Content, exams were developed for initial field test in 2010 and were subsequently administered as operational exams in 2011. Additional exams, which were based on the Assessment Anchors and Eligible Content developed in 2009 and 2010, were developed for initial field test in 2011. Detailed information about the operational exam activities that occurred during the 2010–2011 school year is in the *Keystone Exams Spring 2011 Algebra I, Biology, and Literature Technical Report.*

Field Test and Operational Exams during the 2010–11 School Year

Exam	Assessment Activity	Date
Algebra I	Initial Stand-Alone Field Test	Fall 2010 (November)
Algebra I	Inaugural Operational Exam Administration	Spring 2011 (May)
Algebra II	Initial Stand-Alone Field Test	Spring 2011 (May)
Biology	Initial Stand-Alone Field Test	Fall 2010 (November)
Biology	Inaugural Operational Exam Administration	Spring 2011 (May)
English Composition	Initial Stand-Alone Field Test	Spring 2011 (May)
Geometry	Initial Stand-Alone Field Test	Spring 2011 (May)
Literature	Initial Stand-Alone Field Test	Fall 2010 (November)
Literature	Inaugural Operational Exam Administration	Spring 2011 (May)

Following a one-year program hiatus in 2012, the field test items embedded in the Spring 2011 operational forms were used to construct the forms for the next four administrations (spring, summer, winter, and possible breach). The table below outlines exams administered during the 2012–13 school year. Detailed information about the operational exam activities that occurred during the 2012–2013 school year is in the *Keystone Exams Spring 2013 Algebra I, Biology, and Literature Technical Report.*

Operational Exams during the 2012–13 School Year

Exam	Assessment Activity	Date
Algebra I	Operational Retest Exam Administration	Winter 2012/2013 (December–January)
Algebra I	Operational Exam Administration	Spring 2013 (May)
Algebra I	Operational Retest Exam Administration	Summer 2013 (August)
Biology	Operational Retest Exam Administration	Winter 2012/2013 (December–January)
Biology	Operational Exam Administration	Spring 2013 (May)
Biology	Operational Retest Exam Administration	Summer 2013 (August)
Literature	Operational Retest Exam Administration	Winter 2012/2013 (December–January)
Literature	Operational Exam Administration	Spring 2013 (May)
Literature	Operational Retest Exam Administration	Summer 2013 (August)

CHAPTER ONE: BACKGROUND OF THE KEYSTONE EXAMS

This brief overview of the Pennsylvania Keystone Exams summarizes the history of the program's development process, intent and purpose, and recent changes.

ASSESSMENT HISTORY IN PENNSYLVANIA

Pennsylvania's involvement in statewide assessment actually began in the 1969–1970 school year with a purely school-based assessment known as *Educational Quality Assessment* (EQA), which continued through the 1987–1988 school year. A state-mandated student competency testing program called *Testing for Essential Learning and Literacy Skills* (TELLS) also operated from the school years of 1984–1985 through 1990–1991. Also in 1990, the state initiated an on-demand writing assessment.

The Pennsylvania System of School Assessment (PSSA) program was instituted in 1992 as a school evaluation model with reporting at the school level only. The PSSA initially measured performance in the content areas of mathematics and reading at grades 5, 8, and 11, and in writing at grades 6 and 9. Starting in 1994, as part of the Chapter 5 regulations, the PSSA added student-level reports. In 1999, as part of Chapter 4 regulations, the State Board of Education adopted the Pennsylvania Academic Standards for mathematics and for reading, writing, speaking, and listening. Proficiency levels for Advanced, Proficient, Basic, and Below Basic were defined in 2000. In 2001 and 2004, the reading and mathematics assessments underwent various content enhancements to improve alignment to the 1999 Academic Standards. Grade 11 was added to the writing assessment in 2001. Then, in 2004–2005, the PSSA Assessment Anchors and Eligible Content were developed to clarify content structure and improve articulation between assessment and instruction. In addition, in 2005, the grade 6 and 9 writing assessments were moved to grades 5 and 8. By 2006, the operational mathematics and reading assessments incorporated grades 3 through 8 and 11. In 2007, the PSSA and the PSSA Assessment Anchors and Eligible Content underwent additional content enhancements. In 2008, science was added to the PSSA as an operational assessment. Starting the with 2013 field test, PSSA began a multiyear transition to a new set of standards called the Pennsylvania Core Standards.

THE KEYSTONE EXAMS

In 2008, the Commonwealth of Pennsylvania initiated a comprehensive graduation competency assessment program. As a key piece of this program, the Keystone Exams are designed to assess proficiency in various subject areas, including Algebra I, Algebra II, Biology, Chemistry, Civics and Government, English Composition, Geometry, Literature, U.S. History, and World History. The Keystone Exams are just one component of Pennsylvania's high school graduation requirements. Students must also earn state-specified credits, fulfill the state's service learning and attendance requirements, and complete any additional local school system requirements to receive a Pennsylvania high school diploma.

The stated goals of the Keystone program are to

- provide for a system that is aligned, focused, standards-based, accurate, universally applicable, and publicly accessible.
- develop, produce, distribute, administer (both online and in paper-and-pencil), collect, score, analyze, track, and report results of graduation competency assessments for ten high school–level content areas: Algebra I, Algebra II, Biology, Chemistry, Civics and Government, English Composition, Geometry, Literature, U.S. History, and World History, with each area or course composed of modules containing unique content.

- provide graduation competency testing opportunities for students three times each school year—spring, summer, and fall—with students permitted to retake modules until proficiency is achieved on each module.
- report graduation competency results under accelerated timelines.
- ensure validity and reliability of the assessment systems through technically sound test development and psychometric practices, detailed statistical analyses and research studies, and well-documented processes and quality procedures.

GRADUATION REQUIREMENTS AND THE KEYSTONE EXAMS

Based upon Chapter 4 regulations, each Keystone Exam is designed in modules that reflect distinct, related academic content common to the traditional progression of coursework. Students who do not score Proficient or above on a Keystone Exam module may choose to complete a project-based assessment for that module based on the requirements detailed below.

If a student is unable to meet the requirements in § 4.24(b)(1)(iv)(A) (relating to high school graduation requirements) after two attempts on a Keystone Exam, the student may supplement a Keystone Exam score with satisfactory completion of a project-based assessment. Points earned through satisfactory performance on one or more project modules related to the Keystone Exam module or modules that the student did not pass shall be added to the student's highest Keystone Exam score.

A student may qualify to participate in one or more project-based assessments if the student has met all of the following conditions:

1. The student has taken the course.
2. The student was unsuccessful in achieving a score of Proficient on the Keystone Exam after at least two attempts.
3. The student has met the district's attendance requirements for the course.
4. The student has participated in a satisfactory manner in supplemental instructional services under § 4.24(i).

KEYSTONE ASSESSMENT ANCHORS AND ELIGIBLE CONTENT

In 2009, the state initiated development of test designs and test blueprints for the Keystone Exams based on Pennsylvania Keystone Course Standards and the Common Core State Standards. Committees of Pennsylvania educators met in 2009, 2010, and 2011 to write, review, and approve Assessment Anchors and Eligible Content statements and sample exam items. To provide initial focus, each test blueprint committee was presented with materials specific to the exam in question, including a basic blueprint structure, the Pennsylvania State Standards, the Common Core State Standards, and draft Eligible content statements based on the standards and the Common Core State Standards. The results from the initial committee work were evaluated by national, state, and local subject experts, and, following revisions, they were ultimately validated by another committee of Pennsylvania educators. Following committee approval, the Keystone Assessment Anchors and Eligible Content statements for literacy, mathematics, and science were approved by the State Board of Education in September 2010.

- Mathematics
  - The first committee meetings took place in April 2009, where initial drafts of the test blueprints were developed for Algebra I, Algebra II, and Geometry.
  - A follow-up committee meeting for the three mathematics exams was held in August 2009.
- Literacy
  - The first committee meetings took place in April 2009, where initial drafts of the test blueprints were developed for English Composition and Literature.
  - A follow-up committee meeting for the two literacy exams was held in November 2009.
- Science
  - The first committee meetings took place in October 2009, where the initial draft of the test blueprint was developed for Biology.
  - A follow-up committee meeting for Biology was held in January 2010.
  - In addition, in January 2010, the initial draft of the test blueprint was developed for Chemistry.
  - Chemistry was part of a follow-up committee meeting held in late January 2010.
- Social Studies
  - The first committee meetings took place in November 2010, where initial drafts of the test blueprints were developed for Civics and Government, U.S. History, and World History.
  - A follow-up committee meeting for the Civics and Government exam was held in October 2011.
  - A follow-up committee meeting for U.S. History and World History remains unscheduled pending further decisions about the future of these Keystone exams.

WAVE IMPLEMENTATION OF THE EXAMS

The implementation plan for the Keystone Exams envisioned the ten Keystone Exams becoming operational through a series of waves. The initial wave included Algebra I, Biology, and Literature. These first three exams were field tested in fall 2010 and reached operational status with the spring 2011 administration. The second wave included Algebra II, English Composition, and Geometry; these were field tested in spring 2011. English Composition is now projected to reach operational status with the spring 2015 administration. The third wave included Civics and Government and is projected to reach operational status in spring 2016. The implementation of the five remaining courses, Algebra II, Geometry, Chemistry, U.S. History, and World History, is currently unscheduled. The Pennsylvania Department of Education continues to evaluate the implementation schedule. Table 1–1 reflects the implementation plans as of September 2013.

Table 1–1. Keystone Exams Wave Implementation Plan

Wave	Exam(s)	Initial Field Test	First Operational
1	Algebra I, Biology, Literature	fall 2010	spring 2011
2	English Composition	spring 2011	spring 2015*
2	Algebra II, Geometry	spring 2011	TBD
3	Civics and Government	spring 2015*	spring 2016*
4	Chemistry, U.S. History, World History	TBD	TBD

*Projected

MODE OF DELIVERY FOR THE EXAMS

One key feature of the Keystone Exams is the dual mode of delivery of the testing materials that is available to districts. In addition to the traditional paper-and-pencil format, the Keystone Exams are also available in a computer-based online format using test-delivery software.

While exam materials are still available in the traditional format (two pieces of exam materials—a test book and a separate answer book [or, in the case of English Composition, a single test/answer book]), districts are given the option to administer the exams using computer-based online testing software instead of the paper-and-pencil format.

For more information about how the online exams were developed in concert with the traditional paper-and-pencil format, see Chapter Three.

MULTIPLE TESTING OPPORTUNITIES

Another key feature of the Keystone Exams is the multiple testing opportunities provided to students. Main administrations in both spring and winter provide options for students completing course work at various times of the year and accommodate both traditional and block scheduling. In addition, a summer retest opportunity is also available. The first winter administration took place in winter 2012/2013. The first summer administration took place summer 2013. More information about the winter and summer administrations can be found in Chapter Three.

PERFORMANCE LEVELS FOR THE KEYSTONE EXAMS

The State Board approved a set of criteria defining Advanced, Proficient, Basic, and Below Basic levels of performance for the Keystone Exams. More information about these Performance Level Descriptors (PLDs) is found in Chapter Thirteen.

OPERATIONAL TEST DESIGN INFORMATION

The test definition of each of the operational Keystone Exams, including information about exam-specific test designs, test blueprints, test layouts, item types, and other exam elements, is detailed in Chapter Three.

CHAPTER TWO: TEST DEVELOPMENT OVERVIEW OF THE KEYSTONE EXAMS

KEYSTONE BLUEPRINT/ASSESSMENT ANCHORS AND ELIGIBLE CONTENT

The Keystone Test Blueprints—known as the Keystone Exams Assessment Anchors and Eligible Content—are based on Pennsylvania Keystone Course Standards and the Pennsylvania Core Standards. Prior to the development of the Assessment Anchors, multiple groups of Pennsylvania educators convened to create a set of standards for each of the Keystone Exams. Derived from a review of existing standards, these Enhanced Standards (Course Standards) focus on what students need to know and be able to do in order to be ready for college and career.

Although the Keystone Course Standards indicate what students should know and be able to do, Assessment Anchors are designed to indicate the parts of the Keystone Course Standards (Instructional Standards) that will be assessed on the Keystone Exams. Based on recommendations from Pennsylvania educators, the Assessment Anchors were designed as a tool to improve the articulation of curricular, instructional, and assessment practices. The Assessment Anchors clarify what is expected and focus the content of the standards into what is assessable on a large-scale exam. The Assessment Anchor documents also serve to communicate Eligible Content—the range of knowledge and skills from which the Keystone Exams are designed.

The Keystone Exams Assessment Anchors and Eligible Content have been designed to hold together, or anchor, the state assessment system and curricular/instructional practices in schools by following these design parameters:

- **Clear:** The Assessment Anchors are easy to read and user friendly; they clearly detail which standards are assessed on the Keystone Exams.
- **Focused:** The Assessment Anchors identify a core set of standards that can be reasonably assessed on a large-scale assessment; this keeps educators from having to guess which standards are critical.
- **Rigorous:** The Assessment Anchors support the rigor of the state standards by assessing higher order and reasoning skills.
- **Manageable:** The Assessment Anchors define the standards in a way that can be easily incorporated into a course to prepare students for success.

The Assessment Anchors and Eligible Content are organized into cohesive blueprints, each structured with a common labeling system. This framework is organized by increasing levels of detail: first, Module (Reporting Category); second, Assessment Anchor; third, Anchor Descriptor; and fourth, Eligible Content statement. The common format of this outline is followed across the Keystone Exams.

A description of each level in the labeling system for the Keystone Exams is as follows:

- **Module:** The Assessment Anchors are organized into two thematic modules for each of the Keystone Exams, and these modules serve as the Reporting Categories for the Keystone Exams. The module title appears at the top of each page in the Assessment Anchor document. The module level is also important because the Keystone Exams are built using a module format, with each of the Keystone Exams divided into two equally sized test modules. Each module is made up of two or more Assessment Anchors.
- **Assessment Anchor:** The Assessment Anchor appears in the shaded bar across the top of each Assessment Anchor table in the Assessment Anchor document. The Assessment Anchors represent categories of subject matter that anchor the content of the Keystone Exams. Each Assessment Anchor is part of a module and has one or more Anchor Descriptors unified under it.
- **Anchor Descriptor:** Below each Assessment Anchor in the Assessment Anchor document is a specific Anchor Descriptor. The Anchor Descriptor level details the scope of content covered by the Assessment Anchor. Each Anchor Descriptor is part of an Assessment Anchor and has one or more Eligible Content unified under it.
- **Eligible Content:** The column to the right of the Anchor Descriptor in the Assessment Anchor document contains the Eligible Content statements. The Eligible Content is the most specific description of the content that is assessed in the Keystone Exams. This level is considered the assessment limit. It helps educators identify the range of content covered on the Keystone Exams.
- **Enhanced Standard:** In the column to the right of each Eligible Content statement is a code representing one or more Enhanced Standards that correlate to the Eligible Content statement. Some Eligible Content statements include annotations that clarify the scope of an Eligible Content.
- **Notes:** There are three types of notes included in the Assessment Anchor document.

  "e.g." ("for example")—sample approach, but not a limit to the Eligible Content

  "i.e." ("that is")—specific limit to the Eligible Content

  "Note"—content exclusions or definable range of the Eligible Content

The Assessment Anchor's coding is read like an outline. The coding includes the Subject (Exam), Reporting Category/Module, Assessment Anchor, Anchor Descriptor, and Eligible Content. Each exam has two modules. Each module has two or more Assessment Anchors. Each of the Assessment Anchors has one or more Anchor Descriptors, and each Anchor Descriptor has at least one Eligible Content (generally more than one). The Assessment Anchors form the basis of the test design for the exams undergoing test development. In turn, this hierarchy is the basis for organizing the total module and exam scores (based on the core [common] portions).

Table 2–1. Sample Keystone Assessment Anchor Coding

Sample Code	Subject (Exam)	Reporting Category (Module)	Assessment Anchor (AA)	Anchor Descriptor (AD)	Eligible Content (EC)
A1.1.1.2.1	A1 Algebra I	1 Operations and Linear Equations & Inequalities	1 Linear Equations	2 Write, solve, and/or graph linear equations using various methods.	1 Write, solve, and/or apply a linear equation (including problem situations).
BIO.A.2.1.1	BIO Biology	A Cells and Cell Processes	2 The Chemical Basis for Life	1 Describe how the unique properties of water support life on Earth.	1 Describe the unique properties of water and how these properties support life on Earth (e.g., freezing point, high specific heat, cohesion).
L.F.2.4.1	L Literature	F Fiction	2 Analyzing and Interpreting Literature—Fiction	4 Use appropriate strategies to interpret and analyze the universal significance of literary fiction.	1 Interpret and analyze works from a variety of genres for literary, historical, and/or cultural significance.

The complete set of Assessment Anchors and Eligible Content can be referenced at PDE's Standards Aligned System (SAS) website: http://www.pdesas.org/Standard/KeystoneDownloads.

HIGH-LEVEL TEST DESIGN CONSIDERATIONS

The Keystone Exams employs two types of test items (questions): multiple choice and constructed response. These item types assess different levels of knowledge and provide different information about achievement. Psychometrically, multiple-choice items are very useful and efficient tools for collecting information about a student's academic achievement. Constructed-response performance tasks generally generate fewer scorable points than multiple-choice items generate in the same amount of testing time; however, they provide tasks that are more realistic and sample eligible content that best lends itself to this item type. Furthermore, well-constructed scoring guides have made it possible to include constructed-response tasks in large-scale assessments, and trained scorers apply the scoring guides to efficiently score large numbers of student responses in a highly reliable way. The design of the Keystone Exams attempts to achieve a reasonable balance between the two item types.

Table 2–2. Keystone Exams High-Level Design Considerations

Exam	MC as Percentage of Core Points	CR as Percentage of Core Points	Number of Points per MC	Number of Points per CR	Number of Modules	Number of Assessment Anchors	Number of Eligible Content
Algebra I	60	40	1	4	2	6	33
Biology	73	27	1	3	2	8	38
Literature	65	35	1	3	2	4	56

DEPTH OF KNOWLEDGE

The goal of each Keystone Exam is for each item to be of sufficient rigor, or Webb's Depth of Knowledge (DOK) Level 3. Webb's DOK was created by Norman Webb of the Wisconsin Center for Education Research. Webb's definition of depth of knowledge is the degree or complexity of knowledge that the content curriculum standards and expectations require. Therefore, when reviewing items for depth of knowledge, the item is reviewed to determine whether it is as demanding cognitively as what the actual content curriculum standard expects. In the case of the Pennsylvania Keystone items, the item meets the criterion if the DOK of the item is in alignment with the DOK of the Assessment Anchor as defined by the Eligible Content. Webb's DOK includes four levels, from the lowest (basic recall) level to the highest (extended thinking) level.

In some specific cases, DOK level 2 was allowed when the cognitive intent of an Eligible Content was level 2. For more information on DOK, see Chapter Three and Appendix A.

ONLINE TESTING DESIGN CONSIDERATIONS

The Keystone Exams were designed from the beginning to provide a dual mode of test delivery, using traditional paper-and-pencil forms and using computer-based online forms. The computer-based online testing environment (called INSIGHT) is designed to provide a testing experience that mirrors the elements of traditional paper-and-pencil-based test delivery. This includes not only standard ancillary testing materials available in or with the printed forms, like formula sheets, periodic tables, scoring guidelines, and response spaces, but also analogs of the mechanical elements of response generation not necessarily associated with a computer-screen interface. These elements include line guides, rulers, screen highlighters, magnifiers, equation-building software, online calculators and graphing tools, and keyboard shortcuts.

Consideration of other components of online testing—like item layout, passage layout, font, screen resolution, navigation tools, and other interface mechanisms—all played a role in the overall design constraints, with some considerations having a more meaningful impact on specific exams. For more information on how the online test design impacted the overall test design considerations, see the sections below under each exam. See also Chapter Twenty for more information on a study comparing the use of both modes of delivery.

Online testing also provides an opportunity to utilize software to generate scores for student responses. In cases where responses to questions invoke numerical strings or equations, online responses can be scored through the use of lookup tables. Lookup tables are automated scoring rubrics that contain common correct and incorrect responses. When a response does not match a record in the lookup table, a human scorer is used to adjudicate the score. Operational autoscoring was only used for the Algebra I Exam; see below for more information on its use in Algebra I. For more information on scoring, see Chapter Eight.

ALGEBRA I

The Keystone Algebra I Exam has two reporting categories: Module 1, Operations and Linear Equations & Inequalities, and Module 2, Linear Functions and Data Organizations. Both modules include three Assessment Anchors. Module 1 has 18 Eligible Content, and Module 2 has 15 Eligible Content. Each module corresponds to specific content aligned to statements and specifications included in the course-specific Assessment Anchor documents. The Algebra I content included in the Keystone Algebra I multiple-choice items aligns with the Assessment Anchors and Eligible Content statements. The process skills, directives, and action statements also specifically align with the Assessment Anchors and Eligible Content statements. The content included in Algebra I constructed-response items aligns with content included in the Eligible Content statements. The process skills, directives, and action statements included in the performance demands of the Algebra I constructed-response items align with specifications included in the Assessment Anchor statements, the Anchor Descriptor statements, and/or the Eligible Content statements. In other words, the verbs or action statements used in the constructed-response items or stems can come from the Eligible Content, Anchor Descriptor, or Assessment Anchor statements.

ALGEBRA I ONLINE CONSIDERATIONS

Students taking the computer-based online delivery of the Algebra I exam are provided with online versions of several common tools typically available to a student taking a traditional paper-and-pencil exam. Each student has access to the following online tools: a standard four-function calculator, a scientific calculator, a graphing tool (similar, but not identical to, a graphing calculator), a ruler (available in metric and English units), a highlighter, a line guide, a magnifier, a sticky note generator, and a cross-off tool. In addition, an equation builder—which allows students to generate complex equations not normally possible with a standard keyboard—is also made available with all constructed-response items. Also, if the constructed-response item requests that the student draw, label, or otherwise change a graph, special graph-drawing tools are provided for on-screen graph generation. The Algebra I general scoring guideline and formula sheets are also available to students.

Layout of both the multiple-choice and constructed-response items is optimized for minimal screen manipulation (minimal scrolling required to see graphics or text that extend beyond the visible working space on the computer screen), and exam items are scrutinized carefully in both print and online versions for continuity and accuracy.

ALGEBRA I MULTIPLE-CHOICE ITEMS

Sixty percent of the possible points on the Algebra I Exam are derived from multiple-choice items. This item type is especially efficient for measuring a broad range of content. Each multiple-choice item has four response options, only one of which is correct. The student is awarded one point for choosing the correct response. Distractors typically represent incorrect concepts, incorrect logic, incorrect application of an algorithm, or computational errors.

Algebra I multiple-choice items are intended to take about one and a half minutes of response time per item. They are used to assess a variety of skill levels, including problem solving. Algebra I items involving application emphasize the requirement to carry out some mathematical process to find an answer rather than simply recalling information from memory.

ALGEBRA I CONSTRUCTED-RESPONSE ITEMS

Constructed-response items (tasks) require that students read a problem description and develop an appropriate solution. Algebra I constructed-response items are designed to take about ten minutes of response time per item. Most of the constructed-response items have several components in the overall task that may enable students to enter or begin the problem at different places. In some items, each successive component is designed to assess progressively more difficult skills or higher knowledge levels. Certain components may ask students to explain their reasoning for applying particular operations or for arriving at certain conclusions. The types of tasks utilized do not necessarily require computations. Students may also be asked to perform such tasks as constructing a graph, shading some portion of a figure, or listing object combinations that meet specified criteria.

Constructed-response tasks are especially useful for measuring students' problem-solving skills in Algebra. They offer the opportunity to present real-life situations that necessitate that the students solve problems using mathematics abilities learned in the classroom. Students must read the task carefully, identify the necessary information, devise a method of solution, perform the calculations, enter the solution directly in the answer document, and, when required, offer an explanation. This provides insight into the students' mathematical knowledge, abilities, and reasoning processes.

The constructed-response Algebra items are scored on a 0–4 point scale using an item-specific scoring guideline. The item-specific scoring guideline outlines the requirements for each score point. Item-specific scoring guidelines are based on the Algebra I General Description of Scoring Guidelines. The general guidelines describe a hierarchy of responses, which represent the five score levels. See Appendix B or the *Algebra I Keystone Feb 2011 Item and Scoring Sampler* available on PDE's Standards Aligned System (SAS) website: www.pdesas.org/Assessment/Keystone.

The Algebra I Keystone Exam includes two types of constructed-response items: Scaffolded Constructed Response Items (SCR) and Extended Constructed Response Items (ECR). Both types are scored on the same 0–4 point scale using the same Algebra I General Description of Scoring Guidelines as the base. SCR items are constructed to generally elicit four distinct responses (a response may contain more than one answer blank), and each response has the potential to earn a discrete number of score points (generally just one [1] score point per response). In turn, the four distinct responses are generally organized into four sections, with each labeled as a "Part" within an SCR. The next table shows a generic (nonauthentic) illustration of the application of this concept.

Table 2–3. Generic Example [Nonauthentic] Showing Concept of Four Distinct Responses

Stem	Part A	Part B	Part C	Part D
Presents a numerical distribution	In the answer spaces, write the list of numbers from least to greatest.	Write the mean in an answer blank.	Write the median in an answer blank.	Write the mode in an answer blank.
4 points	1 distinct point even though students enter more than one number	1 distinct point with one distinct entry	1 distinct point with one distinct entry	1 distinct point with one distinct entry

- SCR items do not require narrative, explanation, or "show all your work" responses.
- Most SCR item responses lend themselves to automatic scoring; however, **not all items can be automatically scored exclusively with the use of lookup tables.** The full application of Assessment Anchors and Eligible Content sometimes requires item construction that is incompatible with lookup tables.

In familiar and probably the most descriptive terms, Algebra I ECR items—in form, format, and scoring provisions—adhere to the philosophy of PSSA OE item format. Like SCR items, development is based on the item qualities that best measure the skills and concepts with which the item aligns.

- ECR items intentionally elicit narrative, explanation of reasoning, "explain why . . .", and/or "show your work" responses.
- In contrast to SCR items, in which DOK level 3 cognitive engagement is inferred from student responses, ECR items (through explanations and recorded work) often provide direct evidence of DOK level 3 engagement. This aspect of ECR items is intentionally included during development. Following initial development, the ECR item will be approved by PDE as accepted by the review committee, or PDE and DRC will collaborate in amending the item.

BIOLOGY

The Keystone Biology Exam has two reporting categories: Module 1[A], Cells and Cell Processes; and Module 2[B], Continuity and Unity of Life. Both modules have four Assessment Anchors. Module A has 16 Eligible Content, and Module B has 22 Eligible Content. Each module corresponds to specific content aligned to statements and specifications included in the course-specific assessment anchor documents. The Biology content included in the Keystone Biology multiple-choice items aligns with the Assessment Anchors and Eligible Content statements. The process skills, directives, and action statements also specifically align with the Assessment Anchors and Eligible Content statements. The content included in Biology constructed-response items aligns with content included in the Eligible Content statements. The process skills, directives, and action statements included in the performance demands of the Biology constructed-response items align with specifications included in the Assessment Anchor statements, the Anchor Descriptor statements, and/or the Eligible Content statements. In other words, the verbs or action statements used in the constructed-response items or stems can come from the Eligible Content, Anchor Descriptor, or Assessment Anchor statements.

BIOLOGY ONLINE CONSIDERATIONS

Students taking the computer-based online delivery of the Biology Exam are provided with online versions of several common tools typically available to a student taking a traditional paper-and-pencil exam. Each student has access to the following online tools: a highlighter, a line guide, a magnifier, a sticky note generator, and a cross-off tool. The Biology general scoring guideline and a periodic table are also provided to students.

Layout of both the multiple-choice and constructed-response items is optimized for minimal screen manipulation (minimal scrolling to see graphics or text that extend beyond the visible working space on the computer screen), and exam items are scrutinized carefully in both print and online versions for continuity and accuracy.

BIOLOGY MULTIPLE-CHOICE ITEMS

Seventy-three percent of the possible points on the Biology Exam are derived from multiple-choice items. Multiple-choice items are especially efficient for measuring a broad range of content. Each multiple-choice item has four response options, only one of which is correct. The student is awarded one point for choosing the correct response. Distractors typically represent incorrect concepts, incorrect logic, or incorrect application of a biological principle.

Biology multiple-choice items are intended to take about one and a quarter minutes of response time per item. They are used to assess a variety of skill levels, including the application of Biology content. Biology items involving application emphasize the requirement to utilize science content to find an answer rather than simply recalling information from memory.

BIOLOGY CONSTRUCTED-RESPONSE ITEMS

Constructed-response items (tasks) require students to read a description of a Biology problem and to develop an appropriate solution. Biology constructed-response items are designed to take about eight minutes of response time per item. Constructed-response tasks are especially useful for measuring students' skills in biology. These tasks may present real-life situations that require students to solve problems using science abilities learned in the classroom. Students must read a task carefully, identify the necessary information, devise a method of solution, enter the solution directly into the answer document, and when required, offer an explanation. This provides insight into students' science knowledge, abilities, and reasoning processes.

The constructed-response science items are scored on a 0–3 point scale with an item-specific scoring guideline, and each task is carefully constructed with a scoring guideline reflecting the task requirements. The general guidelines describe a hierarchy of responses, which represents the four score levels. Each item-specific scoring guideline outlines the requirements at each score point, and each item-specific scoring guideline is based on the Biology General Description of Scoring Guidelines. See Appendix B or the *Biology Keystone Feb 2011 Item and Scoring Sampler* available on PDE's Standards Aligned System (SAS) website: www.pdesas.org/Assessment/Keystone.

LITERATURE

The Keystone Literature Exam has two reporting categories: Module 1, Fiction; and Module 2, Nonfiction. Both modules have two Assessment Anchors. Module 1 has 25 Eligible Content, and Module 2 has 33 Eligible Content. The Literature Exam employs two types of test items, multiple-choice and constructed-response, and the content included aligns with content included in the Eligible Content statements. The items are designed to measure students' comprehension of the content contained in the literature passages. Each module corresponds to specific content aligned to statements and specifications included in the course-specific Assessment Anchor documents. The Literature content included in the Keystone Literature multiple-choice items aligns with the Assessment Anchors and Eligible Content statements. The process skills, directives, and action statements also specifically align with the Assessment Anchors and Eligible Content statements. The content included in Literature constructed-response items aligns with content included in the Eligible Content statements. The process skills, directives, and action statements included in the performance demands of the Literature constructed-response items align with specifications included in the Assessment Anchor statements, the Anchor Descriptor statements, and/or the Eligible Content statements. In other words, the verbs or action statements used in the constructed-response items or stems can come from the Eligible Content, Anchor Descriptor, or Assessment Anchor statements.

LITERATURE ONLINE CONSIDERATIONS

Students taking the computer-based online delivery of the Literature Exam are provided with online versions of several common tools typically available to a student taking a traditional paper-and-pencil exam. Each student has access to the following online tools: a highlighter, a line guide, a magnifier, a sticky note generator, and a cross-off tool. The Literature general scoring guideline is also provided to students.

Layout of passages, multiple-choice items, and constructed-response items is optimized for minimal screen manipulation (minimal scrolling to see text and graphics that extend beyond the visible working space on the computer screen), and exam items are scrutinized carefully in both print and online versions for continuity and accuracy. In addition, the amount of space devoted to the passage compared to the amount of space devoted to the exam questions was also optimized.

LITERATURE MULTIPLE-CHOICE ITEMS

Sixty-five percent of the possible points on the Literature Exam are derived from multiple-choice items. Literature multiple-choice items are intended to take about one minute of response time per item. They are designed to measure how well students comprehend the overall meaning of a passage or make basic inferences about it. At times, asking students to choose a preferred answer is the best way to determine whether they have gleaned certain information from a story. Such information may include central idea, setting, or main events and their sequence.

Each Literature multiple-choice item has four response options, only one of which is correct. The student is awarded one point for choosing the correct response. Distractors typically represent some kind of misinterpretation, predisposition, unsound reasoning, or casual reading.

LITERATURE CONSTRUCTED-RESPONSE ITEMS

Constructed-response items (tasks) are designed to address comprehension of text in ways that multiple-choice items cannot. Literature constructed-response items are designed to take about five minutes of response time per item. A short written response allows students to prepare an answer and summarize using supporting details or examples derived from the text.

The Literature constructed-response items are scored on a 0–3 point scale using an item-specific scoring guideline. Each task is text-dependent and is carefully constructed with the scoring guideline reflecting the task requirements. All item-specific scoring guidelines are based on the Literature General Description of Scoring Guidelines. The general guidelines describe a hierarchy of responses, which represent the four score levels. See Appendix B or the *Literature Keystone Feb 2011 Item and Scoring Sampler* available on PDE's Standards Aligned System (SAS) website: www.pdesas.org/Assessment/Keystone.

LITERATURE PASSAGES

One of the key requirements of the Keystone Literature Exam is that students should be able to read and comprehend both literature and informational texts of sufficient text complexity and quality as required by the Assessment Anchors and Eligible Content. For example, the Literature Keystone Assessment Anchors and Eligible Content require students to engage with appropriately complex literary fiction, literary nonfiction, and informational works. Passage genres include, but are not limited to, the following: stories; excerpts from novels, biographies, and autobiographies; letters; dramas; poems; myths from diverse cultures and different time periods; texts in history/social studies, science, and other disciplines; seminal US documents; the classics of American, British, and world literature; and current articles and editorials.

TEXT COMPLEXITY

Text complexity involves three components: matching reader to text and task, qualitative evaluation of the text, and quantitative evaluation of the text.

MATCHING READER TO TEXT AND TASK

A number of factors are taken into consideration when deciding whether a passage will be placed in the pool for possible use on the Keystone Literature Exam. The factors include, but are not limited to, the following:

- Are the conceptual load, vocabulary, syntactic patterns, sentence length, and clarity appropriate for the grade level?
- Does the passage stand the test of time as an example of literary fiction, literary nonfiction, and/or informational text, and is it judged by the committee of Pennsylvania educators as having sufficient quality?
- Is the passage "rich" enough to generate a variety of items?
- Do the passages represent a range of reading levels appropriate to the grade level?
- Do the passages lend themselves well to measuring the Keystone Assessment Anchors and Eligible Content, including text structures and elements?

- Are the passages free of issues of bias, fairness, and/or sensitivity?
- Does the pool of passages represent diversity in the areas of gender, culture, ethnicity, urban/rural status, socioeconomic status, physical differences, and age?

QUALITATIVE EVALUATION OF THE TEXT

Evaluating the text complexity of a passage is essentially a judgmental process by individuals familiar with the classroom context and what is linguistically appropriate at a given grade level. All Keystone passages to be included in the pool of passages for possible use on the Keystone Literature Exam are reviewed and approved by PDE and the Pennsylvania Reading Content Committee (a committee of Pennsylvania educators). The passages are reviewed by Pennsylvania educators to judge whether each passage meets the criteria outlined above. All potential passages are also reviewed by the Pennsylvania Bias, Fairness, and Sensitivity Committee.

QUANTITATIVE EVALUATION OF THE TEXT

Each readability program uses different methods to determine the readability for a particular passage (e.g., syllables, sentence length, number of words, vocabulary lists). Each readability formula is designed for a particular grade range of materials. When using the various readability formulas, a wide range of readability levels may be identified for a particular passage. Some readability formulas are better suited to a particular grade level. If a particular formula being used is outside of the intended range, then the results may be unreliable.

Readability of the Keystone Literature Exam passages has been determined using several of the most widely accepted readability formulas. These formulas are not used in a rigid way, but rather more informally to provide for several “snapshots” of a passage. The readability formulas used for the passages that appear on the Keystone Literature Exam are the Dale-Chall Formula, the Flesch Grade Level Formula, and the Fry Graph.

Chapter Two: Test Development Overview of the Keystone Exams

CHAPTER THREE: ITEM AND TEST DEVELOPMENT PROCESSES

GENERAL KEYSTONE TEST DEVELOPMENT PROCESSES

The core portion of the Spring 2013 Keystone Exams operational administration was made up of items that were field tested in the Spring 2011 Keystone Exams embedded field test administration. Therefore, the activities that led to the Spring 2013 Keystone Exams operational administration began with the development of the test items that appeared in the 2011 administration. In turn, items that appeared on the field test portion of the 2011 administration were developed starting in 2010. In addition, a portion of the core in 2013 will be used for a biennial overlap to the 2015 core. Table 3–1 below is a graphic representation of the basic process flow and overlap of the development cycles.

Table 3–1. General Development and Usage Cycle of the Algebra I, Biology, and Literature Keystone Exams

Admin Year	Events Occurring in Calendar Year						
	2009	2010	2011	2012	2013	2014*	2015*
2010–2011	Initial Item Development for Fall 2010 FT	**Fall 2010 Stand-alone FT** New Item Development for Spring 2011 FT	Data Review of Fall 2010 FT **Spring 2011 Operational & Embedded FT**	Data Review of Spring 2011 FT	***Biennial Core-to-Core Overlap Deferred Due to 2012 Hiatus***	Biennial Core-to-Core Overlap (2011 core included as a portion of the 2014 core)	
2011–2012	**No Operational Administrations in 2011–2012 (Program in Hiatus)**						
2012–2013*			New Item Development for Spring 2013 FT	**Winter 2012/13 Administration**	**Spring 2013 Operational & Embedded FT** Data Review of Spring 2013 FT **Summer 2013 Administration**		Biennial Core-to-Core Overlap (2013 core included as a portion of the 2015 core)
2013–2014*					**Winter 2013/14 Administration** New Item Development for Spring 2014 FT	**Spring 2014 Operational & Embedded FT** Data Review of Spring 2014 FT **Summer 2014 Administration**	
2014–2015*						**Winter 2014/15 Administration** New Item Development for Spring 2015 FT	**Spring 2015 Operational & Embedded FT** Data Review of Spring 2015 FT **Summer 2015 Administration**

*Projected/scheduled tasks and activities

GENERAL TEST DEFINITION

The plan for the Keystone Exam was developed through the collaborative efforts of the Pennsylvania Department of Education (PDE) and Data Recognition Corporation (DRC). The exams are presented online or in two printed testing materials, a test book and a separate answer book. The test book contains multiple-choice (MC) items. The answer book contains scannable pages for multiple-choice responses, constructed-response (CR) items with response spaces, and demographic data collection areas. All MC items are worth 1 point. Algebra I CR items receive a maximum of 4 points (on a scale of 0–4), and all Biology and Literature CR items receive a maximum of 3 points (on a scale of 0–3). In spring 2013, each test form contained common items (identical on all forms) along with embedded field test items.

FUTURE PLANS FOR CORE-TO-CORE OVERLAP ITEMS

The common items consist of a set of core items taken by all students. In future administrations (starting in 2014), these core items may also include core-to-core overlapping items, which are items that also appeared on the core form of the administration two years before. The overlap connects the spring and summer administrations of year *x* and the winter administration in year *x*+1, with the year *x*+2 spring and summer and year *x*+3 winter administrations. The first biennial core-to-core overlap from the spring 2011 and winter 2011–2012 core was scheduled to begin with the spring 2013 administration. However, when the program was placed on hiatus during the 2011–2012 school year, the overlap was moved to the spring 2014 administration.

ALGEBRA I TEST DEFINITIONS

The Spring 2013 Algebra I Keystone Exam was composed of 20 forms. All of the forms contained the common items identical for all students and sets of generally unique items. The following two tables display the design for Algebra I for forms 1 through 20. The column entries for these tables denote the following:

- Number of unique common, or core, MC items
- Number of unique common, or core, CR items
- Number of embedded MC field test items
- Number of embedded CR field test items
- Total number of MC and CR items in the form

Table 3–2. Algebra I Test Plan (Spring 2013) per Operational Form

	Module	Core per Form		Field Test per Form		Total per Form	
		MC Items	CR Items	MC Items	CR Items	Core & FT MC Items	Core & FT CR Items
Algebra I	1	18	3	5	1	23	4
	2	18	3	5	1	23	4
	Total	36	6	10	2	46	8

Table 3–3. Algebra I Test Plan (Spring 2013) per 20 Operational Forms

	Module	Core per 20 Forms		Field Test per 20 Forms		Total per 20 Forms	
		MC Items	CR Items	MC Items	CR Items	Core & FT MC Items	Core & FT CR Items
Algebra I	1	18	3	100	20	236	46
	2	18	3	100	20		
	Total	36	6	200	40		

The core portions of the winter 2012/2013 administration were made up of items that were field tested in fall 2010 and/or spring 2011. Although each spring administration includes embedded field test items, the summer, winter, and breach forms do not include any embedded field test items due to the lower *n*-counts for these administrations. However, summer, winter, and breach forms still include the same number of items that appear in the spring administration. Instead of field test items, the slots in these exams are filled by placeholder (PH) items. The following table displays the design for the Algebra I Summer, Winter, and Breach operational forms.

Table 3–4. Algebra I Test Plan (2013 Summer, Winter, and Breach) per Operational Form

	Module	Core per Form		Placeholders per Form		Total per Form		Number of Forms	
		MC Items	CR Items	MC Items	CR Items	Core & PH MC Items	Core & PH CR Items	Master Core	Scrambles
Algebra I	1	18	3	5	1	23	4	1	3
	2	18	3	5	1	23	4		
	Total	36	6	10	2	46	8		

Since an individual student's score is based solely on the common (or core) items, the total number of operational points is 60 for Algebra I. The total score is obtained by combining the points from the core MC (1 point each) and core CR (up to 4 points each) portions of the exam as follows:

Table 3–5. Algebra I Core Points

Algebra I	Module 1		Module 2		Algebra I Total	
	50%		50%		100%	
	MC Items	CR Items	MC Items	CR Items	MC Items	CR Items
Core Items	18	3	18	3	36	6
Core Points	18	12	18	12	36	24
Total Points	30		30		60	

The Algebra I Exam results will be reported in two categories based on the two modules of the Algebra I Exam. The code letters for these Assessment Anchor categories are

1. Operations and Linear Equations & Inequalities
2. Linear Functions and Data Organization

The distribution of Algebra I items into these two categories is shown in the following table.

Table 3–6. Algebra I Module and Anchor Distribution

Algebra I Module	Raw Points	Module Weight	Number of Anchors	Number of Eligible Content
1	30	50%	3	18
2	30	50%	3	15

The reporting categories are further subdivided for specificity and Eligible Content (limits). Each subdivision is coded by adding an additional character to the framework of the labeling system. These subdivisions are called Assessment Anchors and Eligible Content. More information about Assessment Anchors and Eligible Content is in Chapter Two.

For more information concerning the process used to convert the Algebra I operational test plan into forms (i.e., form construction), see Chapter Six.

For more information concerning the test sessions, timing, and layout for the Algebra I operational exam, see Chapter Seven.

BIOLOGY TEST DEFINITIONS

The Spring 2013 Biology Keystone Exam was composed of 20 forms. All of the forms contained the common items identical for all students and sets of generally unique items. The following two tables display the design for Biology for forms 1 through 20. The column entries for these tables denote the following:

- Number of unique common, or core, MC items
- Number of unique common, or core, CR items
- Number of embedded MC field test items
- Number of embedded CR field test items
- Total number of MC and CR items in the form

Table 3–7. Biology Test Plan (Spring 2013) per Operational Form

	Module	Core per Form		Field Test per Form		Total per Form	
		MC Items	CR Items	MC Items	CR Items	Core & FT MC	Core & FT CR Items
Biology	1	24	3	8	1	32	4
	2	24	3	8	1	32	4
	Total	48	6	16	2	64	8

Table 3–8. Biology Test Plan (Spring 2013) per 20 Operational Forms

	Module	Core per 20 Forms		Field Test per 20 Forms		Total per 20 Forms	
		MC Items	CR Items	MC Items	CR Items	Core & FT MC	Core & FT CR Items
Biology	1	24	3	160	20	368	46
	2	24	3	160	20		
	Total	48	6	320	40		

The core portions of the winter 2012/2013 administration were made up of items that were field tested in fall 2010 and/or spring 2011. Although each spring administration includes embedded field test items, the summer, winter, and breach forms do not include any embedded field test items due to the lower *n*-counts for these administrations. However, summer, winter, and breach forms still include the same number of items that appear in the spring administration. Instead of field test items, the slots in these exams are filled by placeholder (PH) items. The following table displays the design for the Biology Summer, Winter, and Breach operational forms.

Table 3–9. Biology Test Plan (2013 Summer, Winter, and Breach) per Operational Form

	Module	Core per Form		Placeholders per Form		Total per Form		Number of Forms	
		MC Items	CR Items	MC Items	CR Items	Core & PH MC Items	Core & PH CR Items	Master Core	Scrambles
Biology	1	24	3	8	1	32	4	1	3
	2	24	3	8	1	32	4		
	Total	48	6	16	2	64	8		

Since an individual student's score is based solely on the common (or core) items, the total number of operational points is 66 for Biology. The total score is obtained by combining the points from the core MC (1 point each) and core CR (up to 3 points each) portions of the exam as follows:

Table 3–10. Biology Core Points

Biology	Module 1		Module 2		Biology Total	
	50%		50%		100%	
	MC Items	CR Items	MC Items	CR Items	MC Items	CR Items
Core Items	24	3	24	3	48	6
Core Points	24	9	24	9	48	18
Total Points	33		33		66	

The Biology Exam results will be reported in two categories based on the two modules of the Biology Exam.

1. Cells and Cell Processes
2. Continuity and Unity of Life

The distribution of Biology items into these two categories is shown in the following table.

Table 3–11. Biology Module and Anchor Distribution

Biology Module	Raw Points	Module Weight	Number of Anchors	Number of Eligible Content
1	33	50%	4	16
2	33	50%	4	22

The reporting categories are further subdivided for specificity and Eligible Content (limits). Each subdivision is coded by adding an additional character to the framework of the labeling system. These subdivisions are called Assessment Anchors and Eligible Content. More information about Assessment Anchors and Eligible Content is in Chapter Two.

For more information concerning the process used to convert the Biology operational test plan into forms (i.e., form construction), see Chapter Six.

For more information concerning the test sessions, timing, and layout for the Biology operational exam, see Chapter Seven.

LITERATURE TEST DEFINITIONS

The Spring 2013 Literature Keystone Exam was composed of 20 forms. All of the forms contained the common items identical for all students and sets of generally unique items. The following two tables display the design for Literature for forms 1 through 20. The column entries for these tables denote the following:

- Number of unique common, or core, passages
- Number of unique common, or core, MC items
- Number of unique common, or core, CR items
- Number of embedded field test passages
- Number of embedded MC field test items
- Number of embedded CR field test items

Total number of passages, MC items, and CR items in the form

Table 3–12. Literature Test Plan (Spring 2013) per Operational Form

	Module	Core per Form			Field Test per Form			Total per Form		
		Passages	MC Items	CR Items	Passages	MC Items	CR Items	Core & FT Passages	Core & FT MC Items	Core & FT CR Items
Literature	1	2	17	*3	1	6	1	3	23	4
	2	2	17	*3	1	6	1	3	23	4
	Total	4	34	6	2	12	2	6	46	8

*For each module, one core passage has two CRs and one core passage has one CR.

Table 3–13. Literature Test Plan (Spring 2013) per 20 Operational Forms

	Module	Core per 20 Forms			Field Test per 20 Forms			Total per 20 Forms		
		Passages	MC Items	CR Items	Passages	MC Items	CR Items	Core & FT Passages	Core & FT MC Items	Core & FT CR Items
Literature	1	2	17	*3	10	120	20	24	274	46
	2	2	17	*3	10	120	20			
	Total	4	34	6	20	240	40			

*For each module, one core passage has two CRs and one core passage has one CR.

The core portions of the winter 2012/2013 administration were made up of items that were field tested in fall 2010 and/or spring 2011. Although each spring administration includes embedded field test items, the summer, winter, and breach forms do not include any embedded field test items due to the lower *n*-counts for these administrations. However, summer, winter, and breach forms still include the same number of items that appear in the spring administration. Instead of field test items, the slots in these exams are filled by placeholder items. The following table displays the design for the Literature Summer, Winter, and Breach operational forms.

Table 3–14. Literature Test Plan (2013 Summer, Winter, and Breach) per Operational Form

Literature	Module	Core per Form		Placeholders per Form		Total per Form		Number of Forms	
		MC Items	CR Items	MC Items	CR Items	Core & PH MC Items	Core & PH CR Items	Master Core	Scrambles
	1	2	17	*3	1	6	1	1	3
	2	2	17	*3	1	6	1		
	Total	4	34	6	2	12	2		

*For each module, one core passage has two CRs and one core passage has one CR.

Since an individual student's score is based solely on the common (or core) items, the total number of operational points is 52 for Literature. The total score is obtained by combining the points from the core MC (1 point each) and core CR (up to 3 points each) portions of the exam as follows:

Table 3–15. Literature Core Points

Literature	Module 1			Module 2			Literature Total		
	50%			50%			100%		
	Passages	MC Items	CR Items	Passages	MC Items	CR Items	Passages	MC Items	CR Items
Core Items	2	17	3	2	17	3	4	34	6
Core Points		17	9		17	9		34	18
Total Points	26			26			52		

The Literature Exam results will be reported in two broad categories based on the two modules of the Literature Exam.

1. Fiction Literature
2. Nonfiction Literature

The distribution of Literature items into these two categories is shown in the following table.

Table 3–16. Literature Module and Anchor Distribution

Literature Module	Raw Points	Module Weight	Number of Anchors	Number of Eligible Content
1	26	50%	2	25
2	26	50%	2	31

The reporting categories are further subdivided for specificity and Eligible Content (limits). Each subdivision is coded by adding an additional character to the framework of the labeling system. These subdivisions are called Assessment Anchors and Eligible Content. More information about Assessment Anchors and Eligible Content is in Chapter Two.

For more information concerning the process used to convert the Literature operational test plan into forms (i.e., form construction), see Chapter Six.

For more information concerning the test sessions, timing, and layout for the Literature operational exam, see Chapter Seven.

ITEM DEVELOPMENT CONSIDERATIONS

Alignment to the Keystone Assessment Anchors and Eligible Content, course-level appropriateness (as specified by PDE), depth of knowledge (DOK), item/task level of complexity, estimated difficulty level, relevancy of context, rationale for distractors, style, accuracy, and correct terminology were major considerations in the item development process. The *Standards for Educational and Psychological Testing* (American Educational Research Association, American Psychological Association, and National Council on Measurement in Education, 1999) and *Universal Design* (Thompson, Johnstone, & Thurlow, 2002) guided the development process. In addition, *Fairness in Testing: Training Manual for Issues of Bias, Fairness, and Sensitivity* (DRC, 2010) was used for developing items. All items were reviewed for fairness by bias and sensitivity committees and for content by Pennsylvania educators and field specialists.

BIAS, FAIRNESS, AND SENSITIVITY OVERVIEW

At every stage of the item and test development process, DRC employs procedures that are designed to ensure that items and tests meet Standard 7.4 of the *Standards for Educational and Psychological Testing* (AERA, APA, & NCME, 1999).

Standard 7.4: Test developers should strive to identify and eliminate language, symbols, words, phrases, and content that are generally regarded as offensive by members of racial, ethnic, gender, or other groups, except when judged to be necessary for adequate representation of the domain.

To meet Standard 7.4, DRC uses a series of internal quality steps. DRC provides specific training for test developers, item writers, and reviewers on how to write, review, revise, and edit items related to issues of bias, fairness, and sensitivity (as well as based on technical quality). Training also includes an awareness of and sensitivity to issues of cultural diversity. In addition to providing *internal* training in reviewing items in order to eliminate potential bias, DRC also provides *external* training to the review panels of minority experts, teachers, and other stakeholders.

DRC's guidelines for bias, fairness, and sensitivity include instruction concerning how to eliminate language, symbols, words, phrases, and content that might be considered offensive by members of racial, ethnic, gender, or other groups. Areas of bias that are specifically targeted include but are not limited to stereotyping, gender, region/geography, ethnic/cultural, socioeconomics/class, religion, experience, and biases against a particular age group (ageism) or persons with disabilities. DRC catalogues topics that should be avoided and maintains balance in gender and ethnic emphasis within the pool of available items and passages.

See the sections below in this chapter for more information about the Bias, Fairness, and Sensitivity Review meetings conducted for the Keystone Exams.

Chapter Three: Item and Test Development Processes

UNIVERSAL DESIGN OVERVIEW

The principles of universal design were incorporated throughout the item development process to allow participation of the widest possible range of students in the Keystone Exams. The following checklist was used as a guideline:

- Items measure what they are intended to measure.
- Items respect the diversity of the assessment population.
- Items have a clear format for text.
- Stimuli and items have clear pictures and graphics.
- Items have concise and readable text.
- Items allow changes to other formats, such as Braille, without changing meaning or difficulty.
- The arrangement of the items on the test has an overall appearance that is clean and well organized.

A more extensive description of the application of the principles of universal design is provided in Chapter Four.

DEPTH-OF-KNOWLEDGE OVERVIEW

An important element in statewide graduation exams is the alignment between the overall assessment system and the state's standards. A methodology developed by Norman Webb (1999, 2006) offers a comprehensive model that can be applied to a wide variety of contexts. With regard to the alignment between standards statements and the assessment instruments, Webb's criteria include five categories, one of which deals with content. Within the content category is a useful set of levels for evaluating DOK. According to Webb (1999), "depth-of-knowledge consistency between standards and assessments indicates alignment if what is elicited from students on the assessment is as demanding cognitively as what students are expected to know and do as stated in the standards" (Webb, 1999, pp. 7–8). The four levels of cognitive complexity (i.e., DOK) are as follows:

- Level 1: Recall
- Level 2: Application of Skill/Concept
- Level 3: Strategic Thinking
- Level 4: Extended Thinking

DOK levels were incorporated into the item writing and review process, and items were coded with respect to the level they represented. The default DOK for the Keystone Exams is Level 3. The DOK level for CR items must be Level 3. The DOK level for MC items must also be Level 3; however, in some specific cases, Level 2 is allowed when the cognitive intent of an Eligible Content is Level 2. DOK Level 1 and DOK Level 4 are not included on the Keystone Exams. For more information on DOK (and a comparison of DOK to Bloom's Taxonomy), see Appendix A.

PASSAGE READIBILITY OVERVIEW

Evaluating the readability of a passage is essentially a judgment by individuals familiar with the classroom context and what is linguistically appropriate (PDE recommends that the Literature Keystone Exam be administered at grade 10). Although various readability indices were computed and reviewed, it is recognized that such methods measure different aspects of readability and are often fraught with particular interpretive liabilities. Thus, the commonly available readability formulas were not used in a rigid way but more informally to provide for several snapshots of a passage that senior test development staff considered along with experience-based judgments in guiding the passage-selection process. In addition, passages were reviewed by committees of Pennsylvania educators who evaluated each passage for readability and grade-level appropriateness. For more information on Literature passages, see Chapter Two and the literature passage-selection process described below.

TEST ITEM READIBILITY OVERVIEW

Careful attention was given to the readability of the items to make certain that the assessment focus of the item did not shift based on the difficulty of reading the item. Subject/course areas such as Algebra I or Biology contain many content-specific vocabulary terms. As a result, readability formulas were not used. However, wherever it was practicable and reasonable, every effort was made to keep the vocabulary at or one level below the course level for non-Literature exams. There was a conscious effort made to ensure that each question was evaluating a student's ability to build toward mastery of the course standards rather than evaluating the student's reading ability. Resources used to verify the vocabulary level were the *EDL Core Vocabularies* and the *Children's Writer's Word Book*.

In addition, every test question is brought before several different committees composed of Pennsylvania educators who are course-level/grade-level experts in the content field in question. They review each question from the perspective of the students they teach, determine the validity of the vocabulary used, and work to minimize the level of reading required.

Vocabulary was also addressed at the Bias, Fairness, and Sensitivity Review, although the focus was on how certain words or phrases may represent possible sources of bias or issues of fairness or sensitivity. See the sections that follow in this chapter for more information about the Bias, Fairness, and Sensitivity Review meetings conducted for the Keystone Exams.

ITEM AND TEST DEVELOPMENT CYCLE

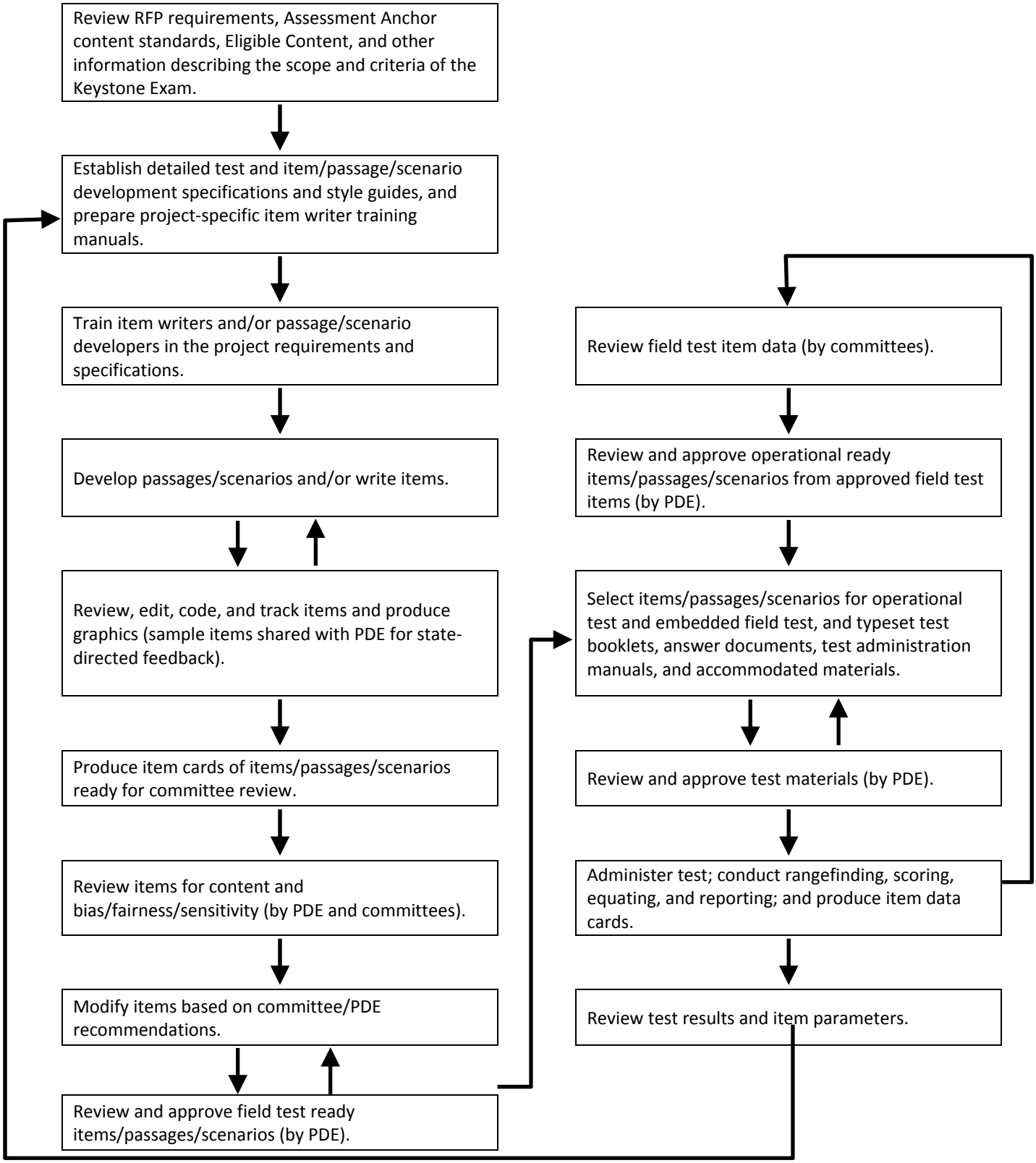
The item development process for items followed a logical cycle and time line, which are outlined in the table and figure below. On the front end of the schedule, tasks were generally completed with the goal of presenting field test candidate items to committees of Pennsylvania educators. On the back end of the schedule, all tasks led to the field test data review and operational test construction. This process represents a typical life cycle for an embedded Keystone field test event, not a stand-alone field test event or an accelerated development cycle.

The process flowchart, also shown below, illustrates the interrelationship among the steps in the primary cycle that occurs in a normal process of development (i.e., when the items for field testing are primarily from new development, as opposed to being selected from an existing item bank). In addition, a detailed process table describing the item and test development processes also appears in Appendix C.

Table 3–17. General Item and Test Development Life Cycle for Spring Keystone Administrations

Cycle	Steps in Development Life Cycle	Time Line	Approximate Window	
Primary	Development Planning	Summer/Fall	Month 1–4	Jul–Oct
	Literature Passage Selection	Summer/Fall	Month 1–6	Jul–Dec
	Item Writer Training	Fall	Month 5	Nov
	Initial Item Authoring	Fall/Winter	Month 5–9	Nov–Mar
	Internal Reviews and PDE Reviews	Fall to Spring	Month 6–12	Dec–Jun
	Bias, Fairness, and Sensitivity Review	Summer	Month 13	Jul
	New Item Content Committee Review (PA Educators)	Summer	Month 13	Jul
	Post-Review Resolution and Cleanup	Summer	Month 13–14	Jul–Aug
	Build Field Test Forms	Summer/Fall	Month 15–16	Sep–Oct
	Internal Form Reviews and PDE Reviews	Summer/Fall	Month 15–16	Sep–Oct
	Final Form and Printer Proof Approvals	Fall/Winter	Month 17–18	Nov–Dec
	Ancillary and Accommodated Form Development	Fall/Winter	Month 18–19	Dec–Jan
	Form Printing, Spiraling, Packaging, and Shipping	Winter/Spring	Month 18–21	Dec–Mar
	Field Test Administration	Spring	Month 22–23	Apr–May
	Material/Data Processing, Rangefinding, and Scoring	Spring/Summer	Month 23–25	May–Jul
	Field Test Item Data Review (PA Educators)	Summer	Month 25	Jul
	Select Operational Items	Summer/Fall	Month 26–27	Aug–Sep
	Build Operational Forms	Fall	Month 27–28	Sep–Oct
	Internal Form Reviews and PDE Reviews	Fall	Month 27–28	Sep–Oct
	Final Form and Printer Proof Approvals	Fall/Winter	Month 29–30	Nov–Dec
	Ancillary and Accommodated Form Development	Fall/Winter	Month 30–31	Dec–Jan
	Form Printing, Spiraling, Packaging, and Shipping	Winter/Spring	Month 30–33	Dec–Mar
	First Operational Test Administration	Spring	Month 35	May
	Material/Data Processing and Scoring	Spring/Summer	Month 35–36	May–Jun
	Score Reporting	Summer	Month 35–39	May–Sep
Secondary	Select Biennial Core-to-Core Overlap Items (Operational Items)	Summer/Fall	Month 51–52	Sep–Oct
	Build Operational Forms	Fall/Winter	Month 52–53	Oct–Nov
	Internal Form Reviews and PDE Reviews	Winter	Month 53–54	Nov–Dec
	Final Form and Printer Proof Approvals	Winter	Month 54–55	Dec–Jan
	Ancillary and Accommodated Form Development	Winter/Spring	Month 55–57	Jan–Mar
	Form Printing, Spiraling, Packaging, and Shipping	Winter/Spring	Month 56–58	Feb–Apr
	Second Operational Test Administration	Spring	Month 59	May
	Material/Data Processing and Scoring	Spring/Summer	Month 59–60	May–Jun
	Score Reporting	Summer	Month 59–63	May–Sep
Tertiary	Release Core-to-Core Overlap Items in Samplers	Fall	Month 63	Sep

Figure 3–1. DRC Item and Test Development Primary Cycle



Chapter Three: Item and Test Development Processes

GENERAL ITEM AND TEST DEVELOPMENT PROCESS

This section describes the processes which lead up to an operational exam. These processes were used to develop the entire pool of items that appeared in the field test and operational administrations.

ITEM DEVELOPMENT PLANNING MEETING

Prior to the start of any item development work, DRC's test development staff meets with PDE's assessment office to discuss the test development plans for the next administration, including the test blueprint, the field test plan (including development counts), procedures, time lines, etc. With a complete development cycle lasting about three years (from item authoring through field test, data review, and operational usage), the initial planning begins well in advance of the anticipated administration.

ITEM WRITER TRAINING

Item writers were selected and trained for the subject areas of Algebra I, Biology, and Literature. Qualified writers—either hired independently by the testing vendor, DRC, or through subcontractors like WestEd—were college graduates with teaching experience and a demonstrated base of knowledge in the content area. Many of these writers were content assessment specialists and curriculum specialists. The writers were trained individually and had previous experience in writing MC and CR items. Prior to developing items for the Keystone Exams, the cadre of item writers was trained with regard to the following areas:

- Keystone Assessment Anchors and Eligible Content
- Webb's levels of cognitive complexity, DOK
- Subject-specific general scoring guidelines
- Specific and general guidelines for item writing
- Bias, fairness, and sensitivity guidelines
- Principles of universal design
- Item quality technical style guidelines
- Reference information
- Sample items

LITERATURE PASSAGE SELECTION

The task of searching for passages was conducted by DRC professionals with classroom experience in reading/language arts. These professionals also underwent specialized training (provided by DRC) in the characteristics of acceptable passages. Guidelines for passage selection included appropriate length, text structure, density, and vocabulary. A judgment was also made about whether the reading level required by a particular passage was at the independent level—that is, where the average student should be able to read 90 percent of words in the text independently. Passage finders were given the task of searching for a specified number of passages for each genre. Generally, they looked for at least twice as many passages as were needed. Passages acquired were either authentic (permissioned), in that they were culled from published materials, or commissioned by experienced authors. See Chapter Two for more information on the types of passages used on the Literature Keystone Exam.

For permissioned passages, approval to reprint was secured from the publishers. Passages underwent an internal review by several test development content editors to judge their merit with regard to the following criteria:

- Passages have interest value for students.
- Passages are appropriate in terms of vocabulary and language characteristics.
- Passages are free of bias, fairness, and sensitivity issues.
- Passages represent different cultures.
- Passages are from a variety of sources.
- Passages are able to stand the test of time.
- Passages are sufficiently rich to generate a variety of MC and CR items.
- Passages are complete with all necessary permissions documentation.
- Passages avoid dated subject matter unless a relevant historical context is provided.
- Passages should not require students to have extensive background knowledge in a certain discipline or area to understand a text.

Once through the internal review process, the passages deemed potentially acceptable were reviewed by the Reading Content Committee and the Bias, Fairness, and Sensitivity Committee for final approval.

ITEM AUTHORING AND TRACKING

Initially, items are generated with software-prepared Keystone Exams Item Cards, which allow for preliminary sorting and reviewing. Although very similar, the Keystone Exams Item Card for Multiple-Choice Items differs from the Keystone Exams Item Card for Constructed-Response Items in that the former has a location at the bottom of the card for comments regarding the distractors. Blank examples of these two cards are shown in Appendix D. In both instances, a column against the right margin includes codes to identify the subject area, grade, content categories, passage information (in the case of reading), item type, DOK (cognitive complexity), estimated difficulty, answer key (for MC items), and calculator use (for mathematics items).

All items undergoing field testing were entered into the DRC Item Development and Educational Assessment System (IDEAS), which is a comprehensive, secure, online item banking system. It accommodates item writing, item viewing and reviewing, and item tracking and versioning. IDEAS manages the transition of an item from its developmental stage to its approval for use in a test form (for both print and online delivery). The system supports item history records that include item usage within a form, item-level notes, content categories and subcategories, item statistics from both classical and Rasch item analyses, and classifications derived from analyses of differential item functioning (DIF). A sample IDEAS Item Card is presented in Appendix D.

INTERNAL REVIEWS AND PDE REVIEWS

To ensure that the items produced were sufficient in number and adequately distributed across subcategories and levels of difficulty, item writers were informed of the required quantities of items. As items were written, an item authoring card was completed. It contained information about the item, such as subject, content category, and subcategories. Based on the item writer's classroom teaching experience, his/her knowledge of the content area curriculum, and the cognitive demands required by the item, estimates were recorded for level of cognitive complexity and difficulty level. Items were written to provide for a range of difficulty and for cognitive complexity focused on DOK Level 3.

As part of the item construction process, each item was reviewed by content specialists and editors at DRC, at WestEd, or at both companies. Content specialists and editors evaluated each item to make sure that it measured the intended Eligible Content and/or Assessment Anchor. They also assessed each item to make certain that it was appropriate for the intended grade and that it provided and cued only one correct answer (MC items only). In addition, the difficulty level, DOK, graphics, language demand, and distractors were also evaluated. Other elements considered in this process included, but were not limited to, universal design, bias, source of challenge, grammar/punctuation, and Keystone style.

Following this internal process, items were reviewed by content specialists at PDE, who then consulted with DRC about any general issues or concerns (e.g., style, format, interpretation of Assessment Anchors and Eligible Content) and about edits to specific items. Following PDE's review, the items were prepared for the content review meetings conducted with Pennsylvania educators.

ITEM CONTENT REVIEWS IN MAY 2012

Prior to the 2013 field testing, all newly developed test items were submitted to content committees for review. The content committees consisted of Pennsylvania educators from school districts throughout the Commonwealth of Pennsylvania, some with postsecondary university affiliations. The primary responsibility of the content committee was to evaluate items with regard to quality and content classification, including grade-level (course) appropriateness, estimated difficulty, DOK, and source of challenge. They also suggested revisions and made recommendations for reclassification of items. In some cases when an item was deleted, the committee suggested a replacement item and/or reviewed a suggested replacement item provided by the facilitators. The committee also reviewed the items for adherence to the principles of universal design, including language demand and issues of bias, fairness, and sensitivity.

With source of challenge, items were identified where the cognitive demand was focused on an unintended content, concept, or skill (Webb, 2002). Source of challenge may be a contributing factor if the reason that an answer could be given results from a cultural bias, an inappropriate reading level, or a flawed graphic in an item, or if an item requires specialized, noncontent-related knowledge to answer. Source of challenge could result in a student who has mastered the intended content or skill answering the item incorrectly or a student who has not mastered the intended content or skill answering the item correctly. Committee members were asked to note any items with a source of challenge and to suggest revisions to remove the source of challenge.

The content review meetings were held on May 7–10, 2012, for Algebra I, Biology, and Literature. Committee members were approved by PDE, and PDE-approved invitations were sent to them by DRC. PDE also selected internal staff members for attendance. The meeting commenced with a welcome by PDE and DRC. This was followed by an overview of the test development process by DRC. PDE, along with DRC, also provided training on the procedures and forms to be used for item content review.

DRC content assessment specialists facilitated the reviews and were assisted by representatives of PDE. Committee members, grouped by exam, worked through and reviewed the items for quality and content, as well as for the following categories:

- Assessment Anchor alignment
- Content limits
- Grade-level (course-level) appropriateness
- Difficulty level
- DOK
- Appropriate source of challenge
- Correct answer
- Quality of distractors
- Graphics in regards to appropriateness
- Appropriate language demand
- Freedom from bias

The members then came to consensus and assigned a status to each item: Approved, Accepted with Revision, or Rejected. All comments were recorded, and a master rating sheet was completed. Committee facilitators recorded the committee consensus on the Item Review Rating Sheet. A sample form and rating criteria may be found in Appendix E.

Security was addressed by adhering to a strict set of procedures. Items in binders were distributed for committee review by number and signed for by each member on a daily basis. All attendees, with the exception of PDE staff, were required to sign a confidentiality agreement. All materials not in use at any time were stored in a locked room. Secure materials that did not need to be retained after the meetings were deposited in secure barrels, the contents of which were shredded.

BIAS, FAIRNESS, AND SENSITIVITY REVIEWS IN MAY 2012

Prior to the 2013 field testing, all newly developed test items for science and writing were also submitted to a Bias, Fairness, and Sensitivity Committee for review. This review took place from May 1–3, 2012, for Algebra I, Biology, and Literature. The committee's primary responsibility was to evaluate items with regard to bias, fairness, and sensitivity issues. They also made recommendations for changes or deletion of items in order to remove the potential for issues of bias, fairness, and/or sensitivity. Included in the review were proposed reading passages. An expert, multiethnic committee composed of men and women was trained by a DRC test development lead to review items for bias, fairness, and sensitivity issues. Training materials included a manual developed by DRC (DRC, 2010). Members of the committee also had expertise with special needs students and English Language Learners (ELL). PDE staff members were also trained and participated in the review. All items were read by a cross-section of committee members. Each member noted bias, fairness, and/or sensitivity comments on tracking sheets and on the item, if needed, for clarification. Committee members individually categorized any concerns as related to ageism, disability, ethnicity/culture, gender, region, religion, socioeconomics, or stereotypes. These categories were the framework through which recommendations for modification or rejection of items occurred during the subsequent committee consensus process. The committee discussed each of the issues as a group and came

to consensus as to which decisions should represent the view of the committee. All consensus comments were then compiled, and the suggested actions on these items were recorded and submitted to PDE. This review followed the same security procedures as outlined above, except that the materials were locked up and stored at the DRC offices in Harrisburg. The table below shows the gender and race/ethnicity of the members of the bias committee who reviewed the Keystone items and passages for bias, fairness, and sensitivity.

Table 3–18. Demographic Composition of the 2012 Keystone Bias, Fairness, and Sensitivity Committee

Member #	May 2012	
	Gender	Race/Ethnicity
1.	Male	Caucasian American
2.	Male	African American
3.	Female	African American
4.	Male	Caucasian American
5.	Male	Asian American
6.	Female	Caucasian American
7.	Female	Hispanic American
Totals	4 Male 3 Female	1 Asian American 2 African American 3 Caucasian American 1 Hispanic American

The results from the 2012 Bias, Fairness, and Sensitivity Committee reviews are summarized in the next table.

Table 3–19. Number of Items—Bias, Fairness, and Sensitivity Committee Review

Date	Algebra I			
	Total Reviewed	Accepted As Is	Accepted with Revision	Rejected
May 2012	267	256	11	0
Date	Biology			
	Total Reviewed	Accepted As Is	Accepted with Revision	Rejected
May 2012	20 Scenarios 478 Items	20 Scenarios 478 Items	0 Scenarios 0 Items	0 Scenarios 0 Items
Date	Literature			
	Total Reviewed	Accepted As Is	Accepted with Revision	Rejected
May 2012	25 Passages 369 Items	20 Passages 367 Items	5 Passages 2 Items	0 Passages 0 Items
Date	All Exams			
	Total Reviewed	Accepted As Is	Accepted with Revision	Rejected
May 2012	20 Scenarios 25 Passages 1114 Items	20 Scenarios 20 Passages 1101 Items	5 Passages 13 Items	0 Passages 0 Items

CHAPTER FOUR: UNIVERSAL DESIGN PROCEDURES APPLIED TO THE KEYSTONE EXAMS TEST DEVELOPMENT PROCESS

UNIVERSAL DESIGN

Universally designed assessments allow participation of the widest possible range of students and contribute to valid inferences about participating students. Principles of Universal Design are based on the premise that each child in school is a part of the population to be tested and that testing results should not be affected by disability, gender, race, or English language ability (Thompson, Johnstone, & Thurlow, 2002). At every stage of the item and test development process, procedures were employed to ensure that items and subsequent tests (in both print and online delivery methods) were designed and developed using the elements of universally designed assessments established by the National Center on Educational Outcomes (NCEO).

Federal legislation addresses the need for universally designed assessments. The No Child Left Behind Act (Elementary and Secondary Education Act) requires that each state must "provide for the participation in [statewide] assessments of all students" [Section 1111(b)(3)(C)(ix)(I)]. Both Title I and IDEA regulations call for universally designed assessments that are accessible and valid for all students, including English Language Learners and students with disabilities. The benefits of universally designed assessments not only apply to these groups of students, but to all individuals with wide-ranging characteristics.

DRC's test development team was trained in the elements of Universal Design as they relate to developing large-scale statewide assessments. Team leaders were trained directly by NCEO, and other team members were subsequently trained by team leaders. Committees involved in content review included some members who were familiar with the unique needs of students with disabilities and English Language Learners. Likewise, some members of the Bias, Fairness, and Sensitivity Committee were conversant with these issues. What follows are the Universal Design guidelines that were followed during all stages of the item development process for the Keystone Exams.

ELEMENTS OF UNIVERSALLY DESIGNED ASSESSMENTS

After a review of research relevant to the assessment development process and the Principles of Universal Design (Connell et al., 1997), NCEO has produced seven elements of Universal Design as they apply to assessments (Thompson, Johnstone, & Thurlow, 2002). These elements served to guide item development for the Keystone Exams.

- **Inclusive Assessment Population**

  The target population includes students attending Commonwealth schools who participate in one or more of the graduation competency exams.

- **Precisely Defined Constructs**

  An important function of well-designed assessments is that the assessments actually measure what they are intended to measure. The Keystone Exams Assessment Anchor Content Standards (Assessment Anchors) provided clear descriptions of the constructs to be measured on each of the exams. Universally designed assessments must remove all non-construct-oriented cognitive, sensory, emotional, and physical barriers.

- **Accessible, Nonbiased Items**

  DRC conducted both internal and external reviews of items and test specifications to ensure that they did not create barriers due to lack of sensitivity to disability, culture, or other subgroups. Items and test specifications were developed by a team who understood the varied characteristics of items that might create difficulties for any group of students. Accessibility is incorporated as a primary dimension of test specifications, so accessibility was woven into the fabric of the test rather than being added after the fact.

- **Amenable to Accommodations**

  Even though items on universally designed assessments are accessible for most students, there are some students who continue to need accommodations. This essential element of a universally designed assessment requires that the exam is compatible with accommodations and a variety of widely used adaptive equipment and assistive technology (see also the section on Assessment Accommodations later in this chapter).

- **Simple, Clear, and Intuitive Instructions and Procedures**

  Assessment instructions should be easy to understand regardless of a student's experience, knowledge, language skills, or current concentration level. Questions that are posed using complex language can invalidate the test if students cannot understand how they are expected to respond to a question. To meet this guideline, directions and questions were prepared in simple, clear, and understandable language that underwent multiple reviews.

- **Maximum Readability and Comprehensibility**

  A variety of guidelines exist to ensure the maximum readability and comprehensibility of a test. These features go beyond what is measured by readability formulas. Readability and comprehensibility are affected by many factors, including student background, sentence difficulty, and text organization. All of these features were considered as item text was developed.

  Plain language is a concept now being highlighted in research on assessments. Plain language has been defined as language that is straightforward and concise. The following strategies for editing text to produce plain language were used during the editing process of the new Keystone Exam items:

  - Reduction of excessive length
  - Use of common words
  - Avoidance of ambiguous words
  - Avoidance of irregularly spelled words
  - Avoidance of proper names
  - Avoidance of inconsistent naming and graphic conventions
  - Avoidance of unclear signals about directing attention

- **Maximum Legibility**

  Legibility is the physical appearance of text, the way that the shapes of letters and numbers enable people to read text easily. Bias can result when tests contain physical features that interfere with a student's focus on or understanding of the constructs that test items are assessing. A style guide was developed and utilized that included dimensions of style consistent with Universal Design.

GUIDELINES FOR UNIVERSALLY DESIGNED ITEMS

All test items written and reviewed adhered closely to the following guidelines for Universal Design. Item writers and reviewers used a checklist during the item development process to ensure that each aspect was followed. For more information on the checklist, see the Universal Design section in Chapter Three of this report.

1. **Items measure what they are intended to measure.** Item writing training included making certain that writers and reviewers had a clear understanding of Pennsylvania's Academic Standards and the Keystone Assessment Anchors. During all phases of test development, items were presented with content-standard information to ensure that each item reflected the intended Assessment Anchor. Careful consideration of the content standards was important in determining which skills involved in responding to an item were extraneous and which were relevant. With certain types of items an additional skill was necessary, such as the Algebra I test, which requires the student to read.
2. **Items respect the diversity of the assessment population.** To develop items that avoid content that might unfairly advantage or disadvantage any student subgroup, item writers, test developers, and reviewers were trained to write and review items to avoid issues of bias, fairness, and sensitivity. Training also included an awareness of and sensitivity to issues of cultural and regional diversity.
3. **Items have a clear format for text.** Decisions about how items were presented to students must allow for maximum readability for all students. Appropriate fonts and point sizes were employed with minimal use of italics, which are far less legible and are read considerably more slowly than standard typeface. Captions, keys, and legends were at least a 12-point size, while footnotes and sentence numbers use a 10-point font.[1] Legibility was enhanced by sufficient spacing between letters, words, and lines. Blank space was used around paragraphs and between columns and staggered right margins.
4. **Stimuli and items have clear pictures and graphics.** When pictures and graphics were used, they were designed to provide essential information in a clear and uncluttered manner. Illustrations were placed directly next to the information to which they referred, and labels were used when possible. Sufficient contrast between the background and text, with minimal use of shading, increased readability for students with visual impairments. Color was not used to convey important information.

[1] While font size follows specific requirements during online setup of an exam, the screen resolution used at the local level can impact whether the effective font size is visible to the student.

5. **Items have concise and readable text.** Linguistic demands of stimuli and items can interfere with a student's ability to demonstrate knowledge of the construct being assessed. During item writing and review, the following guidelines were used:
    - Simple, clear, commonly used words were used whenever possible.
    - Extraneous text was omitted.
    - Vocabulary and sentence complexity were appropriate for the grade level being assessed.
    - Technical terms and abbreviations were used only if they were related to the content being measured.
    - Definitions and examples were clear and understandable.
    - Idioms were avoided unless idiomatic speech was being assessed.
    - Questions to be answered were clearly identifiable.
6. **Items allow changes to format without changing meaning or difficulty.** A Braille version was available for each operational exam. Attention was given to using items that allow for Braille. Specific accommodations were permitted, such as signing to a student, the use of oral presentation under specified conditions, and the use of various assistive technologies. A Spanish version of the Algebra I and Biology exams was available for use by English Language Learners who would benefit from this accommodation and who were in US schools for less than three years.
7. **The test has an overall appearance that is clean and organized.** Information was organized in a left-right, top-bottom format. Images, pictures, and text that may not be necessary (e.g., sidebars, overlays, callout boxes, shading, visual crowding caused by excess information) and that could be potentially distracting to students were avoided. Also avoided were purely decorative features that did not serve a purpose.

ITEM DEVELOPMENT

DRC and WestEd worked closely with the Pennsylvania Department of Education to ensure that the Keystone Exams complied with nationally recognized principles of Universal Design. The implementation of accommodations on large-scale statewide assessments for students with disabilities was supported in the development of the Keystone Exams. In addition to the principles of Universal Design as described in the Pennsylvania Technical Report, DRC and WestEd applied to each exam the standards for test accessibility as described in *Tests Access: Making Tests Accessible for Students with Visual Impairments—A Guide for Test Publishers, Test Developers, and State Assessment Personnel* (Allman, 2004).

To this end, DRC and WestEd embrace the following precepts:

- Test directions are worded to allow for alternate responses to constructed-response items.
- During item and bias reviews, committee members are made aware of the Principles of Universal Design and of issues that may adversely affect students with disabilities. The goal is to make certain that the Keystone Exams are bias free for all students.

- With the goal of ensuring that the Keystone Exams are accessible to the widest range of diverse student populations, PDE instructs DRC and WestEd to limit item types that are difficult to format in Braille and that may become distorted when published in large print. DRC and WestEd are instructed to limit the following on the Keystone Exams.
    - Algebra I: Complicated tessellations; charts or graphs that extend beyond one page
    - Literature: Graphics and illustrations that are not germane to the content presented
    - All exams: Unnecessary boxes and framing of text, unless enclosing the text provides necessary context for the student; use of italics (limited to only when it is absolutely necessary, such as with variables)

ITEM FORMAT

For all Keystone Exams (both online and print), DRC formats the items to maximize accessibility for all students by using text that is in an easily readable size and font style. DRC limits shading, graphics, charts, and the number of items per page so that there is sufficient white space on each page. Whenever possible, DRC ensures that graphics, pictures, diagrams, charts, and tables are positioned on the page with the associated test items. DRC uses high contrast for text and background when possible to convey pertinent information. Tests are published on dull-finish paper to avoid the glare encountered on glossy paper. DRC pays close attention to the binding of the exam books to ensure that they lie flat for two-page viewing and ease of reading and handling.

DRC ensures consistency across Keystone Exams by following these Principles of Universal Design:

- High contrast and clarity is used to convey detailed information.
- Typically, shading is avoided; when necessary for content purposes, 10-percent screens are used as the standard.
- Overlaid print on diagrams, charts, and graphs is avoided.
- Charts, graphs, diagrams, and tables are clearly labeled with titles and with short descriptions when applicable.
- Only relevant information is included in diagrams, pictures, and graphics.
- Symbols used in keys and legends are meaningful and provide reasonable representations of the topics they depict.
- Pictures that require physical measurement are true to size.

ASSESSMENT ACCOMMODATIONS

While universally designed assessments provide for participation of the widest range of students, many students require accommodations in order to participate in the regular assessment. Clearly, the intent of providing accommodations for students is to make certain that students are not unfairly disadvantaged during testing and that the accommodations used during instruction, if appropriate, are made available as students take the test. The literature related to assessment accommodations is still evolving and often focuses on state policies regulating accommodations rather than on providing empirical data that supports the reliability and validity of the use of accommodations. On a yearly basis, the Pennsylvania Department of Education examines accommodations policies and current research to ensure that valid, acceptable accommodations are available for students. Three accommodations manuals for Pennsylvania assessments titled *Accommodations Guidelines for Students with IEPs and Students with 504 Plans, Accommodations Guidelines for Students without IEPs and 504 Plans*, and *Accommodations Guidelines for English Language Learners* were developed for use with the Keystone Exams. The manuals can be accessed by going to www.pdesas.org/Assessment/Keystone and selecting the corresponding document under the Test Accommodations section.

In addition, Spanish-language versions, translated from the original English versions, were made available for both the Algebra I Exam and the Biology Exam. The Spanish-translation editions of the exams are discussed in Chapter Six.

CHAPTER FIVE: FIELD TEST LEADING TO THE SPRING 2013 CORE

FIELD TEST OVERVIEW

All core items appearing on the Spring 2013 Pennsylvania Keystone Exams came from the field test (nonlinking) items on the Spring 2011 Keystone Exams. The purpose of administering field test items is to obtain statistics for them so they can be reviewed before becoming operational (core). Based on this statistical review, many of the field test items appearing in the Spring 2011 Keystone Exams were selected for use as common (core) items in the 2013 Keystone Exams.

The overall Keystone Exams Field Test Plan uses a given spring administration to augment the pool of items available for use in core positions in the subsequent administration cycle starting with the next spring administration. Each spring field test is designed to yield up to three cores' worth of items to fill the core administrations of the subsequent spring, summer, and winter cores. Once the biennial core-to-core overlap comes into effect, the number of field test items scheduled to be administered decreases by a reciprocal amount.

Table 5–1. General Pattern Showing Path from Field Test to Core and to Core-to-Core Overlap for a Given Keystone Exam

Field Test Administration	Initial Core Use			Core-to-Core Overlap Use		
	Spring	Summer	Winter	Spring	Summer	Winter
Spring Year X	X+1	X+1	X+2	X+3	X+3	X+4
Spring Year X+1	X+2	X+2	X+3	X+4	X+4	X+5
Spring Year X+2	X+3	X+3	X+4	X+5	X+5	X+6

See Chapter Three (concerning the test definitions for the individual Keystone Exams) for more details about the number of embedded field test (EFT) items appearing in a Keystone Exam within a typical operational form setting.

SPRING 2011 KEYSTONE EXAMS EMBEDDED FIELD TEST

For 2011, the embedded field test (in spring) was designed to yield enough items to construct the following operational forms: spring 2013, summer 2013, winter 2013/2014, and a possible breach form for 2013/2014. In addition, the 2011 spring test included items selected for use on the 2012/2013 winter operational core. These items were embedded as additional field test items in the spring 2011 administration. The next tables describe the embedded field test plans for the Keystone Exams in the spring of 2011.

SPRING 2011 ALGEBRA I KEYSTONE EXAM EMBEDDED FIELD TEST PLAN

The Spring 2011 Algebra I Keystone Exam was composed of 24 forms. All of the forms contained common items that were identical for all students and sets of generally unique items. The following two tables display the design for Algebra I for forms 1 through 24. The column entries for these tables denote the following:

- Number of unique common, or core, MC items
- Number of unique common, or core, CR items
- Number of embedded MC field test items
- Number of embedded CR field test items
- Total number of MC and CR items in the form

Table 5–2. Algebra I Test Plan (Spring 2011) per Operational Form

	Module	Core per Form		Field Test per Form		Total per Form	
		MC Items	CR Items	MC Items	CR Items	Core & FT MC Items	Core & FT CR Items
Algebra I	1	18	3	5	1	23	4
	2	18	3	5	1	23	4
	Total	36	6	10	2	46	8

Table 5–3. Algebra I Test Plan (Spring 2011) per 24 Operational Forms

	Module	Core per 24 Forms		Field Test per 24 Forms		Total per 24 Forms	
		MC Items	CR Items	MC Items	CR Items	Core & FT MC Items	Core & FT CR Items
Algebra I	1	18	3	120	24	276	54
	2	18	3	120	24		
	Total	36	6	240	48		

SPRING 2011 BIOLOGY KEYSTONE EXAM EMBEDDED FIELD TEST PLAN

The Spring 2011 Biology Keystone Exam was composed of 28 forms. All of the forms contained common items that were identical for all students and sets of generally unique items. The following two tables display the design for Biology for forms 1 through 28. The column entries for these tables denote the following:

- Number of unique common, or core, MC items
- Number of unique common, or core, CR items
- Number of embedded MC field test items
- Number of embedded CR field test items
- Total number of MC and CR items in the form

Table 5–4. Biology Test Plan (Spring 2011) per Operational Form

	Module	Core per Form		Field Test per Form		Total per Form	
		MC Items	CR Items	MC Items	CR Items	Core & FT MC Items	Core & FT CR Items
Biology	1	24	3	8	1	32	4
	2	24	3	8	1	32	4
	Total	48	6	16	2	64	8

Table 5–5. Biology Test Plan (Spring 2011) per 28 Operational Forms

	Module	Core per 28 Forms		Field Test per 28 Forms		Total per 28 Forms	
		MC Items	CR Items	MC Items	CR Items	Core & FT MC Items	Core & FT CR Items
Biology	1	24	3	224	28	496	62
	2	24	3	224	28		
	Total	48	6	448	56		

SPRING 2011 LITERATURE KEYSTONE EXAM EMBEDDED FIELD TEST PLAN

The Spring 2011 Literature Keystone Exam was composed of 24 forms. All of the forms contained common items that were identical for all students and sets of generally unique items. The following two tables display the design for Literature for forms 1 through 24. The column entries for these tables denote the following:

- Number of unique common, or core, passages
- Number of unique common, or core, MC items
- Number of unique common, or core, CR items
- Number of embedded field test passages
- Number of embedded MC field test items
- Number of embedded CR field test items
- Total number of passages, MC items, and CR items in the form

Table 5–6. Literature Test Plan (Spring 2011) per Operational Form

	Module	Core per Form			Field Test per Form			Total per Form		
		Passages	MC Items	CR Items	Passages	MC Items	CR Items	Core & FT Passages	Core & FT MC Items	Core & FT CR Items
Literature	1	2	17	3	1	6	1	3	23	4
	2	2	17	3	1	6	1	3	23	4
	Total	4	34	6	2	12	2	6	46	8

Table 5–7. Literature Test Plan (Spring 2011) per 24 Operational Forms

	Module	Core per 24 Forms			Field Test per 24 Forms			Total per 24 Forms		
		Passages	MC Items	CR Items	Passages	MC Items	CR Items	Core & FT Passages	Core & FT MC Items	Core & FT CR Items
Literature	1	2	17	3	12	144	24	28	322	54
	2	2	17	3	12	144	24			
	Total	4	34	6	24	288	48			

STATISTICAL ANALYSES AND RESULTS

All field test items were analyzed statistically following conventional item analysis methods. For MC items, traditional, or classical, item statistics included the corrected point-biserial correlation (Pt. Bis.) for the correct and incorrect responses (distractors), the percent correct (*p*-value), and the percentage selecting incorrect responses. For CR items, the statistical indices included the item-total test correlation, the point-biserial correlation for each score category or level, the percentage in each score category, and the percentage of non-scorable responses.

In general, more-capable students are expected to respond correctly to easy items and less-capable students are expected to respond incorrectly to difficult items. If either of these situations does not occur, the item will be reviewed by DRC test development staff and committees of Pennsylvania educators to determine the nature of the problem and the characteristics of the students affected. The primary way of detecting such conditions is through the point-biserial correlation coefficient for MC items and the item-total correlation for CR items. In each case the statistic will be positive if the total-test mean score is higher for the students who respond correctly to MC items (or attain a higher CR item score) and negative when the reverse is true. A detailed explanation of item statistics based on the classical test theory (CTT) can be found in Chapter Eleven.

DIFFERENTIAL ITEM FUNCTIONING

The differential item functioning (DIF) analysis was also conducted on all the field test items. Differential item functioning occurs when examinees with the same ability level but different group memberships do not have the same probability of answering an item correctly. This pattern of results may suggest the presence of item bias. As a statistical concept, however, DIF can be differentiated from item bias, which is a content issue that can arise when an item presents negative group stereotypes, uses language that is more familiar to one subpopulation than to another, or is presented in a format that disadvantages certain learning styles. While the source of item bias is often plain to trained judges, DIF may have no clear cause. However, studying how DIF arises and how it presents itself can help to detect and correct for it.

DIF DETECTION PROCEDURES

For MC items, the Mantel-Haenszel (MH) procedure (Mantel & Haenszel, 1959) for detecting DIF is a commonly used technique in educational testing. It does not depend on the application or the fit of any specific measurement model. However, it does have significant philosophical overlap with the Rasch model since it uses a test's total score to organize the analysis.

The procedure as implemented by DRC contrasts a focal group with a reference group. While it makes no practical difference in the analysis which group is defined as the focal group, the group most apt to be disadvantaged by a biased measurement is typically defined as the focal group. In these analyses, the focal group was female for gender-based DIF, black and Hispanic for ethnicity-based DIF, computer-based-test (CBT) group for the test administration mode-based DIF; reference groups were male, white, and paper-and-pencil test (PPT) group respectively. The MH statistic for each item is computed from a contingency table. It has two groups (focal and reference) and two outcomes (right or wrong). The ability groups are defined by the test's score distribution for the total examinee populations.

The basic MH statistic is a single degree of freedom chi-square that compares the observed number in each cell to the expected number. The expected counts are computed to ensure that the analysis is not confounded with differences in the achievement level of the two groups.

For CR items, a comparable statistic is computed based on the standardized mean difference (SMD) (Dorans, Schmitt, & Bleistein, 1992), computed as the differences in mean scores for the focal and reference groups if both groups had the same score distribution.

To assist the review committees in interpreting the analyses, the items are assigned a severity code based on the magnitude of the MH statistic (Zwick & Erickan, 1989) and the effect size for the SMD. Items classified as A+ or A- have little or no statistical indication of DIF. Items classified as B+ or B- have some indication of DIF but are acceptable for future use. Items classified as C+ or C- have strong evidence of DIF and should be reviewed and possibly rejected from the eligible item pool. The plus sign indicates that the item favors the focal group and a minus sign indicates that the item favors the reference group.

LIMITATIONS OF STATISTICAL DETECTION

No statistical procedure should be used as a substitute for rigorous, hands-on reviews by content and bias specialists. The statistical results can help organize the review so the effort is concentrated on the most problematic cases. Further, no items should be automatically rejected simply because a statistical method flagged them or accepted because they were not flagged.

Statistical detection of DIF is an inexact science. There have been a variety of methods proposed for detecting DIF, but no one statistic can be considered either necessary or sufficient. Different methods are more or less successful depending on the situation. No analysis can guarantee that a test is free of bias, but almost any thoughtful analysis will uncover the most flagrant problems.

A fundamental shortcoming of all statistical methods used in DIF evaluation is that all are intrinsic to the test being evaluated. If a test is unbiased overall but contains one or two DIF items, any method will locate the problems. If, however, all items on the test show consistent DIF to the disadvantage of a given subpopulation, a statistical analysis of the items will not be able to separate DIF effects from true differences in achievement.

CRITERIA USED TO FLAG ITEMS

Item statistics are used as a means of detecting items that deserve closer scrutiny rather than as a mechanism for automatic retention or rejection. Toward this end, a set of criteria was used as a screening tool to identify items needing a closer review by committees of Pennsylvania educators.

For all the items, if it had a gender (male vs. female), ethnicity (white vs. black or Hispanic), and/or test administration mode (PPT vs. CBT) DIF code of C+ or C-, it was flagged.

For an MC item to be flagged, the following four additional criteria were also used:

1. Point-biserial correlation for the correct response of less than 0.25
2. Point-biserial correlation for any incorrect response greater than 0.0
3. Percent correct less than 0.3 or greater than 0.9
4. Percentage responding to any incorrect responses greater than the percent correct

For a CR item to be flagged, the following criterion was used in addition to the DIF criteria:

5. Score proportion less than 0.05

The intent of the above criteria is to flag everything that should be reviewed. For this purpose, the preference is to over-identify rather than under-identify the outliers. Any of these flags should cause the item to be reviewed by content experts, but there are many reasons the experts might want to keep an item in spite of the statistics.

RESULTS AND OBSERVATIONS

Details of the samples used for the Spring 2011 field test item analysis can be found in Chapter 9 of the *2011 Pennsylvania Keystone Exams Technical Report* (Pennsylvania Department of Education, 2011). Overall, the samples used to analyze the field test items embedded in 24 forms were equivalent, so the classical statistics for all the field test items across forms can be compared.

This section focuses on reporting the number (*N*) and percentage (%) of items flagged by different criteria (see Tables 5–8 to 5–10). For the DIF analysis, the number and percentage of items were provided not only for the C- and C+ bias codes, which were used as the criteria to flag items, but also for the bias codes A-, A+, B-, and B+.

Table 5–8. Summary of Items Flagged by the CTT-Based Statistics

Item Type	Flagging Criterion*	Algebra I			Biology			Literature		
		Total *N*	*N*	%	Total *N*	*N*	%	Total *N*	*N*	%
MC	1	240	86	35.8	448	180	40.2	288	64	22.2
	2		61	25.4		143	31.9		42	14.6
	3		42	17.5		82	18.3		13	4.5
	4		59	24.6		105	23.4		19	6.6
CR	5	48	28	58.3	56	33	58.9	48	7	14.6

* See Section Criteria Used to Flag Items for what 1–5 stands for.

Table 5–9. DIF Summary — MC Items

Reference Group	Focal Group	Bias Code	Algebra I (Total *N*=240)		Biology (Total *N*=448)		Literature (Total *N*=288)	
			N	**%**	***N***	**%**	***N***	**%**
Male	Female	A–	116	48.3	246	54.9	116	40.3
		A+	116	48.3	184	41.1	153	53.1
		B–	7	2.9	8	1.8	4	1.4
		B+	0	0.0	9	2.0	8	2.8
		C–	1	0.4	1	0.2	3	1.0
		C+	0	0.0	0	0.0	4	1.4
White	Black	A–	137	57.1	257	57.4	165	57.3
		A+	98	40.8	167	37.3	91	31.6
		B–	4	1.7	19	4.2	29	10.1
		B+	0	0.0	5	1.1	1	0.3
		C–	1	0.4	0	0.0	2	0.7
		C+	0	0.0	0	0.0	0	0.0
PPT	CBT	A–	81	33.8	207	46.2	108	37.5
		A+	157	65.4	229	51.1	167	58.0
		B–	0	0.0	7	1.6	4	1.4
		B+	2	0.8	5	1.1	7	2.4
		C–	0	0.0	0	0.0	1	0.3
		C+	0	0.0	0	0.0	1	0.3

Table 5–10. DIF Summary — CR Items

Reference Group	Focal Group	Bias Code	Algebra I (Total *N*=48)		Biology (Total *N*=56)		Literature (Total *N*=48)	
			N	**%**	***N***	**%**	***N***	**%**
Male	Female	A–	22	45.8	20	35.7	0	0.0
		A+	24	50.0	30	53.6	11	22.9
		B–	0	0.0	0	0.0	0	0.0
		B+	2	4.2	6	10.7	13	27.1
		C–	0	0.0	0	0.0	0	0.0
		C+	0	0.0	0	0.0	24	50.0
White	Black	A–	32	66.7	31	55.4	34	70.8
		A+	10	20.8	11	19.6	11	22.9
		B–	3	6.3	9	16.1	2	4.2
		B+	0	0.0	0	0.0	0	0.0
		C–	3	6.3	5	8.9	1	2.1
		C+	0	0.0	0	0.0	0	0.0
PPT	CBT	A–	35	72.9	29	51.8	30	62.5
		A+	10	20.8	24	42.9	16	33.3
		B–	3	6.3	2	3.6	2	4.2
		B+	0	0.0	1	1.8	0	0.0
		C–	0	0.0	0	0.0	0	0.0
		C+	0	0.0	0	0.0	0	0.0

REVIEW OF ITEMS WITH DATA

In the preceding section on statistical analysis of item data, it was stated that content-area test development specialists used certain statistics from item and DIF analyses of the spring 2011 embedded field test to identify items for further review. Specific flagging criteria for this purpose were specified in the previous section. Items not identified for this review were those that had good statistical characteristics and, consequently, were regarded as statistically acceptable. Likewise, items of extremely poor statistical quality were regarded as unacceptable and needed no further review. However, there were some items that DRC content-area test development specialists and DRC psychometric specialists regarded as needing further review by a committee of Pennsylvania educators. The intent was to capture all items that needed a closer look; thus, the criteria employed tended to overidentify rather than under-identify items.

The review of the items with data was conducted by more than 34 Pennsylvania educators (teachers and PDE staff) broken out into exam-based committees. The review took place on February 14 and 15, 2012. In these sessions, committee members were first trained by a representative from DRC's psychometrics staff with regard to the statistical indices used in item evaluation. This training was followed by a discussion with examples concerning reasons an item might be retained regardless of the statistics. The committee review process involved a brief exploration of possible reasons for the statistical profile of an item (e.g., possible bias, grade appropriateness, instructional issues) and a decision regarding acceptance. DRC content-area test development specialists facilitated the review of the items. Each committee reviewed the pool of flagged field test items and made recommendations on each item. The results of the committee reviews are show in the table below. Further discussion on how this information was used is covered in Chapter Six.

Table 5–11. Spring 2011 Keystone Exam Data Review Results

Exam	Type	Number of Items in Spring 2011 EFT	Flagged Items in Spring 2011 EFT Examined at Feb 2012 Data Review Committee		Flagged Items in Spring 2011 EFT Rejected by Feb 2012 Data Review Committee		Items Classified as "Rejected" from Spring 2011 EFT (all sources)*	
			Number of Items	% of Field Test	Number of Items	% of Field Test	Number of Items	% of Field Test
Algebra I	MC	240	98	40.8%	31	12.9%	38	15.8%
	CR	48	29	60.4%	19	39.6%	22	45.8%
Biology	MC	448	202	45.1%	50	11.2%	66	14.7%
	CR	56	37	66.1%	9	16.1%	11	19.6%
Literature	MC	281	74	26.3%	5	1.8%	15	5.3%
	CR	48	30**	62.5%	7	14.6%	7	14.6%
Subtotal	MC	969	374	38.6%	86	8.9%	119	12.3%
	CR	152	96	63.2%	35	23.0%	40	26.3%
	Total	1121	470	41.9%	121	10.8%	159	14.2%

*Data Review Committee, PDE, and DRC
**All CRs were presented at data review.

CHAPTER SIX: OPERATIONAL FORMS CONSTRUCTION FOR 2013 ADMINISTRATIONS

FINAL SELECTION OF ITEMS AND KEYSTONE FORMS CONSTRUCTION

The winter 2012/2013 item selections emerged from the fall 2010 field test and/or spring 2011 embedded field test, while the spring and summer 2013 operational forms emerged from the spring 2011 embedded field test forms. Prior to being placed on the operational tests, these items had undergone multiple reviews, including the following:

- Reviews by Data Recognition Corporation (DRC) and WestEd content-area test development specialists and curriculum specialists to ensure that all items were properly aligned with content standards
- Formal bias, fairness, and sensitivity review by the Bias, Fairness, and Sensitivity Committee, which consisted of a multiethnic group of men and women having expertise with special-needs students and English Language Learners (ELL)
- Formal review by the content committees consisting of Pennsylvania educators, including teachers as well as district personnel
- Pennsylvania Department of Education (PDE) review
- Item data review by members of the PDE subject-area teacher committees

The item and bias reviews are detailed in Chapter Three. The results of the data review are summarized in Chapter Five.

The end product of the above process was an item status designation for each field test item. All items having an item status code of Accepted/Operational Ready were candidates to be selected for the 2013 Keystone Exams. To have an item status code of Accepted/Operational Ready meant that the item met the following criteria:

- Appropriately aligned with its designated Keystone Assessment Anchor Content Standard (Assessment Anchor) and subclassifications
- Acceptable in terms of bias/fairness/sensitivity issues, including differential item functioning (for gender and ethnicity)
- Acceptable in terms of psychometric standards, including a special review of flagged items

Next, all relevant information regarding the acceptable items, including associated graphics, was entered into the item banking system known as IDEAS (Item Development and Education Assessment System). From IDEAS and other database sources, Microsoft Excel files were created for each exam. These files contained all relevant content codes and statistical characteristics. IDEAS also created an item card displaying each acceptable item, any associated graphic, and all relevant exam codes and item statistics for use by the subject-area test development specialists and psychometric services staff.

DRC test development specialists reviewed the test design blueprint, including the number of items per strand for each content-area test. Psychometricians provided content-area test development specialists with an overview of the psychometric guidelines for forms construction.

Senior DRC content-area test development specialists reviewed all items in the operational pool to make an initial selection (pull) for common (core) positions according to test blueprint requirements and psychometric guidelines. Changes to items were not encouraged since alterations could affect how an item performs in subsequent testing.

For these common items, this meant that the combination of multiple-choice (MC) and constructed-response (CR) items would yield the appropriate range of points while tapping an appropriate variety of the Assessment Anchors and related Eligible Content within each Reporting Category (module). Items selected in the first round were examined with regard to how well they fit together as a set. Of particular concern were the following:

- One item providing cues as to the correct answer to another item
- Context redundancy (e.g., mathematics items with a sports context)
- Presence of clang (distractors not unique from one another)
- Diversity of names and artwork for gender and ethnicity

A core-building software tool known as PerForm was used in concert with performance data and metadata from IDEAS to aid in the organization and communication of the pulled data. PerForm automatically tabulates the statistical characteristics of the proposed core, updating instantly whenever item swaps were performed. Using PerForm, the first round of items was then evaluated for statistical features such as an acceptable point-biserial correlation and whether correct answers were distributed equally—that is, whether approximately 25 percent of correct answers appeared in each of the four possible positions (A, B, C, or D). Selected items that were deemed psychometrically less advantageous in contrast to the overall psychometric characteristics of the core resulted in a search by the senior reviewer for suitable replacements. At this point, the second round of items was analyzed. If necessary, this iterative process between content-based selections and statistical properties continued in an effort to reach the best possible balance.

Once the recommendations were finalized for the core items, they were submitted to PDE for review. Department staff provided feedback, which could be in the form of approval or recommendations for replacing certain items. Any item replacement was accomplished by the collective effort of the test development specialists, psychometricians, and PDE staff until final PDE approval was given. See Appendix F for the Keystone Exams Tally Sheets.

Following final approval by PDE, test development specialists developed print and online forms based on the approved core and approved embedded field test items. Both modes of delivery were built using IDEAS. Highly skilled test development specialists and editors used specialized checklists to verify accuracy of layout and formatting in both modes of delivery. Following final approval to print, the documents were prepared for the printing presses. See Chapter 8 for more information about the steps following the final approval to print.

SPECIAL FORMS USED WITH THE OPERATIONAL 2013 KEYSTONE EXAMS

Four accommodated forms are available for the operational Keystone Exams: audio, Braille, large print, and Spanish translation. Audio versions and Spanish versions are available for Algebra I and Biology. Braille and large print are available for all operational exams. Braille, large print, and Spanish translation versions are available in the print mode of delivery. The audio version is only available in the online mode of delivery. The tables below summarize the usage for these four accommodated forms. Refer to the information about test accommodations in Chapter 10 for more information about this topic.

Table 6–1. Special Forms Usage Summary from Operational Spring 2013 Keystone Exams

Exam	Online Delivery	Print Form Delivery			All
	Audio	Braille	Large Print	Spanish	
Algebra I	854	10	84	937	1885
Biology	731	7	60	499	1297
Literature		6	56		62
Total	1585	23	200	1436	3244
Total Administrations by Delivery Method	79,420 (Online)	496,618 (Print)			576,238 (Online & Print)
% of Total Administrations by Delivery Method	1.996%	0.005%	0.040%	0.289%	0.563%

Table 6–2. Special Forms Usage Summary from Operational Winter 2012/2013 Keystone Exams

Exam	Online Delivery	Print Form Delivery			All
	Audio	Braille	Large Print	Spanish	
Algebra I	365	11	55	533	964
Biology	481	8	44	407	940
Literature		9	39		48
Total	846	28	138	940	1952
Total Administrations by Delivery Method	64,902 (Online)	434,296 (Print)			499,198 (Print & Online
% of Total Administrations by Delivery Method	1.304%	0.006%	0.032%	0.216%	0.391%

Table 6–3. Special Forms Usage Summary from Operational Summer 2013 Keystone Exams

Exam	Online Delivery	Print Form Delivery			All
	Audio	Braille	Large Print	Spanish	
Algebra I	8	0	0	N/A	8
Biology	6	1	0	N/A	7
Literature		0	0		0
Total	14	1	0	N/A	15
Total Administrations by Delivery Method	1062 (Online)	2880 (Print)			3942 (Online & Print)
% of Total Administrations by Delivery Method	1.318%	0.035%	0.000%	N/A	0.381%

On a yearly basis, the PDE examines accommodations policies and current research to ensure that valid, acceptable accommodations are available for students. Three accommodations manuals for Pennsylvania assessments titled *Accommodations Guidelines for Students with IEPs and Students with 504 Plans, Accommodations Guidelines for Students without IEPs or 504 Plans*, and *Accommodations Guidelines for English Language Learners* were developed for use with the Keystone Exams. The manuals can be accessed by going to www.pdesas.org/Assessment/Keystone and selecting the corresponding document under the Test Accommodations section. For more information about the general on-screen testing aids available to students taking the online mode of delivery, see Chapter Two.

AUDIO

For students requiring an auditory presentation accommodation, a text-to-speech synthesizer is available to students taking the Algebra I and/or Biology Exams using the online mode of test delivery. For each operational exam, one form was selected for the creation of the audio version. Special scripts are crafted, writing out each item, distractor, graphic, and directions to utilize the rich, synthesized voice features while accounting for specific nuances of the intended sounds. The resulting audio information is provided to students receiving the accommodation. Since additional software is required to generate the vocalization from the scripted text and since headphones are required to minimize disruptions within a computer lab setting, local school personnel generally must preplan to use the audio version in order to ensure that the student has a properly equipped computer and a proper setting.

BRAILLE AND LARGE PRINT

Students with visual impairments were able to respond to test materials that were available in either Braille or large print. For each operational exam, one form was selected for the creation of a Braille and a large print edition. School district personnel ordered Braille or large print assessment materials directly from DRC. They could also contact PaTTAN for technical assistance regarding students with visual impairments.

School personnel were directed to transcribe all student answers (MC and CR) into scannable answer documents exactly as the student responded. No alterations or corrections of student work were permitted, and the transcribed answer document had to have the same form designation as the Braille and large print version.

SPANISH TRANSLATION

Starting with the operational exams in spring 2011, school personnel had the option of allowing Spanish-speaking students who had been enrolled in schools in the United States for less than three years to respond to a Spanish version of the Keystone Exams for Algebra I and Biology. The original translation of the items and the *Directions for Administration Manual* was initiated by Language Services Associates and completed/verified by Exact Communications. These companies use translators with varying cultural and regional backgrounds to create the Spanish versions. The translations were then reviewed and verified by DRC's internal Spanish group. As part of the internal review, a Spanish style guide is maintained to document Spanish word choice from administration-to-administration and across exams within an administration.

Following PDE's approval of the translation, the translated text was typeset into print delivery forms. The test book is constructed with a side-by-side format with the English text and Spanish-translated text on facing pages. The Spanish-translated text is on the left-hand side followed by the original English text on the right-hand (facing) side. Each CR item covered either two or four pages in the answer book, depending on the length of the original English-language item. In the case of four-page open-ended items, the first set of facing pages of an item was presented in Spanish. The second set of facing pages of an item was presented in the original English.

Those students using this accommodated version are permitted to write their answers on either the English language pages or on the translated Spanish language pages. Their answers can be written in English, Spanish, or a combination of both Spanish and English because all pages are evaluated and scored, and the highest possible scores from those combinations are recorded for the students.

CHAPTER SEVEN: TEST ADMINISTRATION PROCEDURES

SECTIONS, SESSIONS, TIMING, AND LAYOUT OF THE KEYSTONE EXAMS

The design for most Keystone Exams utilizes separate test books and answer books. An answer book is used to respond to the multiple-choice (MC) and constructed-response (CR) items and to collect demographic information. The MC items and all stimulus text are placed within the test book. One exam uses a single consumable book. When a single scannable answer book is utilized, the contents of the answer book and the test book are combined into one integrated book. The table below identifies the exam material format for each 2013 Keystone Exam.

Table 7–1. Book Type by Exam

Exam	Test Book	Answer Book	Single Consumable Book
Algebra I	✓	✓	
Biology	✓	✓	
Literature	✓	✓	

Generally, a separate test book and answer book are used to separate the MC items and the CR items. For passage-based exams, like Literature, the separate exam materials allow the students to reference stimulus materials at the same time that a response to a CR item is composed. In addition, since all student responses must be scanned for scoring and storage purposes, a separate answer book limits the volume of data that must be stored.

SECTIONS AND SESSIONS

Each operational Keystone Exam is organized around two equally sized test modules; the focus of each is on two or more specific, thematically linked Assessment Anchors and Eligible Content. The content in each module remains separate, and items measuring the Eligible Content in a module appear only in that module. The module design is identical in the print (paper/pencil) and online modes of delivery.

Each exam section is administered in an exam session. Local districts must schedule the two modules as two separate exam sessions (morning and afternoon or two separate days), and an individual module must be completed in one exam session.

Each test session is to be completed within a prescribed testing window. The testing windows below reflect both online and paper/pencil administrations in the 2012–2013 school year. The testing windows also include all make-up testing. Schools were able to choose one of the two testing windows (“waves”) for the winter administration. Two windows were provided to accommodate different semester end dates for schools with block scheduling.

Table 7–2. Winter 2012/2013 Operational Keystone Exam Testing Windows

Exam	Wave 1 Dates	Wave 2 Dates
Algebra I	December 3–14, 2012	January 9–23, 2013
Biology		
Literature		

Table 7–3. Spring 2013 Operational Keystone Exam Testing Windows

Exam	Dates
Algebra I	May 13–24, 2013
Biology	
Literature	

Table 7–4. Summer 2013 Operational Keystone Exam Testing Windows

Exam	Dates
Algebra I	July 29–August 2, 2013
Biology	
Literature	

TIMING

In general, the estimated testing times allow 1–2 minutes per MC item on the Keystone Exams, depending on the exam. The CR items are estimated to take approximately 5–10 minutes per item, also depending on the exam. Stimulus passages on the Literature exam are estimated to take about 10 minutes to read. There was no difference in the timing for online and print forms of delivery.

Test administrators were instructed that each section (module) in a form should be scheduled as a separate exam session. Exam modules were not to have been scheduled back-to-back in the morning (or in the afternoon). Instead, the exam modules were to be divided across two days or divided across the morning and afternoon of the same day.

Since not all students are expected to finish the exam sections at the same time, test administrators are advised to use the flexibility of the time limits to the students' advantage. For example, test administrators manage the testing time so that students do not feel rushed while they are taking any assessment section, and no student is penalized because he or she works slowly. It is also stressed to test administrators that a student should not be given an opportunity to waste time. Students are told to close their exam materials when they have finished the section of the exam in which they have been working. Students who finish early are allowed to sit quietly or read

for pleasure until all students have finished. Students with special requirements and/or abilities (i.e., physical, visual, auditory, or learning disabilities as defined by their IEP or service contracts) and students who just work slowly may require extended time. Special assessment situations are arranged for these students. When all students in a testing session indicate that they have finished an exam section, test administrators end the section.

Scheduled extended time is provided by a test administrator, and students are allowed to request extended time if they indicate that they have not completed the task. Such requests are granted if the test administrator finds the request to be educationally valid. Test administrators are advised that not permitting ample time for students to complete the assessment might impact the students' and school's performances.

As a general guideline, however, when all students indicate that they have finished a section, that section is closed. Students requiring time beyond the majority of the student population are allowed to continue immediately following the regularly scheduled session in another setting. When such accommodations are made, school personnel ensure that students are monitored at all times to prevent sharing of information. Students are not permitted to continue a section of the assessment after a significant lapse of time from the original session.

Table 7–5. Keystone Testing Load and Duration by Exam

Exam	Total No. of MC Items per Form per Administration	Total No. of CR Items per Form per Administration	Total Estimated Testing Time per Form (in minutes)	Total Estimated Administration Time per Form (in minutes)
Algebra I	46	8	150	170
Biology	64	8	144	164
Literature	46	8	146	166

Table 7–6. Keystone Testing Load and Duration by Type per Unit (in minutes)

Exam	Administration Tasks	Stimulus Passages	MC Points per Minute [PPM]*	CR [PPM]*	Estimated Overall PPM**
Algebra I	20	–	1.5 [0.670]	10 [0.400]	0.400
Biology	20	–	1.25 [0.800]	8 [0.375]	0.458
Literature	20	–	1 [1.000]	5 [0.600]	0.356

*Based on rates per item type
**Based on total testing time

One survey question was administered to each student following the completion of the exam. The survey question was untimed.

LAYOUT

The layout of the operational Keystone Exams follows a general sequence regardless of the exam. Each exam is divided into thematically linked sets of content called modules. Within each module, there are core (common) items and field test items. Both core and field test items are represented though MC and CR items.

Stimulus material (like passages), text for MC items, answer options, and any stimulus materials associated with MC items or answer options appear in the test book. Answer bubbles, text for CR items, and associated response spaces appear in the answer book.

Within a non-passage-based module (like Algebra I and Biology), the sequencing of items follows this pattern:

1st: Approximately half of the MC items

2nd: Half of the CR items

3rd: Remaining half of the MC items

4th: Remaining CR items

Within a passage-based module (like Literature), the sequencing of items follows this pattern:

1st: Stimulus Passage X

2nd: MC items associated with Passage X

3rd: CR items associated with Passage X

4th: Stimulus Passage Y

5th: MC items associated with Passage Y

6th: CR items associated with Passage Y

7th: Stimulus Passage Z

8th: MC items associated with Passage Z

9th: CR items associated with Passage Z

Regardless of sequencing pattern, the field test items appear in the relative middle of each module, and item sequencing is self-contained within a module.

For more information about the test layout of the operational Keystone Exams, see Appendix G.

SHIPPING, PACKAGING, AND DELIVERY OF MATERIALS

There were two shipments sent out by DRC for the Keystone Exams operational assessments:

- Shipment one contained the *Handbook for Assessment Coordinators* and the *Directions for Administration Manual*s for each subject at schools participating in the Algebra I, Biology, and Literature Keystone Exams. Shipment one was delivered by April 15, 2013.
- Shipment two contained the administrative materials (e.g., Return Shipping labels, District/School labels, Do Not Score labels, Student Precode labels) and secure materials (e.g., consumable test/answer books) for each subject at schools participating in the Algebra I, Biology, and Literature Keystone Exams. Shipment two was delivered by April 29, 2013.

DRC ensured that all exam materials were assembled correctly prior to shipping. DRC operations staff used the automated Operations Materials Management System (Ops MMS) to assign secure materials to a school at the time of ship out. This system used barcode technology to provide an automated quality check between items requested for a site and items shipped to a site. A shipment box manifest was produced for and placed in each box shipped. DRC operations staff double-checked all box contents with the box manifest prior to sealing the box for shipping to ensure accurate delivery of materials. DRC operations staff performed lot acceptance sampling on both shipments. Districts and schools were selected at random and examined for correct and complete packaging and labeling. This sampling represented a minimum of 10 percent of all shipping sites.

DRC's materials management system, along with the systems of shippers, allowed DRC to track materials from DRC's warehouse facility to receipt at the district, school, or testing site. All DRC shipping facilities, materials processing facilities, and storage facilities are secure. Access is restricted by security code. Non-DRC personnel are escorted by a DRC employee at all times. Only DRC inventory control personnel have access to stored secure materials. DRC employees are trained in and made aware of the high level of security that is required.

DRC used United Parcel Service (UPS) to deliver the secure materials to the testing sites.

TEST SECURITY MEASURES

Test security is essential to obtaining reliable and valid scores for accountability purposes. Test Security Certifications were required to be signed by each building principal, School Assessment Coordinator, District Assessment Coordinator, Test Administrator, and Proctor prior to the assessment being administered. All signed Certifications were returned to the Chief School Administrator who must retain the Certifications for three years. The purpose of the Certifications was to serve as a tool to document that the individuals responsible for administering the assessments both understood and acknowledged the importance of test security and accountability. The Certifications attested that all security measures were followed concerning the handling of secure materials.

SAMPLE MANUALS

Copies of the *Keystone Exams Test Coordinator Handbook, Keystone Exams User Guide*, and the *Directions for Administration Manual*s are available on the PA eDIRECT online system at https://pa.drcedirect.com. (Click on Documents under the General Information tab.)

TESTING WINDOW ASSESSMENT ACCOMMODATIONS

Three accommodations manuals, *Accommodations Guidelines for Students with IEPs and Students with 504 Plans, Accommodations for English Language Learners*, and *Accommodations Guidelines for All Students*, were developed for use with the Spring 2013 Keystone Exams. Additional information regarding assessment accommodations can be found in Chapter Four of this report.

CHAPTER EIGHT: PROCESSING AND SCORING

RECEIPT OF MATERIALS

Receipt of Pennsylvania Keystone Exams' test materials began on May 16, 2013, and concluded on May 29, 2013. DRC's Operations Materials Management System (Ops MMS) was utilized to receive assessment materials securely, accurately, and efficiently. This system features innovative automation and advanced barcode scanners. Captured data was organized into reports, which provided timely information with respect to suspected missing material.

The first step in Ops MMS was Box Receipt. When a shipment arrived at DRC, the boxes were removed from the carrier's truck and passed under a barcode reader, which read the barcode printed on the return label and identified the district and school. The number of boxes was immediately compared to what was picked up at the district. The data collected in this process was stored in the Ops MMS database. After the barcode data was captured, the boxes were placed on a pallet and assigned a corresponding pallet number.

Once the Box Receipt process was completed, the Materials Separation phase began. Warehouse personnel opened the boxes and sorted materials by grade, subject, and status (used and/or unused booklets) into scanning boxes. Every booklets' security barcode and precode barcode were hand scanned to link each document to the original box. As the booklets were sorted, Ops MMS guided the floor operator to the box in which to place the document. Ops MMS kept count and record of the materials placed in each box. This count remained correlated to the box as an essential quality-control step throughout the secure booklet processing and provided a target number for all steps of the check-in process. Once a box was closed, an MMS Processing Label was placed on that box.

Once labeled, the sorted and counted boxes proceeded to Quality Assurance, where a secure booklet check-in operator used a hand scanner to scan the MMS Processing Label. This procedure identified the material type and quantity parameters for what Ops MMS should expect within a box. The box contents were then loaded into the stream feeder.

The documents were fed past oscillating scanners that captured both the security code and precode from the booklets. A human operator monitored an Ops MMS screen that displayed scan errors, an ordered accounting of what was successfully scanned, and the document count for each box. The system ensured that all material within the box matched the information obtained from the original hand-scanning process.

When all materials were scanned and the correct document count was confirmed, the box was sealed and placed on a pallet. If the correct document count was not confirmed, or if the operator encountered difficulties with material scanning, the box and its contents were delivered to an exception-handling station for resolution.

This check-in process occurred immediately upon receipt of materials; therefore, DRC provided feedback to districts and schools regarding any missing materials based on actual receipt versus expected receipt. Sites that had 100 percent of their materials missing after the date they were due to DRC were contacted, and any issues were resolved.

Throughout the process of secure booklet check-in, DRC project management ran a daily Missing Materials Report. Every site that was missing any number of booklets was contacted by DRC. Results of these correspondences were recorded for inclusion in the final Missing Materials Report if the missing booklets were not returned by the testing site. DRC produced the Missing Materials Report for PDE upon completion of secure

booklet check-in. The report listed all schools in each participating district, along with security barcodes for any booklets not returned to DRC.

After scannable materials (used answer booklets) were processed through booklet check-in, the materials became available to the DRC Document Processing log-in staff for document log-in. The booklets were logged in using the following process:

- A DRC scannable barcode batch header was scanned, and a batch number was assigned to each box of booklets.
- The DRC box label barcode was scanned into the system to link the box and booklets to the newly created batch and to create a Batch Control Sheet.
- The DRC box label barcode number and the number of booklets in the box were printed on the Batch Control Sheet for document-tracking purposes. All booklets linked to the box barcode were assigned to the batch number and tracked through all processing steps. As booklets were processed, DRC staff dated and initialed the Batch Control Sheet to indicate that proper processing and controls were observed.

Before the booklets were scanned, all batches went through a quality inspection to ensure batch integrity and correct document placement.

After a quality check-in at the DRC Document Processing log-in area, the spines were cut off the scannable documents, and the pages were sent to DRC's Imaging and Scoring System.

SCANNING OF MATERIALS

Customized scanning programs for all scannable documents were prepared to read the books and to format the scanned information electronically. Before materials arrived, all image-scanning programs went through a quality review process that included scanning of mock data from production books to ensure proper data collection.

DRC's image scanners were calibrated using a standard deck of scannable pages with 16 known levels of gray. On a predefined page location, the average pixel darkness was compared to the standard calibration to determine the level of gray. Marks with an average darkness level of 4 or above on a scale of 16 (0 through F) were determined to be valid responses, per industry standards. If multiple marks were read for a single item and the difference between the grayscale reads was greater than four levels, the lighter mark was discarded. If the multiple marks had fewer than four levels of grayscale difference, the response was flagged and forwarded to an editor for resolution.

DRC's image scanners read selected-response, demographic, and identification information. The image scanners also used barcode readers to read preprinted barcodes from a label on the book.

The scannable documents were automatically fed into the image scanners where predefined processing criteria determined which fields were to be captured electronically. Open-ended (OE) response images were separated out for image-based scoring.

During scanning, a unique serial number was printed on each sheet of paper. This serial number was used to ensure document integrity and to maintain sequencing within a batch of books.

A monitor randomly displayed images, and the human operator adjusted or cleaned the scanner when the scanned image did not meet DRC's strict quality standards for image clarity.

All images passed through a process and a software clean-up program that despeckled, deskewed, and desmeared the images. A random sample of images was reviewed for image quality approval. If any document failed to meet image quality standards, the document was returned for rescanning.

Page-scan verification was performed to ensure that all predefined portions of the booklets were represented in their entirety in the image files. If a page was missing, the entire book was flagged for resolution.

After each batch was scanned, books were processed through a computer-based editing program to detect potential errors as a result of smudges, multiple marks, and omissions in predetermined fields. Marks that did not meet the predefined editing standards were routed to editors for resolution.

Experienced DRC Document Processing editing staff reviewed all potential errors detected during scanning and made necessary corrections to the data file. The imaging system displayed each suspected error. The editing staff then inspected the image and made any necessary corrections using the unique serial number printed on the document during scanning.

Upon completion of editing, quality control reports were run to ensure that all detected potential errors were reviewed again and a final disposition was determined.

Before batches of books were extracted for scoring, a final edit was performed to ensure that all requirements for final processing were met. If a batch contained errors, it was flagged for further review before being extracted for scoring and reporting.

During this processing step, the actual number of documents scanned was compared to the number of books assigned to the box during book receipt. Count discrepancies between book receipt and books scanned were resolved at this time.

Once all requirements for final processing were met, the batch was released for scoring and student level processing.

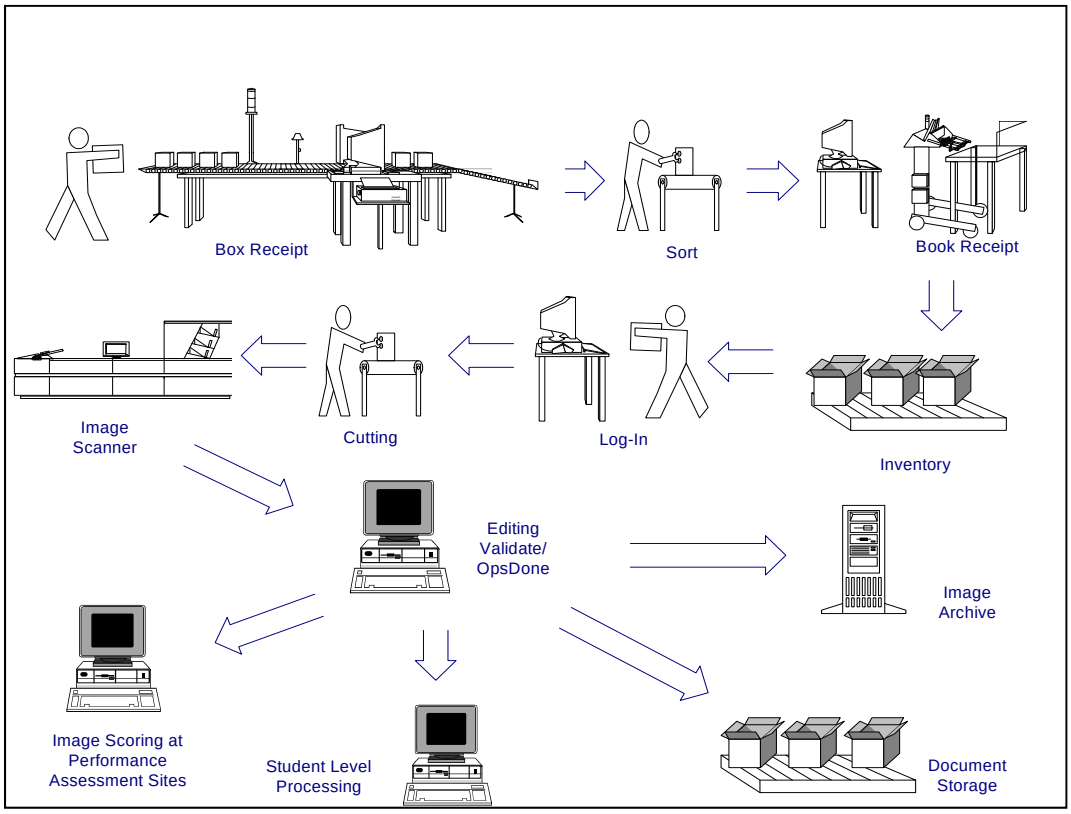
Table 8–1 shows the number of answer books received through book check-in, the number of books that contained student responses that were scanned and scored, the number of test books received, and the total number of books received for the Algebra I, Biology, and Literature Keystone Exams.

Table 8–1. Counts of 2013 Keystone Exams Materials Received: Algebra I, Biology, and Literature

Exam	Answer Books Received	Used Answer Books Received	Test Books Received	Total Books Received	Total Books Shipped
Algebra I	332,586	225,916	332,566	665,152	665,218
Biology	248,561	164,213	248,649	497,210	497,356
Literature	224,240	141,821	224,236	448,476	448,502

Figure 8–1 illustrates the production workflow for DRC's Ops MMS and Image Scanning and Scoring System from receipt of materials through all processing of materials and the presentation of scanned images for scoring.

Figure 8–1. Workflow System



MATERIALS STORAGE

Upon completion of processing, student response documents were boxed for security purposes and final storage as follows:

- Project-specific box labels were created containing unique customer and project information, material type, batch number, pallet/box number, and the number of boxes for a given batch.
- Boxes were stacked on pallets that were labeled with the project information and a list of the pallet's contents before delivery to the Materials Distribution Center for final secure storage.

Materials will be destroyed one year after the contract year ends with PDE written approval.

SCORING MULTIPLE-CHOICE ITEMS

For both online and paper-and-pencil modes, the scoring process included the scoring of multiple-choice (MC) items against the answer key and the aggregation of raw scores from the OE responses. A student's raw score is the actual number of points achieved for tested elements of an assessment. From the raw scores, the scale scores were calculated.

The student file was scored against the final and approved MC answer key. Items were scored as right, wrong, omitted, or double-gridded (more than one answer was bubbled for an item). Sections of the exam were evaluated as a whole, and an attempt status was determined for each student for each subject. The score program defined all data elements for reporting at the student level.

RANGEFINDING

After field test student answer documents were received and processed, DRC's Performance Assessment Services (PAS) staff assembled groups of responses that exemplified the different score points represented in the constructed-response (CR) item-specific scoring guidelines for Algebra I, Biology, and Literature. The scoring scales varied by content area. Biology and Literature responses were scored on a 0–3 point scale. Mathematics responses received 0–4 points. For some mathematics items, scorers simply applied a single score of 0, 1, 2, 3, or 4. Many of the mathematics items, however, were divided into separate parts that were scored on a 0–1, 0–2, or 0–3 point scale, although the sum of the parts always resulted in an overall score of 0–4 for each item. For example, a mathematics item might have a part A, part B, part C, and part D, each of which was scored on a 0–1 point scale, which results in a summed 0–4 point total score for each response.

Sets of student responses were put together for each item, and copies were made for each rangefinding participant. Rangefinding committees consisted of Pennsylvania educators with relevant content expertise, PDE staff, DRC Test Development staff, and DRC PAS staff (i.e., Handscoring Content Specialists and Scoring Directors). The rangefinding meetings for 2013 were held from June 8–12 at the Sheraton Hotel in Harrisburg, PA.

Rangefinding meetings began in a joint session with a rangefinding overview and then broke into subject-specific groups. Copies of student responses were presented to the committees, one item at a time. The committees initially reviewed and scored the student samples together to ensure that everyone was interpreting the scoring guidelines consistently. Committee members then scored responses independently, and those scores were discussed until consensus was reached. The rangefinding sets included both online and paper/pencil responses for every item. Committee members were trained on how to apply scores consistently across the two formats (online and paper/pencil). Discussions of responses included the mandatory use of scoring guideline language to ensure that the scores clearly exemplified the specific requirements of each score level. DRC PAS staff made notes of how and why the committees arrived at score-point decisions, and this information was used by the individual scoring directors in scorer training.

DRC and PDE discussed scoring guideline (rubric) edits that the committees suggested. Changes approved by PDE were then made by DRC Test Development staff, and the edited scoring guidelines were used by PAS staff in the preparation of materials and training of scorers.

After rangefinding, DRC PAS assembled scorer training sets from the responses that were scored by the rangefinding committees.

SCORER RECRUITMENT AND QUALIFICATIONS

DRC retains a number of scorers from year to year. This pool of experienced scorers was used for the 2013 scoring season. To complete the scorer staffing for this project, DRC placed advertisements in local papers and utilized a variety of websites. Open houses were held and applications for scorer positions were screened by the DRC recruiting staff. Candidates were personally interviewed and a mandatory, on-demand writing sample and a mathematics sample for those applying to score mathematics were collected, along with references and proof of a four-year college degree. In this screening process, preference was given to candidates with previous experience scoring large-scale assessments and with degrees emphasizing expertise in the subjects being scored. Because scorers had to have a strong content-specific background, the scorer pool consisted of educators and other professionals who were valued for their experience, but who were also required to set aside their own biases about student performance and accept the scoring standards.

LEADERSHIP RECRUITMENT AND QUALIFICATIONS

Scoring directors and team leaders were chosen by the content specialists from a pool consisting of experienced individuals who were successful scorers and leaders on previous DRC contracts and who had strong backgrounds in scoring mathematics, reading, science, or writing. Those selected demonstrated organization, leadership, and management skills. A majority of the scoring directors and team leaders had at least five years of leadership experience on large-scale assessments. All scoring directors, team leaders, and scorers were required to sign confidentiality agreements before any training or handling of secure materials began.

Each room of scorers was assigned a scoring director. The scoring directors were monitored by the project director and content specialist and led the handscoring for the duration of the project. Scoring directors assisted in rangefinding, worked with content specialists to create training materials, conducted the team leader training, and were responsible for training the scorers. Scoring directors also made sure that handscoring quality reports were available and were interpreted for the scorers. The scoring director supervised the team leaders.

Within each scoring room, the scorers were divided into small teams of 8 to 12 scorers. Each team was assigned a team leader. Team leaders assisted the scoring directors with scorer training and monitoring by working with their teams in small-group discussions and answering individual questions that scorers may not have felt comfortable asking in a large group. Once scorers had qualified, team leaders were responsible for maintaining the accuracy and workload of team members. The ongoing monitoring identified those scorers who required one-on-one retraining. If any scorers were unable to maintain scoring accuracy, even after receiving additional one-on-one training, they were released from the project, any scores they gave were erased, and any responses they scored were rescored by other scorers.

TRAINING

For each field test item, DRC's scoring directors used the collection of scored responses from rangefinding to compile the materials needed to train scorers. Responses that were particularly relevant (in terms of the scoring concepts they illustrated) were annotated for use in the scoring guide as anchor papers. Approximately three anchor papers represented each score point in the scoring guide. The item-specific scoring guidelines for each exam served as the scorers' constant reference. In addition to the scoring guides, the scoring directors also prepared a training set for each field test item.

For each operational item, DRC carried forward the field test training materials. These materials were supplemented with one more training set and two qualifying sets of 10 responses per set. DRC currently requires 70 percent exact agreement as the qualifying standard.

Training and qualifying sets consisted of examples selected to show the scorers the range of each score point, such as high, mid, and low 4, 3, 2, and 1. Examples of different types of 0s were also included. Scorers were instructed on how to apply the guidelines and were required to demonstrate a clear comprehension of each anchor set by performing well on the training materials that were presented for each subject, grade, and item. This process helped train the scorers to recognize the various ways a student could respond to earn the score points that were outlined and defined in the item-specific scoring guidelines. All ranges of score points were represented and clearly annotated in the anchor set, which was used for reference by the scorers throughout the scoring of the project.

The scoring director conducted the team-leader training before the scorer training. This training followed the same procedures as the scorer training, but qualifying standards were more stringent because of the responsibilities required of the team leaders. During team-leader training, all materials were reviewed and discussed, and anticipated scorer questions and concerns were addressed. Team leaders were required to annotate all of their training responses with the official annotations received from the content committee members at the rangefinding meetings. To facilitate scoring consistency, it was imperative that each team leader impart the same rationale for each response that other team leaders used. Once the team leaders qualified, leadership responsibilities were reviewed and team assignments were given. A ratio of one team leader for each 8–12 scorers ensured adequate monitoring of the scorers.

The assessments included the opportunity for students to respond in Spanish to the operational items in the Algebra I and Biology exams. All of the scorers who scored Spanish responses were bilingual and were required to meet the same training and scoring standards set for the scorers of the English version of the assessment.

Scorer training began with the scoring director providing an intensive review of the scoring guidelines and anchor papers for all scorers. Next, the scorers "practiced" by independently scoring the responses in the training sets. Afterward, the scoring director or team leaders led a thorough discussion of each set in either a small-group or room-wide setting.

Once the scoring guidelines, anchor sets, and all the training sets were discussed, scorers were required to apply the scoring criteria by qualifying (i.e., scoring with acceptable agreement to the "true" scores) on at least one of the qualifying sets. The "true" scores were those assigned by the rangefinding committees and agreed upon by the content staff of PDE and DRC. If scorers could not accept or recognize the rationale and purpose for assigning the correct score and did not perform accordingly on the training materials, it was determined that they did not understand the parameters of scoring correctly. Scorers who failed to achieve the 70 percent level of exact agreement were given additional training to acquire the highest degree of accuracy possible. Scorers

who did not perform at the required level of agreement by the end of the qualifying process were not allowed to score "live" student work and were released from the project.

HANDSCORING PROCESS

A minimum of 10 percent of all Algebra I, Biology, and Literature responses were scored independently by two scorers for the purpose of reliability.

Scorers scored the imaged student responses on computer monitors at DRC Scoring Centers in Pittsburgh, Pennsylvania; Plymouth and Woodbury, Minnesota; Sharonville and Columbus, Ohio; and Austin, Texas. Scorers were seated at tables with two imaging stations at each table. Image distribution was controlled, thus ensuring that student images were sent to designated groups of scorers qualified to score those items. Student responses were electronically routed to individual scorers by item, and scorers were only provided with student responses that they were qualified to score. Scorers read each response and entered the score(s).

To handle possible alerts (e.g., student responses indicating potential issues related to the student's safety and well-being that might require attention at the state or local level), the imaging system allowed scorers to forward responses needing attention to the scoring director. These alerts were reviewed by the project director, who forwarded the responses to DRC's project management staff. DRC's project management staff notified the students' schools and PDE of the occurrences. PDE did not, however, receive the students' responses or any other identifying information on the students. Also, at no time did the scorer know anything about the students' personal identities.

Once handscoring was completed, PAS compiled reviews of the field test items. This information was presented to DRC's Test Development group.

HANDSCORING VALIDITY PROCESS

One of the quality/training tools PAS utilized to ensure scorer accuracy was the validity process. The goal of the validity process is to ensure that scoring standards are maintained. Specifically, the objective is to make sure that scorers rate student responses in a manner consistent with statewide standards both within a single administration and across consecutive administrations. This scoring consistency was maintained, in part, through the validity process.

The validity process began with the selection of scored responses from a previous administration of the assessment. The content specialist for each subject selected 39 or 40 validity papers for each core CR item. These papers were drawn from a pool of "exemplars" (responses that were given the same score by at least two scorers and verified by a scoring director). The scores on validity papers are considered "criterion" or "true" scores.

The validity papers were then implemented to monitor scorer accuracy. The responses were scanned into the imaging system and dispersed intermittently to the scorers. Scorers were unaware that they were being fed pre-scored responses and assumed that they were scoring live student responses. This helped bolster the internal validity of the process. It is important to note that all scorers who received validity papers had already successfully completed the training/qualifying process.

Throughout the project, the scores that the scorers assigned to the validity papers were compared to the true scores. For each item, the percentage of exact agreement, as well as the percentage of high and low scores, was computed. This data was accessed through the Validity Item Detail Report. The same kind of data was also computed for each specific scorer. This data was accessed through the Validity Scorer Detail Report. Both of these can be run as a daily or cumulative report.

The Validity Scorer Detail Report was used to identify particular scorers for retraining. If a scorer on a certain day generated a lower rate of agreement on a group of validity papers, it was immediately apparent in the Validity Scorer Detail Report. A lower rate of agreement was defined as anything below 70 percent exact agreement with the true scores. Any time a scorer's validity agreement rate fell below 70 percent, this cued the scoring director to examine that scorer's scoring. First, the scoring director determined what kind of validity papers the scorer was scoring incorrectly. This was done to determine if there was any kind of a trend (e.g., tending to go low on the 1–2 line or failing to notice copied text). Once the source of the low agreement was determined, the scorer was retrained. If it was determined that the scorer had been scoring live papers inaccurately, then his/her scores were purged for that day and the responses were recirculated and scored by other scorers.

The cumulative Validity Item Detail Report was utilized to identify potential room-wide trends in need of correction. For instance, if a particular validity response with a true score of 3 was given a score of 2 by a significant number of scorers, that trend would be revealed in the Validity Item Detail Report. To correct a trend of this sort, the scoring director would look for student responses similar to the validity paper being scored incorrectly. Once located, these responses would be used in room-wide training, usually in the form of an annotated handout or a short set of papers without printed scores given to scorers as a recalibration test. Sometimes, when a particular validity paper generated low agreement, an example of a similar response could be found in the already existing training materials. If this was the case, a quick review of that particular training paper was usually enough to get scorers realigned.

Validity was employed on all operational CR items. Each validity set was formulated to mimic the score-point distribution that the item generated during its previous administration. Each validity set also included multiple examples of each score point and examples of different types of responses to ensure that scorers were tested on the full spectrum of response types.

QUALITY CONTROL

Scorer accuracy was monitored throughout the scoring session by producing both daily and on-demand reports, ensuring that an acceptable level of scoring accuracy was maintained. Inter-scorer reliability was tracked and monitored with multiple quality control reports that were reviewed by quality-assurance analysts. These reports and other quality-control documents were generated at the handscoring centers and were reviewed by the scoring directors, team leaders, content specialists, and project directors. The following reports and documents were used during the scoring of the responses to CR items:

- **Inter-rater reliability on the Scoring Summary Report** monitored how often scorers were in exact agreement with one another and ensured that an acceptable agreement rate was maintained. This report provided daily and cumulative exact and adjacent inter-scorer agreement on the responses that were independently read twice (a minimum of 10 percent of the responses to CR items).
- **Score-point distribution on the Scoring Summary Report** monitored the percentage of responses given each of the score points. For example, the Biology daily and cumulative report showed how many 0s, 1s, 2s, 3s, and 4s were given to all the responses scored at the time the report was produced. It also indicated the number of responses read by each scorer so that production rates could be monitored.
- **The Item Status Report** monitored the progress of handscoring. This report tracked each response and indicated the status (e.g., “needs second read” or “complete”). This report ensured that all responses were scored by the end of the project.
- **The Read-Behind Report** identified all responses scored by an individual. This report was useful if any responses needed rescoring because of possible scorer drift.
- **The Validity Reports** tracked performance by comparing the scores given by raters to predetermined scores on validity responses. If an individual’s agreement rate with the predetermined scores fell below 70 percent, remediation occurred. Scorers who did not retrain to the required level of agreement were released from the project.
- **The Read-Behind Log** was used by the team leader/scoring director to monitor individual scorer reliability. Student responses were randomly selected and team leaders read scored items from each team member. If the team leader disagreed with a score, remediation occurred. This proved to be a very effective type of feedback because it was done with “live” responses scored by individuals receiving the feedback.

Tables 8–2, 8–3, and 8–4 show exact and adjacent agreement rates of readers on the operational OE items in the 2013 Keystone Exams. Ten percent of the CR items were read twice. The data collected from the responses that were read twice was used to calculate the exact and adjacent agreement rates.

Table 8–2. Inter-Rater Agreement and Percentage Awarded for Each Score Point for CR Items Winter 2013

Exam	Module	Item Position	Item Part	Score Point Range	Inter-Rater Agreement %		% Validity Agreement	Percentage Awarded for Each Score Point					
					Exact	Adjacent		0	1	2	3	4	B/NS
Algebra I	1	15	A	0-1	100	0	100	82	13	-	-	-	5
			B	0-1	100	0	100	31	64	-	-	-	5
			C	0-2	100	0	100	47	2	46	-	-	5
		26		0-4	92	8	92	32	32	15	9	6	7
		27	A	0-1	99	1	98	80	13	-	-	-	8
			B	0-1	100	0	98	27	65	-	-	-	8
			C	0-1	94	6	94	64	28	-	-	-	8
			D	0-1	99	1	99	30	62	-	-	-	8
			MU	0-1	99	1	99	90	3	-	-	-	8
	2	15	A	0-1	99	1	100	30	66	-	-	-	4
			B	0-1	99	1	100	72	24	-	-	-	4
			C	0-1	100	0	100	32	64	-	-	-	4
			D	0-1	100	0	100	37	59	-	-	-	4
		26		0-4	91	9	89	32	12	10	16	24	7
		27	A	0-1	100	0	100	29	64	-	-	-	7
			B	0-3	98	2	99	20	28	14	31	-	7
Biology	1	17		0-3	88	12	92	26	38	22	5		9
		35		0-3	85	14	90	19	35	33	4		9
		36		0-3	86	13	92	43	23	10	3		
	2	17		0-3	93	7	97	15	37	30	12		5
		35		0-3	86	14	94	20	39	23	10		7
		36		0-3	85	15	93	25	30	29	7		9
Literature	1	9		0-3	80	20	93	4	20	47	26		3
		26		0-3	84	16	94	5	23	59	9		4
		27		0-3	84	16	83	7	31	36	14		12
	2	9		0-3	80	20	89	14	29	43	8		6
		26		0-3	84	16	86	2	18	58	17		5
		27		0-3	83	17	89	10	23	44	12		10

Notes: B = blank; NS = non-scorable. Mathematics responses received a total of 0–4 points. For some mathematics items, readers simply applied a single score of 0, 1, 2, 3, or 4. Many of the mathematics items, however, were divided into separate parts that were scored on a 0–1, 0–2, or 0–3 point scale, although the sum of the parts always resulted in an overall score of 0–4 for each item. For example, a mathematics item might have a part A, part B, part C, and part D, each of which was scored on a 0–1 point scale, which results in a summed 0–4 point total score for each response. Furthermore, some mathematics items with multiple parts could receive up to one point for "minimal understanding" (MU) if they did not receive points for any of the individual parts.

Table 8–3. Inter-Rater Agreement and Percentage Awarded for Each Score Point for CR Items Spring 2013

Exam	Module	Item ID	Item Part	Score Point Range	Inter-Rater Agreement %		% Validity Agreement	Percentage Awarded for Each Score Point					
					Exact	Adjacent		0	1	2	3	4	B/NS
Algebra I	1	640372	A	0-2	97	3	98	68	14	10	-	-	7
			B	0-1	99	1	98	82	10	-	-	-	7
			C	0-1	98	2	98	65	27	-	-	-	7
		628222	A	0-2	97	3	99	52	16	23	-	-	8
			B	0-1	99	1	99	63	28	-	-	-	8
			C	0-1	97	3	99	31	61	-	-	-	8
			MU	0-1	100	0	100	92	0	-	-	-	8
		640376	A	0-2	99	1	97	62	11	17	-	-	10
			B	0-1	98	2	98	55	34	-	-	-	10
			C	0-1	100	0	99	39	51	-	-	-	10
	2	632505	A	0-1	99	1	100	73	19	-	-	-	7
			B	0-1	96	4	98	61	32	-	-	-	7
			C	0-1	99	1	100	44	49	-	-	-	7
			D	0-1	99	1	99	34	58	-	-	-	7
			MU	0-1	100	0	100	93	0	-	-	-	7
		628225		0-3	88	12	92	15	26	33	15	4	7
		628226		0-3	92	8	94	7	31	15	24	15	8
Biology	1	629477		0-3	79	21	81	33	27	21	9		10
		609478		0-3	92	8	93	53	20	13	7		8
		607796		0-3	95	5	95	57	8	20	3		11
	2	610866		0-3	72	27	77	33	35	20	5		8
		608339		0-3	79	20	81	4	16	63	8		8
		608341		0-3	76	24	81	21	35	26	7		11
Literature	1	613655		0-3	79	21	82	6	35	35	16		8
		613263		0-3	74	26	76	10	37	40	5		7
		613264		0-3	76	24	85	16	39	29	5		11
	2	613849		0-3	77	23	82	7	32	43	11		7
		614013		0-3	74	26	84	10	30	37	14		9
		614014		0-3	76	24	92	18	25	31	12		13

Notes: B = blank; NS = non-scorable. Mathematics responses received a total of 0–4 points. For some mathematics items, readers simply applied a single score of 0, 1, 2, 3, or 4. Many of the mathematics items, however, were divided into separate parts that were scored on a 0–1, 0–2, or 0–3 point scale, although the sum of the parts always resulted in an overall score of 0–4 for each item. For example, a mathematics item might have a part A, part B, part C, and part D, each of which was scored on a 0–1 point scale, which results in a summed 0–4 point total score for each response. Furthermore, some mathematics items with multiple parts could receive up to one point for "minimal understanding" (MU) if they did not receive points for any of the individual parts.

Table 8–4. Inter-Rater Agreement and Percentage Awarded for Each Score Point for CR Items Summer 2013

Exam	Module	Item ID	Item Part	Score Point Range	Inter-Rater Agreement %		% Validity Agreement	Percentage Awarded for Each Score Point					
					Exact	Adjacent		0	1	2	3	4	B/NS
Algebra I	1	631618	A	0-2	98	2	99	74	14	0	-	-	12
			B	0-1	100	0	100	51	36	-	-	-	12
			C	0-1	100	0	100	66	22	-	-	-	12
		613666	A	0-1	100	0	99	35	52	-	-	-	13
			B	0-1	99	1	100	79	8	-	-	-	13
			C	0-1	100	0	100	74	13	-	-	-	13
			D	0-1	100	0	100	86	1	-	-	-	13
		632542		0-4	97	3	98	35	43	4	3	1	13
	2	632546		0-4	91	9	94	48	22	9	6	1	13
		616433	A	0-1	100	0	100	13	73	-	-	-	14
			B	0-1	100	0	100	51	35	-	-	-	14
			C	0-1	100	0	99	50	36	-	-	-	14
			D	0-1	100	0	100	19	67	-	-	-	14
		628223	A	0-1	99	1	99	72	14	-	-	-	14
			B	0-1	98	2	98	61	25	-	-	-	14
			C	0-1	98	2	97	59	27	-	-	-	14
			D	0-1	95	5	97	66	20	-	-	-	14
			MU	0-1	100	0	100	86	0	-	-	-	14
Biology	1	607764		0-3	93	7	98	44	26	10	2		19
		607591		0-3	91	9	94	56	26	4	1		13
		607772		0-3	82	18	94	54	22	8	2		14
	2	608356		0-3	76	21	88	26	31	23	9		9
		608340		0-3	85	13	85	29	28	17	11		15
		608350		0-3	87	13	97	40	35	12	1		13
Literature	1	614804		0-3	85	15	85	10	29	33	10		17
		608194		0-3	84	16	94	9	36	31	8		16
		613272		0-3	88	12	89	13	36	28	3		21
	2	613250		0-3	86	14	89	10	38	29	6		18
		614700		0-3	86	14	91	6	25	36	16		17
		614699		0-3	88	12	97	9	39	26	6		19

Notes: B = blank; NS = non-scorable. Mathematics responses received a total of 0–4 points. For some mathematics items, readers simply applied a single score of 0, 1, 2, 3, or 4. Many of the mathematics items, however, were divided into separate parts that were scored on a 0–1, 0–2, or 0–3 point scale, although the sum of the parts always resulted in an overall score of 0–4 for each item. For example, a mathematics item might have a part A, part B, part C, and part D, each of which was scored on a 0–1 point scale, which results in a summed 0–4 point total score for each response. Furthermore, some mathematics items with multiple parts could receive up to one point for "minimal understanding" (MU) if they did not receive points for any of the individual parts.

CHAPTER NINE: DESCRIPTION OF DATA SOURCES

This section describes the filtering process and data sources used for the various analysis procedures discussed in the remaining sections of this report. Psychometric analyses were conducted at several points for the winter 2012/2013, spring 2013, and summer 2013 Pennsylvania Keystone Exams in Algebra I, Biology, and Literature: 1) key verification analyses for quality-control purposes; 2) post-equating check; 3) item analysis and calibration of field test items embedded in the spring forms; and 4) analyses for this technical report.

STUDENT FILTERING CRITERIA

Students' records included in all the psychometric analyses needed to meet at least the following psychometric analyses criteria:

- Module 1 Attempted Status = 1 (1 = the student attempted a minimum of five items in Module 1)
- Module 2 Attempted Status = 1 (1 = the student attempted a minimum of five items in Module 2)
- Module 1 Invalidated = N (N = the student's score was not invalidated)
- Module 2 Invalidated = N (N = the student's score was not invalidated)
- Student Duplication Status = N (N = no duplication)
- Module 1 Form Number = Module 2 form number

For each specific analysis conducted at different times, additional criteria might be needed to filter students. For example, the following criteria were used in addition to the ones listed above for the post-equating check, since the analyses were conducted during the scoring window:

- Module 1 Complete Status = 01
- Module 2 Complete Status = 01

The value 01 represents the response string which includes scores on the multiple-choice (MC) and constructed response (CR) operational items. When the analyses were conducted by using the final data files, these criteria were no longer necessary since all operational CR items had been scored.

Item analysis and calibration of embedded field test items were conducted using the first-time testers only (i.e., retester = N). The classical item statistics for the field test items analyzed by using the first-time testers were more comparable to the results of the spring 2011 Keystone Exams, which were given to the first-time test takers.

Because a large number of students took the Keystone Exams, only a representative sample of students' responses on field test CR items was scored within each content area. For the item analysis of field test CR items, the following additional criteria were used to select only those who were sampled for hand-scoring:

- Module 1 Complete Status = 02
- Module 2 Complete Status = 02

KEY VERIFICATION DATA

The key verification data are mentioned only for completeness, as no formal results are provided in this technical document. A key verification is often conducted early in the scoring process to ensure the keys for the MC items are applied correctly. The data files used for the key verification analysis are usually (but not always) based on the student data from early-return schools. The sample representativeness is not required for this internal quality check. Available student data typically suffices as long as there is reasonable variability in the total-test scores of students. The details about the sample sizes for the winter, spring, and summer administrations can be found in Table 9–1.

CALIBRATION OF OPERATIONAL TEST DATA

The post-equating check data included all students who met the inclusion criteria and were scored by 02/12/2013, 06/17/2013, and 08/28/2013 for the winter, spring, and summer administrations respectively. Note that the students included in the post-equating check data included those who had testing accommodations.

FINAL DATA

The final data files were used to conduct item analyses of the operational items and the analyses conducted in Chapters 16–19 in this technical report. The final data contained students' responses to both the MC and CR items. All students' responses included in the analyses met the filtering criteria. The final sample sizes (or *n*-counts) can be found in the column labeled "Final" in Table 9–1.

Table 9–1. Data Source *N*-Counts

Administration	Content Area	Key Verification	Post-Equating Check	Final
Winter	Algebra I	56,117	187,228	215,160
	Biology	31,288	127,033	148,667
	Literature	30,574	121,205	140,478
Spring	Algebra I	73,628	247,903	247,978
	Biology	39,458	180,318	180,917
	Literature	39,446	156,168	156,302
Summer	Algebra I	2,142	2,143	2,144
	Biology	1,066	1,071	1,073
	Literature	737	737	741

SPIRALING OF FORMS

During the administration of Keystone Exams, test forms were spiraled at the student level. The goal of spiraling is to achieve equivalent samples of students across forms so the classical statistics (e.g., *p*-value and point-biserial correlation) for all the field test items can be compared. Given that the field test items were embedded in the spring administration only, the equivalence of samples was checked for the spring administration instead of all administrations. When spiraling achieves randomly equivalent samples, the forms will have equal means (within sampling error) over the operational items.

Appendix H provides summary statistics for all the spring forms for each content area exam. The tables provide the form number (Form), number of students (N), test length in items (L), total points (Pts.), minimum (Min) score, maximum (Max) score, mean (Mean) score, median (Med) score, and standard deviation (SD). The extent to which the mean raw scores across forms are similar indicates the extent to which the student populations taking each form are of approximately equal ability. This equivalence of ability distributions across forms is the desired outcome of spiraling and allows for optimum analysis of the embedded field test items.

In Figure 9–1, the form mean raw scores are plotted (circle-shaped marker) with standard error of mean lines. For each form, the standard error of mean was computed by taking the standard deviation of all student scores (assumed as the population standard deviation divided by the square root of the form *n*-count). The mean score across all forms is indicated by the red horizontal broken line. If the three-standard error band captures the horizontal line, then that suggests only random differences exist between the form mean and the population mean. This was true for most of the forms. However, the means of Algebra I and Biology form 1 are lower than the rest of the forms. This is likely due to the fact that form 1 was also given to the students with accommodations.

Figure 9–1. Form Mean Scores with +/- Three-Standard Error (SE) Bands

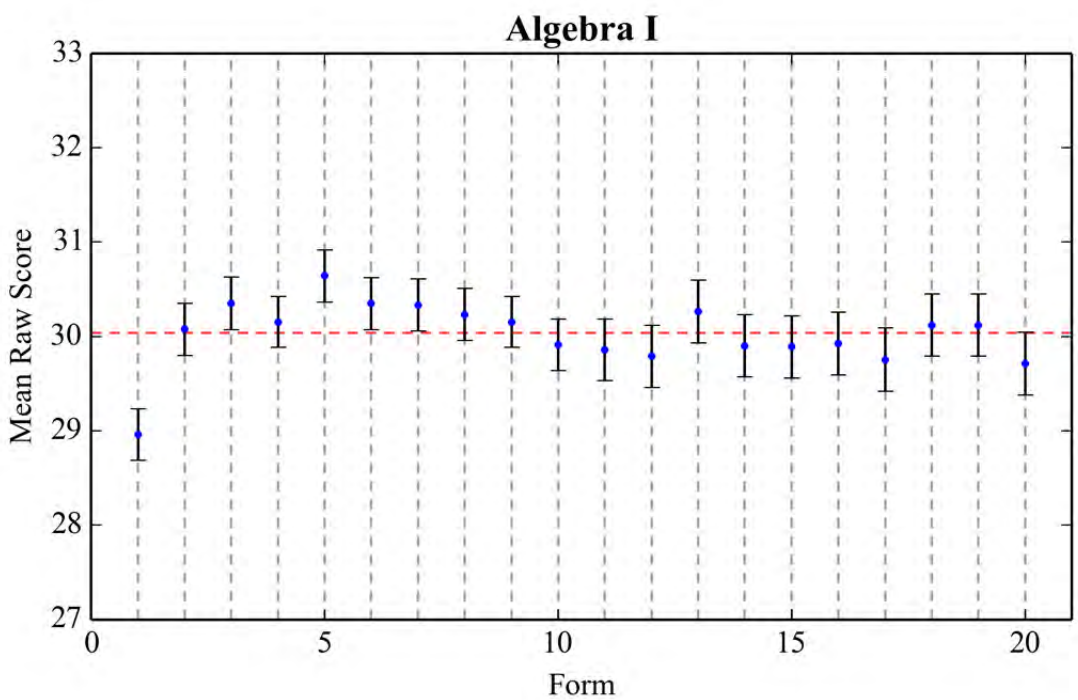
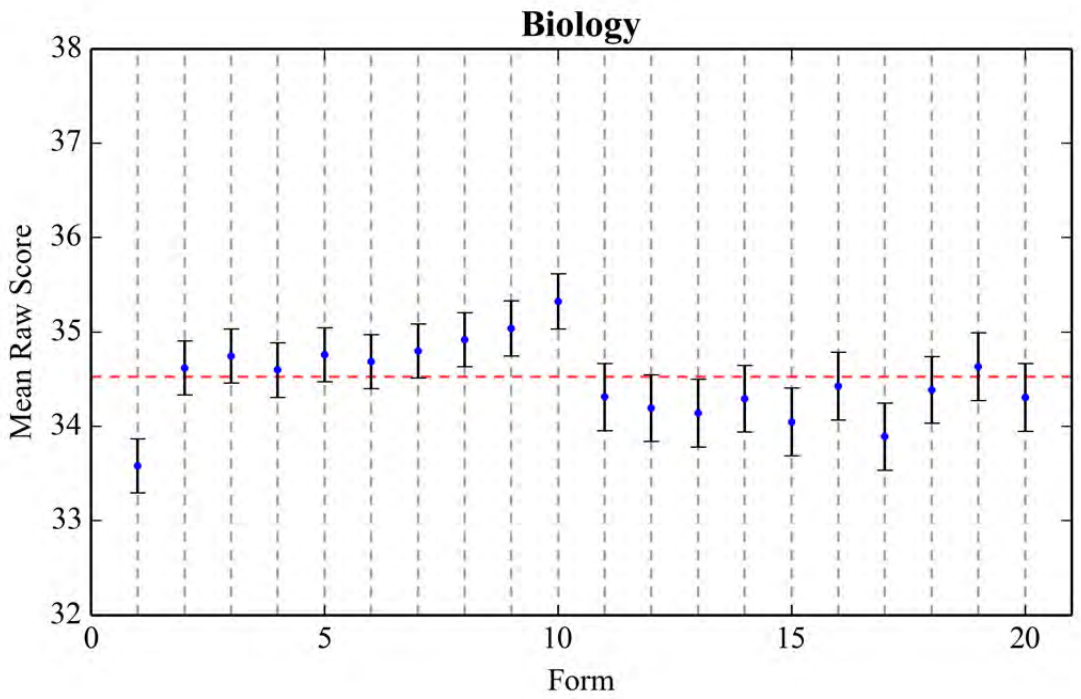
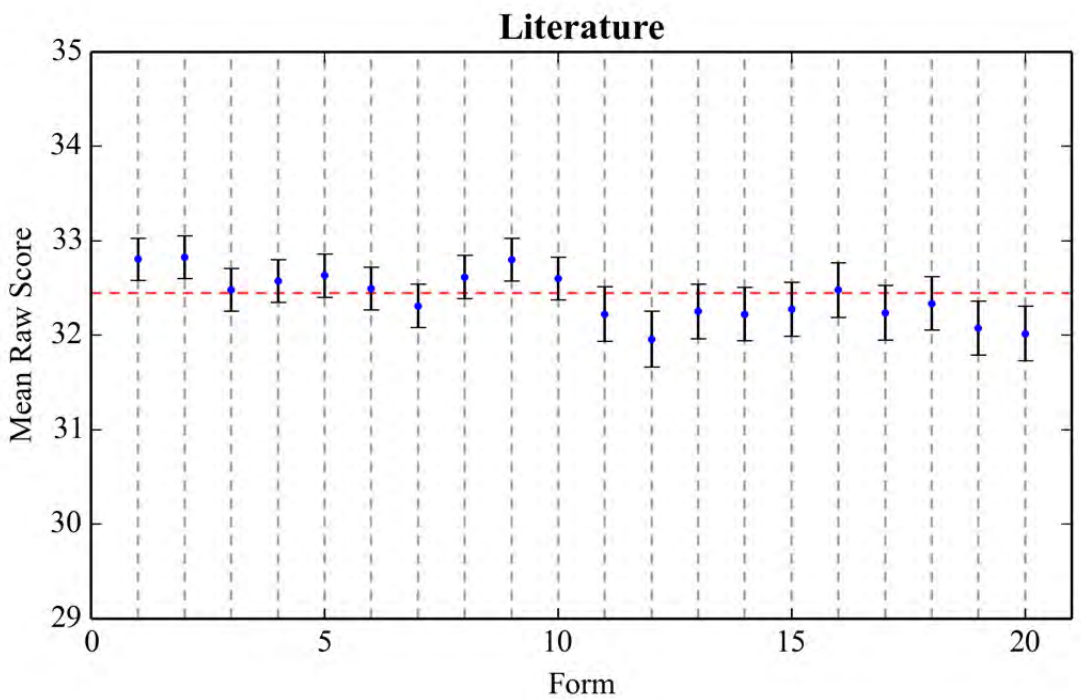


Figure 9–1 (continued). Form Mean Scores with +/- Three-Standard Error (SE) Bands





CHAPTER TEN: SUMMARY DEMOGRAPHIC AND ACCOMMODATION DATA FOR SPRING 2013 KEYSTONE EXAMS

ASSESSED STUDENTS

Assessed students on Keystone Exams include those from public schools who are required to participate by virtue of being in the graduating class of 2017 in a school district planning to use the Keystone Exams to meet graduation requirements and enrolled in Algebra I, Biology or Literature during the 2012–2013 school year. Students graduating before 2017 also participated in the assessment. The operational Keystone Exams were administered in both paper-and-pencil test (PPT) and computer-based test (CBT) formats.

Statistical tables and associated commentary embedded in this chapter are based on data from the spring 2013 test administration of the Keystone exams. There were two other administrations during the school year, each of which involved fewer students than the spring. One occurred during winter 2012–2013 and the other in the summer of 2013. Tables summarizing results from these two administrations may be found in Appendix I.

Results for this chapter are presented in sets of tables for the three Keystone Exams administered in spring 2013 (Algebra I, Biology, and Literature). Accompanying each numbered table is a letter (A, B, or L) to designate the course area. Table set 10–1A through 10–1L provides a summary of tests processed and scored, which are displayed separately by student grade level. The first two rows present the number processed for each administration mode (PPT and CBT). The total number of tests processed is presented on the third row. The fourth row shows the number and percentage of students with a Keystone score, while the fifth row presents the number and percentage not receiving a score. Please note that the percent of students assessed (received a total score) is typically in the high 90s across grade levels.

Table 10–1A. Students Assessed on the Spring 2013 Keystone: Algebra I

	Other*	Gr.6	Gr.7	Gr.8	Gr.9	Gr.10	Gr.11	Gr.12	Total
	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct
Number of PPT processed	175	352	7,464	39,050	73,018	52,585	46,698	273	219,615
Number of CBT processed	1	25	1,169	6,293	10,100	7,584	7,443	46	32,661
Total tests processed	176	377	8,633	45,343	83,118	60,169	54,141	319	252,276
Students with a total test score	156	376	8,605	45,104	80,614	57,682	51,722	293	244,552
	88.6	99.7	99.7	99.5	97.0	95.9	95.5	91.8	96.9
Number of tests processed without a total score	20	1	28	239	2,504	2,487	2,419	26	7,724
	11.4	0.3	0.3	0.5	3.0	4.1	4.5	8.2	3.1

*Other combines students coded as (1) below Grade 6, (2) ungraded, or (3) without a coded grade

Table 10–1B. Students Assessed on the Spring 2013 Keystone: Biology

	Other*	Gr.8	Gr.9	Gr.10	Gr.11	Gr.12	Total
	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct
Number of PPT processed	124	78	41,550	73,053	43,631	233	158,669
Number of CBT processed	1	148	6,258	12,445	7,445	36	26,333
Total tests processed	125	226	47,808	85,498	51,076	269	185,002
Students with a total test score	114	226	46,822	82,471	48,300	246	178,179
	91.2	100.0	97.9	96.5	94.6	91.4	96.3
Number of tests processed without a total score	11	0	986	3,027	2,776	23	6,823
	8.8	0.0	2.1	3.5	5.4	8.6	3.7

*Other combines students coded as (1) below Grade 8, (2) ungraded, or (3) without a coded grade

Table 10–1L. Students Assessed on the Spring 2013 Keystone: Literature

	Other*	Gr.8	Gr.9	Gr.10	Gr.11	Gr.12	Total
	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct
Number of PPT processed	96	98	10,481	86,889	39,467	215	137,246
Number of CBT processed	1	133	1,744	13,541	6,121	45	21,585
Total tests processed	97	231	12,225	100,430	45,588	260	158,831
Students with a total test score	87	231	11,819	97,695	43,433	242	153,507
	89.7	100.0	96.7	97.3	95.3	93.1	96.6
Number of tests processed without a total score	10	0	406	2,735	2,155	18	5,324
	10.3	0.0	3.3	2.7	4.7	6.9	3.4

*Other combines students coded as (1) below Grade 8, (2) ungraded, or (3) without a coded grade

REASONS FOR STUDENT NON-ASSESSMENT

As observed from the bottom row of Table set 10–1, a small percent of students were not assessed. Although there are a variety of reasons for this, the major ones pertain to:

- Extended absence from school that continued beyond the assessment window.
- Absence without make-up for at least one section of a test.
- Failure to meet the attempt criteria on one or more test modules and no exclusion code marked by school personnel. The attempt criteria required a minimum of five items to be completed in each module.
- Medical emergency.
- Other reasons (combined are the categories of: other, parental request due to a religious reason, multiple reasons coded).

The number of students without a total test score for each of these reasons is provided in Tables 10–2A through 10–2L. Associated with this number is the percent of the total of non-assessed students in each column (grade level) attributed to a particular reason.

Table 10–2A. Counts of Students without Scores on the Spring 2013 Keystone: Algebra I

Reason for Non-Assessment	Other*	Gr.6	Gr.7	Gr.8	Gr.9	Gr.10	Gr.11	Gr.12	Total
	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct
Extended absence from school	7	0	8	76	647	504	570	2	1,814
	35.0	0.0	28.6	31.8	25.8	20.3	23.6	7.7	23.5
Absent without make-up	1	0	0	21	436	533	406	3	1,400
	5.0	0.0	0.0	8.8	17.4	21.4	16.8	11.5	18.1
Non-attempt	8	0	5	45	1,064	1,130	979	14	3,245
	40.0	0.0	17.9	18.8	42.5	45.4	40.5	53.8	42.0
Medical emergency	2	0	13	83	116	121	153	2	490
	10.0	0.0	46.4	34.7	4.6	4.9	6.3	7.7	6.3
Other reasons	2	1	2	14	241	199	311	5	775
	10.0	100.0	7.1	5.9	9.6	8.0	12.9	19.2	10.0
Total not assessed	20	1	28	239	2,504	2,487	2,419	26	7,724

*Other combines students coded as (1) below Grade 6, (2) ungraded, or (3) without a coded grade

Table 10–2B. Counts of Students without Scores on the 2013 Keystone: Biology

Reason for Non-Assessment	Other*	Gr.8	Gr.9	Gr.10	Gr.11	Gr.12	Total
	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct
Extended absence from school	5 45.5	0 0.0	268 27.2	699 23.1	604 21.8	6 26.1	1,582 23.2
Absent without make-up	1 9.1	0 0.0	164 16.6	690 22.8	602 21.7	1 4.3	1,458 21.4
Non-attempt	3 27.3	0 0.0	351 35.6	1,169 38.6	865 31.2	10 43.5	2,398 35.1
Medical emergency	1 9.1	0 0.0	91 9.2	200 6.6	136 4.9	1 4.3	429 6.3
Other reasons	1 9.1	0 0.0	112 11.4	269 8.9	569 20.5	5 21.7	956 14.0
Total not assessed	11	0	986	3,027	2,776	23	6,823

*Other combines students coded as (1) below Grade 8, (2) ungraded, or (3) without a coded grade

Table 10–2L. Counts of Students without Scores on the Spring 2013 Keystone: Literature

Reason for Non-Assessment	Other*	Gr.8	Gr.9	Gr.10	Gr.11	Gr.12	Total
	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct
Extended absence from school	3 30.0	0 0.0	114 28.1	590 21.6	551 25.6	1 5.6	1,259 23.6
Absent without make-up	3 30.0	0 0.0	72 17.7	637 23.3	410 19.0	3 16.7	1,125 21.1
Non-attempt	2 20.0	0 0.0	135 33.3	1,080 39.5	771 35.8	10 55.6	1,998 37.5
ELL in first year in U.S. schools	0 0.0	0 0.0	1 0.2	20 0.7	18 0.8	0 0.0	39 0.7
Medical emergency	1 10.0	0 0.0	14 3.4	206 7.5	125 5.8	1 5.6	347 6.5
Other reasons	1 10.0	0 0.0	70 17.2	202 7.4	280 13.0	3 16.7	556 10.4
Total not assessed	10	0	406	2,735	2,155	18	5,324

*Other combines students coded as (1) below Grade 8, (2) ungraded, or (3) without a coded grade

DEMOGRAPHIC CHARACTERISTICS OF STUDENTS RECEIVING TEST SCORES

COMPOSITION OF SAMPLE USED IN SUBSEQUENT TABLES

Students included in the remaining data analyses of this chapter were those contributed to state summary statistics, using the final individual student data file containing records from the spring 2013 administration, which was provided to the Pennsylvania Department of Education in June 2013. State summary statistics were based on students who received a total test score on the spring 2013 administration with the exception of students who attended non-public schools or those who were home schooled. Also excluded were students who were non-Keystone proficient.

Demographic data for students taking the Keystone Exams is presented separately for each course (Tables 10–3A, 10–3B, 10–3L). Results for accommodations received were collected separately by course and are presented in separate tables as well. For example, tables involving accommodations for Biology are found in Tables 10–4B, 10–5B, 10–6B, and 10–7B. Similar data from the winter 2012–2013 and summer 2013 test administrations may be found in Appendix I.

COLLECTION OF STUDENT DEMOGRAPHIC INFORMATION

Data for analyses involving demographic characteristics were obtained primarily from information supplied by school district personnel through the Pennsylvania Information Management System (PIMS) and subsequently transmitted to DRC. Some data such as accommodation information is recorded by school personnel directly on the student answer document (PPT) or in eDirect test setup (CBT) at the time a Keystone exam is administered.

PARTICIPATION BY ADMINISTRATION MODE

The percent of students assessed by the two administration modes, paper/pencil test (PPT) or a computer-based test (CBT) was as follows:

- PPT: Algebra (86.8 percent), Biology (85.4 percent), and Literature (86.1 percent)
- CBT: Algebra (13.2 percent), Biology (14.6 percent), and Literature (13.9 percent)

DEMOGRAPHIC CHARACTERISTICS

Frequency data for each demographic category is presented in Tables 10–3A through 10–3L. Data is presented by grade level with PPT and CBT formats combined into a single composite. Shown at the bottom of the appropriate table is the number of assessed students contributing to summary statistics on which the column percentages are based.

Table 10–3A. Demographic Characteristics of Students taking the Spring 2013 Keystone: Algebra I

Demographic or Educational Characteristic	Other*	Gr.6	Gr.7	Gr.8	Gr.9	Gr.10	Gr.11	Gr.12	Total
	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct
Gender									
Female	34 21.8	134 35.6	3,983 46.3	23,188 51.4	39,547 49.1	28,238 49.0	25,295 48.9	153 52.2	120,572 49.3
Male	49 31.4	242 64.4	4,622 53.7	21,898 48.6	40,985 50.8	29,320 50.8	26,350 50.9	137 46.8	123,603 50.5
Race/Ethnicity									
American Indian/Alaskan Native (not Hispanic)	0 0.0	0 0.0	11 0.1	47 0.1	117 0.1	74 0.1	77 0.1	1 0.3	327 0.1
Asian (not Hispanic)	4 2.6	92 24.5	869 10.1	1,837 4.1	2,394 3.0	1,353 2.3	1,122 2.2	10 3.4	7,681 3.1
Black or African American (not Hispanic)	21 13.5	6 1.6	248 2.9	3,042 6.7	14,355 17.8	11,625 20.2	10,165 19.7	93 31.7	39,555 16.2
Hispanic (any race)	3 1.9	3 0.8	225 2.6	1,734 3.8	8,274 10.3	5,795 10.0	5,221 10.1	57 19.5	21,312 8.7
Multi-Racial (not Hispanic)	0 0.0	8 2.1	126 1.5	557 1.2	1,373 1.7	852 1.5	858 1.7	7 2.4	3,781 1.5
White (not Hispanic)	52 33.3	267 71.0	7,113 82.7	37,828 83.9	53,905 66.9	37,815 65.6	34,161 66.0	122 41.6	171,263 70.0
Native Hawaiian or Other Pacific Islander (not Hispanic)	0 0.0	0 0.0	12 0.1	39 0.1	50 0.1	28 0.0	32 0.1	0 0.0	161 0.1
Educational Category and Other Demographic Groups									
IEP (not gifted)	15 9.6	10 2.7	163 1.9	1,877 4.2	11,206 13.9	10,409 18.0	12,087 23.4	62 21.2	35,829 14.7
Exited IEP in last 2 years	2 1.3	10 2.7	225 2.6	939 2.1	1,419 1.8	840 1.5	705 1.4	6 2.0	4,146 1.7
Title I	21 13.5	10 2.7	491 5.7	4,936 10.9	17,957 22.3	12,507 21.7	11,234 21.7	126 43.0	47,282 19.3
Title III served	4 2.6	1 0.3	22 0.3	225 0.5	2,342 2.9	1,884 3.3	1,870 3.6	12 4.1	6,360 2.6
Title III not served	0 0.0	9 2.4	95 1.1	872 1.9	763 0.9	621 1.1	571 1.1	2 0.7	2,933 1.2
Migrant student	0 0.0	0 0.0	0 0.0	2 0.0	55 0.1	32 0.1	38 0.1	0 0.0	127 0.1
ELL (enrolled after 5/24/12)	1 0.6	1 0.3	14 0.2	67 0.1	636 0.8	396 0.7	382 0.7	3 1.0	1,500 0.6
ELL (enrolled on or before 5/24/12)	1 0.6	0 0.0	14 0.2	196 0.4	1,869 2.3	1,599 2.8	1,601 3.1	9 3.1	5,289 2.2

Table 10–3A (continued). Demographic Characteristics of Students taking the Spring 2013 Keystone: Algebra I

Demographic or Educational Characteristic	Other*	Gr.6	Gr.7	Gr.8	Gr.9	Gr.10	Gr.11	Gr.12	Total
	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct
Exited ESL/bilingual program and in first year of monitoring	0 0.0	0 0.0	17 0.2	114 0.3	208 0.3	305 0.5	204 0.4	1 0.3	849 0.3
Exited ESL/bilingual program and in 2nd year of monitoring	0 0.0	1 0.3	16 0.2	83 0.2	263 0.3	169 0.3	243 0.5	0 0.0	775 0.3
Former ELL no longer monitored	0 0.0	7 1.9	142 1.7	712 1.6	1,729 2.1	977 1.7	853 1.6	8 2.7	4,428 1.8
Foreign exchange student	0 0.0	0 0.0	0 0.0	2 0.0	3 0.0	14 0.0	32 0.1	3 1.0	54 0.0
Economically disadvantaged	17 10.9	21 5.6	1,059 12.3	10,780 23.9	36,257 45.0	27,645 47.9	24,693 47.7	196 66.9	100,668 41.2
Historically Underperforming Subgroup	25 16.0	31 8.2	1,197 13.9	12,061 26.7	41,589 51.6	32,482 56.3	30,690 59.3	220 75.1	118,295 48.4
Enrollment in school of residence after 10/1/12	18 11.5	2 0.5	56 0.7	678 1.5	3,860 4.8	3,005 5.2	3,010 5.8	42 14.3	10,671 4.4
Enrollment in district of residence after 10/1/12	14 9.0	1 0.3	47 0.5	586 1.3	2,957 3.7	2,364 4.1	2,421 4.7	28 9.6	8,418 3.4
Enrollment as PA resident after 10/1/12	6 3.8	1 0.3	25 0.3	262 0.6	1,254 1.6	1,077 1.9	1,004 1.9	6 2.0	3,635 1.5
Enrollment in school of residence after 10/1/11 but on/before 10/1/12	12 7.7	90 23.9	925 10.7	3,784 8.4	27,108 33.6	11,266 19.5	9,578 18.5	100 34.1	52,863 21.6
Enrollment in district of residence after 10/1/11 but on/before 10/1/12	8 5.1	23 6.1	284 3.3	1,734 3.8	10,654 13.2	4,812 8.3	4,377 8.5	66 22.5	21,958 9.0
Home schooled	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
Court/agency placed	0 0.0	0 0.0	0 0.0	10 0.0	32 0.0	33 0.1	52 0.1	3 1.0	130 0.1
Number of assessed students	156	376	8,605	45,104	80,614	57,682	51,722	293	244,552

*Other combines students coded as (1) below Grade 6, (2) ungraded, or (3) without a coded grade

Table 10–3B. Demographic Characteristics of Students taking the Spring 2013 Keystone: Biology

Demographic or Educational Characteristic	Other*	Gr.8	Gr.9	Gr.10	Gr.11	Gr.12	Total
	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct
Gender							
Female	33 28.9	94 41.6	23,585 50.4	40,850 49.5	24,099 49.9	126 51.2	88,787 49.8
Male	27 23.7	132 58.4	23,208 49.6	41,480 50.3	24,127 50.0	114 46.3	89,088 50.0
Race/Ethnicity							
American Indian/Alaskan Native (not Hispanic)	0 0.0	0 0.0	59 0.1	131 0.2	61 0.1	0 0.0	251 0.1
Asian (not Hispanic)	0 0.0	10 4.4	2,103 4.5	2,347 2.8	1,287 2.7	10 4.1	5,757 3.2
Black or African American (not Hispanic)	18 15.8	2 0.9	5,561 11.9	11,874 14.4	7,222 15.0	84 34.1	24,761 13.9
Hispanic (any race)	3 2.6	6 2.7	2,307 4.9	6,814 8.3	3,611 7.5	36 14.6	12,777 7.2
Multi-Racial (not Hispanic)	1 0.9	3 1.3	774 1.7	1,071 1.3	765 1.6	6 2.4	2,620 1.5
White (not Hispanic)	34 29.8	204 90.3	35,901 76.7	60,011 72.8	35,243 73.0	103 41.9	131,496 73.8
Native Hawaiian or Other Pacific Islander (not Hispanic)	0 0.0	0 0.0	32 0.1	69 0.1	33 0.1	1 0.4	135 0.1
Educational Category and Other Demographic Groups							
IEP (not gifted)	13 11.4	27 11.9	4,505 9.6	11,836 14.4	8,486 17.6	56 22.8	24,923 14.0
Exited IEP in last 2 years	1 0.9	2 0.9	811 1.7	1,105 1.3	656 1.4	6 2.4	2,581 1.4
Title I	32 28.1	11 4.9	5,782 12.3	13,460 16.3	7,572 15.7	96 39.0	26,953 15.1
Title III served	1 0.9	0 0.0	489 1.0	1,861 2.3	1,160 2.4	7 2.8	3,518 2.0
Title III not served	0 0.0	1 0.4	442 0.9	931 1.1	426 0.9	4 1.6	1,804 1.0
Migrant student	0 0.0	0 0.0	4 0.0	39 0.0	11 0.0	1 0.4	55 0.0
ELL (enrolled after 5/24/12)	0 0.0	0 0.0	140 0.3	374 0.5	255 0.5	3 1.2	772 0.4
ELL (enrolled on or before 5/24/12)	1 0.9	1 0.4	405 0.9	1,601 1.9	979 2.0	7 2.8	2,994 1.7

Table 10–3B (continued). Demographic Characteristics of Students taking the Spring 2013 Keystone: Biology

Demographic or Educational Characteristic	Other*	Gr.8	Gr.9	Gr.10	Gr.11	Gr.12	Total
	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct
Exited ESL/bilingual program and in first year of monitoring	0 0.0	0 0.0	99 0.2	376 0.5	165 0.3	1 0.4	641 0.4
Exited ESL/bilingual program and in 2nd year of monitoring	0 0.0	0 0.0	103 0.2	221 0.3	178 0.4	0 0.0	502 0.3
Former ELL no longer monitored	1 0.9	2 0.9	843 1.8	1,382 1.7	670 1.4	7 2.8	2,905 1.6
Foreign exchange student	0 0.0	0 0.0	3 0.0	18 0.0	30 0.1	6 2.4	57 0.0
Economically disadvantaged	21 18.4	35 15.5	15,301 32.7	32,261 39.1	19,577 40.5	151 61.4	67,346 37.8
Historically Underperforming Subgroup	25 21.9	54 23.9	17,522 37.4	38,209 46.3	24,002 49.7	168 68.3	79,980 44.9
Enrollment in school of residence after 10/1/12	13 11.4	5 2.2	1,425 3.0	3,185 3.9	2,429 5.0	36 14.6	7,093 4.0
Enrollment in district of residence after 10/1/12	9 7.9	4 1.8	1,131 2.4	2,589 3.1	2,060 4.3	24 9.8	5,817 3.3
Enrollment as PA resident after 10/1/12	4 3.5	0 0.0	420 0.9	1,106 1.3	810 1.7	4 1.6	2,344 1.3
Enrollment in school of residence after 10/1/11 but on/before 10/1/12	16 14.0	16 7.1	13,229 28.3	11,959 14.5	7,074 14.6	77 31.3	32,371 18.2
Enrollment in district of residence after 10/1/11 but on/before 10/1/12	7 6.1	16 7.1	5,031 10.7	5,491 6.7	3,685 7.6	55 22.4	14,285 8.0
Home schooled	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
Court/agency placed	2 1.8	1 0.4	19 0.0	44 0.1	51 0.1	0 0.0	117 0.1
Number of assessed students	114	226	46,822	82,471	48,300	246	178,179

*Other combines students coded as (1) below Grade 8, (2) ungraded, or (3) without a coded grade

Table 10–3L. Demographic Characteristics of Students taking the Spring 2013 Keystone: Literature

Demographic or Educational Characteristic	Other*	Gr.8	Gr.9	Gr.10	Gr.11	Gr.12	Total
	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct
Gender							
Female	25 28.7	109 47.2	5,434 46.0	47,916 49.0	19,026 43.8	124 51.2	72,634 47.3
Male	24 27.6	122 52.8	6,249 52.9	49,676 50.8	24,345 56.1	110 45.5	80,526 52.5
Race/Ethnicity							
American Indian/Alaskan Native (not Hispanic)	0 0.0	0 0.0	20 0.2	143 0.1	60 0.1	0 0.0	223 0.1
Asian (not Hispanic)	1 1.1	3 1.3	209 1.8	3,378 3.5	1,198 2.8	7 2.9	4,796 3.1
Black or African American (not Hispanic)	17 19.5	18 7.8	2,112 17.9	14,182 14.5	8,360 19.2	82 33.9	24,771 16.1
Hispanic (any race)	1 1.1	4 1.7	1,037 8.8	7,604 7.8	4,452 10.3	46 19.0	13,144 8.6
Multi-Racial (not Hispanic)	2 2.3	1 0.4	192 1.6	1,266 1.3	742 1.7	7 2.9	2,210 1.4
White (not Hispanic)	23 26.4	205 88.7	8,048 68.1	70,951 72.6	28,523 65.7	91 37.6	107,841 70.3
Native Hawaiian or Other Pacific Islander (not Hispanic)	0 0.0	0 0.0	7 0.1	66 0.1	27 0.1	0 0.0	100 0.1
Educational Category and Other Demographic Groups							
IEP (not gifted)	13 14.9	25 10.8	1,774 15.0	13,454 13.8	11,256 25.9	53 21.9	26,575 17.3
Exited IEP in last 2 years	1 1.1	2 0.9	152 1.3	1,341 1.4	576 1.3	4 1.7	2,076 1.4
Title I	19 21.8	8 3.5	2,469 20.9	16,168 16.5	9,661 22.2	114 47.1	28,439 18.5
Title III served	0 0.0	0 0.0	216 1.8	1,801 1.8	1,817 4.2	11 4.5	3,845 2.5
Title III not served	0 0.0	1 0.4	42 0.4	1,407 1.4	402 0.9	3 1.2	1,855 1.2
Migrant student	0 0.0	0 0.0	14 0.1	42 0.0	38 0.1	1 0.4	95 0.1
ELL (enrolled after 5/24/12)	0 0.0	0 0.0	58 0.5	231 0.2	244 0.6	2 0.8	535 0.3
ELL (enrolled on or before 5/24/12)	0 0.0	1 0.4	177 1.5	1,700 1.7	1,670 3.8	10 4.1	3,558 2.3

Table 10–3L (continued). Demographic Characteristics of Students taking the Spring 2013 Keystone: Literature

Demographic or Educational Characteristic	Other*	Gr.8	Gr.9	Gr.10	Gr.11	Gr.12	Total
	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct
Exited ESL/bilingual program and in first year of monitoring	0 0.0	0 0.0	19 0.2	450 0.5	229 0.5	1 0.4	699 0.5
Exited ESL/bilingual program and in 2nd year of monitoring	0 0.0	0 0.0	28 0.2	265 0.3	237 0.5	0 0.0	530 0.3
Former ELL no longer monitored	1 1.1	2 0.9	137 1.2	1,777 1.8	739 1.7	8 3.3	2,664 1.7
Foreign exchange student	0 0.0	0 0.0	1 0.0	23 0.0	42 0.1	4 1.7	70 0.0
Economically disadvantaged	15 17.2	56 24.2	5,208 44.1	36,878 37.7	21,056 48.5	162 66.9	63,375 41.3
Historically Underperforming Subgroup	19 21.8	75 32.5	5,945 50.3	43,428 44.5	26,500 61.0	178 73.6	76,145 49.6
Enrollment in school of residence after 10/1/12	11 12.6	3 1.3	654 5.5	3,465 3.5	2,709 6.2	40 16.5	6,882 4.5
Enrollment in district of residence after 10/1/12	6 6.9	3 1.3	543 4.6	2,752 2.8	2,188 5.0	23 9.5	5,515 3.6
Enrollment as PA resident after 10/1/12	2 2.3	0 0.0	212 1.8	1,099 1.1	864 2.0	4 1.7	2,181 1.4
Enrollment in school of residence after 10/1/11 but on/before 10/1/12	11 12.6	15 6.5	2,935 24.8	14,668 15.0	8,291 19.1	85 35.1	26,005 16.9
Enrollment in district of residence after 10/1/11 but on/before 10/1/12	4 4.6	15 6.5	1,581 13.4	5,785 5.9	3,643 8.4	51 21.1	11,079 7.2
Home schooled	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
Court/agency placed	0 0.0	0 0.0	41 0.3	53 0.1	54 0.1	2 0.8	150 0.1
Number of assessed students	87	231	11,819	97,695	43,433	242	153,507

*Other combines students coded as (1) below Grade 8, (2) ungraded, or (3) without a coded grade

TEST ACCOMMODATIONS PROVIDED

School personnel supplied information regarding accommodations that a student may have received while taking the Keystone Exams. Accommodations are classified in terms of presentation, response, setting, and timing to enable students to better manage disabilities that hinder their ability to learn and respond to assessments. An accommodations manual entitled *Accommodations Guidelines: Keystone Exams and PSSA* (PDE, revised 10/31/2012) was updated for use with the 2013 PSSA and Keystone Exams. This manual may be found on the PDE website at www.education.state.pa.us. Click on Programs, Programs O–R, Pennsylvania System of School Assessment (PSSA), and Testing Accommodations & Security. A glossary of accommodation terms as applied to the Keystone Exams is provided in Table 10–10 at the end of this chapter.

It should be noted that there were differences in a few of the accommodations available to students during the 2012–2013 winter test administration of the Keystone exams versus the 2013 spring and summer test administrations. These differences range from very slight word changes to more extensive rewording to several altogether new accommodations.

The frequency with which accommodations were utilized for PPT and CBT formats is summarized separately for each course exam in Tables 10–4A through 10–7L. Tabled values are based on all students whose score contributed to state summary statistics in a given Keystone exam. Because of the very small incidence of usage of many accommodations, combined with the fact that a number of accommodations are primarily accessed by only one of the two administration modes, meaningful comparisons between modes are rather limited. In the following tables, an NA denotes those instances in which a particular accommodation does not apply to one of the testing modes.

PRESENTATION ACCOMMODATIONS RECEIVED

Presentation accommodations are those that provide alternate ways for students to access and process printed instructional material and assessments. These include auditory, tactile, visual, and combined auditory/visual modes of presentation. The number of presentation accommodations provided in the 2013 Keystone exams varied by course exam and test administration mode as follows:

- PPT: Algebra I, 11, Biology, 11, and Literature, 7.
- CBT: Algebra I, 9, Biology, 9, and Literature, 4.

As depicted in Tables 10–4A through 10–4L, the actual frequencies were quite low, generally representing less than one-tenth of one percent of assessed students in each course. The most notable exceptions, applicable to Algebra and Biology only, were “All items/questions read aloud” and “Some items/questions read aloud.” Among accommodations specific to CBT the use of audio was the most frequent. Although included in the tabled data, Spanish version (Algebra and Biology; PPT only) is not included in the counts listed above.

RESPONSE ACCOMMODATIONS RECEIVED

Response accommodations permit students to complete assignments, tests, and activities in different ways to solve or organize problems using some type of assistive device or organizer. The number of response accommodations provided on the spring 2013 Keystone Exams varied by subject as follows:

- PPT: Algebra I, 12, Biology, 12, and Literature, 9.
- CBT: Algebra I, 9, Biology, 9, and Literature, 6.

The frequency with which these accommodations were utilized is summarized in Tables 10–5A through 10–5L. The actual frequencies are quite low, representing less than one-tenth of one percent of assessed students in nearly all instances. Very few response accommodations were coded as being utilized by students responding by CBT.

SETTING ACCOMMODATIONS RECEIVED

Setting accommodations permit a change in location in which a student receives instruction or participates in an assessment. In the spring 2013 Keystone administration there were four categories of setting accommodations, which applied to both administration modes and to each course exam. As depicted in Tables 10–6A through 10–6L, the most common accommodation was small group setting for both PPT and CBT modes of administration, although the percentage of usage was somewhat higher for PPT.

TIMING ACCOMMODATIONS RECEIVED

Timing accommodations involve a change in the allowable length of time to complete assignments or assessments, including the way in which time is organized. There were four categories of timing accommodations, which applied to both administration modes and to each course exam. As depicted in Tables 10–7A through 10-7L, the most common accommodation was extended time for both PPT and CBT administration modes with slightly higher percentages for PPT than CBT in Algebra I and Literature.

Table 10–4A. Incidence of Presentation Accommodations Received on the Spring 2013 Keystone: Algebra I

Type of Presentation Accommodation	PPT	CBT	Total
	N/Pct	N/Pct	N/Pct
Braille format	10	N/A	10
	0.0	N/A	0.0
Large print format	84	N/A	84
	0.0	N/A	0.0
Electronic screen reader	1	N/A	1
	0.0	N/A	0.0
Some test items/questions read aloud	1,288	229	1,517
	0.6	0.7	0.6
All test items/questions read aloud	529	221	750
	0.2	0.7	0.3
Test items/questions signed	17	1	18
	0.0	0.0	0.0
Test items/questions interpreted for ELL student	162	4	166
	0.1	0.0	0.1
Amplification device	16	2	18
	0.0	0.0	0.0
Magnification device	5	0	5
	0.0	0.0	0.0
Color overlay	2	N/A	2
	0.0	N/A	0.0
Other (per Accommodations Guidelines)	24	3	27
	0.0	0.0	0.0
Spanish version	937	N/A	937
	0.4	N/A	0.4
Online Accommodations Received			
Audio recording	N/A	854	854
	N/A	2.7	0.3
Color Chooser	N/A	53	53
	N/A	0.2	0.0
Number of assessed students	212,385	32,167	244,552

Table 10–4B. Incidence of Presentation Accommodations Received on the Spring 2013 Keystone: Biology

Type of Presentation Accommodation	PPT	CBT	Total
	N/Pct	N/Pct	N/Pct
Braille format	7	N/A	7
	0.0	N/A	0.0
Large print format	60	N/A	60
	0.0	N/A	0.0
Electronic screen reader	1	N/A	1
	0.0	N/A	0.0
Some test items/questions read aloud	677	187	864
	0.4	0.7	0.5
All test items/questions read aloud	611	198	809
	0.4	0.8	0.5
Test items/questions signed	7	0	7
	0.0	0.0	0.0
Test items/questions interpreted for ELL student	66	6	72
	0.0	0.0	0.0
Amplification device	11	1	12
	0.0	0.0	0.0
Magnification device	9	6	15
	0.0	0.0	0.0
Color overlay	2	N/A	2
	0.0	N/A	0.0
Other (per Accommodations Guidelines)	22	1	23
	0.0	0.0	0.0
Spanish version	499	N/A	499
	0.3	N/A	0.3
Online Accommodations Received			
Audio recording	N/A	731	731
	N/A	2.8	0.4
Color Chooser	N/A	41	41
	N/A	0.2	0.0
Number of assessed students	152,236	25,943	178,179

Table 10–4L. Incidence of Presentation Accommodations Received on the Spring 2013 Keystone: Literature

Type of Presentation Accommodation	PPT	CBT	Total
	N/Pct	N/Pct	N/Pct
Braille format	6 0.0	N/A N/A	6 0.0
Large print format	56 0.0	N/A N/A	56 0.0
Electronic screen reader	2 0.0	N/A N/A	2 0.0
Amplification device	9 0.0	1 0.0	10 0.0
Magnification device	6 0.0	3 0.0	9 0.0
Color overlay	3 0.0	N/A N/A	3 0.0
Other (per Accommodations Guidelines)	28 0.0	4 0.0	32 0.0
Online Accommodations Received			
Color Chooser	N/A N/A	35 0.2	35 0.0
Number of assessed students	132,197	21,310	153,507

Table 10–5A. Incidence of Response Accommodations Received on the Spring 2013 Keystone: Algebra I

Type of Response Accommodation	PPT	CBT	Total
	N/Pct	N/Pct	N/Pct
Test administrator marked multiple-choice responses at student's direction	77 0.0	11 0.0	88 0.0
Test administrator scribed open-ended responses at student's direction	89 0.0	14 0.0	103 0.0
Test administrator transcribed student responses	139 0.1	11 0.0	150 0.1
Qualified interpreter translated, transcribed, and/or scribed student's signed responses	6 0.0	0 0.0	6 0.0
Qualified interpreter translated, transcribed, and/or scribed ELL student responses	12 0.0	1 0.0	13 0.0
Keyboard, word processor, or computer	27 0.0	N/A N/A	27 0.0
Brailler/Notetaker	5 0.0	N/A N/A	5 0.0
Augmentative communication device	1 0.0	0 0.0	1 0.0
Audio recording of student responses	0 0.0	0 0.0	0 0.0
Electronic screen reader	1 0.0	N/A N/A	1 0.0
Manipulative - Winter only	N/A N/A	N/A N/A	N/A N/A
Translation dictionary for ELL student	186 0.1	3 0.0	189 0.1
Other (per Accommodations Guidelines)	46 0.0	0 0.0	46 0.0
Number of assessed students	212,385	32,167	244,552

Table 10–5B. Incidence of Response Accommodations Received on the Spring 2013 Keystone: Biology

Type of Response Accommodation	PPT	CBT	Total
	N/Pct	N/Pct	N/Pct
Test administrator marked multiple-choice responses at student's direction	54 0.0	11 0.0	65 0.0
Test administrator scribed open-ended responses at student's direction	73 0.0	14 0.1	87 0.0
Test administrator transcribed student responses	124 0.1	12 0.0	136 0.1
Qualified interpreter translated, transcribed, and/or scribed student's signed responses	1 0.0	0 0.0	1 0.0
Qualified interpreter translated, transcribed, and/or scribed ELL student responses	1 0.0	1 0.0	2 0.0
Keyboard, word processor, or computer	43 0.0	N/A N/A	43 0.0
Brailler/Notetaker	2 0.0	N/A N/A	2 0.0
Augmentative communication device	0 0.0	0 0.0	0 0.0
Audio recording of student responses	0 0.0	0 0.0	0 0.0
Electronic screen reader	0 0.0	N/A N/A	0 0.0
Manipulative - Winter only	N/A N/A	N/A N/A	N/A N/A
Translation dictionary for ELL student	115 0.1	2 0.0	117 0.1
Other (per Accommodations Guidelines)	24 0.0	0 0.0	24 0.0
Number of assessed students	152,236	25,943	178,179

Table 10–5L. Incidence of Response Accommodations Received on the Spring 2013 Keystone: Literature

Type of Response Accommodation	PPT	CBT	Total
	N/Pct	N/Pct	N/Pct
Test administrator marked multiple-choice responses at student's direction	64 0.0	11 0.1	75 0.0
Test administrator scribed open-ended responses at student's direction	74 0.1	14 0.1	88 0.1
Test administrator transcribed student responses	131 0.1	12 0.1	143 0.1
Keyboard, word processor, or computer	76 0.1	N/A N/A	76 0.0
Brailler/Notetaker	0 0.0	N/A N/A	0 0.0
Augmentative communication device	3 0.0	0 0.0	3 0.0
Audio recording of student responses	0 0.0	0 0.0	0 0.0
Electronic screen reader	0 0.0	N/A N/A	0 0.0
Other (per Accommodations Guidelines)	12 0.0	0 0.0	12 0.0
Number of assessed students	132,197	21,310	153,507

Table 10–6A. Incidence of Setting Accommodations Received on the Spring 2013 Keystone: Algebra I

Type of Setting Accommodation	PPT	CBT	Total
	N/Pct	N/Pct	N/Pct
Hospital/home setting	59 0.0	0 0.0	59 0.0
Tested in separate setting - Winter only	N/A N/A	N/A N/A	N/A N/A
One-on-one setting	312 0.1	15 0.0	327 0.1
Small group setting	12,972 6.1	1,205 3.7	14,177 5.8
Other (per Accommodations Guidelines)	161 0.1	69 0.2	230 0.1
Number of assessed students	212,385	32,167	244,552

Table 10–6B. Incidence of Setting Accommodations Received on the Spring 2013 Keystone: Biology

Type of Setting Accommodation	PPT	CBT	Total
	N/Pct	N/Pct	N/Pct
Hospital/home setting	55 0.0	1 0.0	56 0.0
Tested in separate setting - Winter only	N/A N/A	N/A N/A	N/A N/A
One-on-one setting	218 0.1	17 0.1	235 0.1
Small group setting	9,525 6.3	982 3.8	10,507 5.9
Other (per Accommodations Guidelines)	80 0.1	29 0.1	109 0.1
Number of assessed students	152,236	25,943	178,179

Table 10–6L. Incidence of Setting Accommodations Received on the Spring 2013 Keystone: Literature

Type of Setting Accommodation	PPT	CBT	Total
	N/Pct	N/Pct	N/Pct
Hospital/home setting	56 0.0	0 0.0	56 0.0
Tested in separate setting - Winter only	N/A N/A	N/A N/A	N/A N/A
One-on-one setting	218 0.2	18 0.1	236 0.2
Small group setting	9,853 7.5	869 4.1	10,722 7.0
Other (per Accommodations Guidelines)	88 0.1	58 0.3	146 0.1
Number of assessed students	132,197	21,310	153,507

Table 10–7A. Incidence of Timing Accommodations Received on the Spring 2013 Keystone: Algebra I

Type of Timing Accommodation	PPT	CBT	Total
	N/Pct	N/Pct	N/Pct
Extended time	20,901 9.8	1,334 4.1	22,235 9.1
Frequent breaks	948 0.4	286 0.9	1,234 0.5
Changed test schedule	374 0.2	46 0.1	420 0.2
Other (per Accommodations Guidelines)	36 0.0	17 0.1	53 0.0
Number of assessed students	212,385	32,167	244,552

Table 10–7B. Incidence of Timing Accommodations Received on the Spring 2013 Keystone: Biology

Type of Timing Accommodation	PPT	CBT	Total
	N/Pct	N/Pct	N/Pct
Extended time	4,757 3.1	784 3.0	5,541 3.1
Frequent breaks	711 0.5	244 0.9	955 0.5
Changed test schedule	227 0.1	36 0.1	263 0.1
Other (per Accommodations Guidelines)	7 0.0	20 0.1	27 0.0
Number of assessed students	152,236	25,943	178,179

Table 10–7L. Incidence of Timing Accommodations Received on the Spring 2013 Keystone: Literature

Type of Timing Accommodation	PPT	CBT	Total
	N/Pct	N/Pct	N/Pct
Extended time	8,617 6.5	749 3.5	9,366 6.1
Frequent breaks	621 0.5	229 1.1	850 0.6
Changed test schedule	283 0.2	36 0.2	319 0.2
Other (per Accommodations Guidelines)	4 0.0	17 0.1	21 0.0
Number of assessed students	132,197	21,310	153,507

ACCOMMODATION RATE FOR NON-IEP AND IEP STUDENTS

A comparison between students without an IEP (non-IEP Students) and those with an IEP (IEP Students) with regard to having received an accommodation is provided in Table 10–8. In this data, accommodated means that a student received one or more of the total number of accommodations available for a given course; however, this varies somewhat with administration mode. The category of non-accommodated indicates that a student did not receive any accommodation during testing. The total number of accommodations available to students by administration mode varied by course exam as follows:

- PPT: Algebra I, 31, Biology, 31, and Literature, 24.
- CBT: Algebra I, 26, Biology, 26, and Literature, 18.

The general pattern of findings provided in Table 10–8 reveals a consistent and substantially higher percentage of IEP Students receiving an accommodation, in contrast to non-IEP Students. This same pattern holds true regardless of test administration mode or Keystone exam.

Comparisons between administration modes were also consistent in demonstrating a higher accommodation rate for IEP students taking a PPT than for those who responded by taking a CBT. The margin of difference in percentage points was approximately 9 for Algebra, nearly 7 for Biology, and 16 for Literature.

Table 10–8. Accommodations Rate for Non-IEP and IEP Students on the Spring 2013 Keystone Exams

Course Tested	Student Subgroup Tested	PPT	CBT	Total
		N/Pct	N/Pct	N/Pct
Algebra I	**Non-IEP Students**	181,112	27,611	208,723
	Non-Accommodated	162,960 90.0	26,861 97.3	189,821 90.9
	Accommodated	18,152 10.0	750 2.7	18,902 9.1
	IEP Students	31,273	4,556	35,829
	Non-Accommodated	18,150 58.0	3,047 66.9	21,197 59.2
	Accommodated	13,123 42.0	1,509 33.1	14,632 40.8
Biology	**Non-IEP Students**	130,857	22,399	153,256
	Non-Accommodated	127,205 97.2	22,137 98.8	149,342 97.4
	Accommodated	3,652 2.8	262 1.2	3,914 2.6
	IEP Students	21,379	3,544	24,923
	Non-Accommodated	12,261 57.4	2,274 64.2	14,535 58.3
	Accommodated	9,118 42.6	1,270 35.8	10,388 41.7
Literature	**Non-IEP Students**	109,287	17,645	126,932
	Non-Accommodated	102,404 93.7	17,464 99.0	119,868 94.4
	Accommodated	6,883 6.3	181 1.0	7,064 5.6
	IEP Students	22,910	3,665	26,575
	Non-Accommodated	13,235 57.8	2,716 74.1	15,951 60.0
	Accommodated	9,675 42.2	949 25.9	10,624 40.0

THE INCIDENCE OF ACCOMMODATIONS AND IEP AND ELL STATUS

As noted in Table 10–8 students with an IEP received an accommodation of some type far more often than non-IEP students. Certain accommodations with very low frequencies are specific to particular disabilities while others are far more common and may also apply to students classified as English Language Learners (ELL). Because the accommodations with the largest frequencies can potentially supply the most stable data when separated out for subgroup analysis, those in most common use were selected for display in Tables 10–9A through 10–9L. The most frequently occurring accommodations for assessed students were:

- Some test items/questions read aloud (Algebra I and Biology only)
- All test items/questions read aloud (Algebra I and Biology only)
- Small group setting
- Extended time
- Frequent breaks

Coding for IEP is dichotomous, as students are classified IEP and non-IEP. For purposes of this analysis, an English Language Learner (ELL) is an assessed student classified ELL and enrolled in a U.S. school before or after May 24, 2012. All other assessed students, including those who have exited an ESL/bilingual program and are in the first or second year of monitoring are regarded as non-ELL.

Customarily, a considerably larger percentage of IEP students receive a given accommodation than non-IEP students. Although less frequent, certain accommodations also have a high frequency rate for ELL students. To separate out the effect of being classified IEP or ELL, four possible combinations are presented in Tables 10–9A through 10–9L. These include general education students (who are neither IEP nor ELL), students who are IEP but non-ELL, students who are ELL but non-IEP, and students who are both IEP and ELL. The bottom row for each administration mode provides the total number of assessed students in each of the four classifications.

For purposes of descriptively comparing the four IEP/ELL subgroups with respect to whether a subgroup displayed a larger percentage rate than another subgroup, a choice was made to use a difference of five or more percentage points as a criterion for judging importance. In many instances, the percentage difference between subgroups was of little practical significance (from zero to only several percentage points).

Although the separate presentation of data for PPT and CBT modes provides an impression of overall findings the much smaller *n*-counts and accommodation rate by students taking a CBT renders an administration mode comparison less meaningful. Nevertheless, it is possible to make some cautious observations when sufficient *n*-counts and consistency are present as noted in the summary of findings below.

SUBGROUP COMPARISONS FOR PPT ADMINISTRATION MODE

Subgroup comparisons were regarded as viable for the PPT administration although the IEP/ELL subgroup *n*-count for Biology was only slightly above 400. There was little differentiation across subgroups for the two accommodations involving items/questions read aloud (Algebra I and Biology) and for frequent breaks (Algebra I, Biology and Literature). Small group setting was by far the most prevalent accommodation for the IEP/non-ELL subgroup followed by the ELL/non-IEP and IEP/ELL subgroups. This pattern was consistent across all three course exams. Another consistent pattern was observed for extended time, which was more prevalent for the IEP/non-ELL, ELL/non-IEP, and IEP/ELL subgroups than for the General Education subgroup.

SUBGROUP COMPARISONS FOR CBT ADMINISTRATION MODE

For the CBT administration the ELL/Non-IEP and IEP/ELL subgroup *n*-counts for Algebra I were only 194 and 58, respectively, and even lower for Biology and Literature. Consequently, only the General Education and IEP/non-ELL subgroups had a sufficient sample size to support reasonable comparisons. A consistent pattern noted for all three course exams was the greater prevalence of small group setting, extended time, and frequent breaks by the IEP/non-ELL subgroup than for the General Education subgroup.

COMPARISONS BETWEEN PPT AND CBT

The only subgroups for which comparisons between PPT and CBT administration modes were deemed reasonable based on sample size were within the General Education and IEP/non-ELL subgroups. The findings are summarized below.

- The General Education subgroup displayed a very low incidence of accommodations, typically less than one percent, in nearly all instances for both PPT and CBT administrations. The difference between PPT and CBT in percent of students receiving an accommodation exceeded five percentage points in only one instance (extended time for Algebra I).
- For the IEP/non-ELL subgroup, small group setting was the only accommodation for which PPT administration consistently exceeded CBT by more than five percentage points (actually by more than 10 percentage points) in all three course exams. The lone instance in which students tested by CBT exceeded those responding by PPT was extended time for Biology.

Table 10–9A. Incidence of IEP and ELL Students Receiving Selected Accommodations on the Spring 2013 Keystone: Algebra I

Classification of Students Regarding IEP and ELL					
Accommodation Received by Administration Mode		General Education (non-IEP or ELL)	IEP and non-ELL	ELL and non-IEP	Both IEP and ELL
		N/Pct	N/Pct	N/Pct	N/Pct
PPT	Some test items/questions read aloud	111 0.1	991 3.3	159 2.8	27 2.9
	All test items/questions read aloud	19 0.0	498 1.6	7 0.1	5 0.5
	Small group setting	994 0.6	11,171 36.8	575 10.2	232 25.3
	Extended time	15,935 9.1	4,197 13.8	690 12.3	79 8.6
	Frequent breaks	55 0.0	801 2.6	72 1.3	20 2.2
	Number assessed	175,493	30,355	5,619	918
CBT	Some test items/questions read aloud	13 0.0	210 4.7	0 0.0	6 10.3
	All test items/questions read aloud	21 0.1	193 4.3	4 2.1	3 5.2
	Small group setting	55 0.2	1,122 24.9	8 4.1	20 34.5
	Extended time	588 2.1	701 15.6	32 16.5	13 22.4
	Frequent breaks	16 0.1	267 5.9	0 0.0	3 5.2
	Number assessed	27,417	4,498	194	58
Total	Some test items/questions read aloud	124 0.1	1,201 3.4	159 2.7	33 3.4
	All test items/questions read aloud	40 0.0	691 2.0	11 0.2	8 0.8
	Small group setting	1,049 0.5	12,293 35.3	583 10.0	252 25.8
	Extended time	16,523 8.1	4,898 14.1	722 12.4	92 9.4
	Frequent breaks	71 0.0	1,068 3.1	72 1.2	23 2.4
	Number assessed	202,910	34,853	5,813	976

Table 10–9B. Incidence of IEP and ELL Students Receiving Selected Accommodations on the Spring 2013 Keystone: Biology

Classification of Students Regarding IEP and ELL					
Accommodation Received by Administration Mode		General Education (non-IEP or ELL)	IEP and non-ELL	ELL and non-IEP	Both IEP and ELL
		N/Pct	N/Pct	N/Pct	N/Pct
PPT	Some test items/questions read aloud	25 0.0	558 2.7	76 2.4	18 4.3
	All test items/questions read aloud	19 0.0	568 2.7	9 0.3	15 3.6
	Small group setting	637 0.5	8,401 40.1	372 11.9	115 27.6
	Extended time	2,398 1.9	2,090 10.0	231 7.4	38 9.1
	Frequent breaks	39 0.0	655 3.1	12 0.4	5 1.2
	Number assessed	127,718	20,962	3,139	417
CBT	Some test items/questions read aloud	8 0.0	173 4.9	1 0.6	5 13.9
	All test items/questions read aloud	19 0.1	173 4.9	2 1.1	4 11.1
	Small group setting	51 0.2	913 26.0	4 2.3	14 38.9
	Extended time	120 0.5	627 17.9	23 13.2	14 38.9
	Frequent breaks	8 0.0	233 6.6	0 0.0	3 8.3
	Number assessed	22,225	3,508	174	36
Total	Some test items/questions read aloud	33 0.0	731 3.0	77 2.3	23 5.1
	All test items/questions read aloud	38 0.0	741 3.0	11 0.3	19 4.2
	Small group setting	688 0.5	9,314 38.1	376 11.3	129 28.5
	Extended time	2,518 1.7	2,717 11.1	254 7.7	52 11.5
	Frequent breaks	47 0.0	888 3.6	12 0.4	8 1.8
	Number assessed	149,943	24,470	3,313	453

Table 10–9L. Incidence of IEP and ELL Students Receiving Selected Accommodations on the Spring 2013 Keystone: Literature

Classification of Students Regarding IEP and ELL					
Accommodation Received by Administration Mode		General Education (non-IEP or ELL)	IEP and non-ELL	ELL and non-IEP	Both IEP and ELL
		N/Pct	N/Pct	N/Pct	N/Pct
PPT	Small group setting	703 0.7	8,531 38.2	472 14.1	147 26.0
	Extended time	5,384 5.1	2,804 12.5	377 11.3	52 9.2
	Frequent breaks	33 0.0	569 2.5	13 0.4	6 1.1
	Number assessed	105,936	22,345	3,351	565
CBT	Small group setting	25 0.1	831 22.9	4 2.9	9 24.3
	Extended time	142 0.8	574 15.8	23 16.4	10 27.0
	Frequent breaks	12 0.1	216 6.0	0 0.0	1 2.7
	Number assessed	17,505	3,628	140	37
Total	Small group setting	728 0.6	9,362 36.0	476 13.6	156 25.9
	Extended time	5,526 4.5	3,378 13.0	400 11.5	62 10.3
	Frequent breaks	45 0.0	785 3.0	13 0.4	7 1.2
	Number assessed	123,441	25,973	3,491	602

GLOSSARY OF ACCOMMODATION TERMS

Table 10–10 provides a brief description of accommodation terms as used in the PSSA and Keystone Exams. Accommodation data was supplied by school personnel as noted in the left column of the table. The right column contains an explanation derived from the PDE publication, 2013 *Accommodations Guidelines: Keystone Exams and PSSA* (PDE, revised 10/31/2012, pages 23–47). This manual may be found on the PDE website at www.education.state.pa.us. Click on Programs, Programs O–R, Pennsylvania System of School Assessment (PSSA), and Testing Accommodations & Security.

Table 10–10. Glossary of Accommodation Terms as Applied in the 2013 PSSA and 2012–2013 Keystone Exams

Type of Testing Accommodation	Explanation
Student used the following Presentation Accommodations	
Braille format	Students may use a Braille format of the test. Answers must then be transcribed into the answer booklet without alteration.
Large print format	Students with visual impairments may use a large print format. Answers must then be transcribed into the answer booklet without alteration.
Magnification device	Devices to magnify print may be used for students with visual impairments and/or print disabilities.
Color overlay	Students with visual impairments may place a color overlay on a printed page of the test document to make text more readable.
Reading windows, reading guides	Students with visual impairments may use reading windows and reading guides. Data was gathered for this accommodation for 2013 PSSA writing and the Winter 2012–2013 Keystone Exams.
Electronic screen reader (PDE approval required)	Students with a severe visual disability may use an electronic screen reader; however, PDE must approve the program and functions prior to the test window.
Test items/questions signed	Deaf/hearing impaired students may receive test directions from a qualified interpreter. Signing is also permitted for essay prompts in PSSA writing and all items in PSSA mathematics and science and for Keystone Algebra and Biology.
Test items/questions interpreted for ELL	A qualified interpreter may translate directions or clarify instructions for the assessments. The interpreter may translate, but not define specific words or test questions on the PSSA mathematics and science tests and Keystone Algebra and Biology exams. On the PSSA reading test, the interpreter may only translate directions and may not translate or define words in the passages or test questions.
Test directions read aloud, signed, or recorded (provided by live reader)	Directions for the 2013 PSSA writing test and the winter 2012–2013 administration of the Keystone Exams may be read aloud, or signed, interpreted for ELL, or recorded.

Table 10–10 (continued). Glossary of Accommodation Terms as Applied in the 2013 PSSA and 2012–2013 Keystone Exams

Type of Testing Accommodation	Explanation
Student used the following Presentation Accommodations (continued)	
Some or all test items/questions read aloud	Students unable to decode text visually may have items/questions read aloud for PSSA mathematics and science and Keystone Algebra I and Biology; however, words may not be defined.
Writing prompts recorded, signed, interpreted for ELL, or recorded	PSSA writing essay prompts may be presented by audio recording.
Amplification device	In addition to using hearing aids, an amplification device to enhance clarity may be required.
Other (PDE approval required)	Other presentation accommodations indicated in the *Accommodation Guidelines* may be provided; however, PDE approval is required prior to the test window.
Spanish version for PSSA (Math and Science) and Keystone (Algebra and Biology)	Students whose first language is Spanish and who have been enrolled in U.S. schools for fewer than three years may take this version.
Student used the following Online Presentation Accommodations	
Audio	An audio CD version of PSSA mathematics and science or Keystone Algebra and Biology test items/questions may be taken by students with severe hearing disabilities as documented by their IEPs.
Color chooser	The use of this accommodation enables the student to change the background color or text color to make text more readable.
Student used the following Response Accommodations	
Brailler/Note taker (per *Accommodations Guidelines*)	Students using this device as part of their regular instructional program may use it on the assessments; however, without thesaurus, spelling, or grammar checker.
Test administrator scribed **open-ended** responses at student's direction	A test administrator may record word-for-word exactly what a student dictated directly into the test booklet. This includes MC and OE responses for Keystone Algebra, Biology, and Literature tests and PSSA mathematics and science.
Test administrator marked **multiple-choice** responses at student's direction	A test administrator may mark an answer booklet at the direction of a student (e.g., a student may point to an MC answer with the test administrator marking the response in the answer booklet).
Test administrator transcribed student responses (per *Accommodations Guidelines*)	A test administrator may transcribe (copy) a student's written, typed, or keyed response into the standard answer document.

Table 10–10 (continued). Glossary of Accommodation Terms as Applied in the 2013 PSSA and 2012–2013 Keystone Exams

Type of Testing Accommodation	Explanation
Student used the following Response Accommodations (continued)	
Qualified Interpreter translated, transcribed, and/or scribed student's **signed** responses	A qualified interpreter may interpret a student's **signed** responses into written English for Keystone Algebra and Biology exams, and PSSA mathematics and science assessments. Interpreters are not permitted to make corrections or change the meaning of the response.
Qualified Interpreter translated, transcribed, and/or scribed ELL student responses	A qualified interpreter may interpret a student's non-English oral responses into written English for Keystone Algebra and Biology exams, and PSSA mathematics and science assessments. Interpreters are not permitted to make corrections or change the meaning of the response.
Augmentative communication device	Students with severe communication difficulties may use a special device to convey responses, which must be transcribed into the test booklet by the test administrator.
Keyboard, word processor, or computer (per *Accommodations Guidelines*)	This is an allowable accommodation as a typing function only for students with the identified need. Supports such as dictionaries, thesauri, spell checkers, and grammar checkers must be turned off. Answers must then be transcribed into the answer booklet without alteration.
Audio recording of student responses (per *Accommodations Guidelines*)	An electronic recording device may be used to record responses, which must be transcribed into the answer document by the test administrator. (Students who are unable to use a pencil or have illegible handwriting may answer MC questions orally. Answers must be recorded in the answer document without alteration during the testing period.)
Translation dictionary for ELL student	A word-to-word dictionary that translates native language to English (or vice versa) without word definitions or pictures is allowed on any portion of the Keystone Algebra and Biology exams, and PSSA mathematics and science tests.
Electronic screen reader (PDE approval required)	Students with blindness or extremely low vision may use computer software that converts text to synthesized speech or Braille.
Other (per *Accommodations Guidelines* or PDE approval)	Other accommodations may be appropriate and available if they do not compromise the integrity of the assessment. Documentation must be provided to PDE.

Table 10–10 (continued). Glossary of Accommodation Terms as Applied in the 2013 PSSA and 2012–2013 Keystone Exams

Type of Testing Accommodation	Explanation
Student used the following Setting Accommodations	
Hospital/home setting	A student who is confined to a hospital or to home during the testing window may be tested in that environment.
One-on-one setting (Keystone Exams and PSSA Math, Reading, Science) or Tested in a separate setting (Writing)	One-on-one settings are necessitated in certain instances, such as to reduce distraction or in the use of certain devices. A separate room may be used to reduce distraction.
Small group setting	Some students may require a test setting with fewer students or a setting apart from all other students to minimize distraction.
Other (per *Accommodations Guidelines* or PDE approval)	Other accommodations may be appropriate and available if they do not compromise the integrity of the assessment. Documentation must be provided to PDE.
Student used the following Timing Accommodations	
Extended time	Extended time may be allotted for each section of the test as a planned accommodation to enable students to finish.
Frequent breaks	Frequent breaks (breaks within a test section) may be scheduled for the completion of each test section; however, a test section must be completed within one school day.
Changed test schedule	Students whose disabilities prevent them from following a regular, planned test schedule may follow an individual schedule that enables test completion.
Other (per *Accommodations Guidelines* or PDE approval)	Other accommodations may be appropriate and available if they do not compromise the integrity of the assessment. Documentation must be provided to PDE.

CHAPTER ELEVEN: CLASSICAL ITEM STATISTICS

This chapter provides an overview of the two most familiar item-level statistics obtained from classical (traditional) item analysis: item difficulty and item discrimination. The following results pertain not only to the operational Keystone Exams items but also to the embedded field test items. Other statistics such as Rasch item statistics and test-level statistics are discussed in Chapter Twelve and Chapter Seventeen, respectively.

ITEM-LEVEL STATISTICS

Appendix J provides classical item statistics for all items (i.e., operational and embedded field test items) in the Algebra I, Biology, and Literature Exams. Results are organized by administration and then content area. These statistics represent the item characteristics most often used to determine whether an item functioned properly and/or how a group of students performed on a particular item. The item statistics in Appendix J include N, the number of students taking the test form for which there are valid test scores; *p*-values (denoted as PVal) for multiple-choice (MC) items and item means (denoted as Mean) for constructed-response (CR) items (indicators of item difficulty); proportions of students who chose each response option for MC items (denoted as P(A), P(B), P(C), P(D)) or gained each score point for CR items (denoted as P(0), P(1), P(2), P(3), and/or P(4)); proportions of students who did not respond to an item (denoted as P(-) for MC items and P(B) for CR items); item-total correlations (denoted as Total, indicators of item discrimination); item-total correlations for each response option for MC items (denoted as PT(A), PT(B), PT(C), and PT(D)) and gained score point for CR items (denoted as PT(1), PT(2), PT(3), and PT(4)).

Appendix J also provides the Rasch measurement-based statistics in columns Rasch, Infit, and Outfit. Detailed explanations of these statistics can be found in Chapter 12. The differential item functioning (DIF) analysis on the embedded field test items is provided in the last three columns. The detailed explanation of DIF codes can be found in Chapter Five.

ITEM DIFFICULTY

At the most general level, an item's difficulty is indicated by its mean score in some specified group (e.g., grade level).

$$\bar{x} = \frac{1}{n} \cdot \sum_{i=1}^{n} x_i$$

In the mean score formula above, the individual item scores (xi) are summed and then divided by the total number of students (*n*). For MC items, student scores are represented by 0's and 1's (0 = wrong, 1 = right). With 0/1 scoring, the equation above also represents the number of students correctly answering the item divided by the total number of students. So, this is also the *proportion correct* for the item, or as it is better known, the *p*-value. In theory, *p*-values can range from 0.00[2] to 1.00 on the proportion-correct scale. For example, if an item has a *p*-value of 0.89, it means 89 percent of the students answered the item correctly. Additionally, this value might also suggest that the item is relatively easy and/or the students who attempted the item are relatively high achievers. In other words, item difficulty and student ability are somewhat confounded.

[2] For MC items with four response options, pure random guessing would lead to an expected *p*-value of 0.25.

For CR items, mean scores can range from the minimum possible score (usually zero) to the maximum possible score (e.g., four points in the case of Algebra I CR items and three points in the case of Biology and Literature CR items). Sometimes a *pseudo p*-value is provided for a CR item by dividing the mean item score by the maximum possible item score.

The minimum and maximum extremes of the difficulty scale are virtually never seen in applied practice. However, understanding what those values are helps illustrate that relatively lower values correspond to more difficult items and that relatively higher values correspond to easier items. (Because of this, some assert that this index would be better referred to as the item's *easiness*.)

Item difficulty is an important consideration for the Keystone Exams because of the ranging achievement levels of students in Pennsylvania (Below Basic, Basic, Proficient, and Advanced). Items that are either very hard or very easy provide little information about student differences in achievement. However, an item answered correctly by a high percentage of students would suggest that the knowledge or skill the item taps has been mastered by most students. Conversely, an item answered correctly by a low percentage of students would suggest that few students have mastered the knowledge or skill the item taps. So, on a criteria-referenced test like the Keystone Exams, a test development goal is to include a wide range of item difficulties.

Utilizing the proportion of students who chose each option can be helpful for verifying keys. For example, if a large proportion of students chose a distractor instead of the key answer, it may, but not always, indicate that the key is not correct. Proportion of students omitting or not reaching an item is useful for identifying issues related to testing time and item/test layout. Keystone Exams are not speed tests. Therefore, students should have enough time to take the exams. An omit proportion greater than 0.05 for a single item could be an indication that students were not given enough time to take the test or an indication of an item/test layout problem. For example, some students might accidentally skip an item that follows a lengthy stem.

ITEM DISCRIMINATION

At the most general level, item discrimination[3] indicates an item's ability to differentiate between high and low achievers. It is expected that students with high ability (i.e., those who perform well on the Keystone Exams overall) would be more likely to answer any given Keystone Exams item correctly, while students with low ability (i.e., those who perform poorly on the Keystone Exams overall) would be more likely to answer the same item incorrectly. For the Keystone Exams, Pearson's product-moment correlation coefficient between item scores and test scores is used to indicate discrimination. As commonly practiced, Data Recognition Cooperation (DRC) removes the item score from the total score so that the resulting correlations will not be spuriously high. The correlation coefficient can range from -1.0 to +1.0. If the aforementioned expectation is met (high-scoring students tend to get the item right while low-scoring students do not), the correlation between the item score and the total test score will be both positive and noticeably large in its magnitude (i.e., well above zero) indicating that the item is a good discriminator between high- and low-ability students.

Item-total correlation for each option is another indicator of an item's ability to differentiate between high and low achievers. It is expected that students with high ability would be less likely to choose any distractors, while students with low ability would be more likely to choose a distractor. In other words, the item-total correlations for the distractors are expected to be negative.

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[3] As noted earlier, the discrimination index for dichotomous MC items is typically referred to as the *point-biserial correlation coefficient*. For CR items, the term *item-test correlation* is sometimes used.

In summary, the correlation will be positive in value when the mean test score of the students answering the item correctly is higher than the mean test score of the students answering the item incorrectly.[4] In other words, students who did well on the total test tended to do well on the item as well. However, an interaction can exist between item discrimination and item difficulty. Items answered correctly (or incorrectly) by a large proportion of examinees (i.e., items with extreme *p*-values) can have reduced power to discriminate and thus can have lower correlations.

Discrimination is an important consideration for the operational Keystone Exams because the use of more discriminating items on a test is associated with more reliable test scores. This in turn means that score estimates will be more precise (i.e., there will be smaller confidence intervals around the scores) and, perhaps more importantly, that more accurate performance level placements will be made. The issues of reliability, confidence intervals, and performance level classifications are further discussed in Chapter Eighteen.

SCATTER PLOTS OF ITEM DISCRIMINATION AND DIFFICULTY

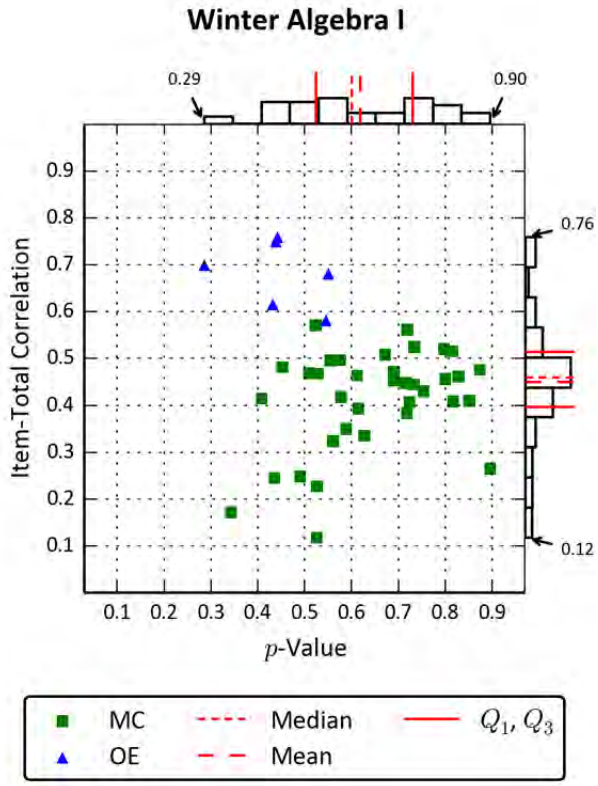
Figure 11–1 contains a series of scatter plots showing item discrimination (i.e., item-total correlation on *y*-axis) on the item difficulty (i.e., *p*-value on *x*-axis) for the operational items in each content area exam by test administration. These plots provide information about item discrimination and difficulty in a single visual image for each Keystone Exam. This is because the *x*- and *y*-axes visually represent many important distributional indices:

- The minimum and maximum values are listed.
- Mean and median scores are indicated by the red dash lines.
- The first and third quartile (Q1 and Q2) are indicated by the red lines.
- Marginal histogram indicates the density of the individual data points.

It should be noted that pseudo *p*-values are used for CR items in these plots. Of course, the bivariate relationship between discrimination and difficulty is also presented. One does not usually expect any type of trend here. However, as noted earlier, it is often the case that items with extreme difficulties can have lower discrimination values, so this can be revealed in such a plot.

[4] It is legitimate to view the point-biserial correlation as a standardized mean. A positive value indicates that students who chose that response had a higher mean score than the average score; a negative value indicates that students who chose that response had a lower mean score than the average score.

Figure 11–1. Scatter Plots of Item Discrimination and Difficulty



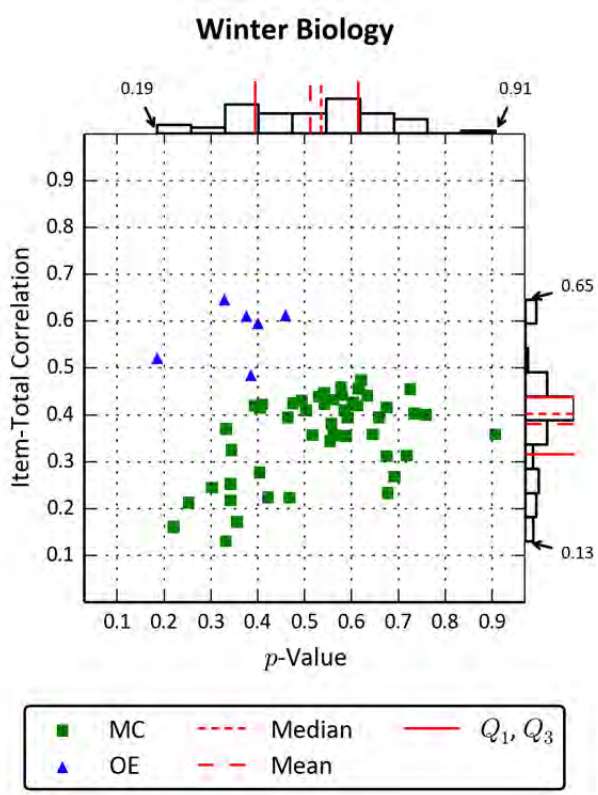
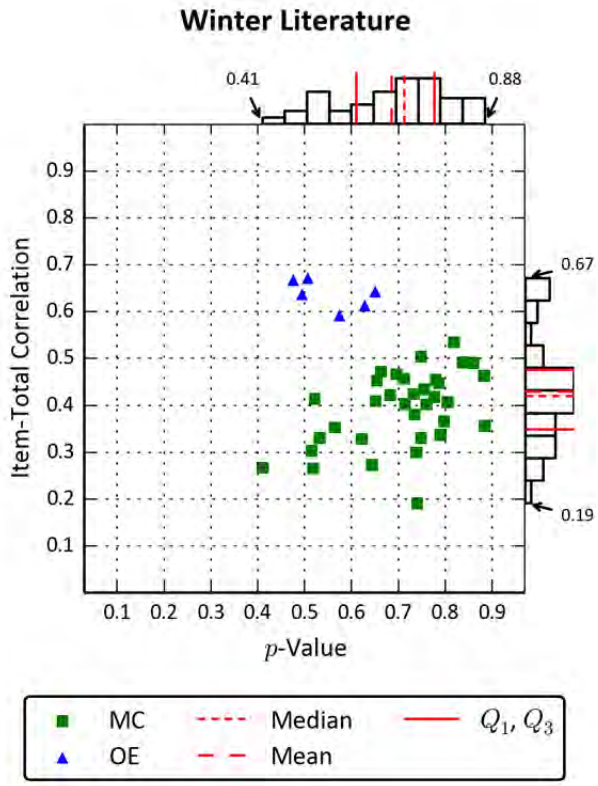


Figure 11–1 (continued). Scatter Plots of Item Discrimination and Difficulty



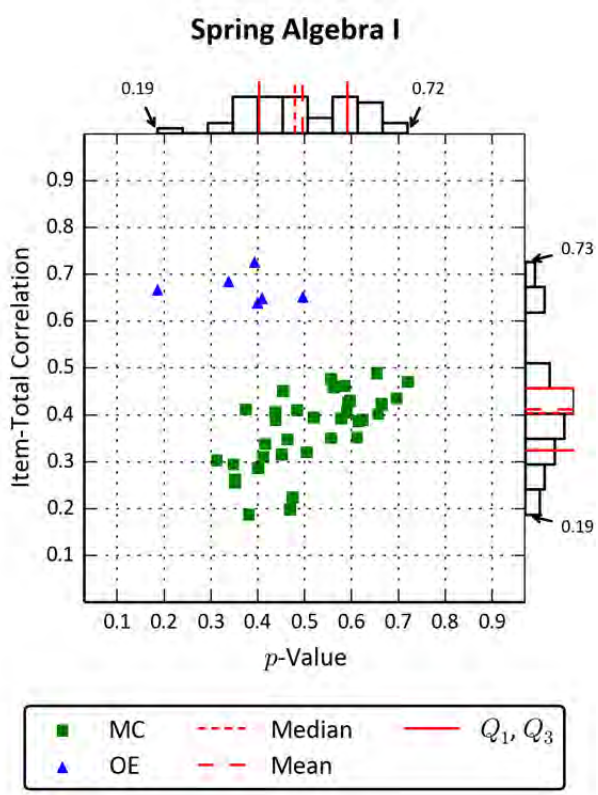
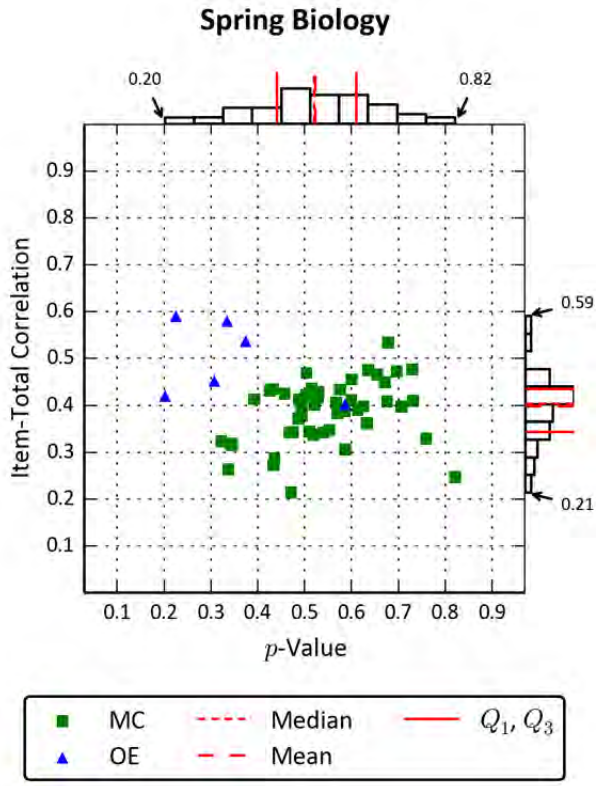


Figure 11–1 (continued). Scatter Plots of Item Discrimination and Difficulty



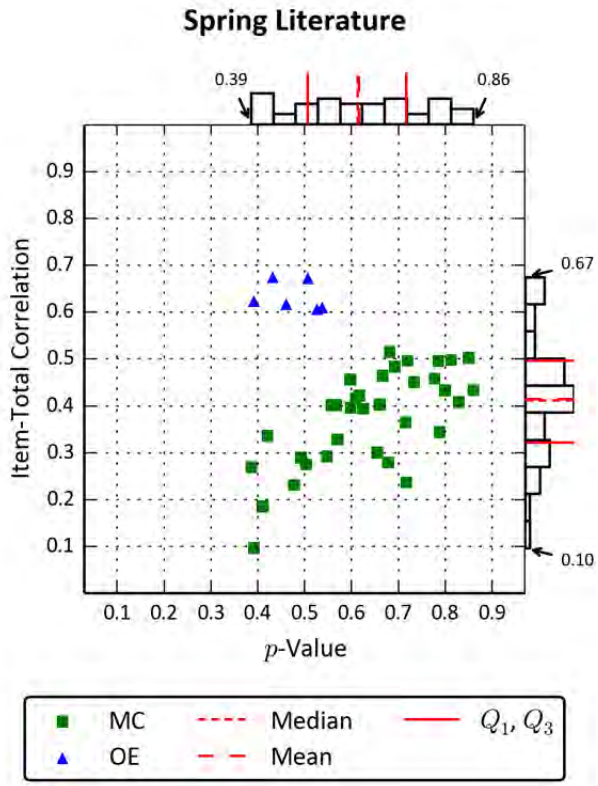
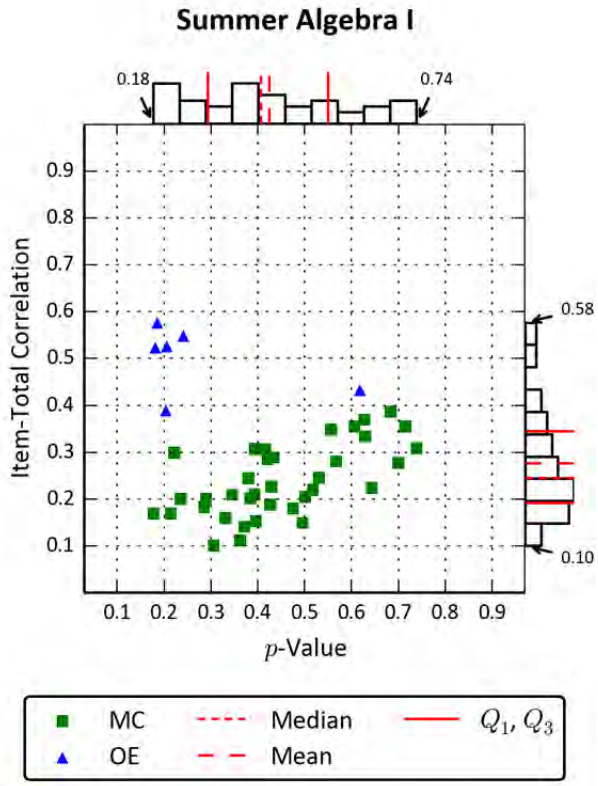


Figure 11–1 (continued). Scatter Plots of Item Discrimination and Difficulty



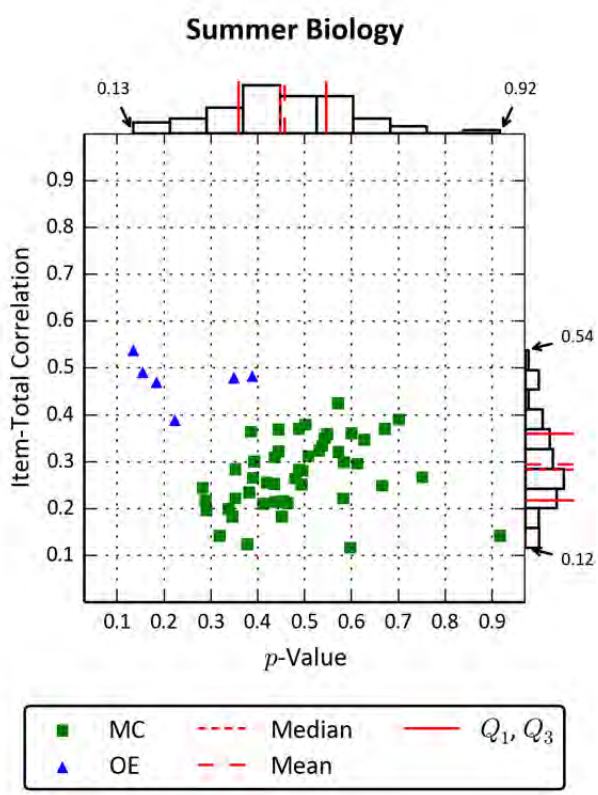
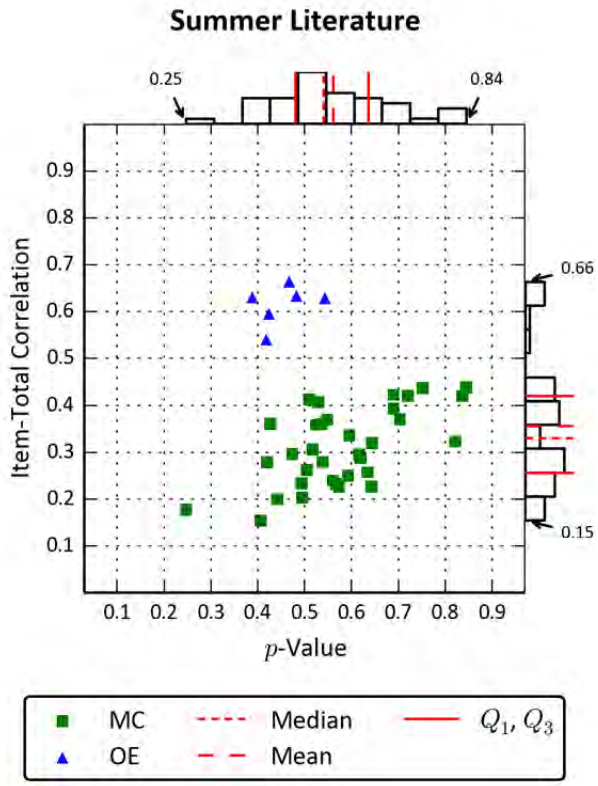


Figure 11–1 (continued). Scatter Plots of Item Discrimination and Difficulty



OBSERVATIONS AND INTERPRETATIONS

Table 11–1 provides the mean and median *p*-values and median[5] item-total correlations for the operational MC and CR items in each content area. The mean *p*-value for the operational MC items ranged from about 0.51 to 0.63 with standard deviation (SD) ranged from 0.15 to 0.16, while the mean *p*-values for the CR items ranged from about 0.31 to 0.45 with standard deviation ranged from 0.10 to 0.13. The median item-test correlations ranged from roughly 0.33 to 0.37 and 0.52 to 0.64 for the MC and CR items, respectively. The CR correlations tended to be higher than the MC correlations, which is not surprising because the CR items include more score points.

It is impossible to make global conclusions about the overall test quality from these item statistics alone. With that caveat in mind, the results presented in this chapter indicate that the item difficulties and discriminations were in expected and acceptable ranges.

[5] Given that the value of the item-total correlation coefficient is not a linear function of the magnitude of the relation between the item and total test scores, the median instead of the mean of the item-total correlation was calculated for this statistic.

Table 11–1. Mean and Median Statistics for Operational MC and CR Items

Administration	Content Area	Multiple-Choice Items				Constructed-Response Items			
		Mean *p*-Value	SD *p*-Value	Median *p*-Value	Median I-T Corr.	Mean *p*-Value	SD *p*-Value	Median *p*-Value	Median I-T Corr.
Winter	Algebra I	0.65	0.14	0.65	0.45	0.45	0.10	0.44	0.69
	Biology	0.53	0.15	0.56	0.39	0.36	0.09	0.38	0.60
	Literature	0.71	0.11	0.74	0.41	0.55	0.07	0.54	0.64
Spring	Algebra I	0.52	0.11	0.51	0.39	0.37	0.10	0.40	0.66
	Biology	0.55	0.12	0.53	0.40	0.34	0.14	0.32	0.49
	Literature	0.64	0.14	0.66	0.40	0.48	0.06	0.48	0.62
Summer	Algebra I	0.45	0.15	0.42	0.22	0.27	0.17	0.20	0.52
	Biology	0.48	0.13	0.47	0.27	0.24	0.11	0.20	0.48
	Literature	0.58	0.13	0.56	0.30	0.45	0.06	0.45	0.63

Note. I-T Corr. is the item-total test score correlation; SD represents the standard deviation.

Chapter Eleven: Classical Item Statistics

CHAPTER TWELVE: RASCH ITEM CALIBRATION

The particular item response theory (IRT) model used for the Keystone Exams is based on the work of Georg Rasch. Rasch models have had a long-standing presence in applied testing programs and have been the methodology continually used to calibrate the Pennsylvania System of School Assessment (PSSA) items in recent history. Consequently, this model was chosen for the Keystone Exams. IRT has several advantages over classical test theory, so it has become the standard procedure for analyzing item response data in large-scale assessments. However, IRT models make a number of strong assumptions related to dimensionality, local independence, and model-data fit. Resulting inferences derived from any application of IRT rest strongly on the degree to which the underlying assumptions are met.

This chapter outlines the procedures used for calibrating the operational Keystone Exams items. Generally, item calibration is the process of assigning a difficulty-parameter estimate to each item on an assessment so that they are placed on a common scale. This chapter briefly introduces the Rasch model, reports the results from evaluations of the adequacy of the Rasch assumptions, and summarizes the Rasch item statistics for the Keystone Exams in Algebra I, Biology, and Literature.

DESCRIPTION OF THE RASCH MODEL

The Rasch partial credit model (RPCM) (Wright & Masters, 1982) was used to calibrate Keystone Exams items because both multiple-choice (MC) and constructed-response (CR) items were part of the assessment. The RPCM extends the Rasch model (Rasch, 1960) for dichotomous (0, 1) items so that it accommodates the polytomous CR items. Under the RPCM, for a given item *i* with m_i score categories, the probability of person *n* scoring *x* (*x* = 0, 1, 2,... m_i) is given by:

$$\pi_{nix} = \frac{\exp \sum_{j=0}^{x} (\beta_n - \delta_{ij})}{\sum_{k=0}^{m_i} \exp \sum_{j=0}^{x} (\beta_n - \delta_{ij})}, \quad x = 0, 1, \ldots, m_i$$

where β_n represents a student's proficiency (ability) level, and δ_{ij} is the step difficulty of the *j*th step on item *i*. For dichotomous MC items, the RPCM reduces to the standard Rasch model and the single step difficulty is referred to as the item's difficulty. The Rasch model predicts the probability of person *n* getting item *i* correct as follows:

$$\Phi_{ni}\left(X = 1 \mid \beta_n\right) = \frac{\exp\left(\beta_n - \delta_{ij}\right)}{1 + \exp\left(\beta_n - \delta_{ij}\right)}.$$

The Rasch model places both student ability and item difficulty (estimated in terms of log-odds or logits) on the same continuum. When the model assumptions are met, it also provides person ability estimates that are independent of the items employed in the assessment, and conversely, estimates item difficulty independently of the sample of examinees. (As noted in Chapter Eleven, interpretation of item *p*-values confounds item difficulty and student ability.)

SOFTWARE AND ESTIMATION ALGORITHM

Item calibration was implemented via WINSTEPS computer program (Linacre & Wright, 2003), which employs unconditional (UCON), joint-maximum-likelihood estimation (JMLE).

SAMPLE CHARACTERISTICS

The characteristics of calibration samples are reported in Chapter Nine. These samples only include the students who attempted the tests. All omits (no response) and multiple responses (more than one response selected) were scored as incorrect answers (coded as 0s) for calibration.

CHECKING RASCH ASSUMPTIONS

Because the Rasch model was the basis of all calibration and equating analyses associated with the Keystone Exams, the validity of the inferences from these results depends on the degree to which the assumptions of the model are met and how well the model fits the test data. Therefore, it is important to check these assumptions. This section evaluates the dimensionality of the data, local item independence, and model-data fit at the item level. Though a variety of methods are available for assessing these issues, the Rasch analyses and criteria available from WINSTEPS were used here. It should be noted that only operational items were analyzed since they are the basis of student scores.

Given Keystone Exams use a pre-equating design (see details in Chapter Fifteen), calibrations with and without anchoring all the item parameter estimates were conducted to check the item difficulty stability. After reviewing the analyses results for the winter, spring, and summer administrations, a decision was made to use the item difficulty estimated from the field test data to generate the raw-to-scaled score conversion tables. In this chapter, the adequacy of the Rasch calibration assumptions was checked with all the item difficulties anchored to the pre-equated values.

UNIDIMENSIONALITY

Rasch models assume that one dominant dimension determines the difference in students' performances. WINSTEPS provides results from a principal components analysis (PCA) that can be used to assess the unidimensionality assumption. Different from standard applications of PCA, WINSTEPS conducts its PCA on the response residuals, not the original observations. That is, the primary dimension from the Rasch model is removed first and then the residual variance is analyzed. The purpose of the analysis is to verify whether any other dominant components exist among the residuals (i.e., they account for a practically significant amount of residual variance). If any other dimensions are found, the unidimensionality assumption would be violated.

For Keystone Exams, the standardized residuals were used to conduct the PCA because simulation studies indicate that it gives the most accurate reflection of secondary dimensions in the items (Linacre, 2013). Table 12–1 presents the PCA results by administration for each content area. The results include the eigenvalues and variance explained by each component. As can been seen from the table, the eigenvalues for the first component are much larger than those for the rest of the components. The first component explained about 28.0 to 48.4 percent of the total variances. The rest of the components explained only a small percentage of variance. These results suggest that each of the Keystone Exams essentially measure a single dominant dimension.

Table 12–1. Results from PCA of Residuals in WINSTEPS

Administration	Content Area	Component	Eigenvalue	Variance Explained
Winter	Algebra I	1	39.5	48.40%
		2	2.0	2.50%
		3	1.4	1.70%
		4	1.4	1.70%
		5	1.3	1.60%
	Biology	1	25.8	32.40%
		2	1.8	2.30%
		3	1.5	1.80%
		4	1.3	1.70%
		5	1.2	1.50%
	Literature	1	22.9	36.40%
		2	1.9	3.00%
		3	1.5	2.40%
		4	1.2	2.00%
		5	1.2	2.00%
Spring	Algebra I	1	30.2	41.80%
		2	1.7	2.40%
		3	1.4	1.90%
		4	1.3	1.80%
		5	1.2	1.70%
	Biology	1	26.9	33.20%
		2	1.7	2.10%
		3	1.6	2.00%
		4	1.4	1.70%
		5	1.2	1.40%
	Literature	1	21.8	35.30%
		2	2.1	3.40%
		3	1.7	2.80%
		4	1.3	2.10%
		5	1.2	1.90%
Summer	Algebra I	1	26.5	38.70%
		2	1.7	2.40%
		3	1.5	2.20%
		4	1.3	1.90%
		5	1.2	1.80%
	Biology	1	22.7	29.60%
		2	1.8	2.30%
		3	1.6	2.10%
		4	1.5	1.90%
		5	1.4	1.90%
	Literature	1	15.6	28.00%
		2	2.6	4.80%
		3	1.6	2.90%
		4	1.5	2.70%
		5	1.4	2.50%

LOCAL INDEPENDENCE

Local independence (LI) is a fundamental assumption of IRT. No relationship should exist between examinees' responses to different items after accounting for the abilities measured by a test. In formal statistical terms, a test X that is composed of items X_1, X_2,…X_I is locally independent with respect to the latent variable δ_n if, for all $x = (x_1, x_2,\ldots x_I)$ and δ_n,

$$P_n\left(\mathbf{X}=\mathbf{x} \mid \delta_n\right)=\prod_{i=1}^{I} P\left(X_i=x_i \mid \delta_n\right).$$

This formula essentially states that the probability of any pattern of responses across all items (x), after conditioning on the abilities (δ_n) measured by the test, should be equal to the product of the conditional probabilities across each item (cf. the multiplication rule for independent events where the joint probabilities are equal to the product of the associated marginal probabilities).

The equation above shows the condition after satisfying the *strong form* of local independence. A *weak form* of local independence (WLI) was proposed by McDonald (1979). The distinction is important as many indicators of local dependency are actually framed by WLI. The requirement here would be for the conditional covariances of all pairs of item responses, conditioned on the abilities, to be equal to zero. When this assumption is met, the joint probability of responses to an item pair, conditioned on abilities, is the product of the probabilities of responses to these two items, as shown below. (This is a *weaker* form because higher-order dependencies among items are allowed.) Based on the WLI, the following expression can be derived:

$$P\left(X_i=x_i, X_j=x_j \mid \delta_n\right)=P\left(X_i=x_i \mid \delta_n\right) P\left(X_j=x_j \mid \delta_n\right).$$

Marais and Andrich (2008) pointed out that local item dependence in the Rasch model can occur in two ways that some may not distinguish. The first way occurs when the assumption of unidimensionality is violated. Here, other nuisance dimensions besides a dominant dimension also determine students' performance (this can be called *trait dependence*). The second violation occurs when responses to an item depend on responses to another. This is a violation of statistical independence and can be called *response dependence*. Many people treat the assumptions of *unidimensionality* and *local independence* as one phenomenon and believe that once unidimensionality holds, that local independence also holds. By distinguishing the two sources of local dependence, one can see that while local independence can be related to unidimensionality, the two are different assumptions, and therefore, require different tests.

Residual item correlations provided in WINSTEPS for each item pair were used to assess the local dependence among the Keystone Exams items. In general, these residuals are computed as follows. First, expected item performance based on the Rasch model is determined using ability and item parameter estimates. Next, deviations (residuals) between the examinees' expected and observed performance is determined for each item. Finally, for each item pair, a correlation between the respective deviations is computed.

Two types of residual correlations are available in WINSTEPS: raw and standardized residuals. It should be noted that the raw score residual correlation essentially corresponds to Yen's Q_3 index (Yen, 1993), a popular LI statistic. The expected value for the Q_3 statistic is approximately -1/(k-1) when no local

dependence exists, where *k* is test length. Thus, the expected Q_3 values should be approximately -0.026 or larger for the Keystone Exams (since Literature is the shortest test with 40 items). Index values that are greater than 0.20 indicate a degree of local dependence that probably should be examined by test developers (Chen & Thissen, 1997). Since the two residual correlations are very similar, the default *standardized residual correlation* in WINSTEPS was used for these analyses. Table 12–2 shows the summary statistics—mean, SD, minimum (Min), maximum (Max), and several percentiles (P_{10}, P_{25}, P_{50}, P_{75}, P_{90})—for all the residual correlations for each test. The total number of item pairs (*N*) and the number of pairs with residual correlations greater than 0.20 are also reported in this table. The mean residual correlations were slightly negative and the values were close to -0.02 after rounding. The vast majority of the correlations were very small, suggesting local item independence generally holds for the Keystone Exams in Algebra I, Biology, and Literature.

Table 12–2. Summary of Item Residual Correlations

Administration	Content Area	Statistics										
		N	Mean	SD	Min	P_{10}	P_{25}	P_{50}	P_{75}	P_{90}	Max	>0.20
Winter	Algebra I	861	-0.02	0.04	-0.13	-0.06	-0.04	-0.02	0.00	0.02	0.30	1
	Biology	1431	-0.02	0.02	-0.10	-0.04	-0.03	-0.02	-0.01	0.01	0.12	0
	Literature	780	-0.02	0.03	-0.11	-0.07	-0.04	-0.02	-0.01	0.01	0.10	0
Spring	Algebra I	861	-0.02	0.03	-0.10	-0.05	-0.04	-0.02	-0.01	0.01	0.17	0
	Biology	1431	-0.02	0.02	-0.09	-0.04	-0.03	-0.02	0.00	0.01	0.11	0
	Literature	780	-0.02	0.04	-0.14	-0.07	-0.05	-0.02	0.00	0.02	0.16	0
Summer	Algebra I	861	-0.02	0.03	-0.13	-0.06	-0.04	-0.02	0.00	0.02	0.12	0
	Biology	1431	-0.02	0.04	-0.16	-0.06	-0.04	-0.02	0.01	0.03	0.14	0
	Literature	780	-0.02	0.06	-0.17	-0.10	-0.06	-0.02	0.01	0.04	0.23	2

ITEM FIT

WINSTEPS provides two item-fit statistics (infit and outfit) for evaluating the degree to which the Rasch model predicts the observed item responses. Each fit statistic can be expressed as a mean square (MnSq) statistic or on a standardized metric (Zstd with mean = 0 and variance = 1). MnSq values are more oriented toward practical significance, while Zstd values are more oriented toward statistical significance. Though both are informative, the Zstd values are very likely too sensitive to the large sample sizes observed on the Keystone Exams. In this situation it is recommended that the Zstd values be ignored if the MnSq values are acceptable (Linacre, 2009).

Both infit and outfit MnSq are the average of standardized residual variance (the difference between the observed score and the Rasch estimated score divided by the square root of the Rasch model variance). The difference is that the outfit statistic gives all examinees equal weight in computing the fit and tends to be affected more by unexpected responses far from the person, item, or rating scale category measure (i.e., it is more sensitive to outlying, off-target, low information responses). The infit statistic is weighted by the examinee locations relative to item difficulty and tends to be affected more by unexpected responses close to the person, item, or rating scale category measure (i.e., informative, on-target responses). Some feel that extreme infit values are a greater threat to the measurement process than extreme outfit values since most tests intend to measure the on-target population rather than extreme outliers.

The expected MnSq value is 1.0, and it can range from 0 to infinity. Deviation in excess of the expected value can be interpreted as noise or lack of fit between the items and the model. Values lower than the expected value can be interpreted as item redundancy or overfitting items (too predictable, too much redundancy), and values greater than the expected value indicate underfitting items (too unpredictable, too much noise). Rules of thumb regarding practically significant MnSq values vary. More conservative users might prefer items with MnSq values that range from 0.8 to 1.2. Others believe reasonable test results can be achieved with values from 0.5 to 1.5. In the results below, values outside of 0.7 to 1.3 are given practical importance.

Table 12–3 presents the summary statistics of infit and outfit mean square statistics for the Keystone Exams in Algebra I, Biology, and Literature, including the mean, SD, and minimum and maximum values. The number of items within the range of [0.7, 1.3] is also reported in Table 12–3. As can been seen, the mean values for both fit statistics were close to 1.00 for all the exams. Most of the items had fit statistics falling in the range of [0.7, 1.3].

Table 12–3. Summary of Infit and Outfit Mean Square Statistics

Administration	Content Area	Infit Mean Square					Outfit Mean Square				
		Mean	SD	Min	Max	[0.7, 1.3]	Mean	SD	Min	Max	[0.7, 1.3]
Winter	Algebra I	1.01	0.15	0.77	1.39	40/42	0.99	0.23	0.59	1.57	34/42
	Biology	0.97	0.10	0.65	1.16	53/54	0.97	0.14	0.50	1.25	52/54
	Literature	0.98	0.14	0.69	1.26	39/40	0.98	0.22	0.56	1.48	35/40
Spring	Algebra I	1.04	0.11	0.80	1.27	42/42	1.06	0.17	0.72	1.43	37/42
	Biology	0.97	0.08	0.78	1.21	54/54	0.97	0.11	0.71	1.29	54/54
	Literature	1.01	0.16	0.78	1.39	38/40	1.02	0.24	0.63	1.55	32/40
Summer	Algebra I	1.00	0.12	0.78	1.23	42/42	1.02	0.15	0.73	1.27	42/42
	Biology	1.00	0.10	0.66	1.24	53/54	1.02	0.11	0.63	1.26	53/54
	Literature	1.02	0.12	0.68	1.20	39/40	1.03	0.16	0.69	1.29	39/40

RASCH ITEM STATISTICS

As noted earlier, the Rasch model expresses item difficulty (and student ability) in units referred to as *logits*, rather than on the percent-correct metric. In the simplest case, a logit is a transformed *p*-value with the average *p*-value becoming a logit of zero. In this form, logits resemble *z*-scores or standard normal deviates; a very difficult item might have a logit of +4.0 and a very easy item might have a logit of –4.0. However, they have no formal relationship to the normal distribution.

The logit metric has several mathematical advantages over *p*-values. Logits have an interval scale, meaning that two items with logits of 0.0 and +1.0, respectively, are the same distance apart as two items with logits of +3.0 and +4.0. Logits are not dependent on the ability level of the students. For example, a test form can have a mean logit of zero, whether the average item *p*-value for the student sample is 0.8 or 0.3.

The standard Rasch calibration procedure arbitrarily sets the mean difficulty of the items on any form at zero. Under normal circumstances where all students are administered the same set of items, any item with a *p*-value lower than the average item on the form receives a positive logit and any item with a *p*-value higher than the average receives a negative logit. Consequently, the logits for any calibration relate to an arbitrary origin defined

by the center of items on that form. Logits for both item difficulties and student abilities are placed on the same scale and relate to the same mean item difficulty.

There are a number of other choices that could be made for centering the item difficulties. Rather than using all the items, the origin could be defined by content. For the Keystone Exams, all test forms in a particular content area share the same operational item set. All items on each form can then be easily adjusted to a single origin by defining the origin as the mean of the operational items. With this done, the origins for all the forms will be statistically equal. For example, items on any two forms that are equally difficult will now have statistically equal logit difficulties.

Appendix J reports the item statistics including classical and Rasch logit difficulties for all the operational items and the field test items embedded in the spring forms. Table 12–4 summarizes the Rasch logit difficulties of the operational items on each test for each administration. The mean of MC item difficulty was no longer equal to zero as it was for the 2011 administration. This is because all the item parameter estimates were anchored to the pre-equated values. The mean item difficulty ranged from 0.05 to 0.48. The mean item difficulties for MC items were smaller than those for the CR items. Table 12–4 also shows the mean standard errors (SE) of the item difficulties, which were relatively small, suggesting that items were calibrated with very small errors. The minimum (Min) and maximum (Max) values and standard deviations (SD) suggest the Keystone Exams items covered a relatively wide range of difficulties.

Table 12–4. Summary of Rasch Item Difficulties

Administration	Content Area	Item Types	N	Mean Item Difficulty	Mean SE	SD	Min	Max
Winter	Algebra I	All	42	0.11	0.01	0.86	-1.64	1.69
		MC	36	-0.04	0.01	0.81	-1.64	1.12
		CR	6	1.05	0.00	0.47	0.39	1.69
	Biology	All	54	0.14	0.01	0.70	-2.10	1.37
		MC	48	0.06	0.01	0.69	-2.10	1.21
		CR	6	0.84	0.00	0.37	0.35	1.37
	Literature	All	40	0.13	0.01	0.72	-1.29	1.69
		MC	34	-0.01	0.01	0.67	-1.29	1.68
		CR	6	0.88	0.00	0.44	0.40	1.69
Spring	Algebra I	All	42	0.38	0.00	0.66	-0.80	1.73
		MC	36	0.28	0.00	0.64	-0.80	1.36
		CR	6	0.96	0.00	0.45	0.42	1.73
	Biology	All	54	0.05	0.01	0.61	-1.45	1.46
		MC	48	-0.05	0.01	0.52	-1.45	1.01
		CR	6	0.85	0.00	0.68	-0.38	1.46
	Literature	All	40	0.15	0.01	0.79	-1.70	1.48
		MC	34	-0.03	0.01	0.71	-1.70	1.33
		CR	6	1.16	0.00	0.19	0.91	1.48
Summer	Algebra I	All	42	0.48	0.04	0.77	-1.06	2.03
		MC	36	0.37	0.05	0.71	-1.06	1.56
		CR	6	1.14	0.03	0.85	-0.43	2.03
	Biology	All	54	0.14	0.06	0.76	-2.14	1.85
		MC	48	-0.01	0.07	0.63	-2.14	0.98
		CR	6	1.34	0.05	0.65	0.42	1.85
	Literature	All	40	0.23	0.08	0.71	-1.50	1.66
		MC	34	0.08	0.08	0.65	-1.50	1.29
		CR	6	1.05	0.05	0.46	0.41	1.66

ITEM DIFFICULTY-STUDENT ABILITY MAP

The distributions of the Rasch item logits (item difficulty estimates) are shown on the item difficulty-student ability maps presented in Figure 12–1. In each item-student map, markers on the right-hand side represent student ability values, whereas markers on the left hand side represent item difficulty parameter estimates. As noted earlier, the Rasch model enables placement of both items and students on the same scale. Consequently, one can easily visualize information about how the difficulty of the test items related to the ability distribution of students who took the test. The students located in the upper right quadrant of any given plot have relatively higher ability. Items in the lower left quadrant are relatively easier.[6] The three dashed lines (from bottom to top) represent the performance cuts: below basic/basic, basic/proficient, and proficient/advanced. For Algebra I and Biology, the common pattern seen across all maps was that the item difficulties were comparable to the student ability levels. For Literature, the items were slightly easier relative to the student ability levels. It is also important to understand where the items are providing more-accurate measurement. This issue is addressed more fully in Chapter Eighteen (see Figure 18–2).

[6] Of course, high-ability students have higher probabilities of correctly answering easier items. Similarly, low-ability students (in lower right quadrant of any given plot) have lower probabilities of answering harder items (in upper left quadrant).

Figure 12–1. Item Difficulty-Student Ability Maps

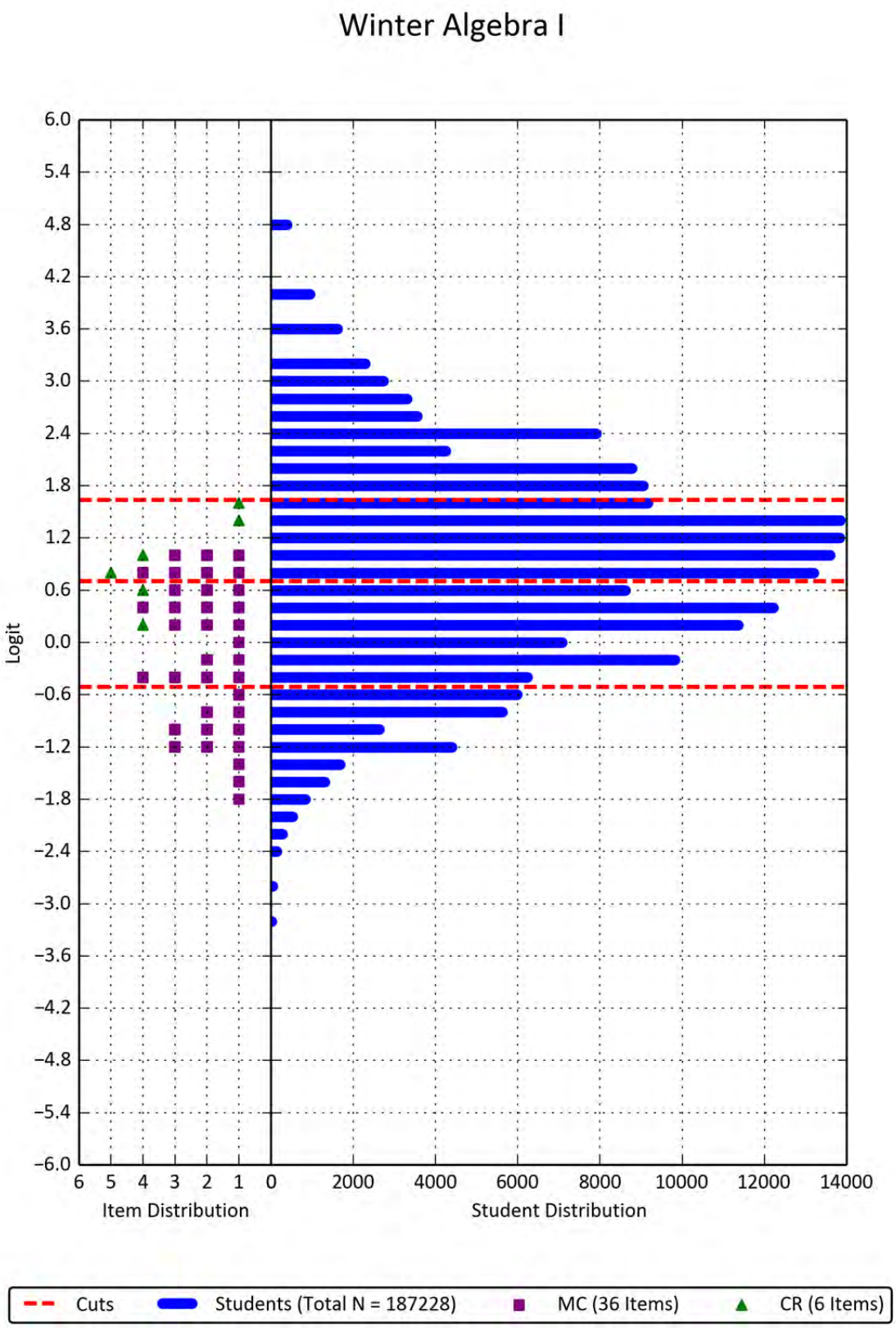


Figure 12–1 (continued). Item Difficulty-Student Ability Maps

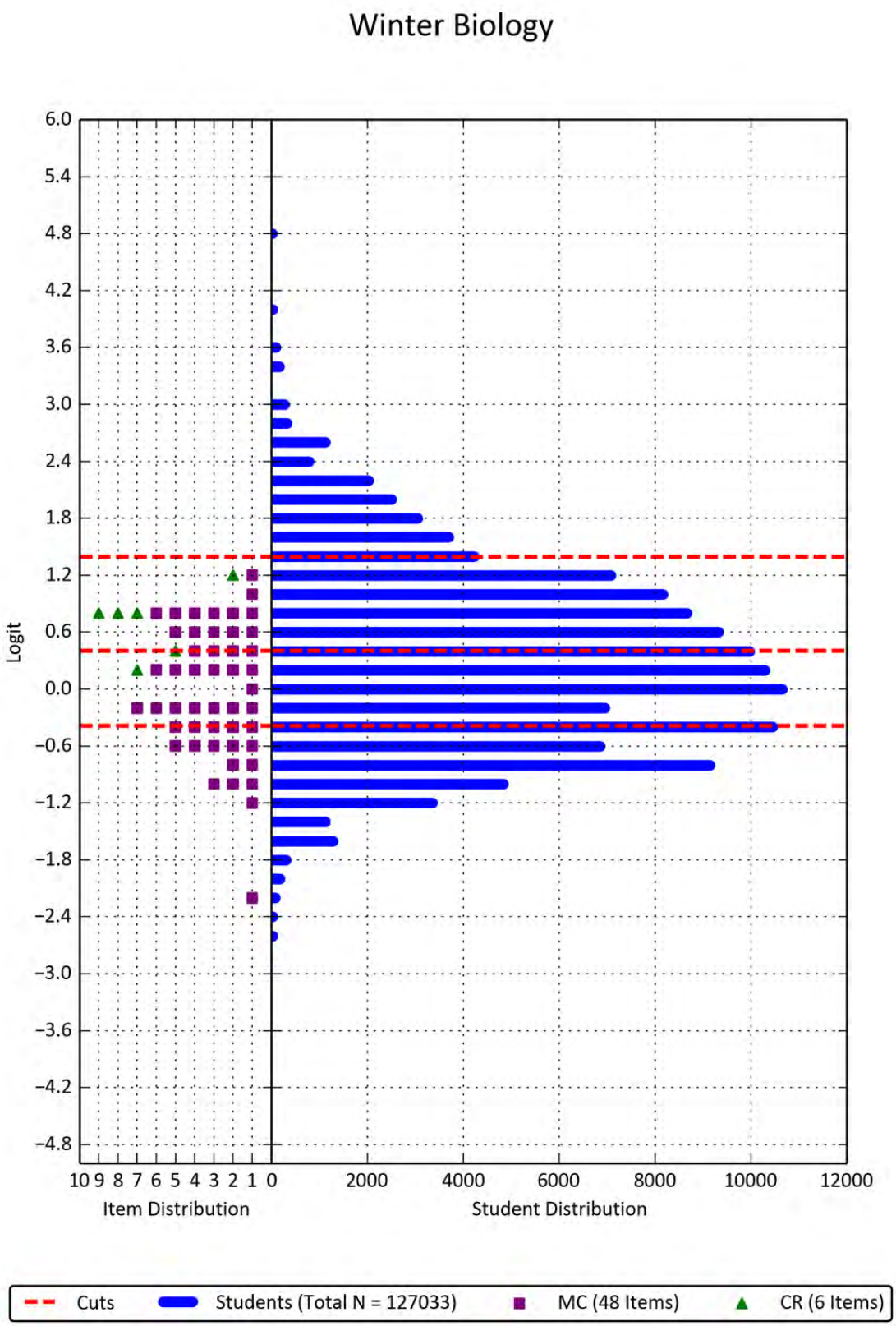


Figure 12–1 (continued). Item Difficulty-Student Ability Maps

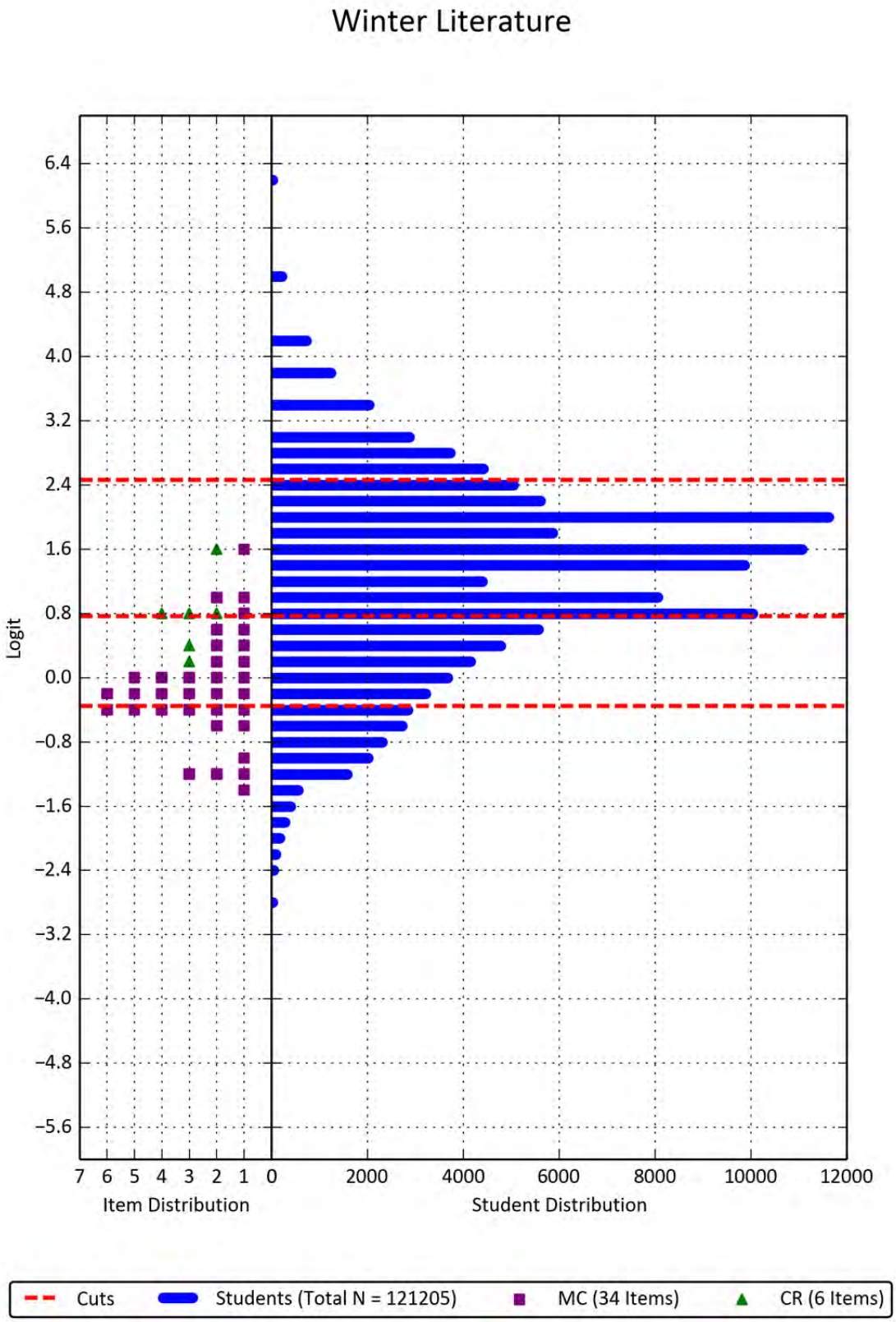


Figure 12–1 (continued). Item Difficulty-Student Ability Maps

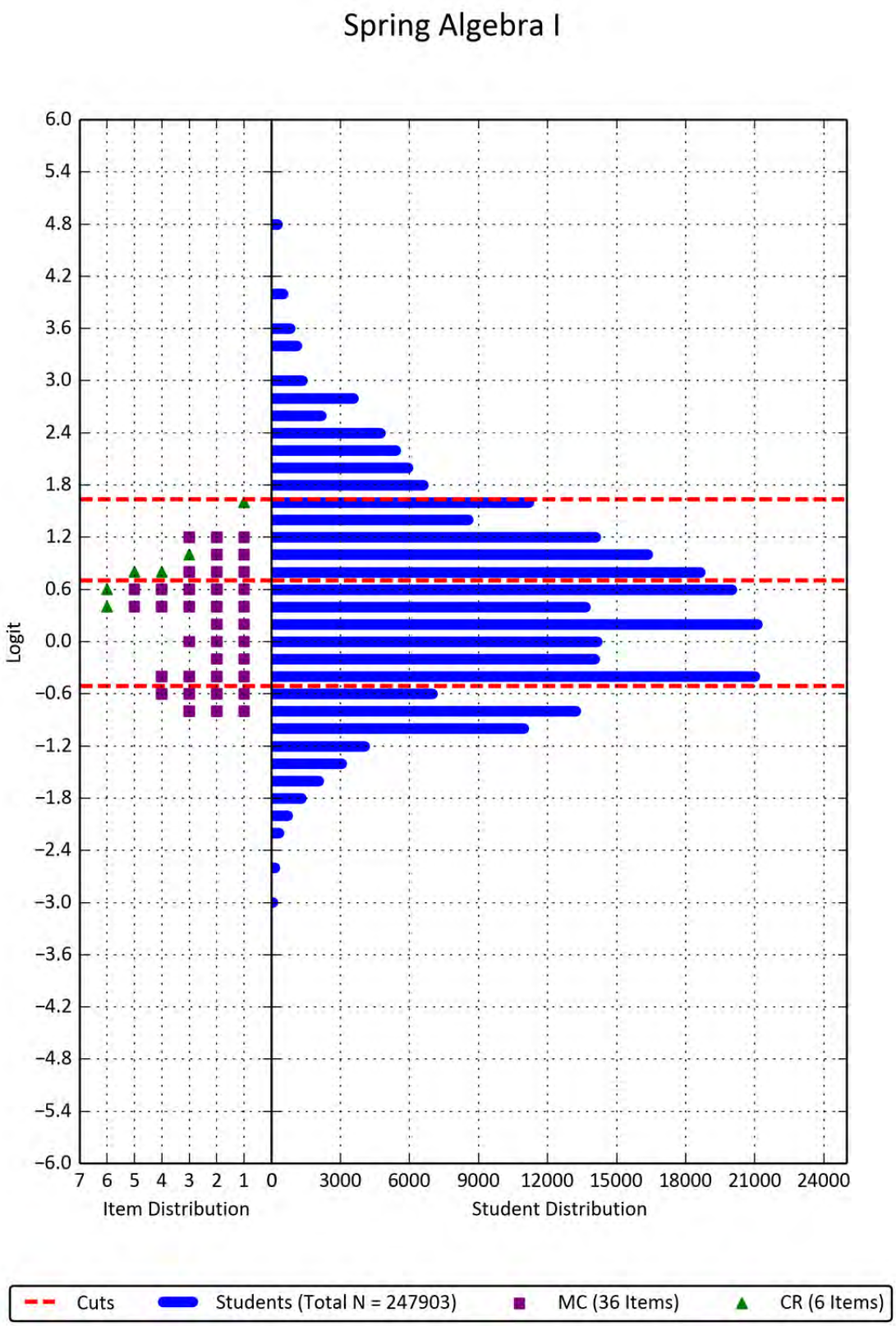


Figure 12–1 (continued). Item Difficulty-Student Ability Maps

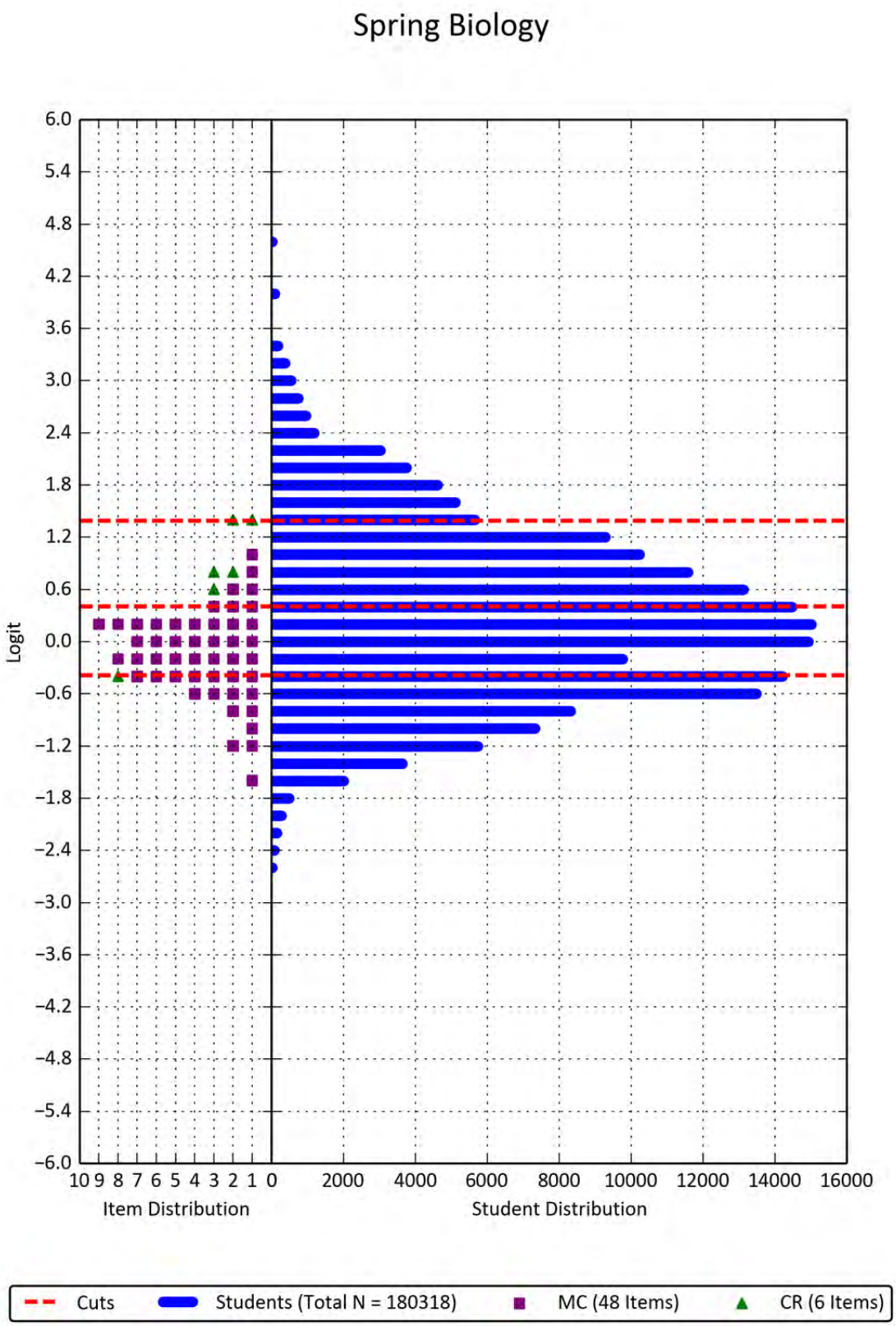


Figure 12–1 (continued). Item Difficulty-Student Ability Maps

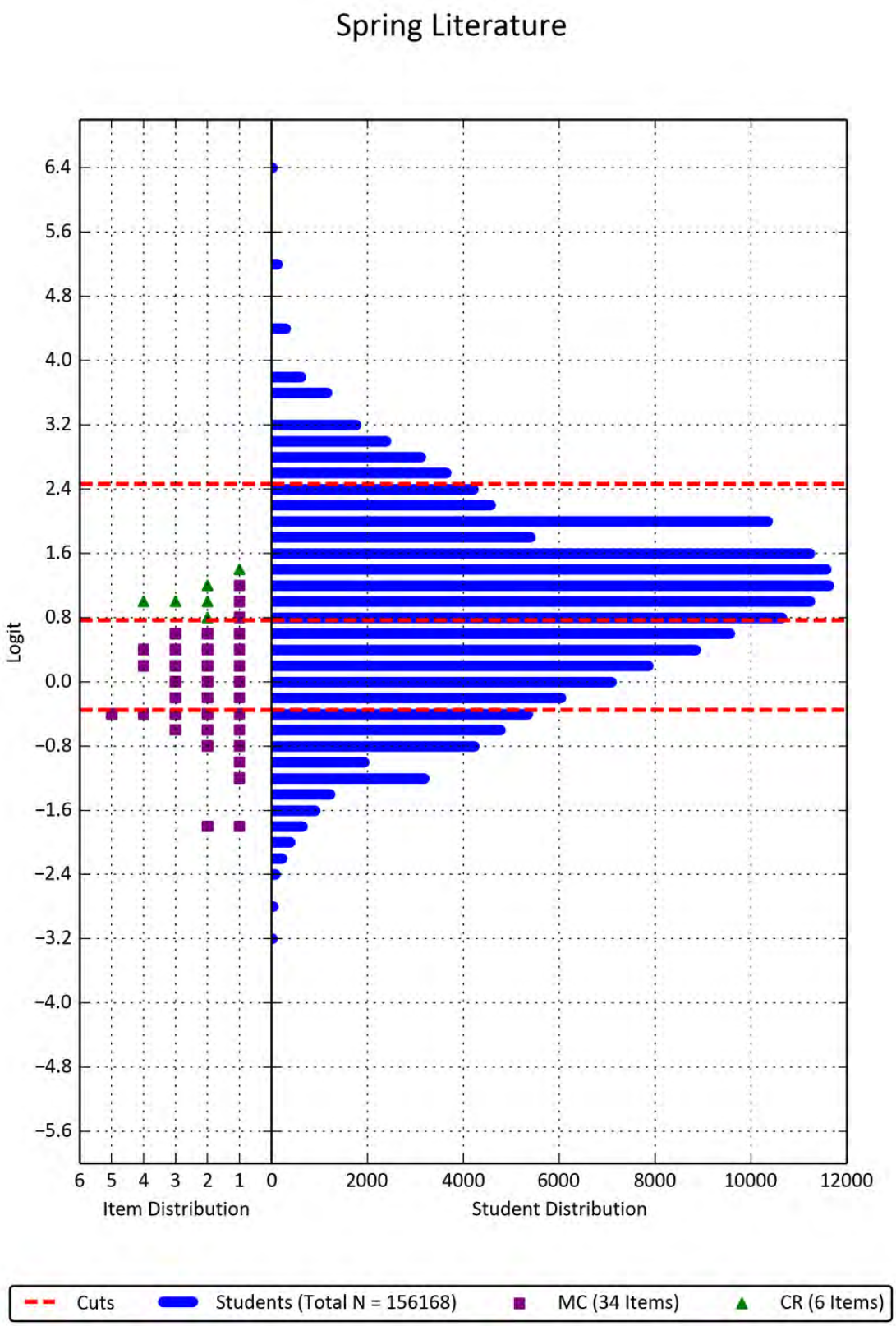


Figure 12–1 (continued). Item Difficulty-Student Ability Maps

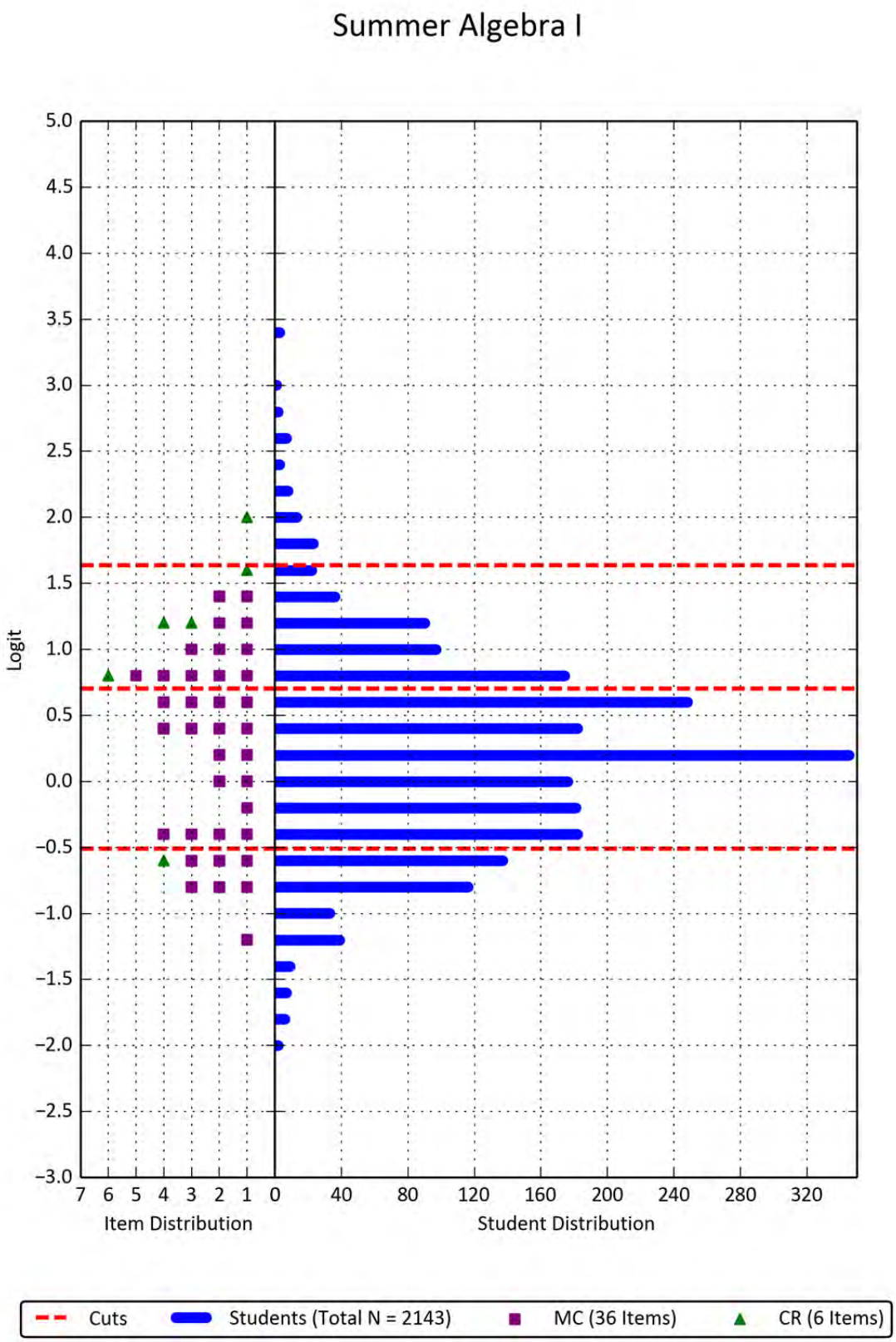


Figure 12–1 (continued). Item Difficulty-Student Ability Maps

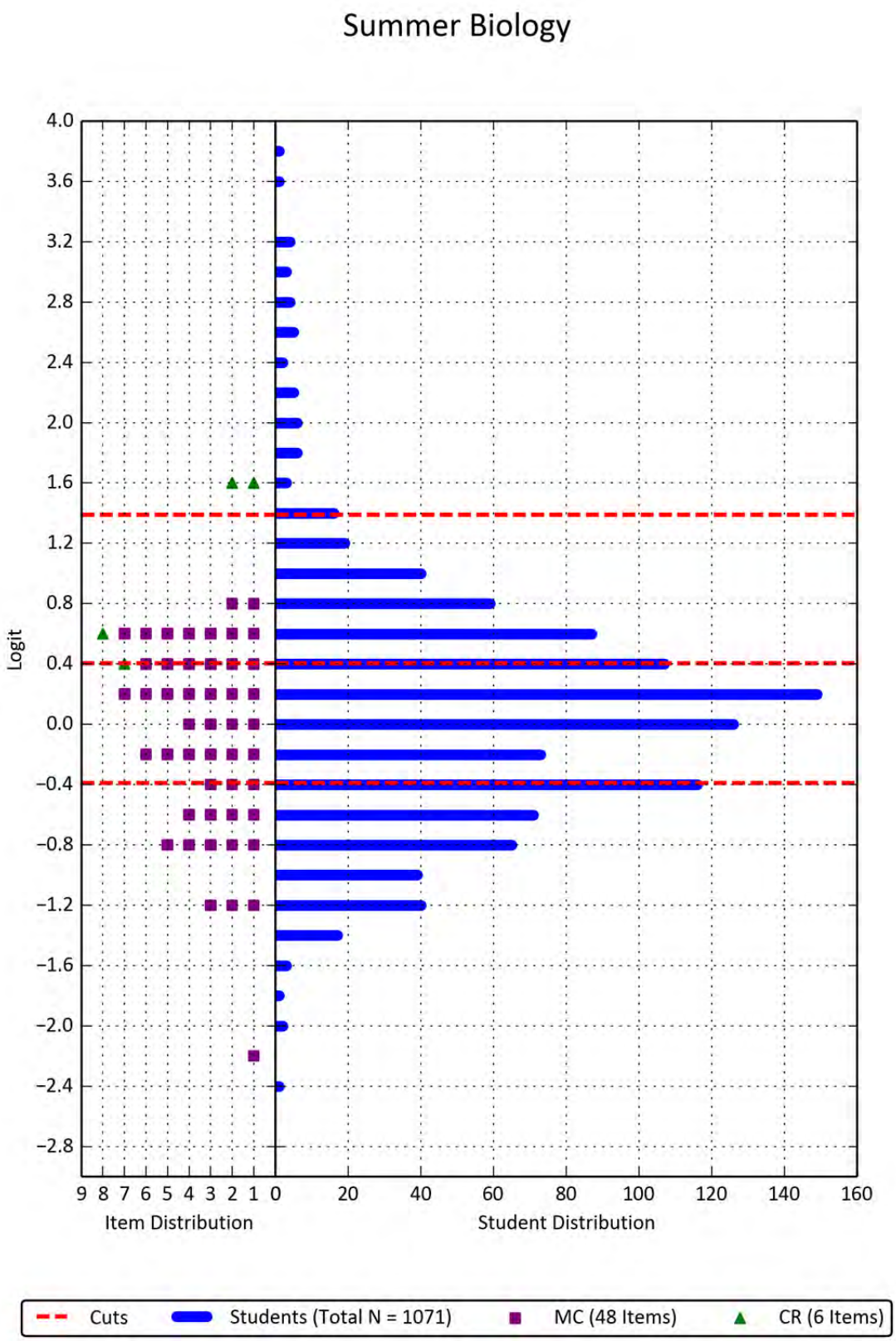
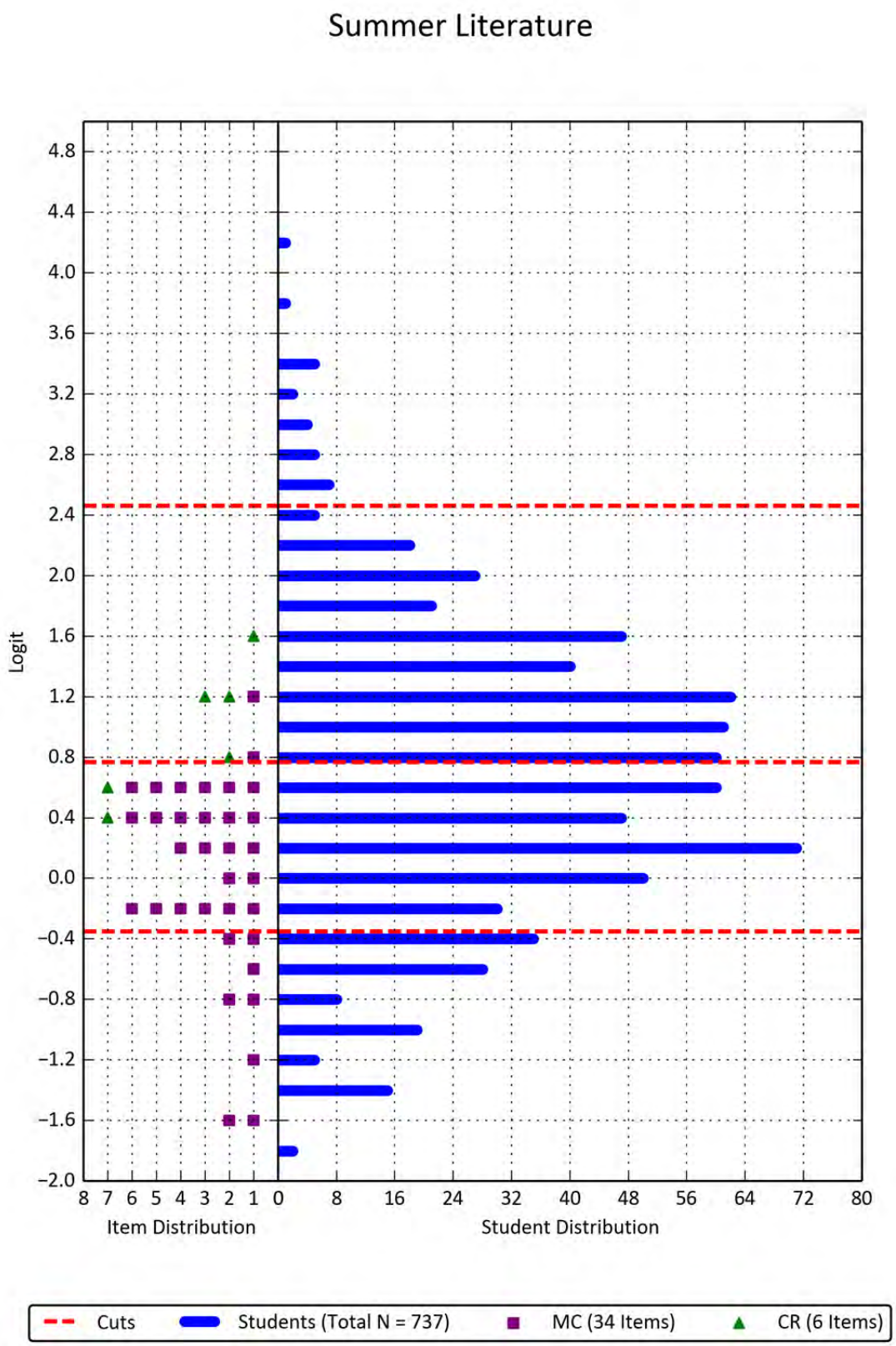


Figure 12–1 (continued). Item Difficulty-Student Ability Maps



CHAPTER THIRTEEN: STANDARD SETTING

STANDARD SETTING AND PERFORMANCE LEVEL DESCRIPTORS

The Keystone Performance Level Descriptors (PLDs) are paragraphs that describe the knowledge and skills expected at different performance levels with respect to the content standards (Pennsylvania Keystone Assessment Anchor Content Standards and Eligible Content) for each of the Keystone Exams. Descriptors must be clearly written to ensure that all stakeholders have a common understanding of what describes expected performance at the various levels (i.e., Below Basic, Basic, Proficient, and Advanced). PLDs were developed, reviewed, and finalized by the PDE/QRT[7] and committees of Pennsylvania educators as required by the Chapter 4 Regulations. After the development and final review by PDE/QRT and Pennsylvania educators, the descriptors were prepared for use during the standard setting workshop. During this meeting, the descriptors were used to guide the standard setting process for each of the Keystone Exams. They were instrumental to the validity and defensibility of the standard setting process.

The standard setting for the Algebra I, Biology, and Literature Keystone Exams was conducted by Data Recognition Corporation (DRC) using a Bookmark procedure (Lewis, Mitzel, & Green, 1996) during a workshop held in Harrisburg, Pennsylvania, June 23–24, 2011. After the standard setting event, the descriptors were finalized. Along with the recommended cut scores, final PLDs for each of the Keystone Exams were submitted to the Pennsylvania Board of Education for final approval.

Below is a summary of the process that was used to guide the development of the Keystone Exams PLDs and a summary of the methodology and results of the standard setting workshop. Additional details about the standard setting event can be found in the *Keystone Standard Setting Technical Report* (Pennsylvania Department of Education, 2011).

DEVELOPMENT OVERVIEW FOR THE PERFORMANCE LEVEL DESCRIPTORS

The Keystone PLDs were developed by Pennsylvania educators during two meetings. The goal of the first meeting was to have Pennsylvania educators review the general Pennsylvania Policy Definitions that describe, at a high level, performance expected for each level and complete an in-depth analysis of the Keystone Assessment Anchors and Eligible Content in order to create a bulleted list describing, in detail, what students are expected to know and be able to do at each performance level. The goal of the second meeting was to have committees of Pennsylvania educators review the Pennsylvania Policy Definitions again and draft general descriptors (paragraphs) that build upon and/or summarize the information from the bulleted lists of what students are expected to know and be able to do at each performance level.

Guiding documents were prepared for each meeting. The guiding documents included the following:

- PowerPoint training presentations
- Meeting agendas
- Assessment Anchors and Eligible Content documents

[7] The PDE/QRT includes the representatives from the Pennsylvania Department of Education, members of the Quality Review Team, and/or others appointed by the Quality Review Team.

- Policy definitions
- Other relevant materials as needed to help guide the work of the committees

All meeting materials were submitted to PDE/QRT for review and approval before each Keystone meeting following an agreed-upon development schedule. The following section provides specific information concerning each meeting.

ROLE OF FACILITATORS AND OBSERVERS FOR THE MEETINGS

The role of the facilitators was to ensure that a fair and orderly consensus process was followed for each meeting, that the committee members' work was adequately documented, and that the process stayed on schedule. The facilitators developed the agenda, prepared all meeting materials such as the PowerPoint training presentations and the task-guiding documents, and provided the initial training on the development of the specific descriptors (meeting 1) and the general descriptors (meeting 2). PDE/QRT members supported the facilitation process and/or served as observers of the process.

The facilitators also served as a resource, answering questions pertaining to the content of the standards (Assessment Anchor Content Standards and Eligible Content) and the documents developed to guide the process. Facilitators also summarized the results of each meeting, finalized the results, and prepared the specific descriptors/bulleted lists (meeting 1) and the general descriptors (meeting 2) for PDE/QRT review and approval.

PERFORMANCE LEVEL DESCRIPTORS MEETING 1

CREATING SPECIFIC LISTS DESCRIBING WHAT STUDENTS SHOULD KNOW AND BE ABLE TO DO AT EACH PERFORMANCE LEVEL

The first PLD meeting for Algebra I, Biology, and Literature Exams was held May 18–19, 2010, in Harrisburg, Pennsylvania. The purpose of the first meeting was to guide Pennsylvania educators in understanding the Assessment Anchors and Eligible Content for Algebra I, Biology, and Literature for what the Commonwealth of Pennsylvania determined students should know and be able to do for a given Keystone subject. Committee members applied this understanding to the development of a bulleted list of specific determinations as to the level of knowledge and skills deemed necessary for each performance level. The section below describes the process used in the first meeting.

TRAINING

Pennsylvania educators received general training on how to develop specific PLDs, including training on how to describe student performance in relation to the Keystone Assessment Anchors and Eligible Content. The training also provided educators with a general overview of the Standards Aligned System (SAS) and the high-level plan for the Keystone Exams. Definitions of key terms (e.g., Assessment Anchor Content Standards, Eligible Content, Performance Level Descriptors) were provided along with information on the background and purpose of the Keystone Exams. Keystone Exams content-specific materials (e.g., Assessment Anchor Content Standards, Eligible Content, other guiding documents) were distributed. The PDE/QRT also provided information on the policy definitions for existing Pennsylvania assessments.

ANALYZING THE ASSESSMENT ANCHORS AND ELIGIBLE CONTENT AND THE GENERAL POLICY DEFINITIONS FOR PENNSYLVANIA ASSESSMENTS

Following the introductory training, educators were divided into groups according to each Keystone Exam. Each group focused specifically on the task at hand—developing the specific PLDs for a given Keystone Exam. Committee members were informed of the format of the specific descriptors (bulleted list) and the number of proposed performance levels for each Keystone Exam (Below Basic, Basic, Proficient, and Advanced). Committee members were then given time to familiarize themselves with the policy definitions and the Assessment Anchors and the Eligible Content for a given Keystone Exam. They were provided with PDE/QRT-approved guiding documents to facilitate the process. Beginning with Proficient, committee members were asked to draft, in bulleted-list format, each performance level for Basic, Proficient, and Advanced, making sure to consider the knowledge and skills required or deemed necessary for each performance level. Note: Educators were not asked to create a specific descriptor for Below Basic.

DRAFTING SPECIFIC DESCRIPTORS

Outlined below is the sequence of steps taken to develop specific descriptors. The sequence was not always followed exactly. For example, some steps occurred simultaneously; other steps were repeated as needed or reordered as necessary.

1. The committee began with the development of the bulleted list for Proficient to serve as a model for the work during the remainder of the development process. As a formative first task and using the Assessment Anchors and Eligible Content and the Pennsylvania Policy Definition for Proficient, the committee was asked to discuss, deliberate, and reach consensus on its initial bulleted list of the knowledge and skills needed to be considered Proficient. During this process, members were encouraged to consult all available resources and guiding documents. Particular emphasis was placed on the alignment of the knowledge and skills necessary for Proficient performance with what students are expected to know and be able to do as defined by the Assessment Anchors and Eligible Content for Algebra I, Biology, and Literature.
2. Once the committee drafted a bulleted list of the knowledge and skills needed to describe Proficient performance based upon the Assessment Anchors and Eligible Content, a group discussion took place. In reviewing the bulleted list for Proficient, the educators were specifically asked to determine whether all members agreed that the list included the appropriate knowledge and skills from the Assessment Anchors and Eligible Content to describe the Proficient performance level and that all Assessment Anchors and Eligible Content were sufficiently addressed.
3. The results of the discussion were summarized, and suggested revisions were made. The summary feedback was presented to the committee for additional consideration. An open discussion followed. Committee consensus was reached.
4. Following development of the bulleted list of the knowledge and skills needed for the Proficient performance level as determined by the committee, the committee began the development of the bulleted lists describing the specific knowledge and skills needed for Basic and Advanced. To complete the task, the committee members followed the procedures analogous to those used to develop the specific bulleted list for the Proficient performance level. These procedures included, as a formative first task, the committee's use of the Assessment Anchors and Eligible Content and the Pennsylvania Policy Definitions (e.g., Basic, Advanced) to discuss, deliberate, and reach consensus on its initial bulleted list of the knowledge and skills needed for Basic and then Advanced. This order

of development—Proficient first, followed by Basic and then Advanced—was followed throughout the remainder of the process.

Once the initial drafts of the bulleted lists for Basic, Proficient, and Advanced were developed, a group discussion took place. To guide the discussion the following questions were used to evaluate each specific descriptor (bulleted list) for a given performance level (Basic, Proficient, Advanced):

- Is the description of the performance level appropriate? If not, what revisions need to be made?
- Is the description of the specific Keystone Exam inappropriate because the list of knowledge and skills included in the description of the performance level is too demanding? If so, what revisions need to be made?
- Is the description inappropriate because the knowledge and skills included in the description of the performance level is inconsistent with the expectation of the high standards as reflected in the Policy Definition? If so, what revisions need to be made?
- Is the description inappropriate because the knowledge and skills included in the description of the performance level might be too easy? If so, what revisions need to be made?

5. The results of the discussion were summarized, and suggested revisions were listed. The summary feedback was presented to the committee for additional consideration. An open discussion followed. Depending upon the degree of concurrence, the facilitators proposed revisions based on the committee members' feedback to the specific descriptors (bulleted lists) for each descriptor. Committee consensus was reached.
6. Once consensus was reached, the bulleted lists or specific descriptions for each performance level were reviewed once again to confirm that all Assessment Anchors and Eligible Content were sufficiently addressed for each performance level and that the lists showed a clear progression from one performance level to the next. The results of the discussion were summarized, and suggested revisions were listed. The summary feedback was presented to the committee for additional consideration. An open discussion followed. Depending upon the degree of concurrence, the facilitators proposed revisions to the lists for each descriptor based on the committee members' feedback. Committee consensus was reached.
7. Following completion of the committee's work, the specific PLDs or bulleted lists of the knowledge and skills needed for each descriptor were collected. The bulleted lists were prepared for final review by the PDE/QRT. Upon approval by the PDE/QRT, the bulleted lists of the knowledge and skills describing each performance level were posted on the PDE website for additional review and feedback.

PERFORMANCE LEVEL DESCRIPTORS MEETING 2

CREATING GENERAL DESCRIPTIVE PARAGRAPHS DESCRIBING WHAT STUDENTS SHOULD KNOW AND BE ABLE TO DO AT EACH PERFORMANCE LEVEL

The second meeting for Algebra I, Biology, and Literature Exams took place in Harrisburg, Pennsylvania, on April 27–28, 2011. The second meeting built upon the work completed at the first meeting. The purpose of the second meeting was to guide the committee of Pennsylvania educators in developing general PLDs (paragraphs) for each of the performance levels (Basic, Proficient, and Advanced). These paragraphs were clearly written to ensure all stakeholders have a common understanding of what describes expected performance at the various levels. The paragraphs were not to be as specific as the bulleted lists but were to be aligned to the bulleted lists. In order to complete the task, the educators reviewed the Pennsylvania Policy Definitions for the performance levels.

Table 13–1. Pennsylvania Policy Definitions

Level	Description
Advanced	The Advanced Level reflects superior academic performance. Advanced work indicates an in-depth understanding and exemplary display of the skills included in the Keystone Assessment Anchors and Eligible Content.
Proficient	The Proficient Level reflects satisfactory academic performance. Proficient work indicates a solid understanding and adequate display of the skills included in the Keystone Assessment Anchors and Eligible Content.
Basic	The Basic Level reflects marginal academic performance. Basic work indicates a partial understanding and limited display of the skills included in the Keystone Assessment Anchors and Eligible Content. This work is approaching satisfactory performance, but has not been reached. There is a need for additional instructional opportunities and/or increased student academic commitment to achieve the Proficient Level.
Below Basic	The Below Basic Level reflects inadequate academic performance. Below Basic work indicates little understanding and minimal display of the skills included in the Keystone Assessment Anchors and Eligible Content. There is a major need for additional instructional opportunities and/or increased student academic commitment to achieve the Proficient Level.

The committee members then reviewed the specific bulleted list describing the knowledge and skills for Proficient based upon the Assessment Anchors and Eligible Content to determine whether the list of knowledge and skills provided in the bulleted list was still in alignment with the Policy Definition for Proficient. This review by the committee also included an in-depth analysis of the Assessment Anchors and Eligible Content. The section below describes, in detail, the process used in the second meeting.

TRAINING

Pennsylvania educators received general training on how to develop general descriptors (paragraphs) that describe performance at the various levels, including training on how to describe student performance in relation to the Keystone Assessment Anchors and Eligible Content. The training also included providing Pennsylvania educators with a general overview of the SAS and the high-level plan for the Keystone Exams. Definitions of key terms (e.g., Assessment Anchor Content Standard, Eligible Content, specific and general

Performance Level Descriptors) were provided along with information on the background and purpose of the Keystone Exams. A review of the Pennsylvania Policy Definitions was also included in the training, including a discussion of how the policy definition for Proficient relates to what it means to be Proficient on a given Keystone Exam. Content-specific materials (e.g., Policy Definitions, Assessment Anchor Content Standards and Eligible Content, specific descriptors or bulleted lists from the first meeting, other guiding documents) were also distributed.

ANALYZING THE ASSESSMENT ANCHORS AND ELIGIBLE CONTENT AND THE POLICY DEFINITION FOR PROFICIENT

Following the introductory training, Pennsylvania educators were divided into groups according to Keystone Exam. Each group focused specifically on the task at hand—developing the general PLD paragraphs (Basic, Proficient, and Advanced) for a given Keystone Exam. To begin the process, educators reviewed the Pennsylvania Policy Definition for Proficient.

DRAFTING GENERAL DESCRIPTOR PARAGRAPHS

Once the committee reviewed the bulleted list for alignment to the Policy Definition for Proficient, committee members were asked to describe, in general terms, the knowledge and skills deemed necessary for each performance level (Basic, Proficient, and Advanced), beginning with Proficient. As a formative first task, committee members were instructed to refer to the bulleted list of the knowledge and skills required or deemed necessary for each performance level. Outlined below is the sequence of steps for the process used to develop the general PLD paragraphs. The sequence was not always followed exactly. For example, some steps occurred simultaneously; other steps were repeated as needed or reordered as necessary.

The committee began with the development of the general descriptor paragraph for the Proficient performance level. This general descriptor served as a model for the committee's work during the remainder of the development process. Using the Assessment Anchors and Eligible Content, the specific descriptors (bulleted list) for Proficient and the Pennsylvania Policy Definition for Proficient, the committee was asked to discuss, deliberate, and reach consensus on a written description of the knowledge and skills needed for Proficient. During the process, members were encouraged to consult all available resources and guiding documents. Particular emphasis was placed on the alignment of the knowledge and skills necessary for the Proficient performance descriptor to the Assessment Anchors and Eligible Content for the given Keystone Exam.

> *Note*: In order to help guide educators in the development of the general descriptor paragraph for Proficient, samples of descriptor paragraphs for Algebra I, Biology, and Literature (e.g., Georgia, North Carolina) were provided. The committee members were encouraged to approach the task by noting how the sample general descriptors must provide the right words to define performance—having a balance between keeping the description of Proficient general enough yet not as specific as the bulleted list. Committee members were also encouraged not to focus too heavily upon style, grammar, and mechanics at this stage. In other words, committee members were not to serve as "wordsmiths."

1. Once an initial draft paragraph summarizing the knowledge and skills needed to describe Proficient performance was developed, a group discussion took place. Committee members were asked to review the draft paragraph and determine whether the paragraph provided a clear description of what it means to be Proficient on a given Keystone Exam and the Policy Definition for Proficient. The goal of the discussion was to reach consensus.
2. Following development of the general paragraph describing Proficient, the committee began the development of the general paragraph describing Basic performance and the general paragraph describing Advanced performance. To complete the task, the committee members followed the procedures analogous to those used to develop the general paragraph describing Proficient performance on a given Keystone Exam. This process included, as a formative first task, using the Assessment Anchors and Eligible Content, the specific descriptors (bulleted lists), and the Pennsylvania Policy Definitions for a given level (e.g., Basic, Advanced) and discussing, deliberating, and reaching consensus on the knowledge and skills needed for Basic and the knowledge and skills needed for Advanced. This order of development—Proficient first, followed by Basic and then Advanced—was followed throughout the remainder of the process.
3. Once the initial draft paragraphs were developed for the other performance levels, a group discussion took place. In reviewing the state of development of the general PLD paragraphs at this stage, the committee members were asked to consider the following questions:
    - Does each paragraph clearly summarize the knowledge and skills required for a given performance level (Basic, Proficient, and Advanced)? If not, what revisions need to be made?
    - Does each paragraph provide for an appropriate description of the performance level? In other words, does each paragraph provide an overview or summary of the knowledge and skills appropriate for a given performance level? If not, what revisions need to be made?
    - Does any paragraph provide information that should not be included in the description of the performance level? If so, what revisions need to be made?
    - Is there information in any PLD paragraph that does not align well with the Pennsylvania Policy Definitions for a given performance level? If so, what revisions need to be made?
    - Do any paragraphs include information that might be inconsistent with the knowledge and skills defined by the Assessment Anchors and Eligible Content? If so, what revisions need to be made?
    - Does any paragraph include information describing performance that might be too demanding or too easy? If so, what revisions need to be made?
4. The results of the discussion were summarized, and revisions to each general PLD paragraph were made. Committee consensus was reached.
5. Once consensus was reached, the paragraphs describing performance at each level were reviewed again by the committee to confirm the following:
    - The PLD paragraphs show a clear progression from one performance level to the next level.
    - The PLD paragraphs are consistent with the Pennsylvania Policy Definitions.
    - The PLD paragraphs are aligned to the Assessment Anchors and Eligible Content.

6. The results of the discussion were summarized, suggested revisions were made, and committee members' feedback was incorporated into the paragraphs. Committee consensus was reached.
7. Following completion of the committee's work, the general PLD paragraphs were provided to PDE/QRT for final review and feedback. Upon approval by PDE/QRT, the general PLD paragraphs were used to guide the standard setting process.

STANDARD SETTING

A major purpose in the design of the standard setting workshop for the Keystone Exams is to establish procedures to set the performance cuts for the newly developed exams and, at the same time, adhere to the framework required by federal guidelines (USED, 2004) for setting performance levels. Federal guidelines (USED, 2004: Sect 2) specify that the setting of performance standards must involve the following elements:

- Formal adoption of performance categories that comprise at least three levels
- Pluralistic representation by education stakeholders, to include, for example, members of the public, school teachers and administrators, special education teachers, etc.
- Performance standards based primarily on expert judgment regarding content-based expectations of student achievement, but includes the consideration of student impact data
- Descriptions of the competencies associated with each performance level

Accordingly, the standard setting workshop is designed to satisfy the following goals:

- A defensible and federally acceptable standard setting methodology that emphasizes a content-based approach for recommending the new performance standards
- The incorporation of PLDs developed by Pennsylvania educators into the standard setting process. (The larger goal around the incorporation of PLDs into the process is to help ensure the alignment of Pennsylvania's content standards to performance expectations as established by the recommended cut scores.)

The panelists were informed that the results from this meeting would be presented to the Board for review and possible adoption.

PANELIST RECRUITMENT

PDE selected committee members for the Algebra I, Biology, and Literature standard setting workshop mostly from members who participated in the May 2010 and April 2011 Performance Level Advisory committees. These committee members were selected as the starting pool because they represented the diversity of the Commonwealth of Pennsylvania, had a mix of teaching and committee experience, and, most importantly, were familiar with the PLDs of Keystone Exams. From this list, PDE selected a subset of 25 members for Algebra I, 25 members for Biology, and 23 members for Literature to serve as eligible candidates. DRC, in collaboration with PDE and its Technical Advisory Committee (TAC), established a target of 15 to 20 participants for each of the Keystone Exams in Algebra I, Biology, and Literature.

Between March and June 2011, a great effort was made to recruit enough panelists to meet the target number of participants. In accordance with federal guidelines for representative committees and TAC's recommendation of recruiting a few committee members with higher education experience, the following background factors were applied in the recruitment decision:

- Gender
- Ethnicity
- Grade level and higher education experience
- Content expertise
- Geographic location
- Specializations
- Experience in developing state academic standards, state assessments, and other related activities

However, due to the unavailability of and the cancellation by some committee members, a total of 15, 13, and 11 panelists attended the standard setting workshop for Algebra I, Biology, and Literature, respectively. Table 13–2 contains the summary information about the characteristics of the selected panelists for each content area based on their self-reported responses to the Participant Survey. As can be seen from this table, there were committee members who considered themselves minority in the Algebra I and Literature groups. There were also committee members with administration and/or teaching experience in higher education, special education, and/or individualized education plan (IEP); those with experience of working in different regions; and those with different years of teaching experience.

Table 13–2. Self-Reported Demographic Composition of Panelists by Content Area

Demographic Information		Algebra I		Biology		Literature	
		N	Percentage	*N*	Percentage	*N*	Percentage
Gender	**Male**	9	60.0%	5	38.5%	5	45.5%
	Female	6	40.0%	8	61.5%	6	54.5%
Ethnicity	**Asian**	1	6.7%	0	0.0%	0	0.0%
	American Indian	0	0.0%	0	0.0%	0	0.0%
	Black	1	6.7%	0	0.0%	1	9.1%
	Latino	0	0.0%	0	0.0%	0	0.0%
	Multi-Race	0	0.0%	0	0.0%	0	0.0%
	White	13	86.7%	13	100.0%	10	90.9%
Role	**Classroom Teacher**	8	53.3%	9	69.2%	4	36.4%
	Educator	3	20.0%	0	0.0%	0	0.0%
	Higher Education Educator	3	20.0%	1	7.7%	4	36.4%
	Other	1	6.7%	3	23.1%	3	27.3%
Special Education	**Yes**	7	46.7%	7	53.8%	4	36.4%
	No	2	13.3%	4	30.8%	3	27.3%
	N/A	6	40.0%	2	15.4%	4	36.4%
LEP	**Yes**	4	26.7%	5	38.5%	2	18.2%
	No	4	26.7%	6	46.2%	5	45.5%
	N/A	6	40.0%	2	15.4%	4	36.4%
	Missing	1	6.7%	0	0.0%	0	0.0%
Region	**Urban**	3	20.0%	2	15.4%	2	18.2%
	Suburban	7	46.7%	5	38.5%	5	45.5%
	Rural	4	26.7%	6	46.2%	3	27.3%
	Other	1	6.7%	0	0.0%	1	9.1%
Experience	**Less than 10 years**	0	0.0%	5	38.5%	0	0.0%
	10–20 years	4	26.7%	2	15.4%	4	36.4%
	20–30 years	8	53.3%	4	30.8%	3	27.3%
	More than 30 years	3	20.0%	2	15.4%	4	36.4%

MATERIALS PREPARATION

Workshop materials were developed and printed by DRC. The following is a list of materials that were available to panelists during the workshop:

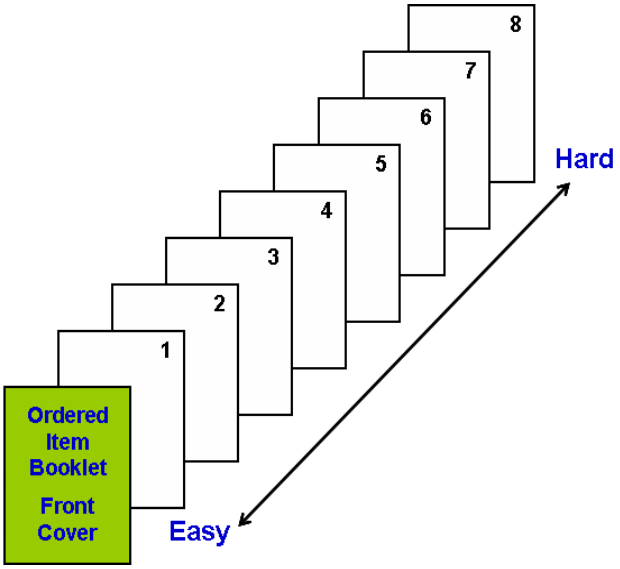
- Item Map
- Item Separation Map
- Ordered Item Booklet (OIB)
- Passages
- Scoring Rubrics
- 2011 Operational Test Form

- PLDs
- Content Standards
- Participant Rating Form
- Participant Survey
- Readiness Form
- Evaluation Form
- Adhesive bookmarks, pens, highlighters, etc.

Item Map. The item map is a summary document displaying relevant information regarding each item. It contains the OIB page number, the original test sequence, item type, key, and content standard. The item map is ordered by difficulty in the same manner as the ordered item booklet. The item separation map is a graphical display of the relative difficulty of each item.

Ordered Item Booklet. The ordered item booklet is composed of all the operational items included in the test given to students in spring 2011. Items are ordered from the easiest to the hardest. Each page contains an item and a page number. For constructed-response (CR) items, each score point with a sample response has a unique location in the OIB. A visual illustration of the OIB is provided in Figure 13–1.

Figure 13–1. Illustration of Ordered Item Booklet



To ensure there was no item difficulty gap for the items in an OIB, a few field test items were added to the OIBs. Table 13–3 shows the number of items supplemented into the OIBs by content area.

Table 13–3. Number of Score Points in OIB and Number of Items Supplemented

Exam	Number of Score Points in OIB	Number of Items Supplemented
Algebra I	63	3
Biology	69	3
Literature	54	2

Details of all other materials can be found in the *Keystone Standard Setting Technical Report* (Pennsylvania Department of Education, 2011).

DATA PREPARATION

In Bookmark standard setting (Lewis et al., 1996), the locations of items are typically rescaled to produce better alignment with the task of asking panelists what a student should know and be able to do. A probability of 0.67 is often used to find the corresponding item location during rescaling because this probability aligns better with the likelihood panelists use to make their judgment on whether a borderline student should answer the item correctly or receive a score point or higher. For Keystone Exams, the multiple-choice (MC) items were calibrated using the familiar form of the dichotomous Rasch model. The CR items were calibrated using another model in the Rasch family, Master's partial-credit model (Wright & Masters, 1982). The latter model parameterizes each threshold needed to obtain the maximum score on the task. Consequently, there is one item difficulty parameter for each of the n – 1 score transitions (0/1, 1/2, etc.), or thresholds. Using the equated item parameters, the locations of items were rescaled to a response probability of 0.67 (i.e., RP=0.67). For MC items, the item locations were found by solving

$$\Phi_{ni} = \frac{\exp(\beta_n - \delta_i)}{1 + \exp(\beta_n - \delta_i)}$$

for the value of β_n that gives Φ_{ni} =0 .67. Φ_{ni} is the probability that person *n* scores 1 on item *i*; β_n is the ability of person *n*; and δ_i is the difficulty of item *i*.

For CR items, the probability of person *n* scoring *x* on item *i* is

$$\pi_{nix} = \frac{\exp \sum_{j=0}^{x} (\beta_n - \delta_{ij})}{\sum_{k=0}^{m_i} \exp \sum_{j=0}^{x} (\beta_n - \delta_{ij})}, \quad x = 0, 1, \ldots, m_i$$

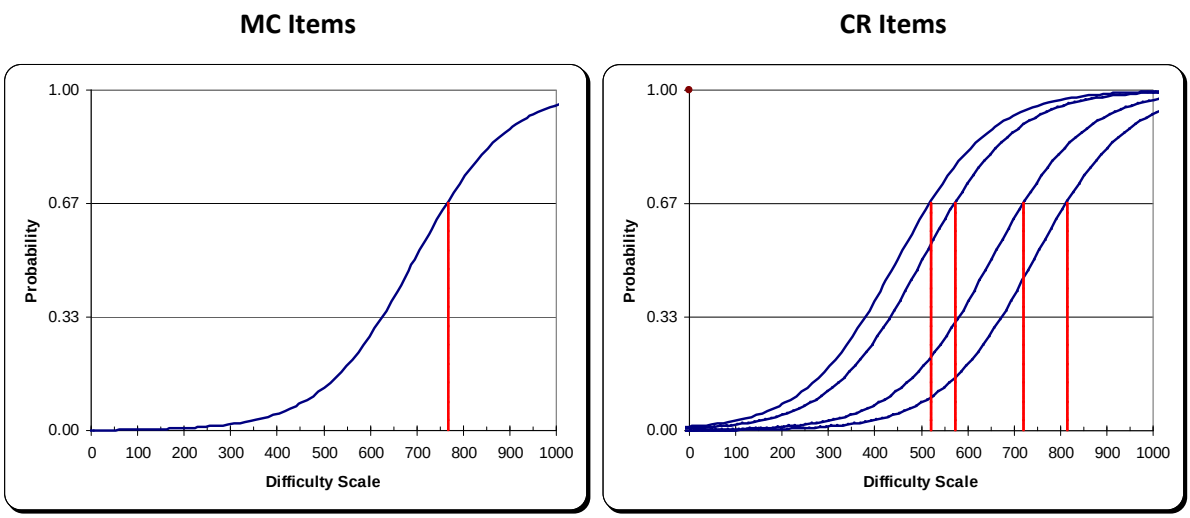
where *mi* is the number of thresholds and for notational convenience,

$$\exp \sum_{j=0}^{0} (\beta_n - \delta_{ij}) = 1.$$

This equation expresses the probability of person *n* scoring *x* on the *mi* threshold of item *i* as a function of the person's measure (β_n) and the threshold difficulties (δ_{ij}) of the *mi* thresholds for item *i*. The observation *x* is a count of the successfully completed item thresholds. The item location for a score point is determined by finding the β_n for the person who has a 0.67 probability of earning this score point or higher.

The figure below shows how the difficulty values of MC items and score values for the CR items were treated in determining their respective OIB placements. For an MC item (left plot), the difficulty is the point on the scale at which the examinees have a 0.67 probability of answering the item correctly. For the CR item (right plot), the four illustrated values (e.g., on a 0–1000 scale) indicate where the examinees have a 0.67 probability of earning a particular score point or higher. The item difficulty for the MC item is 768, and the four threshold values for the CR items are 521, 575, 723, and 815. The value of 521 is the location on the scale where examinees have a 0.67 probability of earning a score of 1 or higher (i.e., 2, 3, or 4). The value of 575 is where examinees have a 0.67 probability of earning a score of 2 or higher (i.e., 3 or 4). The value of 723 is where examinees have a 0.67 probability of earning a score of 3 or 4.

Figure 13–2. Example of Obtaining Item Difficulties for MC and CR Items



TRAINING

The overall training was conducted the first morning of the workshop. Participants were informed that they were to

- be responsible for all secure materials,
- verify their individual placements for each round of judgments, and
- participate in a discussion as a large group.

Content-specific training was conducted after content area groups assembled in different rooms. These training materials included the following:

- Item Map
- Item Separation Map
- OIBs
- Training Rubrics and/or Passages
- PLDs
- Rating Form

Panelists were told that the process includes iterations (rounds) of individual judgments, group discussions, and opportunities to revise judgments. In addition, impacts were presented (percentage of students in each performance level) based on the large groups' results and external data.

BOOKMARK PROCEDURE

DRC utilized a Bookmark method to set the performance standards. Bookmark is one in a broad category of methods commonly referred to as item mapping that focus on items rather than examinees. To begin the process, participants were asked to visualize the knowledge and skills of a student who is at the borderline between two performance levels based on the PLDs. Thereafter, participants were given an ordered item booklet (with items ordered from easiest to most difficult) and asked to assess whether this borderline student has a reasonably high probability of answering each item correctly. "Reasonably high" was defined as 0.67. In addition, an item map was presented that contained the response key, the content objective, and the item sequence in the test booklets. An item separation map was also presented that showed the relative difficulty of each item. Panelists were given a rating form to record their individual placements for all performance levels in each round. Before each round, panelists were asked to fill out a readiness form in order to proceed.

Round 1. The Bookmark procedure proceeded in three rounds. Round 1 began following the review and discussion of PLDs facilitated by a DRC test development specialist. Participants then reviewed the OIBs independently. During this review, they were asked to determine what academic knowledge, skills, and competencies were required for a barely Proficient, Basic, or Advanced student to respond correctly to each successively more difficult item.

Training by the overall psychometric lead during the bookmark placement session emphasized the following points:

- The bookmark represents a judgment of the divide between items that a student at the borderline of a performance level should master and those that are not necessary to master.
- Bookmark placement should not be thought of as separating two items but rather two groups of items. In other words, a placement should not hinge on distinctions drawn for adjacent items without some compelling reason, such as a large gap in content difficulty.

- Students with a scaled score at a given cut score should have approximately a 0.67 probability of correctly responding to a MC item or receiving a certain score point and higher for a CR item at the cut score. These same students should have a higher probability of success on easier items (before the bookmark placement) and a lower probability of success on harder items (after the bookmark placement).
- While placing their bookmarks, panelists should consider what students should know and be able to do in the context of the skills implied by the PLDs and the item content.
- Panelists could start with placing the Basic/Proficient cut point, next the Below Basic/Basic cut point, and finally the Proficient/Advanced cut point.

Panelists were asked to record their bookmark placements on the rating form after they filled out a readiness form, which indicated they had completed the training and understood the standard setting process and their roles. Panelists' judgments were entered into a spreadsheet program. The median ratings of all panelists were calculated. The median placements were treated as the recommended cut scores. In addition, the standard errors associated with the recommended bookmark placements were calculated and associated impact data were determined.

Round 2. Round 2 started with a discussion of Round 1 results. The individual panelists' Round 1 bookmark placements, the median bookmark placements, and the percentage of students in each performance level were presented. Panelists were instructed to verify the ratings entered into the program as correct. A large group discussion followed. The panelists compared their results with others by considering questions such as why they made their Round 1 placements at the locations where they did and what skills and knowledge were required to answer the items. After that, the impact data, based on the median bookmark placement from Round 1 (using the spring 2011 operational test score distributions), were provided to help panelists frame the effects of their judgments. During Round 2 discussion, there was no attempt by the facilitators to reach consensus.

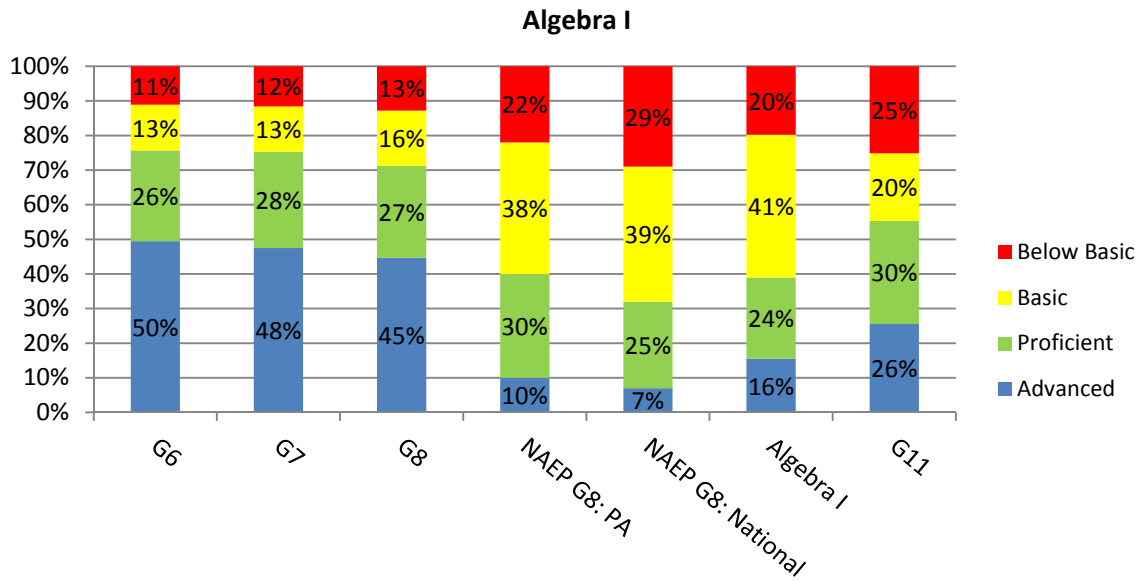
After Round 2 discussion, panelists were asked to make a second set of bookmark placements. Before they revised their Round 1 placements, they were asked to fill out the readiness form to make sure they understood how to adjust their placements (if they desired to do so) based on Round 1 information. The judgments were entered into the spreadsheet program to calculate the median cut scores for each table and the full panel. The associated impact data were also calculated.

Round 3. Round 3 began with a discussion of Round 2 results. The process followed in Round 2 was used. More specifically, the individual panelist's Round 2 bookmark placements, the median bookmark placements from Round 2, and the percentage of students in each performance level were presented. Panelists were instructed to verify the ratings entered into the program as correct. A table discussion followed. Panelists compared their results with others by considering questions such as why they made their Round 2 placements at the locations where they did and what skills and knowledge were required to answer the questions. The impact data, based on the median bookmark placement from Round 2, were provided to help panelists frame the effects of their judgments.

The Keystone Exams are one component of Pennsylvania's new system of high school graduation requirements. Because of the high-stakes consequences, the TAC strongly recommended bringing in external impact data to provide panelists with a reference outside of the Keystone Exams. The intent was to achieve reasonableness of results rather than to use the external data in a directive manner. DRC investigated Pennsylvania students' performance on the Pennsylvania System of School Assessment (PSSA), National Assessment of Educational Progress (NAEP), and Student Achievement Test (SAT) and presented external data as shown in Figures 13–3A to 13–3C before panelists made their Round 3 judgments. The panelists were informed of the following points:

- The PSSA and NAEP results were based on students' performance in 2009. The PSSA results were from grades 6–8 and 11. The NAEP results were from grade 8.
- All students in grades 6–8 and 11 in Pennsylvania took the PSSA. A sample that represents the Pennsylvania grade 8 students took the NAEP tests.
- The SAT results were based on the performance of students who took the SAT in 2010 or prior years.
- About 99% of students in the 2010 SAT data file indicated their expected graduation dates were in 2010; most of these students were in grade 11 in 2009. Therefore, the 2010 SAT data and the 2009 PSSA data were matched.
- Based on the matched sample, it was found that students with higher PSSA scores were more likely to take the SAT. To represent the full population in terms of demographics and PSSA scores, the matched sample was weighted by students' demographics and PSSA scores when calculating the impacts.

Figure 13–3A. External Impact Data

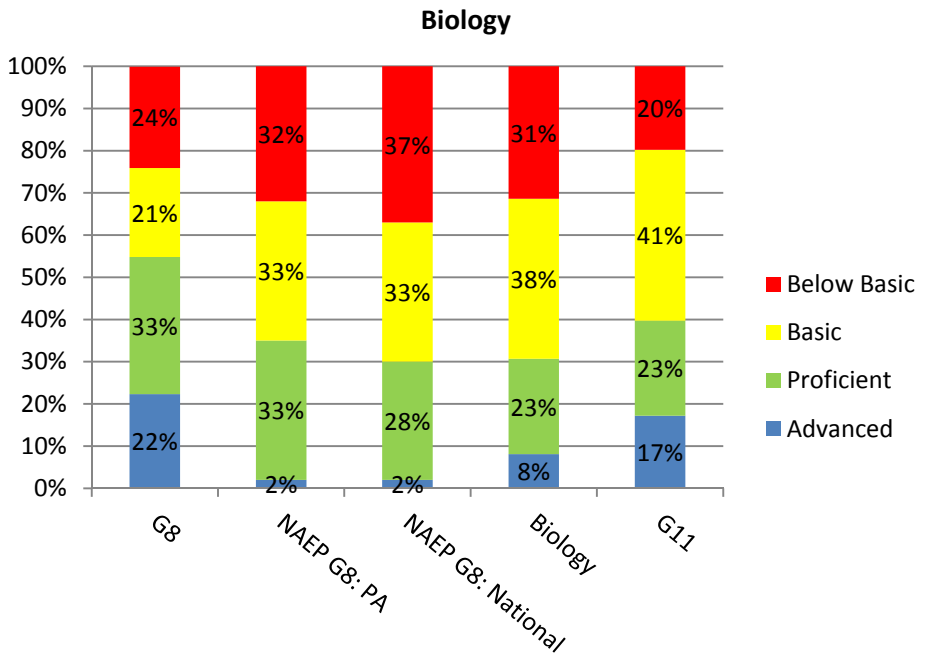


Performance Level	PSSA			NAEP Math		KE	PSSA
	G6	G7	G8	NAEP G8: PA	NAEP G8: National	Algebra I	G11
Below Basic	11.1%	11.6%	12.8%	22.0%	29.0%	19.8%	25.1%
Basic	13.2%	13.1%	16.0%	38.0%	39.0%	41.2%	19.5%
Proficient	26.2%	27.8%	26.6%	30.0%	25.0%	23.5%	29.8%
Advanced	49.5%	47.5%	44.7%	10.0%	7.0%	15.5%	25.5%
Below Basic + Basic	24.3%	24.7%	28.8%	60.0%	68.0%	61.0%	44.8%
Proficient + Advanced	**75.7%**	**75.3%**	**71.3%**	**40.0%**	**32.0%**	**39.0%**	**55.3%**
Total Percentage	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Total N	128,421	132,803	135,909	3,600	161,700	93,703	135,676

College Ready - Yes
Projected
0.9%
7.8%
42.2%
91.2%
4.0%
64.9%
38.1%
61,118

SAT Math: College Ready - Yes	
PA	National
51.7%	54.0%
65,426	N/A

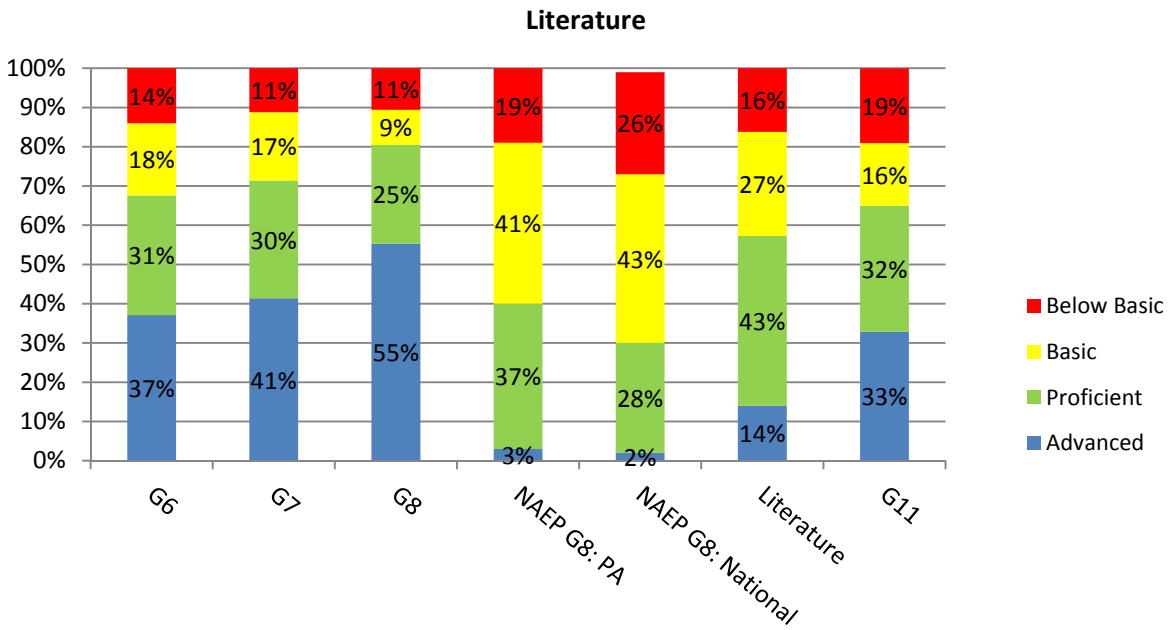
Figure 13–3B. External Impact Data



Performance Level	PSSA	NAEP Science		KE	PSSA
	G8	NAEP G8: PA	NAEP G8: National	Biology	G11
Below Basic	24.0%	32.0%	37.0%	31.4%	19.8%
Basic	21.1%	33.0%	33.0%	37.9%	40.5%
Proficient	32.5%	33.0%	28.0%	22.6%	22.5%
Advanced	22.3%	2.0%	2.0%	8.1%	17.2%
Below Basic + Basic	45.1%	65.0%	70.0%	69.3%	60.3%
Proficient + Advanced	**54.8%**	**35.0%**	**30.0%**	**30.7%**	**39.7%**
Total Percentage	100.0%	100.0%	100.0%	100.0%	100.0%
Total N	134,969	3,600	151,100	46,394	131,534

College Ready - Yes	SAT Total: College Ready - Yes	
Projected	PA	National
1.4%	38.7%	43.0%
9.1%		
45.9%		
86.6%		
6.6%		
63.8%		
29.4%		
60,311	65,426	N/A

Figure 13–3C. External Impact Data



Performance Level	PSSA			NAEP Reading		KE	PSSA	College Ready - Yes	SAT Critical Reading: College Ready - Yes	
	G6	G7	G8	NAEP G8: PA	NAEP G8: National	Literature	G11	Projected	PA	National
Below Basic	14.0%	11.2%	10.6%	19.0%	26.0%	16.2%	19.0%	1.2%	46.4%	50.0%
Basic	18.4%	17.4%	8.9%	41.0%	43.0%	26.5%	16.0%	4.7%		
Proficient	30.5%	30.0%	25.2%	37.0%	28.0%	43.3%	32.1%	24.8%		
Advanced	37.1%	41.4%	55.3%	3.0%	2.0%	14.0%	32.9%	76.7%		
Below Basic + Basic	32.4%	28.6%	19.5%	60.0%	69.0%	42.7%	35.1%	2.7%		
Proficient + Advanced	**67.6%**	**71.4%**	**80.5%**	**40.0%**	**30.0%**	**57.3%**	**64.9%**	**51.1%**		
Total Percentage	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	34.5%		
Total N	128,284	132,641	135,739	3,500	160,900	42,292	135,470	61,081	65,426	N/A

The Keystone Exams and PSSA results were presented to the panelists first. Panelists were encouraged to compare the impact data and discuss whether the results for the Keystone Exams were reasonable. The NAEP results were added next, and the SAT results were introduced last for comparison and discussion. While discussing the external data, panelists were reminded that all these tests were created for different purposes and might cover different content standards.

Before panelists provided their final judgments, they were instructed to fill out the readiness form to make sure they understood how to adjust their placements (if they desired to do so) based on the Round 2 information and external impact data. After their individual bookmark placements, panelists filled out the evaluation form. The judgments were entered into the spreadsheet program to calculate the median placements for the full panel. The associated impact data were also calculated. The Round 3 results were presented to the panelists for their information after the lunch break.

PANELISTS' RECOMMENDATIONS

Table 13–4 provides a summary of each round's median, minimum, and maximum ratings (i.e., bookmark page numbers) of the group.

Table 13–4. Summary of Panelists' Ratings for Each Round

Exam	Round	Bookmark Page Number								
		Below Basic/Basic			Basic/Proficient			Proficient/Advanced		
		Median	Min.	Max.	Median	Min.	Max.	Median	Min.	Max.
Algebra I	1	11	6	19	28	14	42	45	33	56
	2	11	6	13	26	17	33	42	40	46
	3	11	10	12	26	18	30	46	41	46
Biology	1	9	4	15	26	20	30	56	43	62
	2	8	7	14	24	21	30	54	50	60
	3	8	7	12	22	20	30	54	50	60
Literature	1	8	5	14	27	12	34	47	38	52
	2	9	8	15	23	15	34	46	38	48
	3	9	8	15	25	17	34	48	38	48

CUT POINTS AND STANDARD ERRORS

Each bookmark page number is associated with a bookmark difficulty (i.e., logit value). The logit cut is the bookmark difficulty corresponding to the median OIB page number minus one. The logit cut and the standard error (SE) of median logit based on panelists' Round 1 rating were used to establish the 1 and 2 SE confidence intervals. By bracketing the median cut score by 2 SEs, the 95% confidence interval was identified; the confidence interval can be used to estimate the effects of false positives (passing students who may not actually have sufficient knowledge and skills) or false negatives (failing students who do have sufficient knowledge and skills). PDE can use these standard errors to identify the appropriate cut score by taking into consideration the variance in the human judgments. Table 13–5 summarizes the logit cuts associated with Round 3 median ratings, median +/-1 SE, and median +/-2 SE. The corresponding impacts (percentages in performance level) are provided in this table as well. Note that BB represents Below Basic; B represents Basic; P represents Proficient; and A represents Advanced.

Table 13–5. Summary of Logit Cuts and Impacts

Exam	Stats	Logit Cut			Percentage in Performance Level (%)				
		BB/B	B/P	P/A	BB	B	P	A	P+A
Algebra I	Median-2SE	-0.7273	0.4291	1.3694	14.7	37.3	30.2	17.8	48.0
	Median-1SE	-0.6181	0.5659	1.5041	17.2	37.8	31.6	13.4	45.0
	Median	-0.5090	0.7027	1.6388	19.8	41.2	27.5	11.5	39.0
	Median+1SE	-0.3999	0.8395	1.7735	22.4	44.4	23.5	9.7	33.2
	Median+2SE	-0.2907	0.9763	1.9082	25.2	47.0	19.7	8.1	27.8
Biology	Median-2SE	-0.5977	0.3098	1.2500	22.5	38.9	27.9	10.7	38.6
	Median-1SE	-0.4933	0.3564	1.3205	28.3	33.1	29.3	9.3	38.6
	Median	-0.3888	0.4029	1.3910	31.4	32.7	27.8	8.1	35.9
	Median+1SE	-0.2843	0.4494	1.4615	34.5	32.2	25.2	8.1	33.3
	Median+2SE	-0.1799	0.4960	1.5320	40.7	26.0	26.4	6.9	33.3
Literature	Median-2SE	-0.6561	0.2338	1.7014	12.4	20.9	46.3	20.4	66.7
	Median-1SE	-0.5545	0.4116	1.9551	14.2	25.3	46.5	14.0	60.5
	Median	-0.4530	0.5894	2.2088	16.2	26.5	48.4	8.9	57.3
	Median+1SE	-0.3515	0.7672	2.4625	18.3	31.4	43.6	6.7	50.3
	Median+2SE	-0.2499	0.9450	2.7162	20.5	36.5	38.2	4.8	43.0

FINAL RESULTS

After reviewing the results in Table 13–5 and considering panelists' discussions at the standard setting workshop, PDE recommended using the logit cut scores associated with the median of panelists' Round 3 ratings for Algebra I and Biology. For Literature, PDE recommended the logits cuts associated with the Round 3 median plus 1 SE.

To avoid negative values on the logit scale, the scaling constants were determined next to linearly convert the logit values to scaled scores. The scaled cut scores for each performance level were obtained by linearly transforming the logit cuts. Details of the scaling process can be found in Chapter Fourteen. A brief description is below.

For Keystone Exams, the linear transformation from logits or Rasch measures to scaled scores was established by anchoring the logit cut for Basic/Proficient to a scaled score 1500 and fixing the slope constant to 50. The intercept constant was calculated next based on the known values 1500, 50, and the logits cut for Basic/Proficient for each content area. In addition, the bottom of the scale was truncated at the lowest obtainable scaled score (LOSS), 1200. The top of the scaled scores was truncated at the highest obtainable scaled score (HOSS), 1800. The recommended scaled score cuts and the corresponding impacts were provided to the Board on July 20, 2011, for approval. Table 13–6 presents the final scaling constants and the Board-approved scaled score ranges for each performance level.

Table 13–6. Summary of Scaled-Score Ranges and Scaling Constants

Exam	Performance Level				Scaling Constants	
	Below Basic	Basic	Proficient	Advanced	Slope	Intercept
Algebra I	1200–1438	1439–1499	1500–1545	1546–1800	50	1464.365
Biology	1200–1459	1460–1499	1500–1548	1549–1800	50	1479.355
Literature	1200–1443	1444–1499	1500–1583	1584–1800	50	1461.140

The Keystones Exams are reported by total and modules. Although the panelists made recommendations based on the total test only, the Basic/Proficient cut for the total test is applied directly in setting the passing cut score for each module. In this case, the passing scaled score cut at module level is 1500.

CHAPTER FOURTEEN: SCALING

Scaling is used to transform test score values (i.e., raw scores) onto a scale that can be interpreted by users easily and correctly. Raw scores cannot be used to compare students' achievement across administrations because they depend on the difficulty of the tests. The same student can score higher on an easy test than on a difficult test. To overcome the limitation of raw scores, the scaled scores are introduced to report students' achievement in Algebra I, Biology, and Literature. This chapter describes the two major steps to convert a raw score to a scaled score (SS) and some key considerations for establishing the score scale for Keystone Exams.

RAW SCORES TO RASCH ABILITY ESTIMATES

The preequated item parameter estimates for the operational items (further discussed in Chapters Twelve and Fifteen) were used to obtain Rasch person ability estimates and asymptotic standard errors of measurement for each possible raw score value for the overall test, as well as each module. The generation of this raw score-to-Rasch ability was accomplished through application of the fundamental formulas in the Rasch measurement model. The combination of both dichotomously scored multiple-choice (MC) items as well as polytomously scored constructed-response (CR) items requires the use of a partial-credit model (RPCM) (Wright & Masters, 1982). The Newton-Raphson iterative procedure is used to obtain precise ability estimates:

$$b_r^{(t+1)} = b_r^t - \frac{r - \sum_i^L \sum_{k=1}^m kP_{rik}^{(t)}}{-\sum_i^L \left[\sum_{k=1}^m k^2 P_{rik}^{(t)} - \left(\sum_{k=1}^m kP_{rik}^{(t)} \right)^2 \right]}, \quad r=1, \ldots, M-1,$$

where b_r^t is the estimated ability of the student with score r after t iterations, k is the number of thresholds, L is the number of items, $M = \sum_i^L m_i$, and $P_{rik}^{(t)}$ is the probability, π_{nix} , defined earlier in Chapter Twelve:

$$\pi_{nix} = \frac{\exp \sum_{j=0}^{x} (\beta_n - \delta_{ij})}{\sum_{k=0}^{m_i} \exp \sum_{j=0}^{x} (\beta_n - \delta_{ij})}, \quad x = 0, 1, \ldots, m_i.$$

The asymptotic standard error of measurement (SEM) was estimated from the denominator of the final iteration:

$$SE(b_r) = \left[\sum_i^L \left[\sum_{k=1}^m k^2 P_{rik}^{(t)} - \left(\sum_{k=1}^m kP_{rik}^{(t)} \right)^2 \right] \right]^{-1/2}.$$

The Rasch ability estimates and the corresponding SEMs are then transformed to scaled scores and SEMs of scaled scores as discussed in the following section.

ZERO AND PERFECT SCORES

A direct ability estimate for zero (no points earned) or perfect (all points earned) raw scores can't be achieved. Thus, a default procedure for estimating such extreme scores was used for the Keystone Exams. Essentially, a fractional raw score (a value less than one, e.g., 0.3) was added to zero scores and subtracted from perfect scores to determine the corresponding logit values for these extreme scores.

RASCH ABILITY ESTIMATES TO SCALED SCORES

Generally, scaled scores are preferred over Rasch ability estimates for reporting purposes. One issue is that Rasch ability estimates are on a scale that includes negative and decimal values. By transforming the Rasch ability estimates to scaled scores, all reported values can become positive integers, which makes more sense to parents and students. Since Rasch ability estimates are comparative after equating (discussed further in Chapter Fifteen) to the base administration/year, the transformed scaled scores have a common scale across administrations, even though the corresponding raw scores may differ.

Scaled scores are usually obtained through some linear transformation of Rasch ability estimates. Before the linear equation is established for each content area, a few points were considered for the Keystone Exams:

- Avoid scales that might be confused with scores for other types of assessment, for example:
  - Scaled scores ranging from 0 to 100 (because this might be confused with percentage correct scores or percentile ranks)
  - Scaled scores ranging from 200 to 800 (because this might be confused with SAT scores)
  - Scaled scores with similar ranges as the ones for the Pennsylvania System of School Assessment (PSSA) or Classroom Diagnostic Tools (CDT)
- Avoid scales similar to raw scores from a base form.
- Avoid scales that might suggest the scores are more precise than they actually are (i.e., suggesting more precision than can actually be supported by the test scores).
- Avoid scales with negative numbers and decimals.

In terms of industry standard practice, a common perspective is that scaled scores should facilitate score interpretation while at the same time minimize misinterpretation and unwarranted inferences. Often this is done by incorporating some kind of meaning to the scores[8] (Peterson, Kolen, and Hoover, 1989). The incorporation of content meaning is one way to facilitate score interpretation. This might be done in several different ways. For example, the current PSSA scaled scores, like those of many other state assessments, try to input some content meaning by having the PSSA performance level cut scores have known values on the scaled score metric. Such an approach appears to make good sense given the purposes of a criterion-referenced test like the PSSA.

[8] Not everyone agrees with this sentiment. Some have argued the opposite point, that is, any attempt to add meaning to test scores actually predisposes the scores to be misinterpreted (Angoff, 1984).

As a result, a scaled score range of 1200 to 1800 and the Proficient scaled score cut, 1500, for all content areas were selected as the start point to establish the scales for the Keystone Exams in Algebra I, Biology, and Literature. It is worth noting that, although careful considerations were given to the selection of these values, they are completely arbitrary. For example, the label of 1500 could have been called 100 or any other value or letter without affecting any of the relationships among schools, administrations, students, or items. In other words, changing the scale would simply be changing the labels on the axis of a graph without moving any of the points.

LINEAR TRANSFORMATION FORMULAS

The scaled scores for the Keystone Exams are obtained through a linear transformation of the Rasch ability estimates ($\hat{\beta}$). Specifically,

$$SS = m\hat{\beta} + b,$$

where *m* is the slope and *b* is the intercept. The linear transformation for the Keystone Exams is derived by anchoring the Proficient cut (i.e., Rasch ability estimate) recommended by the panelists at the standard-setting workshop to the scaled score 1499.5 (i.e., 1500 after rounding), and then set the slope of the line. There could be many lines with different slopes going through the anchor point. However, the slope of the line has influence over the variability of the scaled scores. For Keystone Exams, the slope of 50 was chosen because it results in desired scaled score standard deviation. Once the scaled score, slope, and Rasch ability estimate are determined, the intercept *b* can be derived by the equation above. The final slopes and intercepts for deriving scaled scores for the Keystone Exams are provided in Table 14–1.

Table 14–1. Scaling Constants by Content Area

Exam	Scaling Constants	
	Slope	Intercept
Algebra I	50	1,464.365
Biology	50	1,479.355
Literature	50	1,461.140

ROUNDING

The linearly transformed scaled scores are always rounded to the nearest integer value for reporting purposes. Values greater than or equal to 0.50 are rounded up. Values less than 0.50 are rounded down.

LOWEST OBTAINABLE SCALED SCORES

The Keystone Exams in Algebra I, Biology, and Literature have a lowest obtainable scaled score (LOSS) of 1200. Any derived scaled score less than 1200 is truncated to this minimum value. The selection of a LOSS is mainly based on two considerations: 1) extreme low scaled scores may have an impact on the average of the scaled scores at school/district level and 2) score truncation makes sense from a score precision perspective given measurement errors at the extremes are large. The LOSS value 1200 is established by giving consideration to *chance* performance over the MC items (e.g., if 40 four-option MCs were on a test, approximately 10 points might be earned on guessing alone) and considering the percentage of students who would be awarded the LOSS values.

HIGHEST OBTAINABLE SCALED SCORES

A highest obtainable scale score (HOSS), 1800, is set for the Keystone Exams for the same reasons described for the LOSS value. However, unlike the LOSS value, which is set initially by giving consideration to guessing over MC items, it is somewhat more difficult to determine what rules should be applied to establish the HOSS. Based on the empirical results, the value 1800 corresponds to a logit value (or Rasch ability estimate) that ranged from 6 to 7, and 0 percent of students received this score.

RAW-TO-SCALED SCORE TABLES

The final raw-to-scaled score conversion tables can be found in Appendix K. Note that only the raw-to-scaled score tables for each single administration were reported. In other words, these tables cannot be used to look for a student's best scaled score if it is combined from two different administrations. The conditional standard error of measurement (CSEM, see Chapter Eighteen for detailed discussion) and corresponding 1 CSEM confidence intervals are also provided in these tables.

CHAPTER FIFTEEN: EQUATING

Equating is a statistical process that is used to adjust scores on test forms so that scores on the forms can be used interchangeably (Kolen & Brennan, 2004), even though the test forms consist of different items. In large-scale testing programs, it is a common practice to have different item sets appear in different test forms across administrations. Students' raw scores (or number-correct scores) cannot be compared between forms or administrations because they depend on the difficulty of the items in a form. The same student can score higher on an easy test than on a difficult test.

To make meaningful comparisons of test scores across administrations, various equating models and procedures have been developed in the literature. For example, in terms of design, there are randomly equivalent groups design and common-item non-equivalent groups design. In terms of testing model, it can be classified as either classical test theory-based equating model or modern test theory-based (e.g., Rasch model or item response theory) equating model. In terms of when the equating is conducted in the assessment cycle, it can be classified as pre-equating or post-equating. The following sections will focus on the equating design and analyses for the winter, spring, and summer Keystone Exams administered in 2012–2013.

PRE- VS. POST-EQUATING

As with other Pennsylvania assessment programs, the Rasch model is used to guide the test design, form construction, calibration, scaling, and equating of the Keystone Exams. The key element of equating test forms using the Rasch model is to place the item parameters from different administrations on the same scale. This is also referred to as item equating. Once the item parameters from different operational test forms are on the same scale, the Newton Raphson procedure can be used to convert number-correct scores to scaled scores as described in Chapter Fourteen. As a result, the scaled scores can be compared across forms with different items.

A common practice in many K–12 large-scale assessment programs is to have all the items field tested before they go operational. Once the field test items' difficulties are placed on the base scale or common metric, in theory, one should not expect the Rasch item difficulties for these items to change, except within a reasonable range of measurement error, after they are administered in an operational test providing the Rasch model fits the data. Based on this theoretical advantage of using Rasch models, equating can be conducted using the item parameters calibrated from field test data. This statistical procedure is referred to as pre-equating. In contrast, post-equating involves the use of Rasch item difficulties calibrated from the data of the operational test to be equated.

Although, in theory, the two equating procedures should provide identical results when the model fits the data, each has its own advantages and disadvantages. The use of pre-equating can facilitate the operational process in terms of rapid score reporting, more time for quality control, and more flexibility in the assessment. One successful application of pre-equating is for computer-adaptive tests where test questions are tailored to the student's achievement as the test progresses. This allows for providing scores immediately after students finish the test. However, a variety of issues need to be considered when using pre-equating in practice. For example, students may not be motivated to take the field tests, especially standalone field tests, which may make the items appear harder in the field test than in the operational test (Eignor, 1985; Eignor & Stocking, 1986; Stocking & Eignor, 1986; Kolen & Harris, 1990). Other concerns for the field test items include item context, item position, and sample size. In contrast, the use of post-equating, when applicable, does not have the same motivational concerns as with pre-equating. Also, post-equating uses post-administration data and is sometimes considered to yield more accurate analysis results, given that the number of students who take the operational

tests is usually large. On the other hand, when the reporting window is extremely tight, as is the case with some graduation or end-of-course exams in various states, post-equating has to occur within a very short time, and hence it leaves less time for the equating analyses and quality control.

EQUATING DESIGN FOR KEYSTONE EXAMS

The Keystone Exams, like many other graduation or end-of-course exams, require a quick turnaround of testing results. After the exams are administered, the bulk of the time is consumed by various data-processing steps. As a result, the equating analyses must be produced in a short period of time, which puts the quality of final analysis results under great risk. In addition, the requirement that a student's final score is the combination of the two highest module scores from any operational test (see Chapter 16 for details) increases the complexity of equating analyses and score reporting for future administrations. To control the quality of post administration processing and guarantee the accuracy of students' reports, pre-equating, one of the most promising applications of Rasch model or item response theory (see Lord, 1980, chap. 13), was proposed and implemented for the Keystone Exams.

To implement the pre-equating model in the Keystone Exams, more efforts have been made to enhance the accuracy of pre-equating results based on the findings from the literature. For example, to address the concerns regarding students' motivation to take field tests, it was decided that no Rasch item difficulty estimates from stand-alone field tests can be used to pre-equate test forms. Instead, all the field test items have to be embedded in an operational test before their Rasch item difficulty estimates can be used. This is based on the assumption that students should be equally motivated to take the operational and embedded field test items, especially when they are not aware of which item is a field test item. To minimize item context and item position effects (i.e., lack of motivation and fatigue), field test items were interspersed within the operational sections. With this design, students have a lesser chance of knowing the field test item positions. Fatigue effects due to field test items being placed in the last section of the operational test can be mitigated in this design as well.

To improve the accuracy of the Rasch item difficulties estimated from the 2011 field test data but used as the values for the 2012–2013 operational items, Data Recognition Cooperation (DRC) scored as many students' responses as possible in 2011, given that increasing sample size can increase the estimation accuracy. More specifically, DRC scored all students' responses to the multiple-choice (MC) items and approximately 2,000 students' responses to the constructed-response (CR) items. For the spring 2011 administration, the details of the number of students for each form and item type can be found in the *2011 Pennsylvania Keystone Exams Technical Report* (Pennsylvania Department of Education, 2011).

POST-EQUATING CHECK ANALYSES

Although extra care has been taken to guarantee the success of pre-equating during the test design, form construction, and calibration of embedded field test items, is the pre-equated result (e.g., raw-to-scaled score table) still valid given the sample change and item sequence change from the field test positions to operational test positions?

After the operational testing data was collected for the winter, spring, and summer 2012–2013 administrations, post-equating check analyses were conducted to validate the raw-to-scaled score tables generated using the pre-equated item parameter estimates. The post-equating check analysis conducted at item level evaluated the item difficulty estimate stability. The analysis conducted at form level investigated whether or not the raw-to-scaled score tables had changed significantly.

ANALYSES AT ITEM LEVEL

To conduct the evaluation of item difficulty parameter estimate stability, the operational items were calibrated using WINSTEPS. There were two approaches used in running WINSTEPS. The first one was that the item parameters for all operational items were anchored to the bank values (also referred to as old values). WINSTEPS provided the displacements between the anchor values and the values that would have been estimated from the current data. The items with displacement value of 0.5 or larger were further investigated as outliers. The second approach was to calibrate the item parameters freely in WINSTEPS. The newly calibrated values (referred to as new values) were equated to the bank scale by adjusting the new item parameter estimates by the difference of the means between the old bank values and the new values. These adjusted values are referred to as equated values. Tables K–1 to K–9 in Appendix L present the item sequence change; *n*-count; old, new, and equated item difficulty estimates (i.e., logit); the corresponding standard error of measurement (SEM); and displacement. A scatter plot of the old and equated values was plotted to check for outlier items. Outliers were identified as those items where the perpendicular distance to the line was greater than or equal to 1.96 standard deviations (see Figures 15–1 to 15–9). As can be seen from Appendix L and the figures below, most of the items had stable item difficulty estimates; most outliers were flagged consistently by both the scatter plot and displacement. Table 15–1 summarizes the outliers flagged by both criteria. These items were reviewed by DRC content specialists, but no obvious reasons were found to explain the item difficulty change.

Figure 15–1. Scatter Plot of Old and Equated Item Parameter Difficulty Estimates for Algebra I: Winter

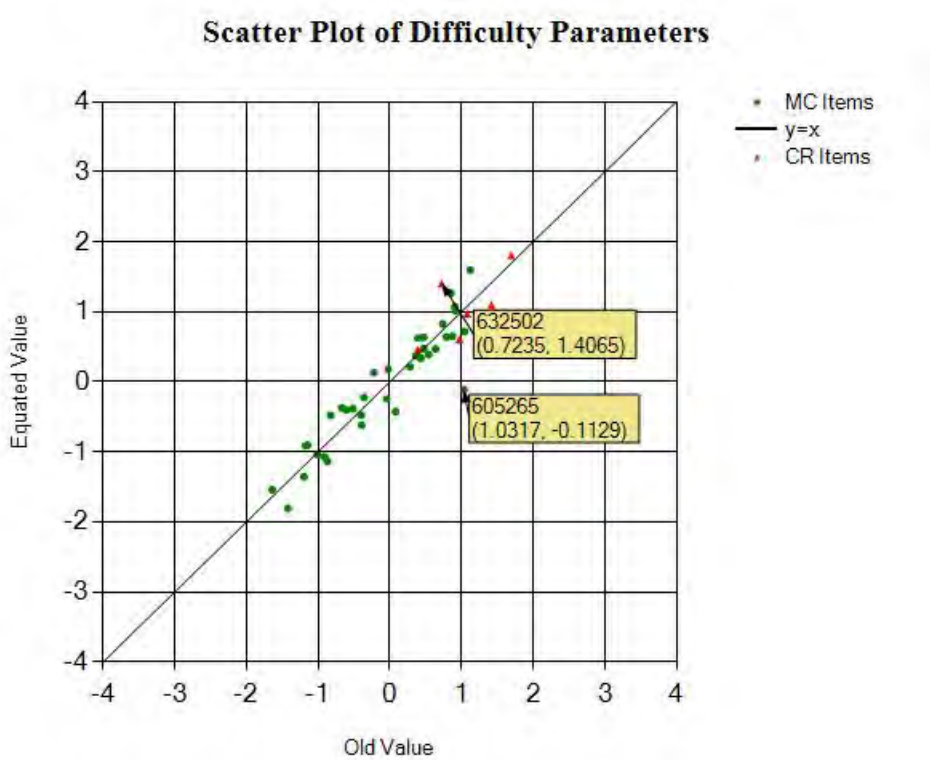


Figure 15–2. Scatter Plot of Old and Equated Item Parameter Difficulty Estimates for Biology: Winter

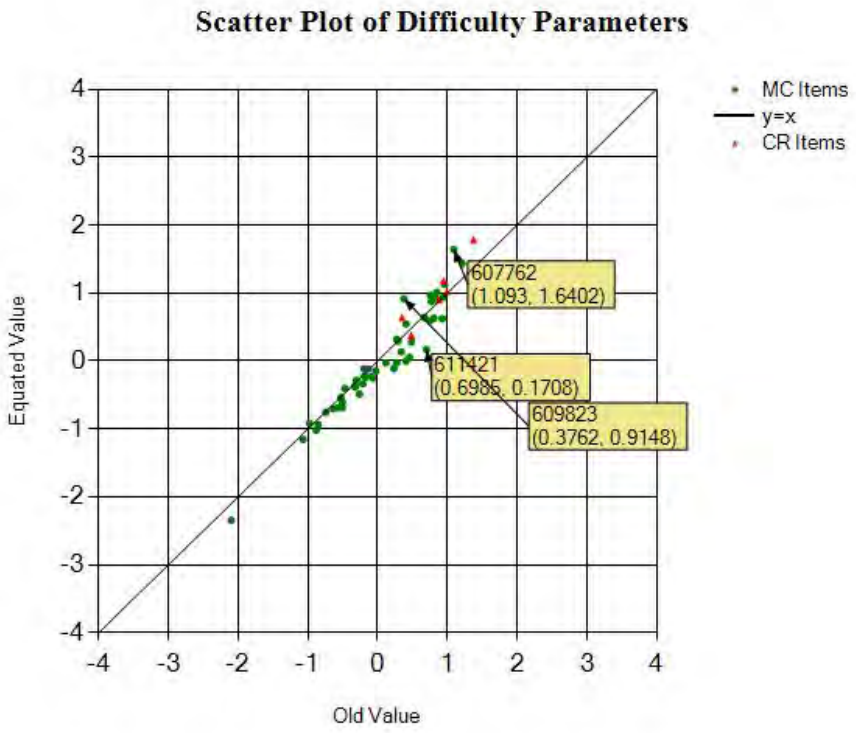


Figure 15–3. Scatter Plot of Old and Equated Item Parameter Difficulty Estimates for Literature: Winter

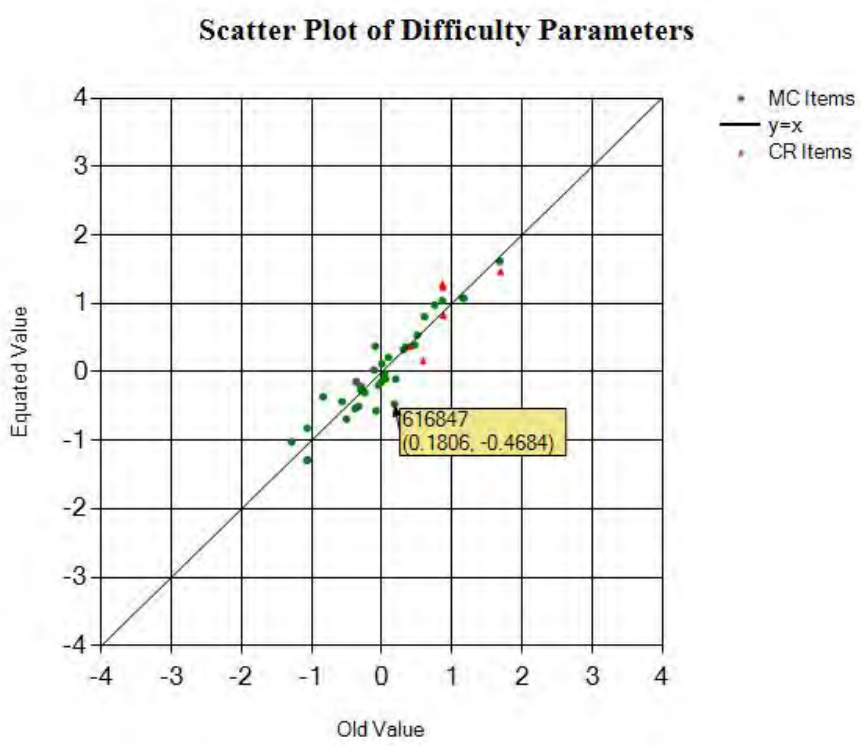


Figure 15–4. Scatter Plot of Old and Equated Item Parameter Difficulty Estimates for Algebra I: Spring

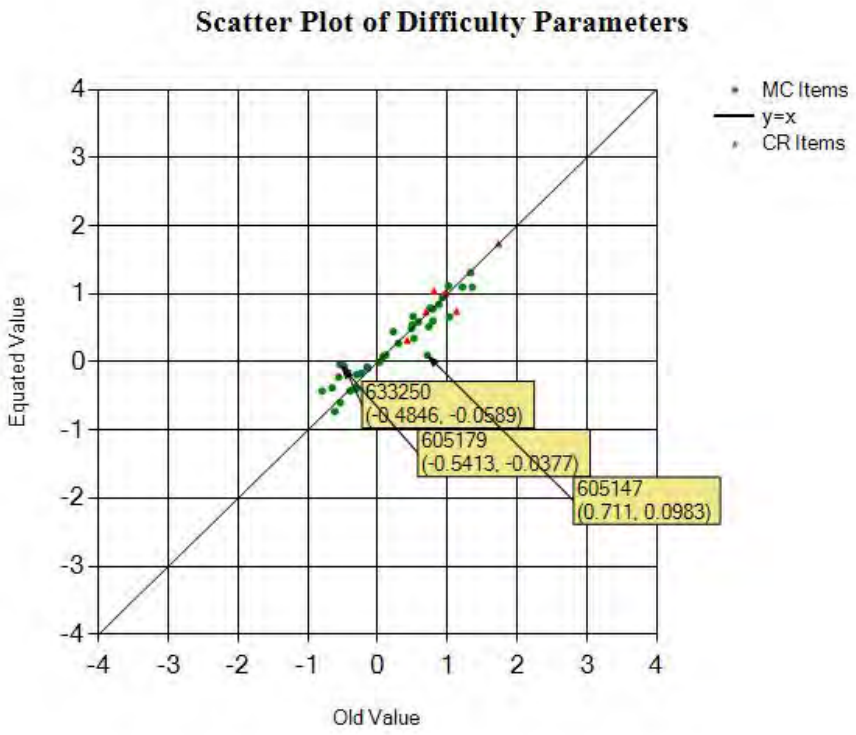


Figure 15–5. Scatter Plot of Old and Equated Item Parameter Difficulty Estimates for Biology: Spring

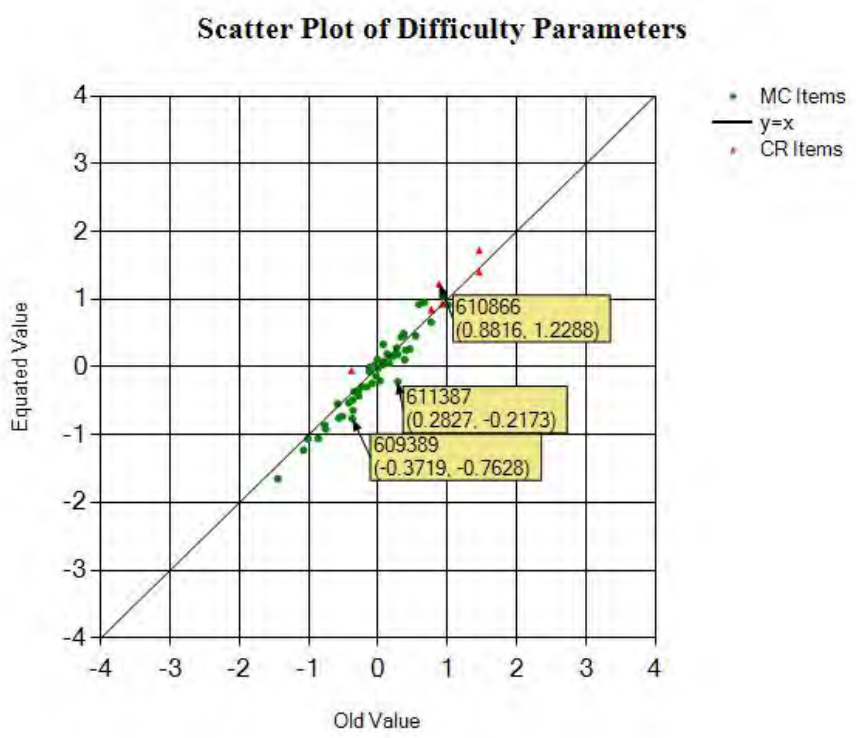


Figure 15–6. Scatter Plot of Old and Equated Item Parameter Difficulty Estimates for Literature: Spring

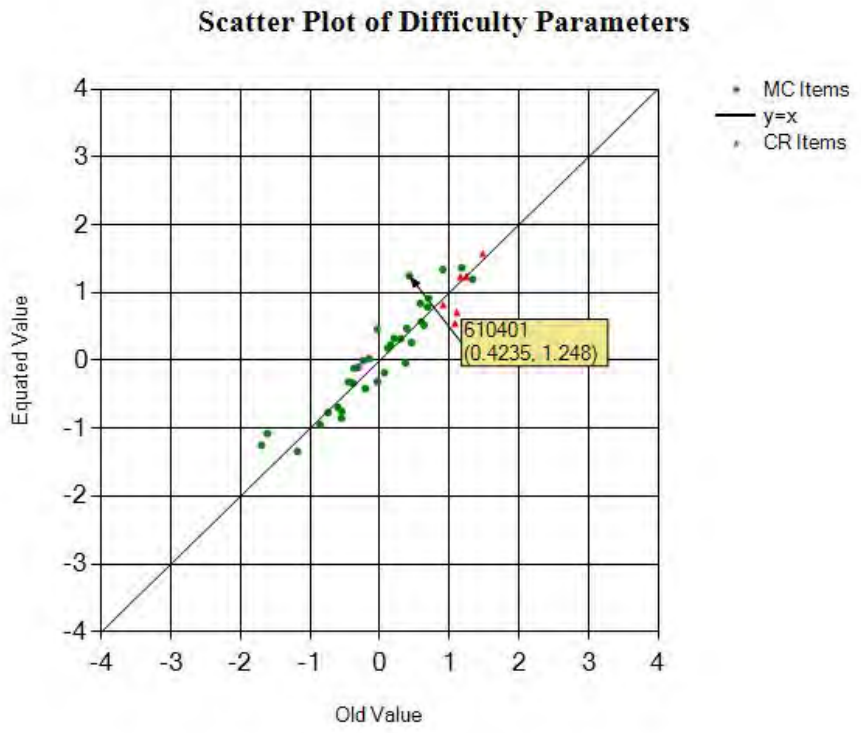


Figure 15–7. Scatter Plot of Old and Equated Item Parameter Difficulty Estimates for Algebra I: Summer

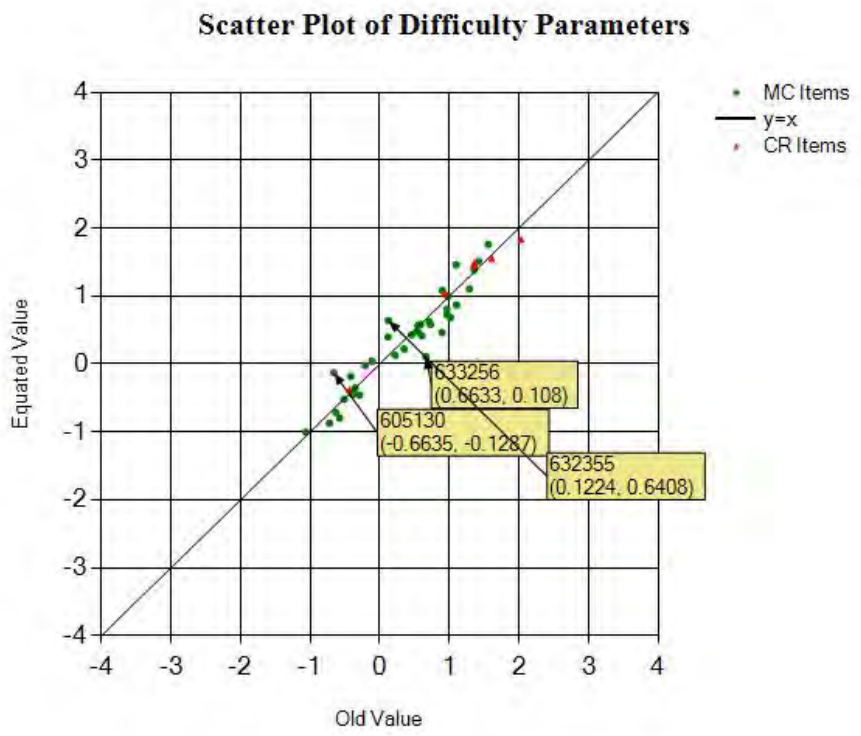


Figure 15–8. Scatter Plot of Old and Equated Item Parameter Difficulty Estimates for Biology: Summer

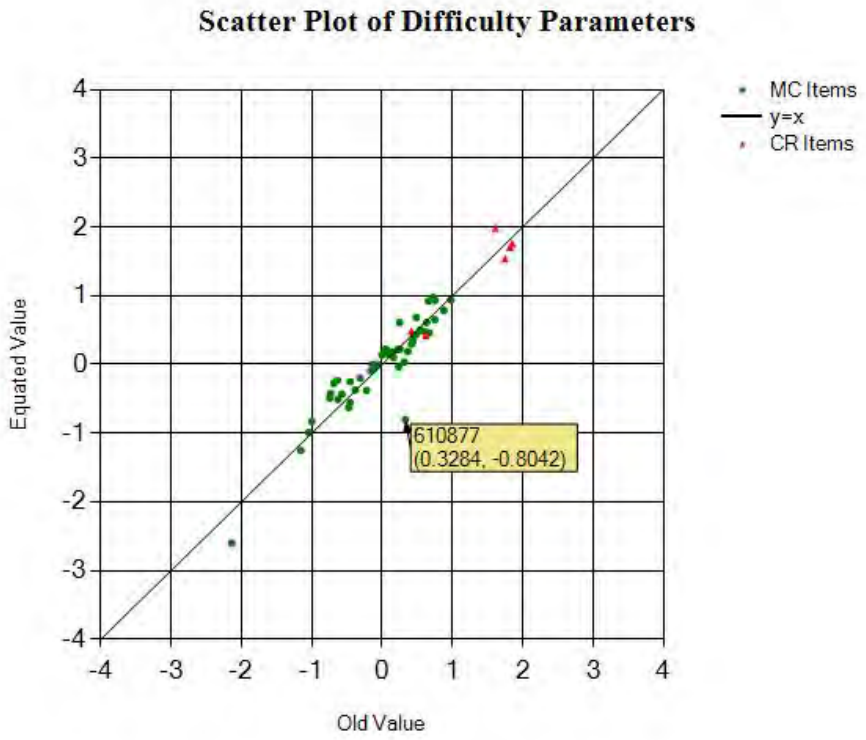


Figure 15–9. Scatter Plot of Old and Equated Item Parameter Difficulty Estimates for Literature: Summer

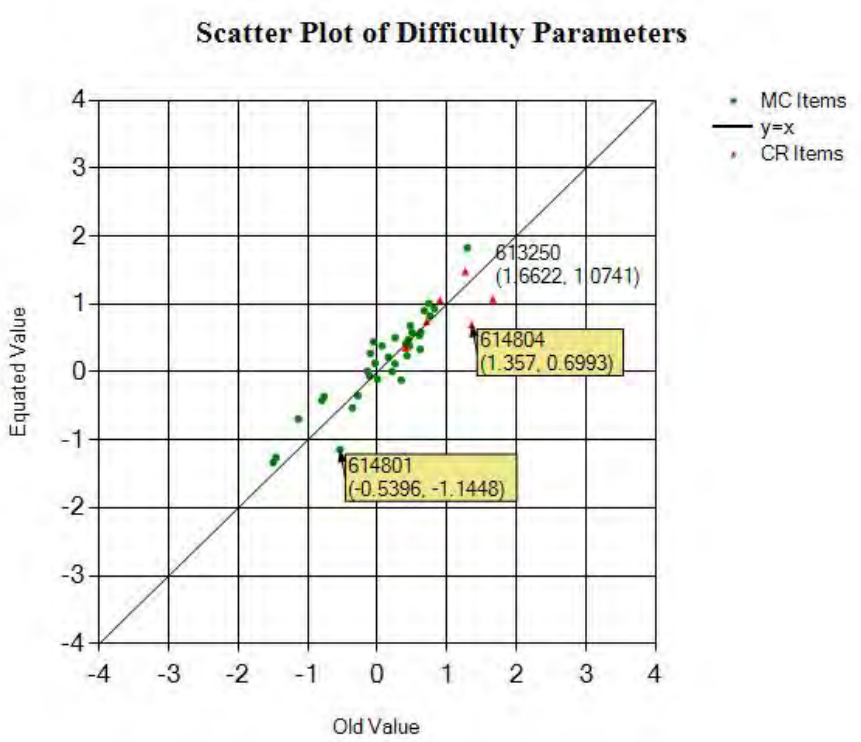


Table 15–1. Summary of Items Flagged by both the Scatter Plot and Displacement

Administration	Content Area	Item IDs
Winter	Algebra I	665265
	Biology	607762; 609823
	Literature	616847
Spring	Algebra I	605147
	Biology	None
	Literature	610401
Summer	Algebra I	633256; 633255
	Biology	610877
	Literature	614801; 614804; 613250

ANALYSES AT FORM LEVEL

At the form level, the analyses focused on the comparison of pre- and post-equated raw-to-scaled score tables. The outliers, if any, were either kept or removed from the post-equating analyses. Tables K–10 to K–18 in Appendix L contain the raw-to-scaled scores tables produced under different conditions. The three performance level cuts are shown by the thicker lines. As can be seen, the post-equated scaled scores, whether outliers were removed or not, were very close or identical to the pre-equated scaled scores at each raw score point. The differences were within the standard error of measurement. The raw cut scores were the same or within one score point difference.

To summarize, both the item level and form level post-equating check analyses results indicate that the raw-to-scaled score tables produced by using the pre-equated item difficulty parameter estimates can be used to score students.

EQUATING FOR THE EMBEDDED FIELD TEST ITEMS

Field test items were embedded in the spring operational forms to guarantee enough items would be available for future form construction. Equating was needed to place these embedded field test items onto the base or common scale established in spring 2011. The equating was accomplished by running the calibration of field test items with item parameters of operational items fixed/anchored to the bank values using WINSTEPS. The final Rasch item difficulty estimates can be found in Appendix J.

CHAPTER SIXTEEN: SCORES AND SCORE REPORTS

This chapter provides information about the scores provided for the Pennsylvania Keystone Exams (e.g., scaled scores, performance levels, and module scores), how the scores are presented on score reports, and appropriate and inappropriate uses of the scores.

SCORING

Keystone Exams items include both multiple-choice (MC) and constructed-response (CR) items. Each correct response to an MC item receives a score of 1. Incorrect responses receive a score of 0. Scores on CR items range from 0 to 4, depending on the content area. Table 16–1 summarizes the types of items used in each content-area exam.

Table 16–1. Item Types Used by Content Area

Exam	Item Type		
	MC (1 point)	CR (3 point)	CR (4 point)
Algebra I	■		■
Biology	■	■	
Literature	■	■	

DESCRIPTION OF TOTAL-TEST SCORES

Different types of scores have been developed for Keystone Exams reporting. Since the underlying properties of these scores are not necessarily the same, the particular scores used depend on the purposes for which the test has been given. The following types of scores are provided for reporting overall performance on each Keystone Exam:

- Raw scores
- Scaled scores
- Performance levels

RAW SCORES

A raw score (or number-correct score) is the number of points a student earned over all the operational MC and CR items. By itself, the raw score has very limited utility. One limitation is that it can only be interpreted with reference to the total number of items on a specific exam (e.g., a raw score of 15 on a 20-item exam is different from a raw score of 15 on a 30-item exam). In addition, raw scores depend on the difficulty of test items across test forms (e.g., a raw score of 15 on a test with 20 easy items is different from a raw score of 15 on a test with 20 difficult items). Because the difficulty of the items on a test can change from administration to administration, raw scores should not be compared across administrations.

SCALED SCORES

Scaled scores were introduced in Chapter Fourteen. In the simplest sense, a scaled score is a transformed number-correct score. The specifics of the transformation processes for the Keystone Exams were also discussed in Chapter Fourteen. When all students take the same test items, as with the operational items on the Keystone Exams, the more points the student earns, the higher the associated scaled score will be.

The value of switching to the more abstract scaled-score metric is that it produces more general, interpretable, and equitable results. As noted above, a raw score of 30 is meaningless unless the maximum raw score is known. The difficulty of the test items was also mentioned as an additional challenge with interpreting raw scores. Number-correct scores are transformed to scaled scores to remove the effects of test length and item difficulty. (Strictly speaking, transformation of number-correct scores to percent-correct scores would also remove the effect of test length, but it would do nothing to adjust for the difficulty of the items.)

Another advantage of scaled scores is that they lend themselves to interpretations at what is referred to as an interval level, while raw scores do not. Interval-level scales allow an interpretation of a scaled-score difference of 5 points to be the same whether the scores are 1295 vs. 1300 or 1445 vs. 1450. Raw-score differences, in this context, cannot be interpreted in this manner and are thus neither generalizable nor equitable.

A scaled score of 1500—or any other value for a particular content-area exam, such as Algebra I—should have the same absolute meaning in the current administration as it had in previous administrations when test scores are properly equated across administrations. More importantly, a significant increase in the scaled score from the previous administration to the current administration means that student performance improved[9]; it does not say anything about whether this administration's exam is easier or harder than last administration's exam. To make these interpretations requires no information about the length or the difficulty of the exam in either administration, although these variables are essential for the process of deriving the scaled scores.

There is considerable auxiliary information presented in this report that might aid in further contextualizing Keystone Exams scaled scores:

- Chapter Fourteen provides information on the development of the Keystone Exams scaled-score system, including transformation formulas, rounding rules, and general scale characteristics (e.g., minimum values).
- Chapter Seventeen provides total-test score statistics. In particular, Table 17–2 lists the scaled-score means and standard deviations for the testing results.

[9] This example is not an endorsement of conducting a trend analysis with just two years of results. Further, small differences may not be statistically or practically significant.

PERFORMANCE LEVELS

Keystone Exams results are also reported using four performance levels: Below Basic, Basic, Proficient, and Advanced. The cut scores on the scaled-score metric (i.e., the lowest possible scaled score to enter the Basic, Proficient, and Advanced levels) were presented earlier in this report. However, the information is repeated below (Table 16–2) for convenience.

Table 16–2. Scaled-Score Cuts for Each Performance Level by Content Area

Exam	Min	Scaled Score Cuts			Max
		BB/B	B/P	P/A	
Algebra I	1,200	1,439	1,500	1,546	1,800
Biology	1,200	1,460	1,500	1,549	1,800
Literature	1,200	1,444	1,500	1,584	1,800

Note. BB = Below Basic; B = Basic; P = Proficient; and A = Advanced

Performance level descriptors (PLDs) are another way to attach meaning to the scaled score metric. They associate precise quantitative ranges of scaled scores with verbal, qualitative descriptions of student status. While much less precise, the qualitative description of the levels is one way for parents and teachers to interpret the student scores. They are also useful in assessing the status of the school. The Pennsylvania General PLDs developed by Pennsylvania Department of Education (PDE) and teacher panels are given below. These are also included on student score reports.

- **Advanced:** Superior academic performance indicating an in-depth understanding and exemplary display of the skills included in the Keystone Exams Assessment Anchors and Eligible Content.
- **Proficient:** Satisfactory academic performance indicating a solid understanding and adequate display of the skills included in the Keystone Exams Assessment Anchors and Eligible Content.
- **Basic:** Marginal academic performance indicating work approaching, but not yet reaching, satisfactory performance. Performance indicates a partial understanding and limited display of the skills included in the Keystone Exams Assessment Anchors and Eligible Content. The student may need additional opportunities and/or increased student academic commitment to achieve the Proficient level.
- **Below Basic:** Inadequate academic performance indicating little understanding and minimal display of the skills included in the Keystone Exams Assessment Anchors and Eligible Content. There is a major need for additional instructional opportunities and/or increased student academic commitment to achieve the Proficient Level.

DESCRIPTION OF MODULE SCORES

Each of the Keystone Exams in Algebra I, Biology, and Literature contains two modules. A module score describes performance of a student, school, or district on a particular module (content standard defined in the exam). The following types of scores are provided for Keystone Exams at module level:

- Raw scores
- Scaled scores
- Performance levels

MODULE RAW SCORES

Raw scores at module and assessment anchor levels were reported in different summary reports. As described earlier, a raw score is the number of points a student earned over all the operational MC and CR items; it depends on the difficulty and length of the test form; and it should not be compared across administrations. In the summary reports, the school, district, and/or state median points earned were reported at module and assessment anchor levels. These raw scores can provide some diagnostic information when they are compared with the minimum estimated points needed to pass. The latter is calculated by summing the probabilities of a barely proficient student answering the items included in a module or assessment anchor correctly. The sum is rounded up to the nearest integer. The probability is derived using the Rasch models discussed in Chapter Twelve.

MODULE SCALED SCORES

The module scaled scores were provided in the individual student report. For the Keystone Exams, the module scaled score represents a student's achievement on each module. They can be compared across administrations because they are statistically equated. However, it is not advisable to compare scores across modules because each module contains varying item content and difficulty. This variation is also the reason the total scaled score is not the average of the two modules' scaled scores.

MODULE PERFORMANCE LEVELS

Based on the testing results at the module level, students can be classified as Passed or Not Passed. The derived scaled-score cut is 1500 for both modules. This cut score is determined by panelists' recommendations for the proficient cut of the corresponding total test. Note that a student who does not pass a module can still be Proficient or above on the total test if the student performs very well on the other module. If a student is not proficient on the total test but passes one module, although it is recommended that this student take both modules during retesting, the student can choose to take just the non-passed module because the final score is based on the highest combination of module scores.

APPROPRIATE SCORE USE

INDIVIDUAL STUDENTS

Scaled scores on the Keystone Exams indicate a student's achievement with respect to the Keystone Exams Assessment Anchors and Eligible Content. Scaled scores are primarily used to determine student performance-level classifications (i.e., a criterion-referenced inference). Scaled scores that are based on Rasch models are typically assumed to be of the interval type, so comparisons may be made on differences in scaled scores. If this assumption holds, then it would be safe to infer for Algebra I that the ability difference between 1410 and 1420 represents the same ability difference that separates 1550 and 1560. Scaled scores can also be used to compare the performance of an individual student to the performance of a similar demographic or subgroup at a school or district. Test score standard errors (discussed in Chapter Eighteen) should be considered.

GROUPS OF STUDENTS

Test results can be used to evaluate performance over time. Mean scaled scores can be compared across administrations within the same content area to indicate whether a student's performance is improving across years. Generally, such trend analyses benefit from using mean results from as many test administrations as possible. Different cohorts of students are used (i.e., the same student or students are not tracked across grade levels). All scores can be analyzed within the same content area for any single administration to determine which demographic or program group had, for example, the highest average performance or the highest percentage of students at or above Proficient.

Module scores can help evaluate academic areas for relative strengths or weaknesses. These module scores provide information to identify areas where further diagnosis is warranted. Generalizations from test results may be made to the specific content domain represented by the academic standards measured in the Keystone Exams. However, all instruction and program evaluations should include as much information from other sources as possible to provide a complete picture of performance.

CAUTIONS FOR SCORE USE

EXTREME ERROR FOR EXTREME SCORES

Student scores toward the minimum or maximum ends of the score range will have very large standard errors of measurement (SEM) and, therefore, should be viewed very cautiously. The maximum scaled score only provides a very rough estimate of a student's ability. For example, if a student achieved the maximum scaled score, for example, 1776 for Biology in the winter administration, it cannot be determined whether this student could have achieved an even higher scaled score. If the test were 10 items longer, a different estimate might have been obtained. Similarly, if the items in a new test are more difficult than the items on a previous administration, the maximum scaled score would likely be higher on the new test because it would take a greater level of achievement to answer the items correctly. In this manner, extreme scaled scores may vary from one administration to the next even if the number of test items does not change. The fluctuation of extreme scaled scores complicates the comparisons of students with scaled scores at the extreme ends of the score distribution. To minimize confusion and potential misinterpretation, the minimum and maximum scaled scores possible on the Keystone Exams have been fixed (see Table 16–2) so they do not change between administrations.

UNIQUE SCALE FOR EACH CONTENT AREA

Scaling was conducted for each content-area exam separately. Therefore, the scaled scores should be interpreted only within each content area. The scaled scores are not status indicators in the same sense as percentile ranks (or scales that are essentially transformations of percentile ranks) and therefore cannot be used to profile relative strengths and weaknesses across content areas. As an example, the scaled scores of 1450 in Algebra I and 1400 in Biology gained by a student do not necessarily imply that the student performed better in Algebra I than in Biology.

USING KEYSTONE EXAMS RESULTS FOR OTHER PURPOSES

Other uses or inferences based on Keystone Exams results may or may not be valid as the validity evidence and arguments provided in Chapter Nineteen may not necessarily support other score uses and interpretations. According to the *Standards for Educational and Psychological Tests* (AERA, APA, & NCME, 1999), if a test is used in a way that has not been validated, it is incumbent on the user to justify the new use, collecting new evidence if necessary. Finally, a universal caveat for any test's result is that it should not be used for placement and educational planning alone. Instead, other information about the student (e.g., other test performance data) should be included.

REPORT DEVELOPMENT

Several months prior to the first release of reports for the Keystone Exams, PDE and DRC conducted focus groups with Pennsylvania educators and parents/guardians. In the focus groups, educators and parents/guardians provided feedback on report mock-ups for the Keystone Exams. Feedback from the focus groups was used to inform the design and content of the Keystone individual and summary reports. The focus groups targeted educator and parent/guardian constituencies in three geographic regions of the state—the Pittsburgh area, the Harrisburg area, and the Philadelphia area.

Two preliminary educator groups were convened in Harrisburg on November 15 and 17, 2010. These groups, totaling 34 educators, reviewed the student report and provided feedback using both a survey and group discussion. Substantive changes to the individual student report were made on the basis of these meetings, with two different versions of the report emerging from these reviews. These two groups did not review the summary reports.

A second set of focus groups were conducted in December 2010 to review the updated reports. For the December meetings there were 35 panelists (22 educators & 13 parents) for six focus groups in Pittsburgh (December 3), Harrisburg (December 6), and King of Prussia (December 7). The three educator groups reviewed the two versions of the student report and the one version of the school summary report. The three parent groups reviewed the two versions of the student report.

Feedback from these two focus groups was taken into consideration during final report development. For more information about the focus groups, please refer to the *Keystone Exams Score Report Focus Group Findings* (Pennsylvania Department of Education, 2011).

REPORTS

The following score reports are provided to students, schools, and districts for the Keystone Exams in Algebra I, Biology, and Literature:

- Individual student report
- School summary report
- District summary report
- State summary report
- Report interpretation guide

INDIVIDUAL STUDENT REPORT

A student report is provided for all students who took the Keystone Exams. Two copies of the individual student report for all Keystone Exams were sent to each school district and charter school for distribution to parents, teachers, guidance counselors, and/or principals. School districts and charter schools may publish the results of the Keystone Exams school-level reports. This report is a two-page color document that provides the types of scores explained earlier in this chapter. Screenshots of the two pages from a sample individual student report are provided in Figures 16–1 and 16–2.

Figure 16–1. Page 1 of the Individual Student Report

PENNSYLVANIA KEYSTONE EXAMS

Student Report

Student Name:	SAMPLE STUDENT
PA Student ID:	*****12345
School:	SAMPLE HS
District:	SAMPLE SD
Test Date:	Spring 2011
Grade:	09

Content Area:
Algebra I

Student's Keystone Exam Result

		Goal Range	
Below Basic	Basic	Proficient	Advanced
		✓	

Dear Family:

This report provides information about your child's performance on a Pennsylvania test known as the Keystone Exam. Your child took this Keystone Exam in May 2011. On this page, you can see your child's overall performance – below basic, basic, proficient or advanced.

On this report, you will find specific information about your child's performance on the Algebra I Keystone Exam. It displays your child's Highest Total Test Scale Score to Date for Module 1 and Module 2. Module 1 assesses Operations and Linear Equations and Inequalities, and Module 2 assesses Linear Functions and Data Organization. No previous scores will be displayed because the May 2011 administration marks the first time this test was given.

For detailed information about how the Keystone Exams are being integrated into the Pennsylvania graduation requirements, please visit the Pennsylvania Department of Education's Standards Aligned System website at www.pdesas.org, or contact your child's school.

Sincerely,
Ronald J. Tomalis
Ronald J. Tomalis
Secretary of Education

About the Keystone Exams

The Keystone Exams are tests students take at the end of specific high school level courses, including for 2010-11: Algebra I, Biology and Literature. They are offered in both paper/pencil and online formats.

Keystone Exams are one component of Pennsylvania's new system of high school graduation requirements affecting students in the class of 2015 and beyond. These tests were developed by Pennsylvania educators and are aligned to the standards adopted by the Pennsylvania State Board of Education. The results help students, parents and educators understand how well we are meeting rigorous expectations for student achievement in core subject areas. In future years, under Pennsylvania's new system of graduation requirements, Keystone Exam results will help determine whether or not a student has mastered the standards associated with earning a high school diploma.

For more information about the Keystone Exams, please visit the Pennsylvania Department of Education's Standards Aligned System website at www.pdesas.org (select "Assessments" and then "Keystone Exams").

www.pdesas.org

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Page 1

Figure 16–2. Page 2 of the Individual Student Report

Performance Level on Total Test

Highest Total Test Scale Score to Date

Student's total test scale score is indicated by the (⬆) . If this student were to test again under similar circumstances, his/her score would likely remain in the following range: **1520-1550.**

1200 – 1439	1439 – 1500	1500 – 1546	1546 – 1800
Below Basic	Basic	Proficient	Advanced

Highest Total Test Scale Score to Date - 1535 ⬆

Below Basic	Basic	Proficient	Advanced
Inadequate academic performance that indicates little understanding and minimal display of the skills included in the Keystone Exams Assessment Anchors & Eligible Content. There is a major need for additional instructional opportunities and/or increased student academic commitment to achieve the Proficient level.	Marginal academic performance, work approaching, but not yet reaching, satisfactory performance. Performance indicates a partial understanding and limited display of the skills included in the Keystone Exams Assessment Anchors & Eligible Content. The student may need additional instructional opportunities and/or increased student academic commitment to achieve the Proficient level.	Satisfactory academic performance indicating a solid understanding and adequate display of the skills included in the Keystone Exams Assessment Anchors & Eligible Content.	Superior academic performance indicating an in-depth understanding and exemplary display of the skills included in the Keystone Exams Assessment Anchors & Eligible Content.

Algebra I - SAMPLE STUDENT

	Module 1 Operations and Linear Equations & Inequalities			Module 2 Linear Functions and Data Organization			Total Test [1]	
	Result	Scale Score	Test Date	Result	Scale Score	Test Date	Scale Score	Performance Level
Highest Total Test Scale Score to Date [2]	Passed	1524	Spring 2011	Passed	1547	Spring 2011	1535	Proficient

[1] The scale score for the Total Test reflects the highest score computed as the combination of the two highest module scores to date. Given that modules contain varying item content and difficulty, the total scale score may not equal the average of the modules.

[2] Students who do not score Proficient on the Total Test may choose to take the test more than once.

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SUMMARY REPORTS

Summary reports are provided at the school, district, and state levels. These reports contain summary information about the percentage of students in each of the four performance levels. Raw scores are also provided by assessment anchor to allow schools or districts to identify strengths and weaknesses at the content-strand level.

REPORT INTERPRETATION GUIDE

A report interpretation guide is provided to help parents and other Keystone Exams stakeholders better understand test-result information presented in the individual student report. The report interpretation guide can be found on the PDE SAS website (www.pdesas.org/Assessment/Keystone).

CHAPTER SEVENTEEN: OPERATIONAL TEST STATISTICS

This chapter presents various summary statistics for the total-test scores based on the final data file described in Chapter Nine. Related information covered elsewhere in this report includes the item-level statistics that were presented in Chapters Eleven (classical item statistics) and Twelve (Rasch item statistics). The reader is referred to these chapters for additional consideration as item difficulty distributions can affect total score distributions.

PERFORMANCE LEVEL STATISTICS

Table 17–1 presents performance level percentages by test administration, content area, and student type. As can be seen from the table, the overall percentage in each performance level varied from administration to administration, depending on the ratio of the first-time testers and retesters. In general, retesters had a lower percentage of students in the Proficient and Advanced levels than the first-time testers did.

Table 17–1. Performance Level Percentages

Content Area	All Testers					First-Time Testers					Retesters				
	N	Percentage in Each Performance Level				*N*	Percentage in Each Performance Level				*N*	Percentage in Each Performance Level			
		Below Basic	Basic	Proficient	Advanced		Below Basic	Basic	Proficient	Advanced		Below Basic	Basic	Proficient	Advanced
Winter															
Algebra I	215159	13.3	33.1	29.9	23.8	177302	14.4	30.7	28.3	26.5	37857	7.7	44.0	37.5	10.7
Biology	148666	28.4	30.4	30.0	11.1	138506	28.7	29.4	30.3	11.6	10160	24.8	45.0	25.9	4.4
Literature	140478	10.5	23.3	53.8	12.4	138379	10.5	23.1	53.9	12.5	2099	10.7	37.5	47.3	4.5
Spring															
Algebra I	247978	16.5	43.7	26.7	13.1	157811	17.0	35.4	28.4	19.2	90167	15.6	58.1	23.7	2.6
Biology	180917	27.1	33.1	28.4	11.4	134995	26.1	26.7	32.1	15.1	45922	30.2	51.8	17.5	0.5
Literature	156302	12.1	33.1	46.4	8.4	117830	10.7	26.1	52.1	11.0	38472	16.1	54.6	29.0	0.3
Summer															
Algebra I	2144	8.8	65.3	23.4	2.5	182	28.0	41.2	20.3	10.4	1962	7.0	67.6	23.6	1.7
Biology	1073	21.3	51.5	23.4	3.7	234	37.6	31.6	16.2	14.5	839	16.8	57.1	25.4	0.7
Literature	741	8.6	45.2	43.6	2.6	272	9.6	28.3	55.5	6.6	469	8.1	55.0	36.7	0.2

SCALED SCORES

Table 17–2 provides the scaled score means and standard deviations by test administration, content area, and student type. As can be seen from the table, in most of the cases, first-time testers had a higher average scaled score than retesters did.

Table 17–2. Means and Standard Deviations of Scaled Scores

Administration	Content Area	All Testers		First-Time Testers		Retesters	
		Mean	SD	Mean	SD	Mean	SD
Winter	Algebra I	1504.6	57.8	1506.2	60.8	1497.1	40.1
	Biology	1490.2	46.8	1490.6	47.5	1484.6	34.7
	Literature	1519.2	57.2	1519.4	57.2	1502.5	48.3
Spring	Algebra I	1488.2	51.1	1494.9	56.9	1476.5	36.2
	Biology	1490.6	46.2	1496.0	49.8	1474.6	28.1
	Literature	1505.4	53.4	1514.0	55.5	1479.2	35.4
Summer	Algebra I	1482.6	31.4	1474.9	53.0	1483.3	28.5
	Biology	1486.0	35.5	1486.4	58.3	1485.9	25.8
	Literature	1499.2	42.2	1513.6	52.9	1490.9	31.6

RAW SCORES

SUMMARY STATISTICS

The reader is referred to Appendix M to review summary statistics for the operational raw scores. The statistics reported include number of points possible (Pts.), number of items (Len.), number of students tested (*N*), mean number of score points received (Mean), standard deviation of test scores (SD), reliability (r), and traditional standard error of measurement (SEM).

SCORE DISTRIBUTIONS

Raw score distributions are provided in Figure 17–1. As can be seen from the graphs, overall, the retesters scored lower than the first-time testers. With the exception of Algebra I in the winter administration, the distributions of raw scores for Algebra I and Biology are positively skewed while the distributions of raw scores for Literature are negatively skewed.

Figure 17–1. Raw Score Distributions

All Testers

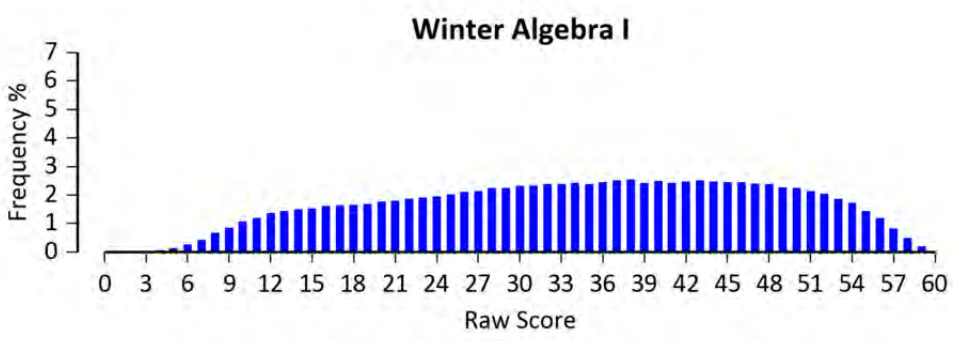
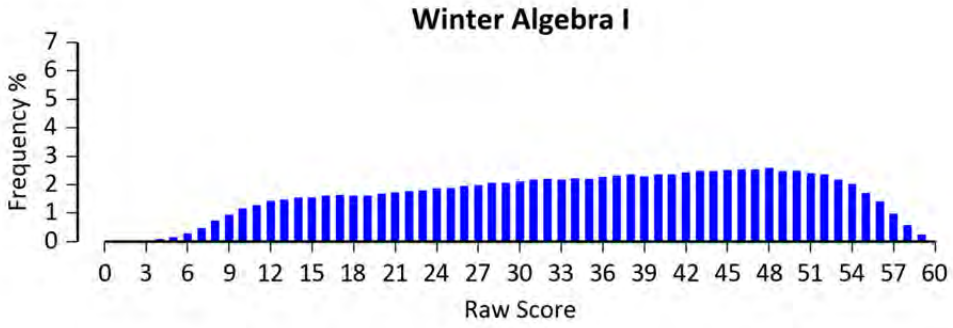
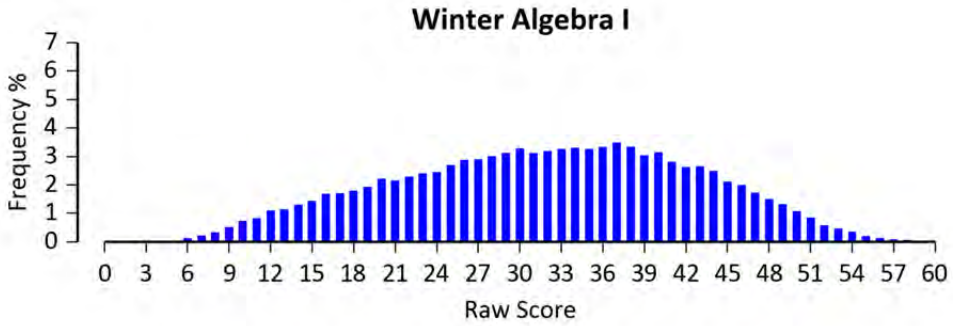


Figure 17–1 (continued). Raw Score Distributions

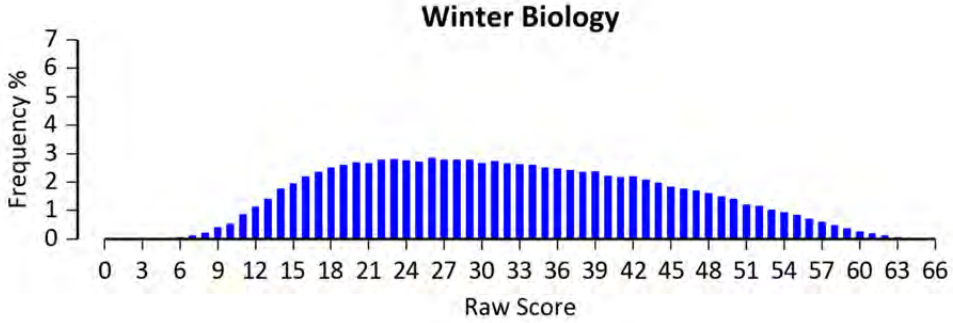
First-Time Testers



Retesters



All Testers



First-Time Testers

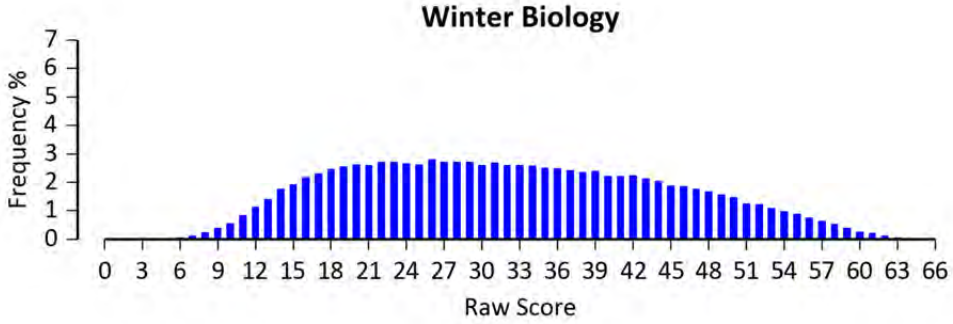
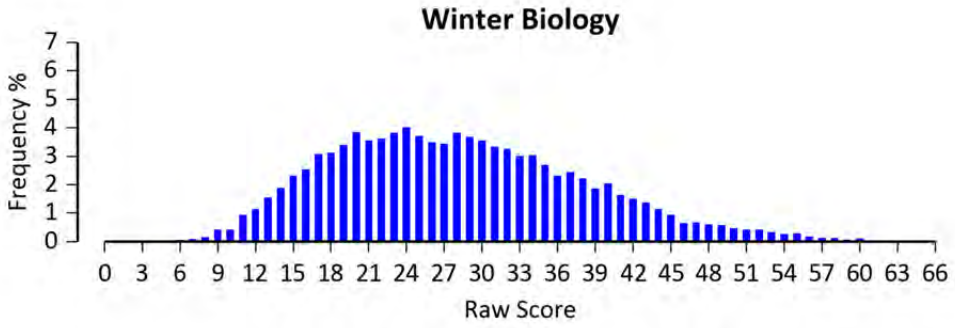
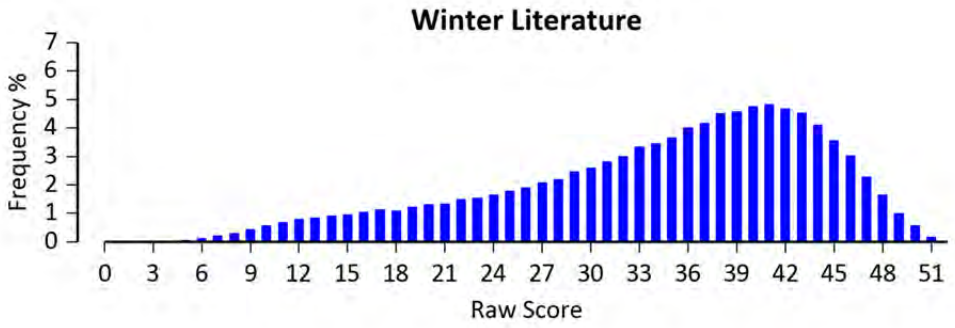


Figure 17–1 (continued). Raw Score Distributions

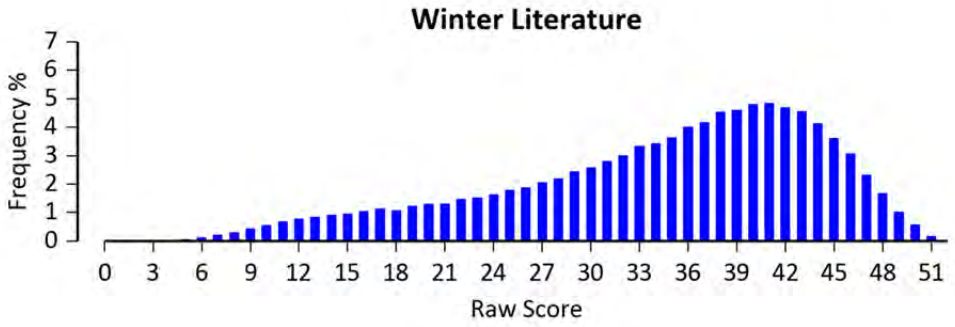
Retesters



All Testers



First-Time Testers



Retesters

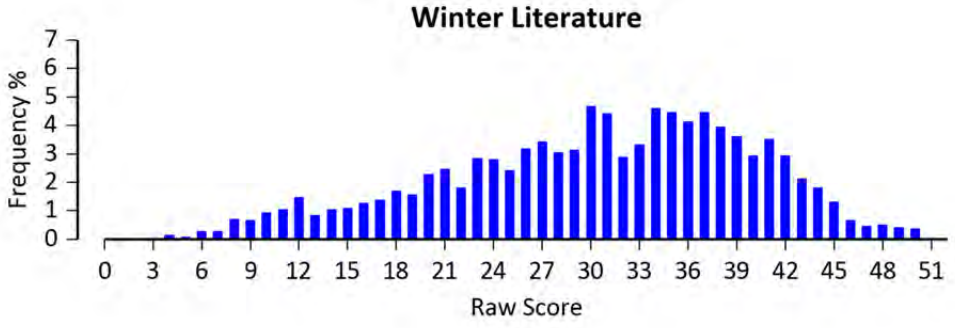
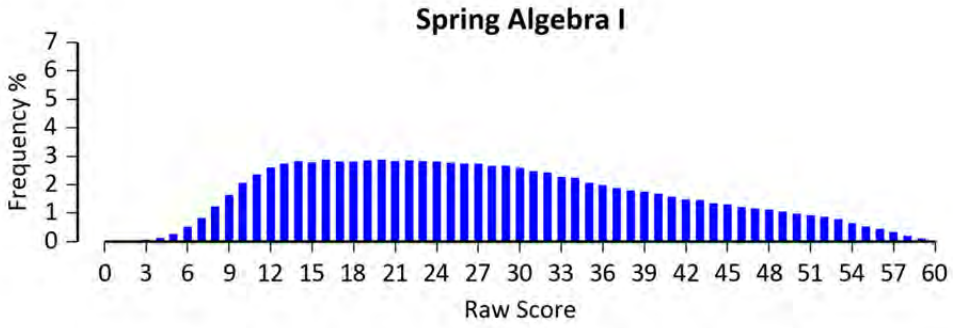
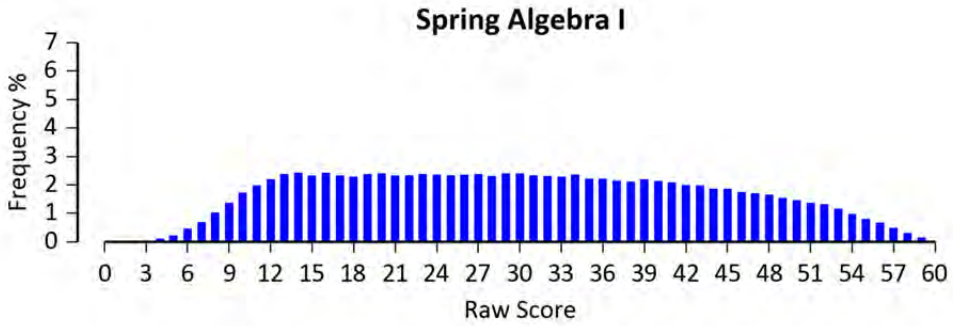


Figure 17–1 (continued). Raw Score Distributions

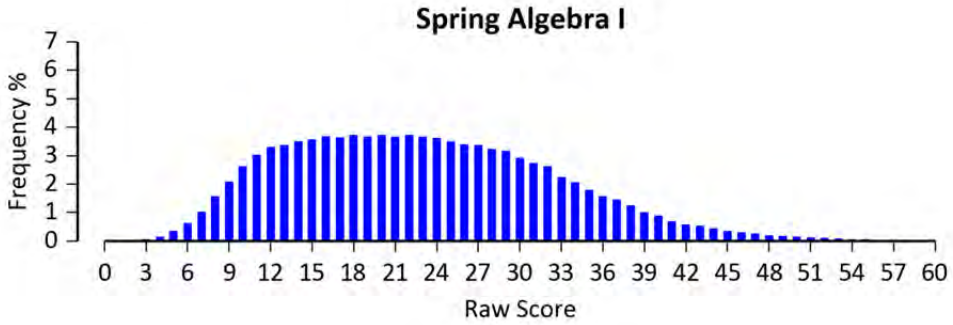
All Testers



First-Time Testers



Retesters



All Testers

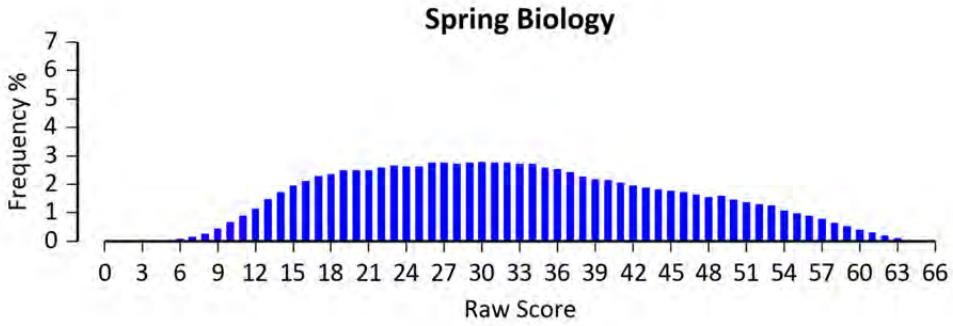
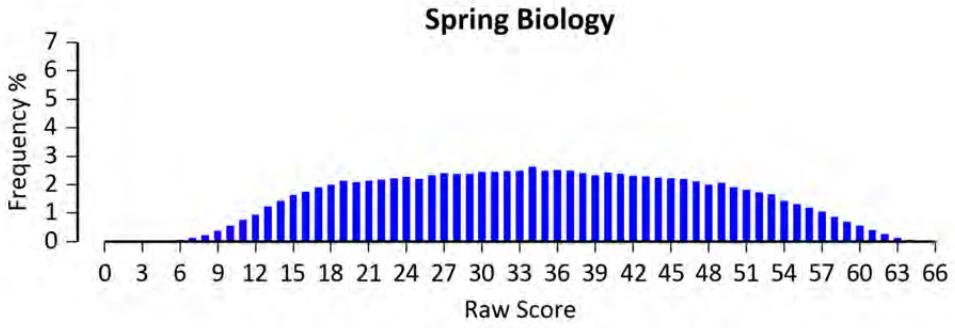
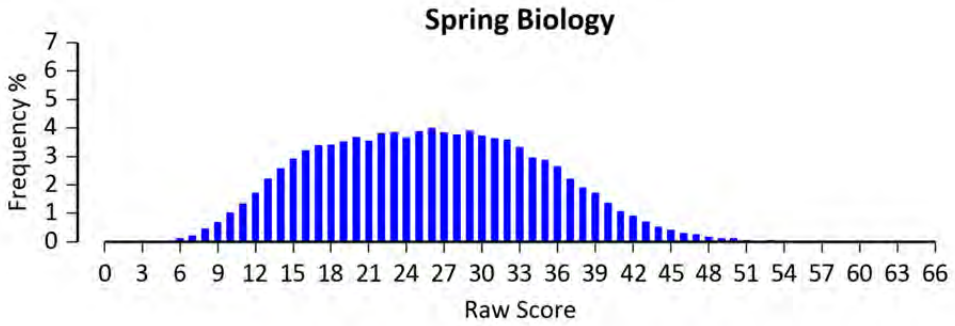


Figure 17–1 (continued). Raw Score Distributions

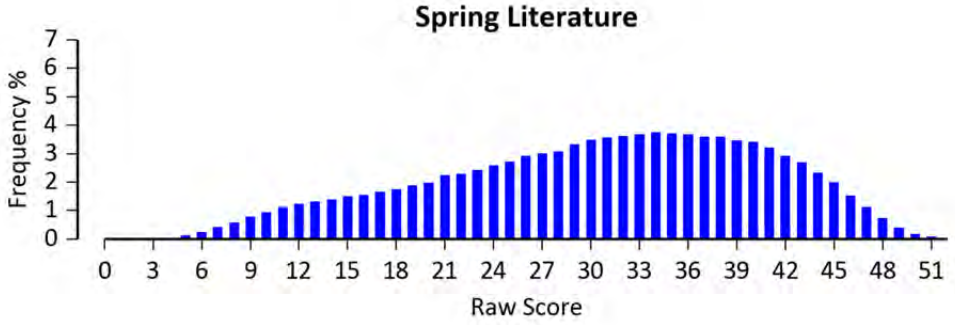
First-Time Testers



Retesters



All Testers



First-Time Testers

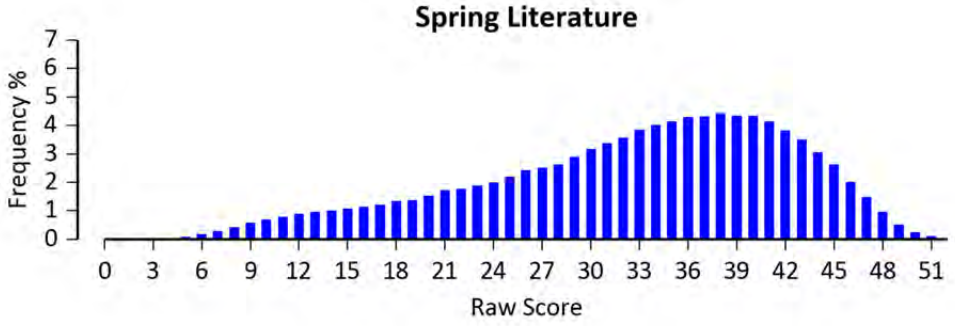
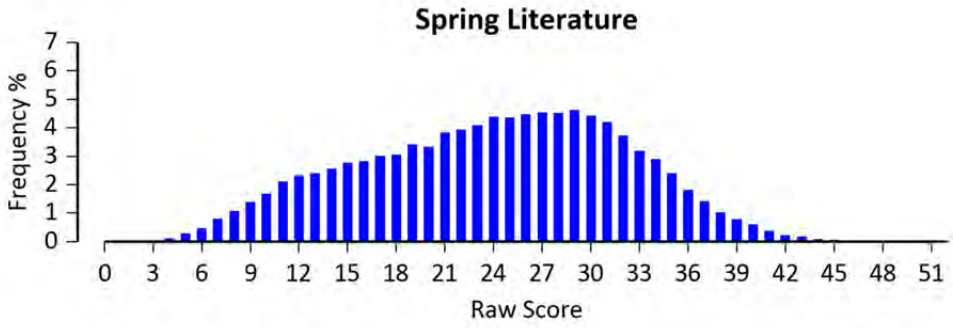
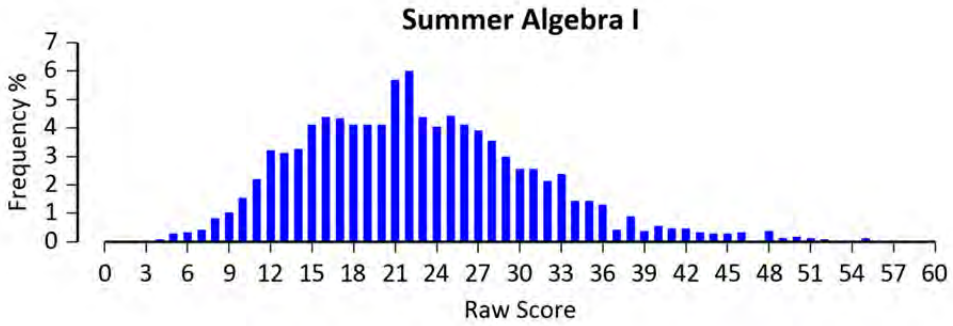


Figure 17–1 (continued). Raw Score Distributions

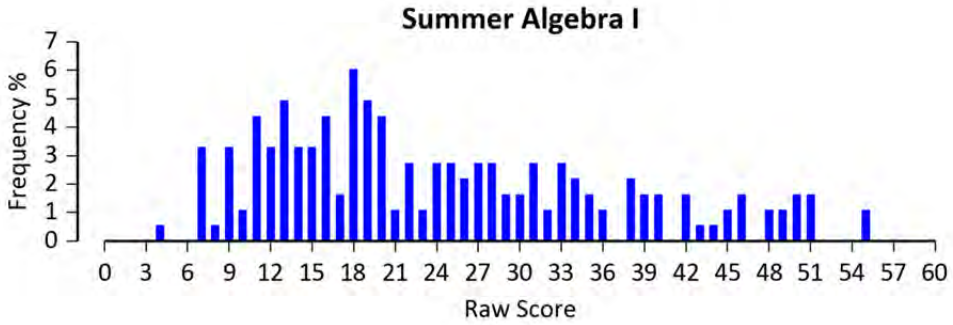
Retesters



All Testers



First-Time Testers



Retesters

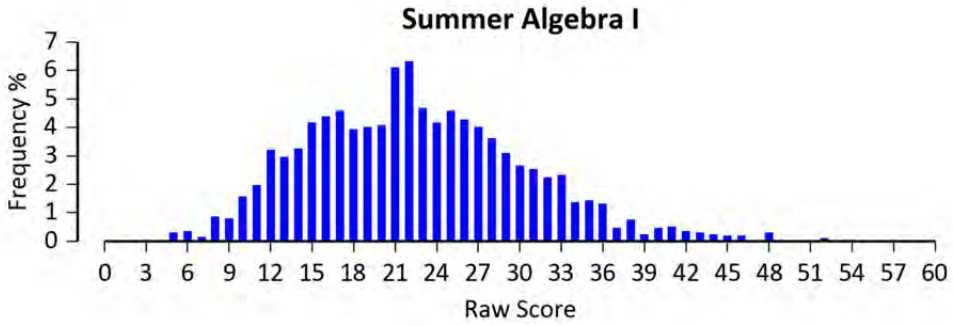
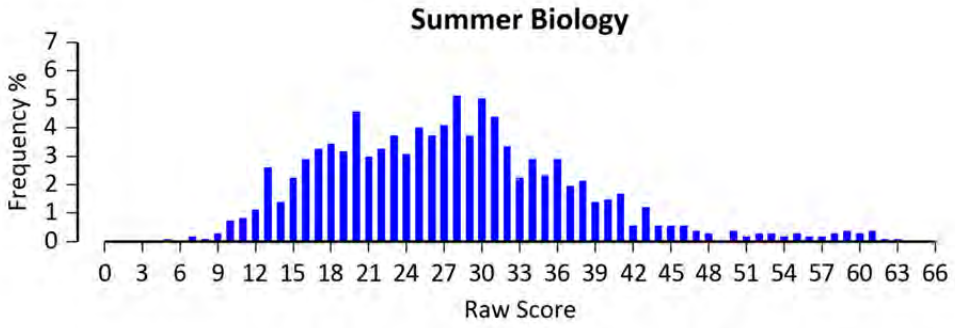
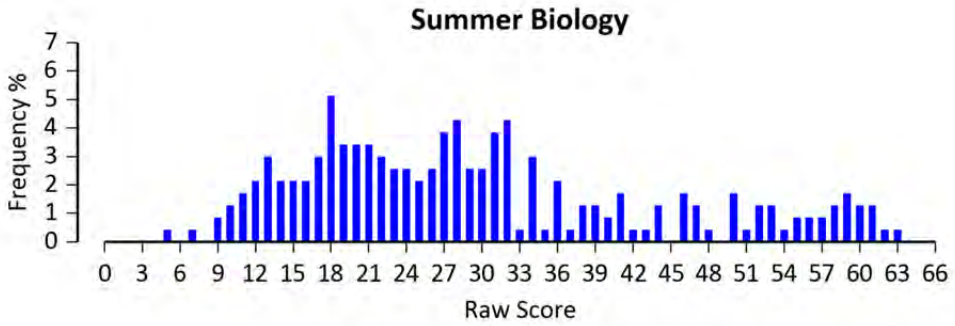


Figure 17–1 (continued). Raw Score Distributions

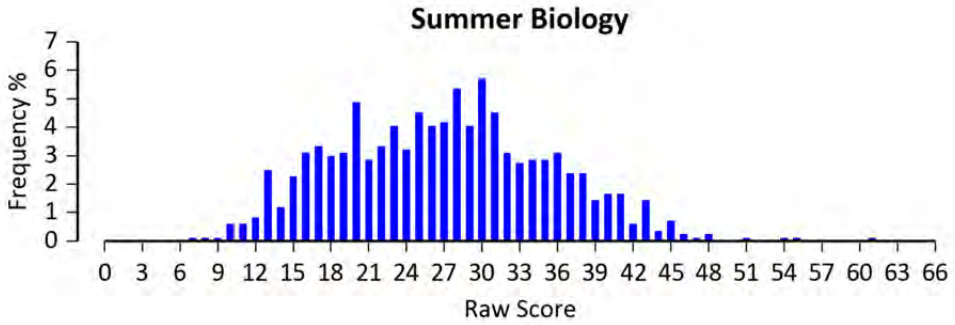
All Testers



First-Time Testers



Retesters



All Testers

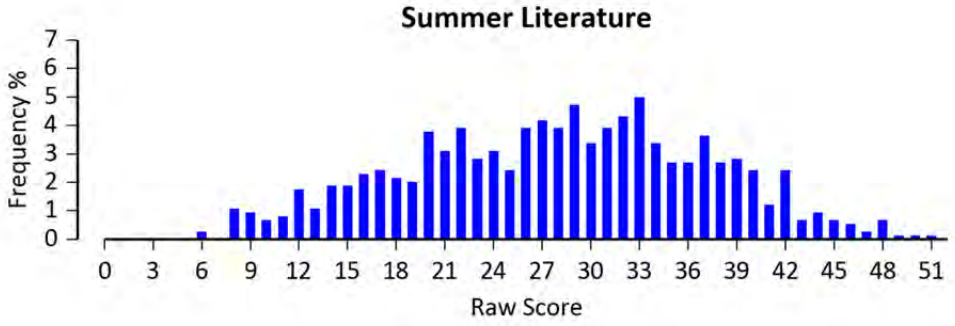
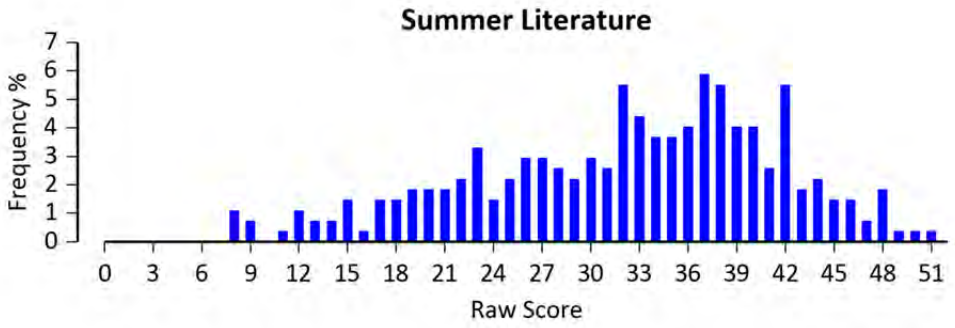
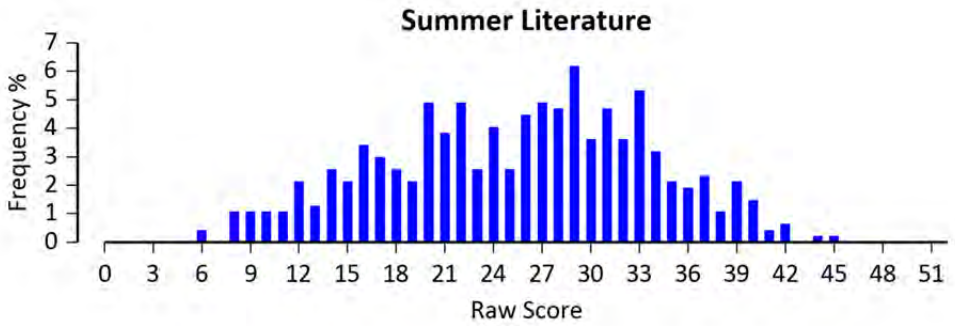


Figure 17–1 (continued). Raw Score Distributions

First-Time Testers



Retesters



CHAPTER EIGHTEEN: RELIABILITY

This chapter addresses the reliability of Pennsylvania Keystone Exams test scores. According to the *Standards for Educational and Psychological Testing* (AERA, APA, & NCME, 1999), reliability refers to

> the degree to which test scores for a group of test takers are consistent over repeated applications of a measurement procedure and hence are inferred to be dependable and repeatable for an individual test taker; the degree to which scores are free of errors of measurement for a given group (p. 25).

Frisbie (2005) highlighted several elements of this definition. First, reliability is a property of test scores, not of a test itself. Many may appreciate this distinction, but in casual usage, individuals frequently make reference to a reliable test. While reliability concerns test scores (and not the test specifically), it's important to appreciate the fact that test scores can be affected by characteristics of the instrument. For example, all other things being equal, tests with more items/points tend to be more reliable than tests with fewer items/points. Second, reliability coefficients are group specific. Reliabilities tend to be higher in populations that are more heterogeneous and lower in populations that are more homogeneous. Consequently, both test length and population heterogeneity should be considered when evaluating reliability.

There are other reliability considerations that may be less evident from the definition above yet are still important for test users to understand. While freedom from measurement error is highlighted in the definition, reliability is specifically concerned with random sources of error. Indeed, the degree of inconsistency due to random error sources is what determines reliability: less consistency is associated with lower reliability and more consistency is associated with higher reliability. Of course, systematic error sources also exist. These can artificially increase reliability and decrease validity. (Validity is further discussed in Chapter Nineteen.)

Another noteworthy issue is that multiple sources of error exist (e.g., the day of testing, the items used, the raters who score the items). However, most widely used reliability indices only reflect a single type of error. Consequently, it is important for test users to understand which specific type of error is being considered in a reliability study, and equally, if not more importantly, which types are not.

Understanding the distinction between relative error and absolute error is important because many reliability indices only reflect relative error. Relative error is of interest whenever the relative ordering of individuals with respect to their test performance is of interest. When specific score values are considered important (e.g., if cut scores are used), then absolute error is of interest, too. Generally, there is more error variance when considering the absolute scores of examinees, which, in turn, suggests lower reliability. Understanding examinee rank-order stability is also important; however, such stability might be well achieved even when the specific score values are considerably different.

As the above discussion suggests, reliability is a complex, nonunitary notion that cannot be adequately represented by a single number. There are several reliability indices available, and these may not provide the same results (Frisbie, 2005). The remainder of this chapter covers the following:

- Reliability coefficients and their interpretation
- Unconditional and conditional standard errors of measurement
- Decision consistency
- Rater agreement

RELIABILITY INDICES

As shown below, the reliability coefficient expresses the consistency of test scores as the ratio of true score variance to total score variance. The total variance contains two components: variance in true scores and variance due to the imperfections in the measurement process. Put differently, total variance equals true score variance plus error variance.[10]

$$\rho_X^2 = \frac{\sigma_T^2}{\sigma_X^2} = \frac{\sigma_T^2}{\sigma_T^2 + \sigma_E^2}$$

Reliability coefficients indicate the degree to which differences in test scores reflect true differences in the attribute being tested rather than random fluctuations. Total test score variance (i.e., individual differences) is partly due to real differences in the attribute (true variance) and partly due to random error in the measurement process (error variance).

Reliability coefficients range from 0.0 to 1.0. If all test score variance were true, the index would equal 1.0. The index would be 0.0 if none of the test score variance were true. Such scores would be pure random noise—that is, all measurement error. If the index had a value of 1.0, scores would be perfectly consistent—that is, contain no measurement error. Although values of 1.0 are never achieved in practice, it is clear that larger coefficients are more desirable as they indicate that test scores are less influenced by random error. (How big is big enough and how small is too small are issues considered in a later section.)

As noted in the introduction, there are several different indices that can be used to estimate this ratio. One approach is referred to as internal consistency, which is derived from analyzing the performance consistency of individuals over the items within a test. As discussed below, these internal consistency indices do not take into account other sources of error, such as day-to-day variations (e.g., student health, testing environment) or rater inconsistency.

COEFFICIENT ALPHA

Although a number of reliability indices exist, perhaps the most frequently reported for achievement tests is coefficient alpha. Consequently, this index is the one reported for the Keystone Exams (see the column with title "r" in Appendix M). Alpha indicates the internal consistency over the responses to a set of items measuring an underlying trait, in this case, academic achievement, in content areas such as algebra, biology, and literature.

Alpha is an internal consistency index. It can be conceptualized as the extent to which an exchangeable set of items from the same domain would result in a similar rank ordering of students. Note that relative error is reflected in this index. Variation in student performance from one sample of items to the next should be of particular concern for any achievement test user. Consider two hypothetical vocabulary tests intended for the same group of students. Each test contains different sets of unique words that are believed to be randomly equivalent, perhaps like the ones shown below:

[10] A Covariance term is not required as true scores and error are assumed to be uncorrelated in classical test theory.

Table 18–1. Two Hypothetical Vocabulary Tests

Test One	Test Two
Abase	Abate
Boon	Bilk
Capricious	Circuitous
Deface	Debase
....	....
Zealous	Zenith

If a representative group of students could take both of these tests, the correlation between the scores obtained would represent the parallel-forms reliability of the test scores. However, such data-collection designs are impractical in large-scale settings, and experimental confounds like fatigue and practice effects are likely to affect the results. Internal-consistency reliability indices arose in part to provide reliability measures using the data from just a single test administration. So, if students only took Test One and the coefficient alpha index for those test scores were high, this would suggest that Test Two would provide a very similar rank ordering of the students if they had taken it instead. If coefficient alpha were low, dissimilar rank orderings would likely be observed—again, relative-error variance is reflected in alpha.

FORMULA

Consider the following data matrix representing the scores of persons (rows) on items (columns):

Table 18–2. Person × Item Score (*Xpi*) Infinite (Population-Universe) Matrix

Person	Item			
	1	2	. . . I	. . . k
1	*Y*11	*Y*12	. . . *Y*1*i*	. . . *X*1*k*
2	*Y*21	*Y*22	. . . *Y*2*i*	. . . *X*2*k*
. . . . .				
P	*Yp*1	*Yp*2	. . . *Ypi*	. . . *Xpk*
. . . . .				
N	*YN*1	*YN*2	. . . *YNi*	. . . *XNk*

Note. Adapted from Cronbach and Shavelson (2004).

Then, a general computational formula for alpha is as follows:

$$\alpha = \frac{N}{N-1}\left(1 - \frac{\sum_{i=1}^{N} \sigma_{Y_i}^2}{\sigma_X^2}\right)$$

where *N* is the number of parts (items or testlets), σ_X^2 is the variance of the observed total test scores, and $\sigma_{Y_i}^2$ is the variance of part *i*.

FURTHER INTERPRETATIONS

RULES OF THUMB

Which reliability values are considered high enough? Which values are considered too low? Although frequently asked for, any rules of thumb for interpreting the magnitude of reliability indices are mostly arbitrary. Another approach is to research the reliabilities from similar testing instruments to see what values are commonly observed. For the Keystone Exams, comparisons to tests of similar lengths that were administered to similar student populations from other large-scale assessment programs would be relevant. For many other state assessment programs, reliabilities in the low 0.90s are usually the highest ever observed, and reliabilities in the high 0.80s are very common.

The lower a given reliability coefficient, the greater the potential for over-interpretation of the associated results. As suggested earlier, there is no firm guideline regarding how low is too low. However, as an informative point of reference, a reliability coefficient of 0.50 would mean that there is as much error variance as true-score variance in the scores.

IS ALPHA A LOWER LIMIT TO RELIABILITY?

According to Brennan (1998), the conventional wisdom that coefficient alpha is a lower limit to reliability is based largely on a misunderstanding. In reflecting on the 50th anniversary of his seminal 1951 article, Cronbach—in Cronbach and Shavelson (2004)—expressed similar misgivings about this conventional wisdom:

> one could argue that alpha was almost an unbiased estimate of the desired reliability. . . the *almost* in the preceding sentence refers to a small mathematical detail that causes the alpha coefficient to run a trifle lower than the desired value. This detail is of no consequence and does not support the statement made frequently in textbooks or in articles that alpha is a lower value to the reliability coefficient. That statement is justified by reasoning that starts with the definition of the desired coefficient as the expected consistency among measurements that had a higher degree of parallelism than the random parallel concept implied.

The assumptions for three common parallelism models are presented in Table 18–3. Alpha's assumptions come from the Essentially-Tau-Equivalent model, which does not require equal means or equal variances across test parts. Based on this, Brennan (1998) asserts that the lower-limit issue, as conceptualized by many, provides an answer to a question that is of minimal importance. Reframed differently, the goal of selecting a reliability coefficient is not to find the one that provides the highest coefficient, but the one that most accurately reflects the test data under study.

It is important to note that there are factors encountered in practice that may legitimately make coefficient alpha an underestimate of reliability. However, there are also factors that might make coefficient alpha an overestimate of reliability. Both possibilities are discussed further below and generally arise when the Essentially-Tau-Equivalent assumptions are strained.

Table 18–3. Summary of Expectations/Observable Relationships for Different Parallelism Models

Relationship	Degree of Measurement Parallelism*		
	Classically Parallel	Essentially-Tau Equivalent	Congeneric
Content Similarity	Yes	Yes	Yes
Equal Means across Parts	Yes	No	No
Equal Variances across Parts	Yes	No	No
Equal Covariances across Parts	Yes	Yes	No
Equal Covariances with other Variables	Yes	Yes	No

**Note*. Other models exist but are not considered here due to their limited application in practice.

BIASES THAT MIGHT MAKE ALPHA AN UNDERESTIMATE OF RELIABILITY

There are factors that might negatively bias coefficient alpha, making the apparent reliability lower than it may actually be. In practice, two situations frequently encountered that might cause this include tests that are composed of mixed item types (e.g., MC and CR items) and tests that include a planned stratification of the test items according to topics or subdomains.

Although both situations strictly violate the assumptions used in deriving the coefficient alpha (i.e., the tests are not based on equal part lengths in the former case and are not randomly parallel in the latter case), neither necessarily guarantees that the reliability will be markedly lower. In the latter case, reliability will be underestimated only when strand items are homogeneous enough for the average covariance within strata to exceed the average covariance between strata. Although both are potential influences for the Keystone Exams, the total test score reliabilities (i.e., r) reported in Appendix M ranged from 0.82 to 0.92, indicating highly consistent test scores for these instruments.

BIASES THAT MIGHT MAKE ALPHA AN OVERESTIMATE OF RELIABLITY

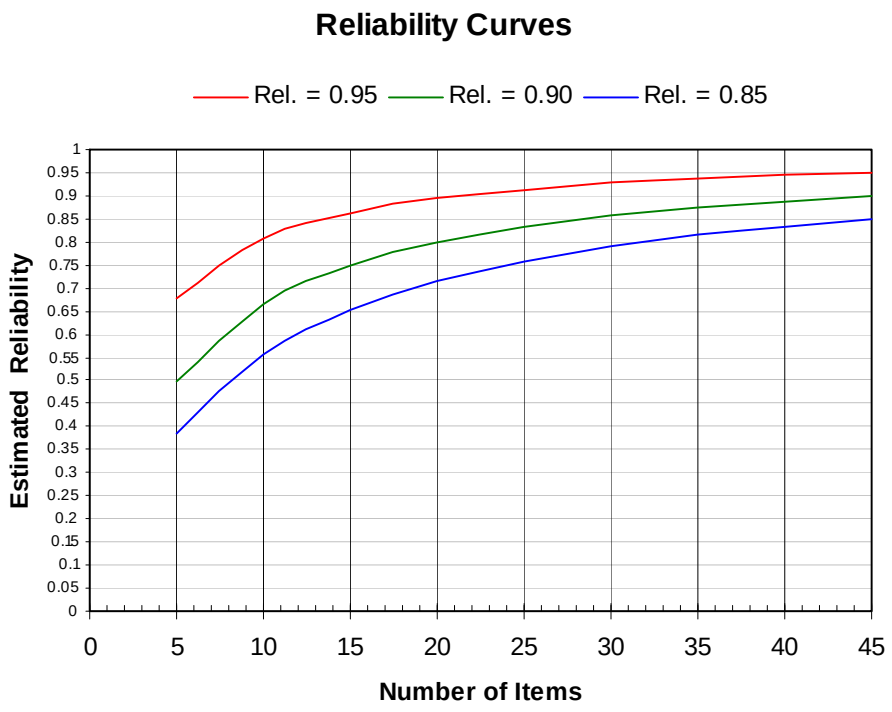
As emphasized in earlier sections, coefficient alpha only takes into account measurement error that arises from the selection of items used on a particular test form. There are other sources of random inaccuracy. One is due to the occasion of testing. Examples of other various random conditions that might affect students on any particular testing occasions include illness, fatigue, and anxiety. Also, when a test includes CR items, another source of random fluctuation can be the CR item scorers. In a sense, alpha may be positively biased because it does not take into account these other important sources of random error. Actually, any internal consistency reliability index might understate the overall problem of measurement error because they all ignore such sources of random error.

Another positive bias can occur when items are associated (clustered) with a common stimulus. Item bundles and testlets are other frequently used terms for this situation. One concrete example is when multiple reading comprehension items are associated with a common passage selection. Again, such a situation does not guarantee that the reliability estimate will be markedly affected, but the potential exists.

MODULE SCORE RELIABILITY

As noted in the introduction, reliabilities tend to be higher with an increase in test length and lower with a decrease in test length. Figure 18–1 illustrates this relationship for a hypothetical 45-point test with three total score reliabilities: 0.95, 0.90, and 0.85. As an example, the curve for reliability equal to 0.90 suggests that a 10-item module would be expected to have a score reliability of just over 0.65. The use of the Spearman-Brown prophecy formula assumes all items are exchangeable, which in practice, they may not be. While such a chart may not perfectly model actual module correlations, the intent is only to illustrate the substantial impact that limited numbers of module items can have on module-score reliability.

Figure 18–1. Example of the Relationship Between Test Length and Reliability



As can be seen in Appendix M, the reliability coefficients at the module level were always lower than those at the total test level. This is more likely because the number of items at the module level is half of the number of items in the total test.

STANDARD ERROR OF MEASUREMENT

The reliability coefficient is a unit-free indicator that reflects the degree to which scores are free of measurement error. It always ranges between 0.0 and 1.0 regardless of the test's scale. Reliability coefficients best reflect the extent to which measurement inconsistencies may be present or absent in a group. However, they are not that useful for helping users interpret test scores. The standard error of measurement (SEM) is another indicator of test score precision that is better suited for determining the effect of measurement inconsistencies on the scores obtained by individual examinees. This is particularly so for conditional SEMs (CSEM) discussed further below.

TRADITIONAL STANDARD ERROR OF MEASUREMENT

A precise, theoretical interpretation of the SEM (see Appendix M) is somewhat unwieldy. A beginning point for understanding the concept is as follows. If everyone being tested had the same true score,[11] there would still be some variation in observed scores due to imperfections in the measurement process, such as random differences in attention during instruction or concentration during testing or the sampling of test items. The standard error is defined as the standard deviation[12] of the distribution of observed scores for students with identical true scores. Because the SEM is an index of the random variability in test scores in actual score units, it represents very important information for test score users.

The SEM formula is provided below.

$$SEM = SD\sqrt{1 - reliability}$$

It indicates that the value of the SEM depends on both the reliability coefficient and the standard deviation of test scores. If the reliability were equal to 0.00 (the lowest possible value), the SEM would be equal to the standard deviation of the test scores. If test reliability were equal to 1.00 (the highest possible value), the SEM would be 0.0. In other words, a perfectly reliable test has no measurement error (Harvill, 1991). Additionally, the value of the SEM takes the group variation (i.e., score standard deviation) into account. Consider that an SEM of 3.0 on a 10-point test would be very different from an SEM of 3.0 on a 100-point test.

TRADITIONAL SEM CONFIDENCE INTERVALS

The SEM is an index of the random variability in test scores in actual score units, which is why it has such great utility for test score users. SEMs allow statements regarding the precision of individual tests scores. SEMs help place reasonable limits (Gulliksen, 1950) around observed scores through construction of an approximate score band. Often referred to as confidence intervals, these bands are constructed by taking the observed scores, *X*, and adding and subtracting a multiplicative factor of the SEM. As an example, students with a given true score will have observed scores that fall between ±1 SEM about two-thirds of the time.[13] For ±2 SEM confidence intervals, the percentage increases to about 95 percent.

FURTHER INTERPRETATIONS

ONE SEM FOR ALL TEST SCORES

The SEM approach described above only provides a single numerical estimate for constructing the confidence intervals for examinees regardless of their score levels. In reality, however, such confidence intervals vary according to one's score. Consequently, care should be taken when using the SEM for students with extreme scores. An alternate approach that conditions the SEM on a student's score estimate is described in the next sections.

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[11] True score is the score the person would receive if the measurement process were perfect.

[12] The standard deviation of a distribution is a measure of the dispersion of the observations. For the normal distribution about 16 percent of the observations are more than one standard deviation above the mean.

[13] Some prefer the following interpretation: if a student were tested an infinite number of times, the ±1 SEM confidence intervals constructed for each score would capture the student's true score 68 percent of the time.

GROUP SPECIFIC

As noted in the introduction, reliabilities are group specific. The same is true for SEMs because both score reliabilities and score standard deviations vary across groups.

RAW SCORE METRIC

The SEM approach is calculated using raw scores, and as such, the resulting confidence interval bands are on the raw score metric. Error bands on the scaled score metric are considered in the next section.

TYPE OF ERROR REFLECTED

The interpretation of the SEM should be driven by the type of score reliability that underpins it. So, the Keystone Exams SEMs involve the same source of error relevant to internal consistency indices. As noted earlier, a precise technical explanation of the SEM (and resulting confidence intervals) can be unwieldy. Because of this, score users are often provided less complex interpretations.

One simpler description sometimes used is that a confidence interval represents the possible score range that one would observe if a student could be tested twice with the same instrument. Taking the same test on a different day implies the only source of random error being considered is related to the occasion of testing—such as a student might be sleepier one day than another, might be sick, or might not have eaten a good breakfast. There is a reliability index that captures this source of random error, and it is referred to as the test-retest reliability coefficient. This is not the type of reliability computed for the Keystone Exams. When internal consistency reliability estimates are used, such an explanation blurs the fact that random error based on the occasion of testing is not considered.

When SEMs are derived from internal consistency reliability estimates, a better approach is to describe the confidence interval as providing reasonable bounds for the range of scores that a student might receive if he or she took an equivalent version of the test. (That is, the student took a test that covered exactly the same content, but included a different set of items.) As an example, if the Algebra I score was 1450 and the SEM band was 1435 to 1465, then a student would be likely to receive a score somewhere between 1435 and 1465 if he or she took a different version of the test.

RESULTS AND OBSERVATIONS

Coefficient alpha results and associated (traditional) SEMs for various Keystone Exam scores are documented in Appendix M. Values were derived using the final data file (see Chapter Nine). The results are organized by administration and then content area. Each table also breaks out the modules and groups of interest such as the total student population (overall), gender, ethnicity, English language learner (ELL), students with an individualized education plan (IEP), and the economically disadvantaged (ED). The statistics reported include the number of points possible (Pts.), number of items (Len.), number of students tested (*N*), mean number of score points received (Mean), standard deviation of test scores (SD), reliability (r), and traditional standard error of measurement (SEM).

Note that these tables report the standard deviations of observed scores. Assuming normally distributed scores, one would expect about two-thirds of the observations to be within one standard deviation of the mean. An estimate of the standard deviation of the true scores can be computed as

$$\hat{\sigma}_T = \sqrt{\hat{\sigma}_x^2 - \hat{\sigma}_x^2(1-\hat{\rho}_{xx})}\ .$$

The overall test score reliability values are high (with a value of 0.82 or higher) for Algebra I, Biology, and Literature. The reliabilities at the module level are relatively low. This is most likely due to the fact that each module contains fewer items. It was also noted that reliabilities tend to go up in value with an increase in population heterogeneity and go down in value with a decrease in more homogeneous populations. Once again, there is no firm guideline regarding how low is too low. The lower a given reliability coefficient, the greater the potential for over-interpretation. As a point of reference, a reliability coefficient of 0.50 would suggest that there is as much error variance as true-score variance in the scores. It should be noted that the reliability of group mean scores (e.g., school or district means) tends to be higher than that of individual scores, suggesting interpretation of strand scores at these aggregate levels is likely reasonable.

RASCH CONDITIONAL STANDARD ERRORS OF MEASUREMENT

The CSEM also indicates the degree of measurement error but does so in scaled-score units and varies as a function of a student's actual scaled score. Therefore, the CSEM may be especially useful in characterizing measurement precision in the neighborhood of a score level used for decision-making—such as cut scores for identifying students who meet a performance standard.

Technically, when a Rasch model is applied, the CSEM at any given point on the ability continuum is defined as the reciprocal of the square root of the test information function derived from the Rasch scaling model:

$$CSEM(\hat{\beta}_n) = \frac{1}{\sqrt{I(\hat{\beta}_n)}}$$

where $CSEM(\hat{\beta}_n)$ is conditional standard error of measurement and $I(\hat{\beta}_n)$ is test information function. Test information depends on the sum of the corresponding information functions for the test items. Item information depends on each item's difficulty and conditional item score variance. The formula above utilizes the Rasch ability (β_n) metric. The conditional standard error on the scaled score (SS) metric is determined simply by multiplying the $CSEM(\hat{\beta}_n)$ by the slope (multiplicative constant, m) of the linear transformation equation used to convert the Rasch ability estimates to scaled scores.

$$CSEM(\text{SS}) = CSEM(\hat{\beta}_n)*m$$

Chapter Fourteen provides the linear transformation formulas for each of the Keystone Exams.

RASCH CSEM CONFIDENCE INTERVALS

CSEMs also allow statements regarding the precision of individual tests scores. And like SEMs, they help place reasonable limits around observed scaled scores through construction of an approximate score band. The confidence intervals are constructed by adding and subtracting a multiplicative factor of the CSEM and may be interpreted as described in the earlier section.

FURTHER INTERPRETATIONS

DIFFERENT CSEMS FOR DIFFERENT TEST SCORES

The CSEM approach provides different numerical estimates for constructing the confidence intervals for examinees depending on their specific score levels. The magnitude of the CSEM values is U-shaped with larger CSEM values associated with lower and higher scores.

GROUP SPECIFIC

Assuming reasonable model-data fit—as explored in Chapter Twelve—the Rasch-based CSEMs (conditioned on score level) should not vary across groups.

SCALED SCORE METRIC

The CSEM and associated confidence interval bands are on the scaled score metric.

TYPE OF ERROR REFLECTED

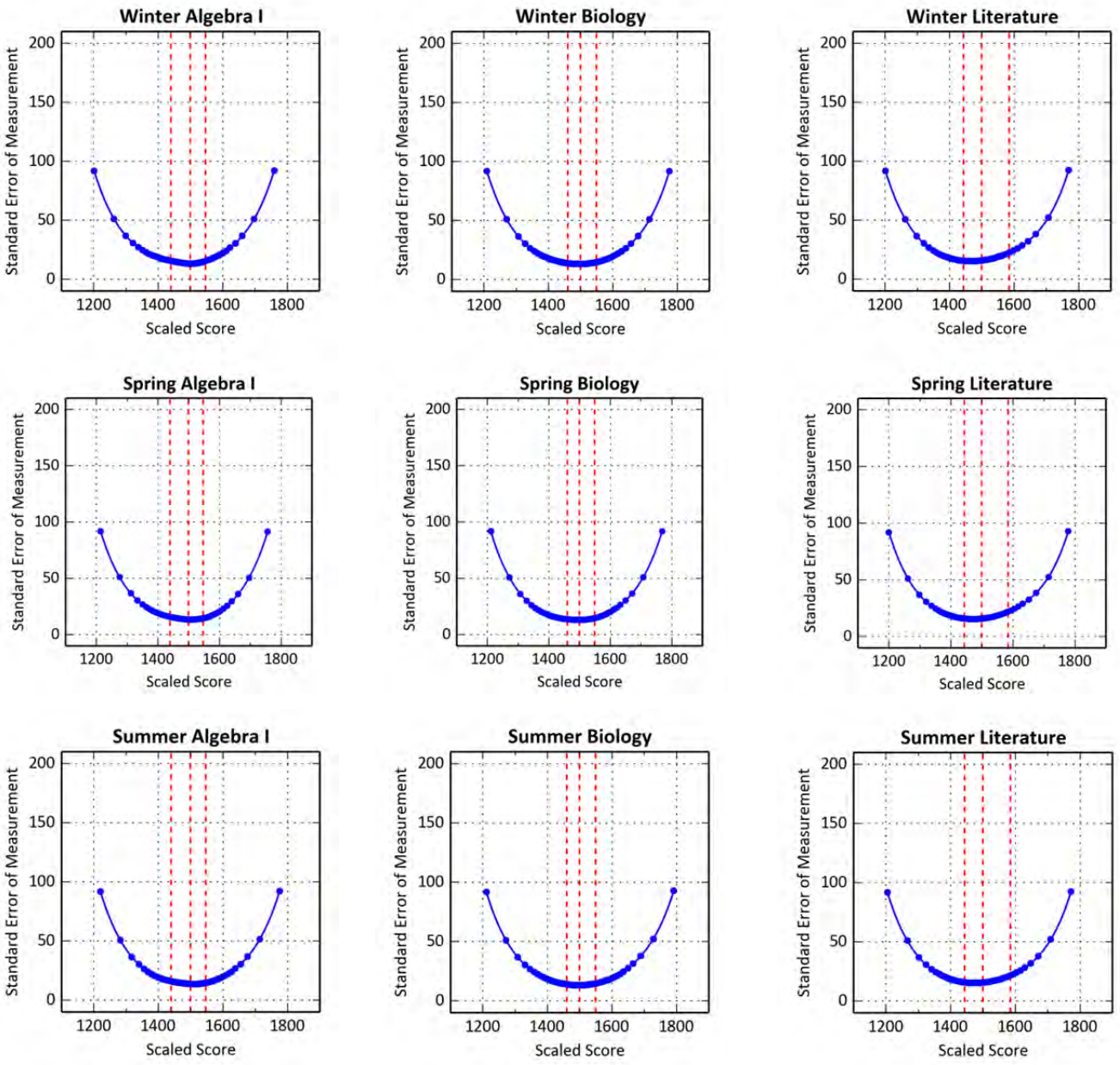
The CSEMs documented on the Keystone Exams score reports are the Rasch-based conditional standard errors of measurement described above. These are provided by the program WINSTEPS described in Chapter Twelve. As noted earlier, these CSEMs are based on the concept of statistical information. For the purpose of providing a simpler explanation of CSEMs to test score users, the earlier description of SEMs framed using the idea of internal consistency reliability was provided in the Keystone Exams score report interpretive guide.[14] Score report content is considered in greater detail in Chapter Sixteen.

RESULTS AND OBSERVATIONS

Figure 18–2 shows the Rasch CSEMs associated with each scaled score level. (This information is also provided in tabular form in Appendix K.) Values were derived using the calibration data file described in Chapter Ten. The values are fairly consistent across a noticeably large range of the scaled scores, as demonstrated by the relatively flat bottoms of most plots. The values increase at both extremes (i.e., at smaller and larger scaled scores) giving these figures their typical U-shaped pattern. The three red-dashed lines represent the Basic, Proficient, and Advanced scaled score cuts, respectively, moving from lower to higher scaled score values. CSEM values at the cut score lines are associated with smaller values, indicating more precise measurement occurs at these cuts.

[14] Because Rasch CSEMs are based on statistical information, it is questionable whether they account for error variance due to items. However, it seems difficult to construct a simple explanation of Rasch CSEMs for the general public.

Figure 18–2. Conditional Standard Error Plots for Each Administration and Content Area



RELIABILITY OF PERFORMANCE LEVEL CLASSIFICATION DECISIONS

Student performance on the Keystone Exams is classified into one of four achievement levels using the cut scores described in Chapter Thirteen. The reliability of the classification decisions can be assessed by two statistics: decision accuracy and decision consistency.

DECISION ACCURACY

Decision accuracy describes the extent to which performance-level classification decisions based on the administered test form would agree with the decisions that would be made on the basis of a perfectly reliable test (i.e., if it was possible to know each examinee's true score). Decision accuracy answers the question: How does the actual classification of test takers, based on their single-form scores, agree with the classification that would be made on the basis of their true scores, if their true scores were somehow known?

DECISION CONSISTENCY

Decision consistency describes the extent to which classification decisions based on the administered test form would agree with the decisions made if a parallel alternate form had been administered. Decision consistency answers the question: What is the agreement between the classifications based on two non-overlapping, equally difficult forms of the test?

Since the true scores are unknown and it is not feasible to repeat the Keystone Exams in order to estimate the proportion of students who would be reclassified in the same performance levels, a statistical model needs to be imposed on the data in order to project the consistency of classifications solely using data from the available administration (Hambleton and Novick, 1973). Although a number of procedures are available, two well-known methods were developed by Hanson and Brennan (1990) and Livingston and Lewis (1995), utilizing specific true score models. These approaches are fairly complex, and the cited sources contain details regarding the statistical models used to calculate the decision accuracy and consistency from a single administration.

For Keystone exams, given the two approaches provide similar results, true scores and single-form scores on forms parallel to the one actually given are estimated following the Livingston and Lewis (1995) method. The decision accuracy is estimated using an estimated joint distribution of reported performance-level classifications on the current form of the exam and the performance-level classifications based on the true score. Decision consistency is estimated using an estimated joint distribution of reported performance-level classifications on the current form of the exam and performance-level classifications on the parallel alternate form. In each case, the proportion of performance-level classifications with exact agreement is the sum of the entries in the diagonal of the contingency table representing the joint distribution. Reliability of classification at each performance-level cut score is estimated by collapsing the joint distribution at the passing score boundary into a 2-by-2 table and summing the two entries.

Several factors might affect the classification decision accuracy and consistency. One important factor is the reliability of the scores. All other things being equal, more reliable test scores tend to result in more similar reclassifications. Another factor is the location of the cut score in the score distribution. More consistent classifications are observed when the cut scores are located away from the mass of the score distribution. For example, when scores are close to being normally distributed, the mass is concentrated in the middle of the distribution, and thus, classifications tend to become more consistent when cut scores go up from

70 percent to 80 percent, or, alternatively, go down from 30 percent to 20 percent. The number of performance levels is also a consideration. Consistency indices for four performance levels should be lower than for those based on two categories. This is not surprising since classification using four levels would allow more opportunity to change achievement levels. Hence, there would be more classification errors with four achievement levels, resulting in lower consistency indices.

The results—derived using the program *BB-Class* (Brennan, 2004)—for the overall accuracy and consistency across all four performance levels as well as for the dichotomies created by the three cut scores are presented in Table 18–4.

Across all administrations and content areas, the overall decision accuracy ranged from 0.77 to 0.81 and the decision consistency ranged from 0.67 to 0.73. Dichotomous decisions have the higher accuracy and consistency values than the overall. The decision accuracy of the Basic/Proficient cut scores ranged from 0.89 to 0.92 and the decision consistency ranged from 0.85 to 0.89. These results indicate that at least 89% of students meeting or exceeding the Proficient cut score would receive the same classification if their true scores were known. If a parallel test were administered, at least 85 percent or more of students meeting or exceeding the Proficient cut score would be classified in the same way.

Table 18–4. Reliability of Performance-Level Classification Decisions

Administration	Content Area	Statistics	Overall	Below Basic/Basic	Basic/Proficient	Proficient/Advanced
Winter	Algebra I	Accuracy	0.78	0.94	0.92	0.92
		Consistency	0.70	0.92	0.88	0.89
	Biology	Accuracy	0.79	0.92	0.92	0.96
		Consistency	0.71	0.88	0.88	0.94
	Literature	Accuracy	0.79	0.96	0.92	0.90
		Consistency	0.72	0.95	0.89	0.87
Spring	Algebra I	Accuracy	0.79	0.91	0.92	0.96
		Consistency	0.71	0.88	0.89	0.94
	Biology	Accuracy	0.80	0.92	0.92	0.96
		Consistency	0.72	0.89	0.89	0.94
	Literature	Accuracy	0.80	0.95	0.91	0.94
		Consistency	0.71	0.92	0.87	0.92
Summer	Algebra I	Accuracy	0.78	0.87	0.92	0.99
		Consistency	0.69	0.82	0.89	0.98
	Biology	Accuracy	0.77	0.87	0.92	0.98
		Consistency	0.67	0.82	0.89	0.97
	Literature	Accuracy	0.81	0.93	0.89	0.98
		Consistency	0.73	0.90	0.85	0.97

RATER AGREEMENT

Because CR items are included on the Keystone Exams, another source of random error is related to the scorers of those items. Frisbie (2005) noted that "test score reliability differs from scorer reliability" and that "the need for one kind of estimate cannot be satisfied by the other." Additionally, the data most easily obtainable that captures this information comes from the "10 percent read behinds" collected during the scoring process. Partly because of the way these data are obtained and reported (i.e., it's **not** a ratio of true score variance over observed score variance), the term *rater agreement* is used here, not *rater reliability* or *inter-rater reliability* as these terms are somewhat misleading.

The rater agreements for the Keystone Exams are presented in Tables 18–5 to 18–7. In addition, the percentages awarded to each score point are also presented in these tables. As the table shows, the exact inter-rater agreement percentages ranged from 72 to 100 percent. Overall, Algebra I has the highest exact agreements while Literature has the lowest exact agreement. The percentages of exact and adjacent agreement for all content areas are 100 or close to 100.

Table 18–5. Rater Agreement and Percentage Awarded for Each Score Point of CR Items: Winter

Content Area	Item	Inter-Rater Agreement %		% Exact + Adjacent Agreement	Percentage Awarded for Each Score Point					
		Exact	Adjacent		0	1	2	3	4	B/NS
Algebra I	1A	100	0	100	82	13	-	-	-	5
	1B	100	0	100	31	64	-	-	-	5
	1C	100	0	100	47	2	46	-	-	5
	2	92	8	100	32	32	15	9	6	7
	3A	99	1	100	80	13	-	-	-	8
	3B	100	0	100	27	65	-	-	-	8
	3C	94	6	100	64	28	-	-	-	8
	3D	99	1	100	30	62	-	-	-	8
	3MU	99	1	100	90	3	-	-	-	8
	4A	99	1	100	30	66	-	-	-	4
	4B	99	1	100	72	24	-	-	-	4
	4C	100	0	100	32	64	-	-	-	4
	4D	100	0	100	37	59	-	-	-	4
	5	91	9	100	32	12	10	16	24	7
	6A	100	0	100	29	64	-	-	-	7
	6B	98	2	100	20	28	14	31	-	7
Biology	1	88	12	100	26	38	22	5	NA	9
	2	85	14	99	19	35	33	4	NA	9
	3	86	13	99	43	23	10	3	NA	0
	4	93	7	100	15	37	30	12	NA	5
	5	86	14	100	20	39	23	10	NA	7
	6	85	15	100	25	30	29	7	NA	9
Literature	1	80	20	100	4	20	47	26	NA	3
	2	84	16	100	5	23	59	9	NA	4
	3	84	16	100	7	31	36	14	NA	12
	4	80	20	100	14	29	43	8	NA	6
	5	84	16	100	2	18	58	17	NA	5
	6	83	17	100	10	23	44	12	NA	10

Note: Some of the Algebra I CR items were scored by part. For example, 1A in the second column means part A of item 1. B/NS in the last column represents blank/non-scorable. NA means not applicable.

Table 18–6. Rater Agreement and Percentage Awarded for Each Score Point for CR Items: Spring

Content Area	Item	Inter-Rater Agreement %		% Exact + Adjacent Agreement	Percentage Awarded for Each Score Point					
		Exact	Adjacent		0	1	2	3	4	B/NS
Algebra I	1A	97	3	100	68	14	10	-	-	7
	1B	99	1	100	82	10	-	-	-	7
	1C	98	2	100	65	27	-	-	-	7
	2A	97	3	100	52	16	23	-	-	8
	2B	99	1	100	63	28	-	-	-	8
	2C	97	3	100	31	61	-	-	-	8
	2MU	100	0	100	92	0	-	-	-	8
	3A	99	1	100	62	11	17	-	-	10
	3B	98	2	100	55	34	-	-	-	10
	3C	100	0	100	39	51	-	-	-	10
	4A	99	1	100	73	19	-	-	-	7
	4B	96	4	100	61	32	-	-	-	7
	4C	99	1	100	44	49	-	-	-	7
	4D	99	1	100	34	58	-	-	-	7
	4MU	100	0	100	93	0	-	-	-	7
	5	88	12	100	15	26	33	15	4	7
	6	92	8	100	7	31	15	24	15	8
Biology	1	79	21	100	33	27	21	9	NA	10
	2	92	8	100	53	20	13	7	NA	8
	3	95	5	100	57	8	20	3	NA	11
	4	72	27	99	33	35	20	5	NA	8
	5	79	20	99	4	16	63	8	NA	8
	6	76	24	100	21	35	26	7	NA	11
Literature	1	79	21	100	6	35	35	16	NA	8
	2	74	26	100	10	37	40	5	NA	7
	3	76	24	100	16	39	29	5	NA	11
	4	77	23	100	7	32	43	11	NA	7
	5	74	26	100	10	30	37	14	NA	9
	6	76	24	100	18	25	31	12	NA	13

Note: Some of the Algebra I CR items were scored by part. For example, 1A in the second column means part A of item 1. B/NS in the last column represents blank/non-scorable. NA means not applicable.

Table 18–7. Rater Agreement and Percentage Awarded for Each Score Point for CR Items: Summer

Content Area	Item	Inter-Rater Agreement %		% Exact + Adjacent Agreement	Percentage Awarded for Each Score Point					
		Exact	Adjacent		0	1	2	3	4	B/NS
Algebra I	1A	98	2	100	74	14	0	-	-	12
	1B	100	0	100	51	36	-	-	-	12
	1C	100	0	100	66	22	-	-	-	12
	2A	100	0	100	35	52	-	-	-	13
	2B	99	1	100	79	8	-	-	-	13
	2C	100	0	100	74	13	-	-	-	13
	2D	100	0	100	86	1	-	-	-	13
	3	97	3	100	35	43	4	3	1	13
	4	91	9	100	48	22	9	6	1	13
	5A	100	0	100	13	73	-	-	-	14
	5B	100	0	100	51	35	-	-	-	14
	5C	100	0	100	50	36	-	-	-	14
	5D	100	0	100	19	67	-	-	-	14
	6A	99	1	100	72	14	-	-	-	14
	6B	98	2	100	61	25	-	-	-	14
	6C	98	2	100	59	27	-	-	-	14
	6D	95	5	100	66	20	-	-	-	14
	6MU	100	0	100	86	0	-	-	-	14
Biology	1	93	7	100	44	26	10	2	NA	19
	2	91	9	100	56	26	4	1	NA	13
	3	82	18	100	54	22	8	2	NA	14
	4	76	21	97	26	31	23	9	NA	9
	5	85	13	98	29	28	17	11	NA	15
	6	87	13	100	40	35	12	1	NA	13
Literature	1	85	15	100	10	29	33	10	NA	17
	2	84	16	100	9	36	31	8	NA	16
	3	88	12	100	13	36	28	3	NA	21
	4	86	14	100	10	38	29	6	NA	18
	5	86	14	100	6	25	36	16	NA	17
	6	88	12	100	9	39	26	6	NA	19

Note: Some of the Algebra I CR items were scored by part. For example, 1A in the second column means part A of item 1. B/NS in the last column represents blank/non-scorable. NA means not applicable.

Chapter Eighteen: Reliability

CHAPTER NINETEEN: VALIDITY

As defined in the *Standards for Educational and Psychological Testing* (AERA, APA, & NCME, 1999, refer to as *Standards*), validity is "the degree to which evidence and theory support the interpretation of test scores entailed by proposed uses of tests" (p.9). The *Standards* provides a framework for describing the sources of evidence that should be considered when evaluating validity. These sources include evidence based on test content, response processes, the internal structure of the test, the relationships between test scores and other variables, and the consequences of testing. In addition, when Rasch models are used to analyze assessment data, validity considerations related to those processes should also be explored.

The validity process involves the collection of a variety of evidence to support the proposed test score interpretations and uses. The entire technical report describes the technical aspects of the Keystone Exams in support of their score interpretations and uses. Each of the previous chapters contributes important evidence components that pertain to score validation: test development, test administration, test scoring, item analysis, Rasch calibration, scaling, equating, score reporting, and reliability. This chapter summarizes and synthesizes the evidence based on the framework of the *Standards*. The purposes and intended uses of the Keystone Exams are reviewed first, and then each type of validity evidence is addressed in turn.

PURPOSES AND INTENDED USES OF THE KEYSTONE EXAMS

The *Standards* emphasize that validity pertains to how test scores are used. To help contextualize the evidence that will be presented below, the purposes of the Pennsylvania Keystone Exams will be reviewed first. The Keystone Exams, which began in 2010–2011 for Algebra I, Biology, and Literature, are one component of Pennsylvania's new system of high school graduation requirements for students in the class of 2015 and beyond. Students take the exams toward the end of specific courses. The Keystone Exams results help school districts guide students toward meeting state standards. Students who do not score Proficient or above on a Keystone Exam module may choose to complete a project-based assessment for that module, provided that they meet the requirements detailed below.

- The student has taken the course.
- The student was unsuccessful in achieving a score of Proficient or Advanced on the Keystone Exam after at least two attempts.
- The student has met the district's attendance requirements for the course.
- The student has participated in a satisfactory manner in supplemental instructional services.

EVIDENCE BASED ON TEST CONTENT

Test content validity evidence for the Keystone Exams rests greatly on establishing a link between each piece of the assessment (i.e., the items) and what students should know and be able to do as prescribed by the Keystone Exams Assessment Anchors and Eligible Content. The Keystone Exams are intended to measure the knowledge and skills described in the Assessment Anchors and Eligible Content for Algebra I, Biology, and Literature.

Chapter Nineteen: Validity

Lane (1999) suggests taking the following steps to support the content validity of an assessment. In the case of Keystone Exams, one should

- Evaluate the degree to which the test specifications represent and align with the knowledge and skills described in the Assessment Anchors and Eligible Content for Algebra I, Biology, and Literature.
- Evaluate the alignment between the Keystone Exams items and test specifications to ensure representativeness.
- Evaluate the extent to which the curriculum aligns with the Assessment Anchors and Eligible Content.
- Conduct content reviews of the Keystone Exams items using a panel of content experts to see whether items measure the intended construct or are the sources of construct-irrelevant variance.
- Conduct fairness reviews of the items to avoid issues related to a specific subpopulation.
- Evaluate procedures for administration and scoring such as the appropriateness of instructions to examinees, time limit for the assessment, and training of raters.
- Submit operational tests to third-party independent reviews.

Chapters Two through Eight of this report present a considerable amount of evidence related to test content. As described in these chapters, all the items were developed and aligned with the Keystone Exams Assessment Anchors and Eligible Content for Algebra I, Biology, and Literature. After development, items underwent multiple rounds of content and bias reviews. After being field tested, they were reviewed with respect to their statistical properties. Items selected for the operational assessment had to pass content, psychometric, and PDE reviews. Tests were administrated according to standardized procedures with allowable accommodations.

Some of the efforts made to ensure content validity are summarized below.

- DRC used Webb's (1999) Depth of Knowledge (DOK) model to ensure the Keystone Exams items aligned with the Assessment Anchors and Eligible Content and the Academic Content Standards in terms of both content and cognitive levels.
- DRC established detailed test and item/passage development specifications and ensured the items were sufficient in number and adequately distributed across content, levels of cognitive complexity, and levels of difficulty.
- DRC selected qualified item writers and provided training to help ensure they wrote high-quality items.
- All newly developed items were first reviewed by content specialists and editors at DRC to make sure they measured the intended Assessment Anchors and Eligible Content for Algebra I, Biology, and Literature. Appropriateness for the intended students was also considered, as well as DOK, graphics, grammar/punctuation, language demand, and distractor reasonableness.
- Prior to field testing, the test items were submitted to content committees (composed of Pennsylvania educators) for review using, but not limited to, the following categories:
    - Overall quality and clarity
    - Anchor, Eligible Content, and/or standard alignment
    - Grade-level appropriateness

  - Difficulty level
  - DOK
  - Appropriate sources of challenge (e.g., unintended content and skills)
  - Correct answer
  - Quality of distractors
  - Graphics
  - Appropriate language demand
  - Freedom from bias

- The items were also submitted to a Bias, Fairness, and Sensitivity Committee for review. This committee reviewed items for issues related to diversity, gender, and other pertinent factors.
- Items passing all the prior hurdles were tried out as embedded field test items in the operational test. Several statistical analyses were conducted on the field test data including classical item analyses, distractor analyses, and differential item functioning (DIF). Items were again carefully reviewed by DRC staff and a committee of Pennsylvania teachers with respect to their statistical characteristics. DIF was used to detect test items that might bias test scores for particular groups. Empirical investigation of DIF strengthens the validity evidence related to score interpretations for students in particular groups by eliminating potential sources of construct-irrelevant variance.
- The Keystone Exams were administered according to standardized procedures with allowable accommodations. Students were given ample time to complete the tests (i.e., there were no speediness issues).
- As described in Chapter Eight, the raters for constructed-response (CR) items were carefully recruited and well trained. Their scoring was monitored throughout the scoring session to ensure that an acceptable level of scoring accuracy was maintained.

EVIDENCE BASED ON RESPONSE PROCESS

Response-process evidence is used to examine the extent to which the cognitive skills and processes employed by students match those identified in the test developer's defined construct domains for all students and for each subgroup. Think-aloud procedures or cognitive labs can be used to collect this type of evidence. In addition, when an assessment includes CR items, an examination of the extent to which the raters interpret and apply the scoring criteria accurately when assigning scores to students' responses on CR items also adds response-process validity evidence.

For the operational Keystone Exams offered in winter, spring, and summer, no cognitive lab studies were conducted to collect the response-process evidence. Rather, for all the Keystone Exams, well-organized scorer training and subsequent monitoring of rating accuracy helped ensure that raters strictly followed the scoring criteria and that no features unrelated to the rubric significantly affected their scoring.

EVIDENCE BASED ON INTERNAL STRUCTURE

As described in the *Standards* (1999), internal-structure evidence refers to the degree to which the relationships between test items and test components conform to the construct on which the proposed test interpretations are based. For each Keystone Exam, one total test score as well as module scores were reported (see Chapter Sixteen for more information about the Keystone Exams scores). Several dimensionality studies were conducted in order to provide internal-structure evidence relating to the use of both types of scores.

ITEM-TEST CORRELATIONS

Item-test correlations are provided and discussed in Chapter Eleven. All values were positive and of acceptable magnitude.

DIFFERENTIAL ITEM FUNCTIONING (DIF)

DIF analyses with respect to gender, ethnicity, and test administration mode help address construct-irrelevant variance, which represents an important threat to the validity of achievement tests. As noted in Chapter Five, field test items were screened and reviewed for DIF. Only items approved by teacher committees were eligible for operational use. DIF analyses were conducted on the operational items again to monitor the bias code change. As can be seen in Table 19–1, there were a very few items where the bias code changed from A/B (i.e., A+, A-, B+, and B-) to C (i.e., C+ or C-). Given that most items selected to build the operational forms had no C-level DIF, the Keystone Exams can be considered valid from this perspective.

Table 19–1. Summary of Bias Code Change from Field Test to Operational Test

Administration	Content Area	Change	Male/Female	White/Black	PPT/CBT
Winter	Algebra I	C →A/B	0	2	0
		A/B → C	0	1	0
	Biology	C → A/B	0	0	0
		A/B → C	0	0	0
	Literature	C → A/B	2	0	0
		A/B → C	0	0	1
Spring	Algebra I	C → A/B	0	0	0
		A/B → C	0	0	0
	Biology	C → A/B	0	0	0
		A/B → C	0	1	0
	Literature	C → A/B	2	0	0
		A/B → C	1	0	0
Summer	Algebra I	C → A/B	0	1	0
		A/B → C	0	1	2
	Biology	C → A/B	0	0	0
		A/B → C	0	1	2
	Literature	C → A/B	3	0	0
		A/B → C	1	0	3

Note: PPT represents the paper-and-pencil-based test, and CBT represents the computer-based test.

DIMENSIONALITY

Dimensionality analyses were conducted for the winter, spring, and summer Keystone Exams using WINSTEPS's principle components analyses on response residuals for each content area. Results are shown in Chapter Twelve. The principal component analysis results provided evidence that each of the three Keystone Exams was essentially unidimensional, supporting the validity of using the total scores to estimate student's overall ability in each subject area.

MODULE CORRELATIONS

Correlations and disattenuated correlations among module scores for the Keystone Exams are presented below. Values were derived from the Keystone final data files (see Chapter Nine). These data can also provide information on score dimensionality that is part of internal-structure evidence. All Keystone Exams have two modules. The intercorrelations between the modules within the content areas were positive and ranged from 0.65 to 0.86. The intercorrelations between modules in different content areas ranged from 0.44 to 0.74, which were relatively small as expected.

Table 19–2. Correlations among Algebra I, Biology, and Literature Modules

Administration	Content Area	Module	Algebra I		Biology		Literature	
			Module 1	Module 2	Module 1	Module 2	Module 1	Module 2
Winter	Algebra I	Module 1	-					
		Module 2	**0.86**	-				
	Biology	Module 1	0.71	0.69	-			
		Module 2	0.74	0.72	**0.81**	-		
	Literature	Module 1	0.70	0.69	0.64	0.68	-	
		Module 2	0.74	0.73	0.66	0.70	**0.81**	-
Spring	Algebra I	Module 1	-					
		Module 2	**0.77**	-				
	Biology	Module 1	0.62	0.60	-			
		Module 2	0.64	0.63	**0.76**	-		
	Literature	Module 1	0.60	0.59	0.62	0.65	-	
		Module 2	0.60	0.61	0.60	0.65	**0.75**	-
Summer	Algebra I	Module 1	-					
		Module 2	**0.65**	-				
	Biology	Module 1	0.52	0.51	-			
		Module 2	0.52	0.45	**0.72**	-		
	Literature	Module 1	0.53	0.50	0.44	0.47	-	
		Module 2	0.58	0.57	0.54	0.59	**0.71**	-

The correlations in Table 19–2 are based on the observed module scores. These observed-score correlations are weakened by existing measurement error contained within each module. As a result, disattenuated correlations could provide an estimate of the relationships among modules if there were no measurement error. (An important caveat is explained further below.) The disattenuated correlation coefficients (R_{12}) can be computed by using the formula (Spearman, 1904; Spearman, 1910) below:

$$R_{12} = \frac{r_{12}}{\sqrt{r_{11} r_{22}}},$$

where r_{12} is the observed correlation, and r_{11} and r_{22} are the reliabilities for Module 1 and Module 2. Disattenuated correlations very near 1.00 suggest that the same or very similar constructs are being measured. Values somewhat less than 1.00 suggest that different modules are measuring slightly different aspects of the same construct. Values markedly less than 1.00 suggest the modules reflect different constructs.

Table 19–3 shows the corresponding disattenuated correlations for each Keystone Exam. Given that none of these modules had perfect reliabilities (see Chapter Eighteen), the disattenuated module correlations are higher than their observed score counterparts.

Table 19–3. Disattenuated Correlations among Algebra I, Biology, and Literature Modules

Administration	Content Area	Module	Algebra I		Biology		Literature	
			Module 1	Module 2	Module 1	Module 2	Module 1	Module 2
Winter	Algebra I	Module 1	-					
		Module 2	**1.02**	-				
	Biology	Module 1	0.84	0.82	-			
		Module 2	0.87	0.86	**0.97**	-		
	Literature	Module 1	0.84	0.83	0.77	0.82	-	
		Module 2	0.87	0.87	0.78	0.83	**0.97**	-
Spring	Algebra I	Module 1	-					
		Module 2	**0.93**	-				
	Biology	Module 1	0.74	0.71	-			
		Module 2	0.77	0.75	**0.90**	-		
	Literature	Module 1	0.74	0.73	0.74	0.79	-	
		Module 2	0.71	0.73	0.70	0.77	**0.91**	-
Summer	Algebra I	Module 1	-					
		Module 2	**0.93**	-				
	Biology	Module 1	0.72	0.69	-			
		Module 2	0.72	0.61	**0.94**	-		
	Literature	Module 1	0.72	0.67	0.57	0.61	-	
		Module 2	0.79	0.77	0.70	0.77	**0.90**	-

Some within–content area correlations were very high (e.g., above 0.90), suggesting that the within–content area modules might be measuring essentially the same construct. This, in turn, suggests that some module scores might not provide unique information about the strengths or weaknesses of students. On the other hand, the within–content area module correlation is 0.90 for Biology and Literature, which is somewhat lower than 1.00. For such modules, partial evidence is provided regarding the multidimensional structure of this exam and further supporting the validity of those specific module scores.

On a fairly consistent basis, the correlations among the modules within each content area are higher than the correlations among modules across different content areas. In general, within–content area module correlations are at or higher than 0.90, while across-content area module correlations range from 0.57 to 0.87.

It should be noted that some caution is needed when interpreting the disattenuated results because the reliabilities used to calculate the disattenuated correlations are subject to both upward and downward biases. Consequently, some of the values in the table above may be higher or lower than they should be, depending on which bias prevails for any given pair of module scores. When the reliabilities are lower than they should be, the disattenuated correlations will be inflated and in some instances can appear higher than the theoretical correlation maximum value of 1.00.

EXPLORATORY FACTOR ANALYSIS

In order to further explore the internal structure of the Keystone Exams, an exploratory factor analysis (EFA) of the module scores across all the Keystone Exams content areas was conducted. The Keystone Exams final data file (see Chapter Nine) was used to create the observed correlation matrices shown in Table 19–2, which, in turn, were used in the EFA. In the Statistical Package for the Social Sciences (SPSS), Principle Axis Factor extraction was utilized with an oblique rotation (Promax) of the initial factor solution to improve interpretability. Oblique rotations allow for correlated factors, which seemed more appropriate for the Keystone Exams because of a priori expectations that academic achievement across subject areas should be correlated.

Table 19–4 presents the eigenvalues and the explained variance for the extracted factors for the Keystone Exams in Algebra I, Biology, and Literature. The scree plots of the eigenvalues and the first six factors can be found in Figure 19–1. The first factor accounts for 62.79 to 77.14 percent of the total variance, while the second factor explains 7.85 to 12.23 percent of the total variance. Only the first factor had an eigenvalue greater than 1.0, typically suggesting a one-factor solution using the Kaiser criterion. However, based on the belief that there should be three distinct factors (one for each content area), a three-factor solution was further explored.

Table 19–4. Eigenvalues and Explained Variance for Algebra I, Biology, and Literature Modules

Administration	Factor	Eigenvalue	Variance Explained (%)
Winter	1	4.63	77.14
	2	0.47	7.85
	3	0.39	6.54
	4	0.19	3.11
	5	0.18	3.04
	6	0.14	2.32
Spring	1	4.23	70.51
	2	0.57	9.43
	3	0.50	8.25
	4	0.25	4.21
	5	0.23	3.89
	6	0.22	3.71
Summer	1	3.77	62.79
	2	0.73	12.23
	3	0.60	10.03
	4	0.35	5.90
	5	0.29	4.87
	6	0.25	4.18

Figure 19–1. Scree Plot for Algebra I, Biology, and Literature Modules

Winter

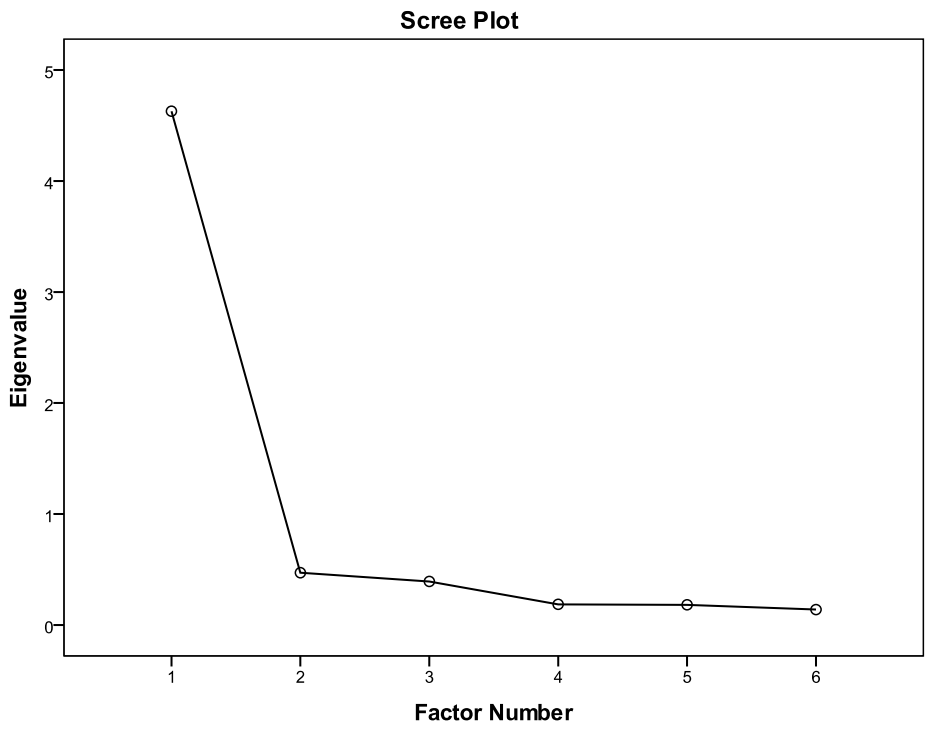
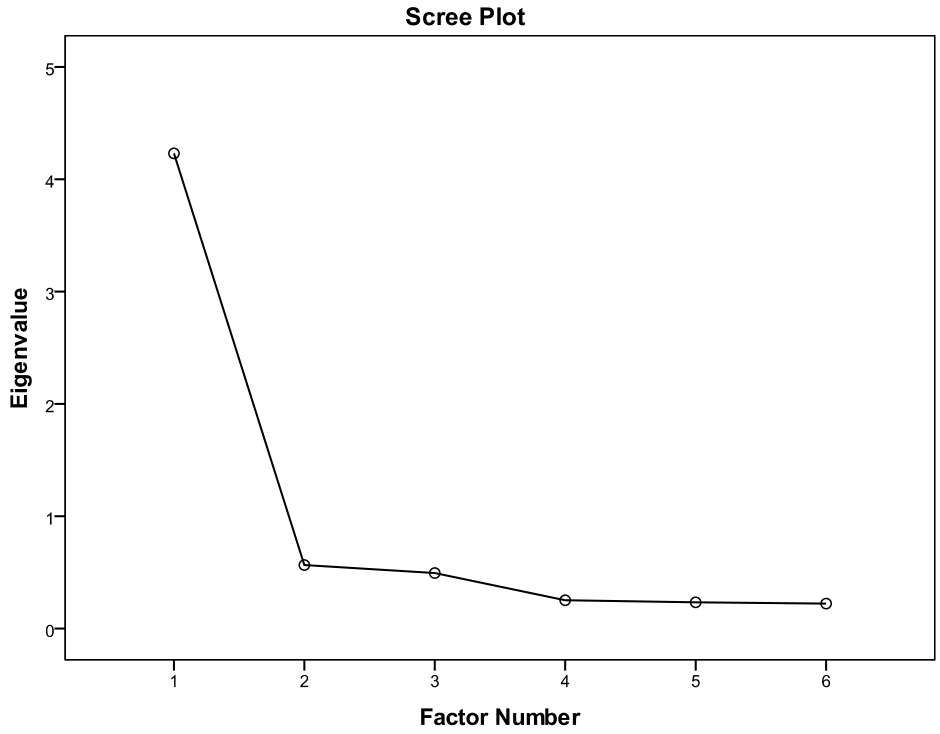
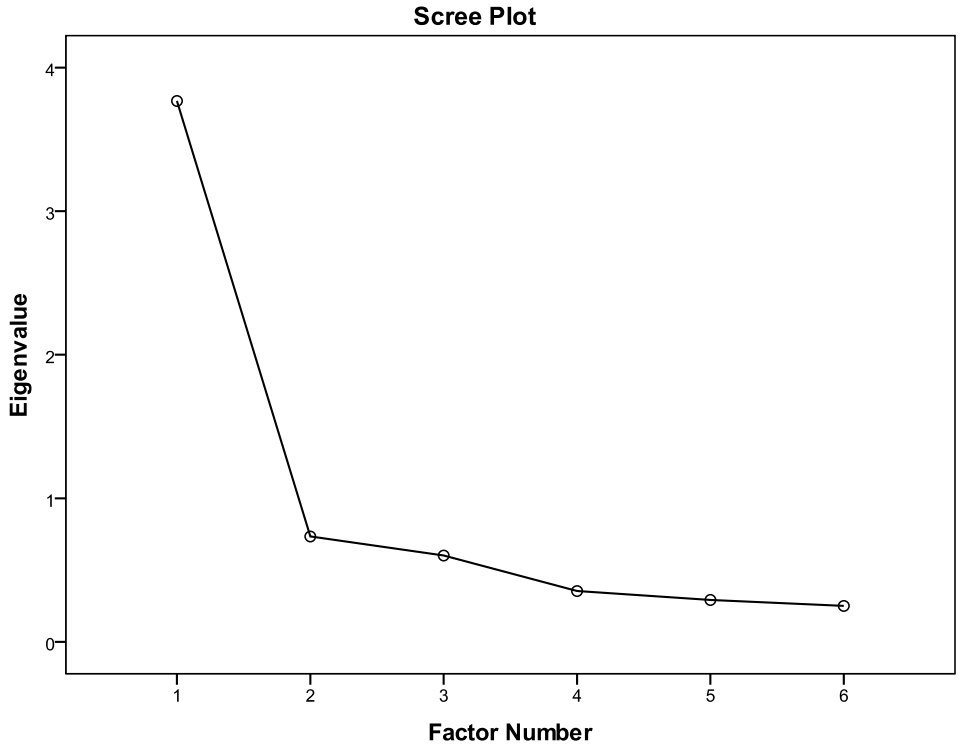


Figure 19–1 (continued). Scree Plot for Algebra I, Biology, and Literature Modules

Spring



Summer



The pattern loadings resulting from the three-factor solution are presented in Table 19–5. The pattern loadings have *simple structure*, which shows that the two Algebra I, Biology, and Literature modules clearly loaded on three different factors. The respective factor loadings were quite high. The factor correlation matrix showed that the correlations among the three latent factors are very close to the observed correlations (see Table 19–5) but lower than the disattenuated correlations.

Table 19–5. Pattern Matrix and Factor Correlation

Administration	Content Area	Module	Factor			Correlation
			1	2	3	
Winter	Algebra I	Module 1	0.09	0.06	**0.82**	Correlation (F1, F2) = 0.76
		Module 2	0.05	0.07	**0.83**	
	Biology	Module 1	**0.83**	0.02	0.06	Correlation (F1, F3) = 0.79
		Module 2	**0.80**	0.09	0.06	
	Literature	Module 1	0.07	**0.82**	0.02	Correlation (F2, F3) = 0.79
		Module 2	0.02	**0.81**	0.11	
Spring	Algebra I	Module 1	**0.82**	0.01	0.08	Correlation (F1, F2) = 0.73
		Module 2	**0.83**	0.06	0.01	
	Biology	Module 1	0.05	0.01	**0.81**	Correlation (F1, F3) = 0.76
		Module 2	0.04	0.10	**0.78**	
	Literature	Module 1	0.02	**0.79**	0.07	Correlation (F2, F3) = 0.77
		Module 2	0.05	**0.82**	0.02	
Summer	Algebra I	Module 1	0.11	0.12	**0.61**	Correlation (F1, F2) = 0.68
		Module 2	-0.03	0.01	**0.87**	
	Biology	Module 1	**0.76**	-0.06	0.15	Correlation (F1, F3) = 0.67
		Module 2	**0.90**	0.06	-0.09	
	Literature	Module 1	-0.05	**0.82**	0.04	Correlation (F2, F3) = 0.73
		Module 2	0.10	**0.79**	0.03	

Taken as a whole, all the internal structure evidence presented generally indicates that related elements of each of the Keystone Exams are correlated in the intended manner. Different Keystone Exams seem to measure different constructs. Additionally, the modules *within* each content area have stronger relationships than the *across* content area modules. This further supports using a total score to report students' performances in the different content areas.

The module scores present more of a mixed message. Since the modules in each content area were designed to measure distinct components of the content area, it is reasonable to expect that the inter-content module correlations should be positive and strong but, ideally, not extremely high. However, the disattenuated correlations imply that some modules (e.g., Algebra I modules) are essentially measuring the same constructs. Consequently, there may be less support for providing results for some module scores beyond the total score. While there is content rationale underlying the creation of the module scores, the empirical correlations illustrate that caution is required when using the module scores as a way to identify individual student's strengths and weaknesses. Certainly, instructional programs should not be based on module score information alone, but rather in conjunction with other sources of evidence available (e.g., teacher observations, other exam performance).

EVIDENCE BASED ON RELATIONSHIPS WITH OTHER VARIABLES

As described in the *Standards* (AERA, APA, & NCME, 1999), "Evidence based on relationships with other variables addresses questions about the degree to which relationships are consistent with the construct underlying the proposed interpretations" (p. 13). This category of evidence refers to external structure evidence and has been classified as three types of evidence: *convergent, discriminant*, and *criterion-related*. Convergent evidence is provided by relationships among students' performances on different assessments intended to measure a similar construct. Discriminant evidence is provided by relationships among students' performances on different tests intended to measure different constructs. Criterion-related evidence, either predictive or concurrent, is provided by relationships between students' test scores and their performances on a criterion measure (Cronbach, 1971; Messick, 1989).

The correlations among students' test scores on different Keystone Exams including Algebra I, Biology, and Literature are shown in Table 19–6 to provide some discriminant validity evidence. In this table, both the observed and disattenuated correlations (in the parentheses) are reported.

Table 19–6. Correlations Among Students' Performances

Administration	Content Area	Algebra I	Biology
Winter	Biology	0.78 (0.85)	-
	Literature	0.78 (0.85)	0.74 (0.82)
Spring	Biology	0.70 (0.77)	-
	Literature	0.68 (0.75)	0.72 (0.79)
Summer	Biology	0.59 (0.70)	-
	Literature	0.65 (0.76)	0.59 (0.68)

Each Keystone Exam assessment measures a different construct, so the correlations among them were not expected to be extremely high. The values in this table are consistent with this expectation. As can be seen, the correlations among the Keystone Exams ranged from 0.59 to 0.78.

External evidence for the Keystone Exams is examined by using students' scores on the 2013 Pennsylvania System of School Assessment (PSSA) as the external criteria. The final Algebra I, Biology and Literature data files were merged with the PSSA mathematics, science, and reading data using students' PA secure IDs. Then the correlations between students' scores on the Keystone Exams and on the PSSA were calculated as one piece of external evidence. This analysis was attempted for all Keystone administrations. However, only enough students were obtained for the spring administration. Table 19–7 summarizes the sample sizes and correlations by grade and content area after the file merging of the spring Keystone Exams and the PSSA.

Table 19–7. Number of Students with Both Spring Keystone Exams and PSSA Scores

Content Area	Grade 7		Grade 8	
	N	Correlation	*N*	Correlation
Algebra I/Mathematics	8,595	0.77	45,212	0.81
Biology/Science	NA	NA	248	0.72
Literature/Reading	NA	NA	240	0.80

The correlations within the same content area ranged from 0.72 to 0.81. These results suggest the Keystone Exams measured something similar but not identical to the corresponding PSSA tests. The results also provide external evidence in support of the Keystone Exams as a valid measure of students' achievement.

The collection of external evidence relating to the Keystone Exams is an ongoing process once the data are collected in the future. Other criterion-related evidence can be evaluated by the relationships between the Keystone Exams and criterion variables such as the Scholastic Aptitude Test (SAT), the American College Testing (ACT), or students' Grade Point Average (GPA) in their first college course.

EVIDENCE BASED ON CONSEQUENCES OF TESTS

Based on the *Standards* (AERA, APA, & NCME, 1999), evidence of the consequences of implementing an assessment program is an additional source of validity information. Both positive and negative (intended and unintended) consequences of score-based inferences must be investigated to fully evaluate the pool of validity evidence.

Lane and Stone (2002) summarized the general *intended* consequences for state assessments and accountability programs:

- Student, teacher, and administrator motivation and effort
- Curriculum and instruction practices (including content and strategies)
- Improved learning for all students
- Content and format of classroom assessments
- Professional development support
- Use and nature of test-preparation activities
- Student, teacher, administrator, and public awareness and beliefs about the assessment, criteria for judging performance, and the use of assessment results

Evidence for the improvement of student learning can be seen by looking at the increasing percentage of students who scored Proficient or Advanced across years. Table 19–8 provides the percentages of students who scored Proficient or Advanced by administration and content area. Values are derived from the first-time test takers for the purpose of comparison. The values for the summer 2013 administration were not provided because most students (469 out of 741) were retesters.

Table 19–8. Percentages of Students at Proficient or Advanced Across Administrations

Administration	Algebra I		Biology		Literature	
	N	%	*N*	%	*N*	%
Spring 2011	94,697	38.6	46,979	35.7	42,808	49.9
Winter 2012–2013	177,302	54.8	138,506	41.9	138,379	66.4
Spring 2013	157,811	47.6	134,995	47.2	117,830	63.1

Lane and Stone (2002) also summarized the possible *unintended* outcomes:

- Narrowing of curriculum and instruction to focus only on the specific standards assessed and ignoring the broader construct reflected in the specified standards
- Use of test-preparation materials that are closely linked to the assessment without making changes to instruction
- Use of unethical test-preparation materials or administration procedures
- Differential performance gains for subgroups of students
- Inappropriate or unfair uses of test scores, such as questionable practices in reassignment of teachers or principals
- For some students, decreased confidence and motivation to learn and to perform well on the assessment because of past experiences with assessments

As noted above, one important piece of consequential evidence pertains to the use of assessment results. As shown in Chapter Sixteen, there are several different types of scores and score reports used for the Keystone Exams. The extent to which various groups of users (e.g., students, teachers) interpret these scores and reports appropriately affects the validity of subsequent uses of these results. Chapter Sixteen is intended to provide accurate and clear test score and report information with the hope that this will help users avoid unintended uses and interpretations of the Keystone Exams results. Nevertheless, evidence pertaining to other consequences of the Keystone Exams needs continued research.

EVIDENCE RELATED TO THE USE OF RASCH MODEL

Since the Rasch model is the basis of all calibration, scaling, and equating analyses associated with the Keystone Exams, the validity of the inferences from these results depends on the degree to which the assumptions of the model are met, as well as the fit between the model and the test data. As discussed in Chapter Twelve, the underlying assumptions of Rasch models were essentially met for all the Keystone Exams data, indicating the appropriateness of using the Rasch models to analyze the Keystone Exams data.

VALIDITY EVIDENCE SUMMARY

Validity evidence related to test content was reviewed earlier in this chapter. On the whole, the early chapters of this technical report show that a strong link can be established between each Keystone Exams item and its associated Eligible Content. Details regarding how the operational Keystone Exams were assembled to reflect the state content standards and detailed information regarding educator reviews (including content, bias, and sensitivity reviews) are presented in Chapter Six.

Module score intercorrelations were also presented in this chapter. In general, within–content area modules (e.g., Algebra I) were correlated more highly with themselves than they did with other content-area modules (e.g., Literature). Consequently, this provides some favorable evidence regarding the internal and external relationships between the tests' components.

Validity of score inferences is bolstered when test scores are consistent. Here, the reliabilities of the total test scores (presented in Chapter Eighteen) were very good, with many in the low 0.90s.

As reported in Chapter Five, DIF with respect to gender, ethnicity, and test administration mode helps address construct-irrelevant variance, which represents an important threat to the validity of inferences made from achievement test scores. As noted in that chapter, field test items are screened and reviewed for DIF. Only items approved by data review committees are eligible for operational use.

CHAPTER TWENTY: SPECIAL STUDY ON ITEM SCRAMBLING

While building the 2012–2013 Keystone Exams in Algebra I, Biology, and Literature, the Pennsylvania Department of Education (PDE) requested test design options that would increase the security of items within test forms during test administration. Namely, PDE is interested in changing the design so that all students do not answer the same questions in the same order. As a result, a master core form (form 2) and two scrambled variations for the winter and summer administrations and seven variations for the spring administration were built for the Keystone Exams. The master core form is the version that would have been administered to all students in the absence of scrambling. The items in the master core form are ordered to best meet the test development guidelines.

ITEM SCRAMBLING

Variations of forms were created by combining assorted scrambled blocks. Within each block, the sequence of the multiple-choice (MC) items was scrambled following a specific set of guidelines to minimize any possible item sequence change effects. For passage-based sections or modules, like those in literature, the order of the passages within a section or module were presented in the same sequence across forms, but the items associated with each passage were scrambled within its passage-based block. A block generally consists of 6 to 7 items (or one passage), but the block size may vary depending on the test and module. Given the scrambling guidelines, constructed-response (CR) items appeared in the same position on all forms.

ITEM SCRAMBLING GUIDELINES

- Items must remain in the same block on all forms within a given administration.
- Items can be swapped only within a given block and cannot move between blocks.
- DRC will work with PDE content experts to ensure that the scrambling does not result in making content more difficult than with the original item order. Items of similar cognitive complexity will be swapped rather than random scrambling.
- Item swap candidates are only valid if the resulting swap does not create an invalid key distribution—either within a block or between blocks (e.g., item swaps must not create more than three (3) of the same key positions in a row).
- Item swap candidates are only valid if the resulting swap does not create an invalid standard distribution (within a block or between blocks).
- Item swaps must not place a difficult item as the first item in a section (including the start of a test).
- For passage-based items, item swap candidates are only valid if the resulting swap does not create dissonance between the item and passage(s).
- Item swaps must not place a difficult item as the first item in a passage set.
- Within a set of items connected to a paired set of passages, an item associated with both passages can be swapped only with another item associated with both passages. These items must remain at the end of the set of items associated with the passage set.

ANALYSES OF ITEM-SCRAMBLING EFFECTS

Item position change could potentially change the item difficulty. As a result, some scrambled forms may appear more difficult than others even though the items are the same. The item-scrambling effects were checked by comparing the *p*-value and logit (i.e., item difficulty parameter) differences between the scrambled forms (e.g., F1, F3) and the master form (form 2, F2). Tables N–1 through N–9 in Appendix N provide the item sequence, *p*-value, and logit differences at the item level. Note that only the operational MC items are reported in these tables because the operational CR items remain in the same positions on all forms. The summary statistics of the item sequence, *p*-value, and logit differences are provided at the bottom of each table. As can be seen in these tables, the average sequence change is 0. The average *p*-value and logit changes are close to 0. These results indicate that the item position change was canceled out and, overall, the item difficulties of the scrambled forms are similar to the difficulties of the master core forms in all content areas.

Tables N–10 through N–18 in Appendix N provide the scaled score for each form and for the overall test. The difference of the scaled score for each raw score point is very small and within the standard error of measurement. The values in these tables further confirm that there were no significant item scrambling effects that might disadvantage some students just because they took a certain form.

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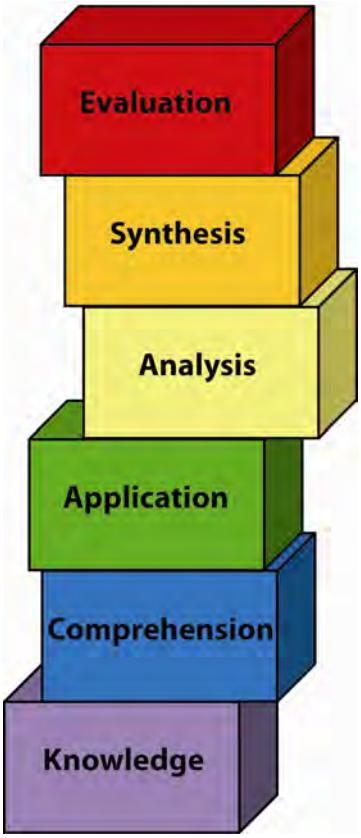
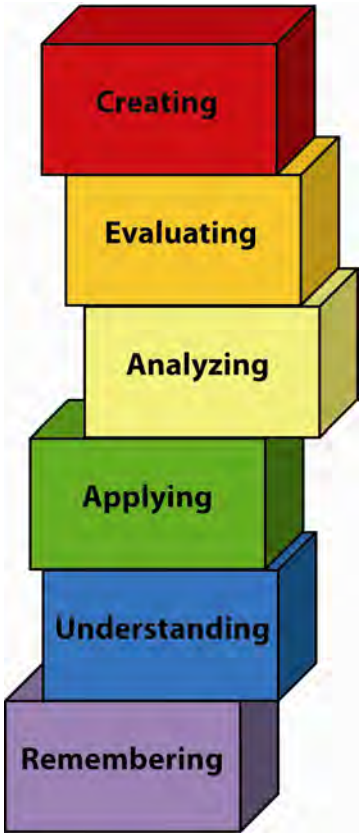
APPENDIX A: UNDERSTANDING DEPTH OF KNOWLEDGE AND COGNITIVE COMPLEXITY

One of the steps in the item review process involves Pennsylvania educators' review of items for cognitive complexity or the nature of thinking. One model for classifying thinking into cognitive levels of complexity is Bloom's Taxonomy. Bloom's Taxonomy was first presented in 1956 through the publication, The Taxonomy of Educational Objectives, The Classification of Educational Goals, Handbook I: Cognitive Domain. This taxonomy identifies six levels within the cognitive domain, from the simple recall or recognition of facts, at the lowest level, through increasingly more complex levels, to the highest level which is classified as evaluation.

During the late 1990s, the original Bloom's Taxonomy was revised (Anderson and Krathwohl, 2001). In the 2001 version of Bloom's Taxonomy, the names of the six major cognitive process categories or levels were revised to indicate action (verbs) rather than non-action (nouns) as noted in the graphic below.



Bloom's Taxonomy (1956)



Revised Taxonomy (2001)

More recently, Webb's Depth-of-Knowledge Levels have also been used in the review of items for cognitive demand. Webb's Depth of Knowledge was created by Norman Webb from the Wisconsin Center for Education Research. Webb's definition of depth of knowledge is the degree or complexity of knowledge that the content curriculum standards and expectations require. Therefore, when reviewing items for depth of knowledge, the item is reviewed to determine whether or not it is as demanding cognitively as what the actual content curriculum standard expects. In the case of the Pennsylvania Keystone items, the item meets the criterion if the depth of knowledge of the item is in alignment with the depth of knowledge of the Assessment Anchor as defined by the Eligible Content.

Webb's Depth of Knowledge includes four levels, from the lowest (basic recall) to the highest (extended thinking). Verb examples that represent each level in Webb's Depth of Knowledge can be found in the information that follows. However, verbs alone do not describe the depth of knowledge. Rather, depth of knowledge also focuses upon how well the students need to know the content before they can respond to a given item.

Because Bloom's Taxonomy (1956) is very familiar to many teachers, information comparing Bloom's Taxonomy and Webb's Depth of Knowledge is provided to Pennsylvania educators during the review of the Keystone items. The comparison serves as a "bridge" for teachers to understand Webb's Depth of Knowledge as compared to Bloom's Taxonomy.

ALGEBRA I DEPTH OF KNOWLEDGE

DEPTH OF KNOWLEDGE GUIDELINES FOR REVIEW OF ALGEBRA I, ALGEBRA II, AND GEOMETRY ITEMS

Committees of Pennsylvania educators review each Keystone Exam item, not only to determine whether or not the item measures what it is intended to measure, but also to determine whether or not the item aligns with the cognitive level or depth of knowledge of the Assessment Anchor as defined by the Eligible Content. The information below provides a definition of the four depth-of-knowledge levels. The charts at the end of the section also provide a comparison between Bloom's Taxonomy and Webb's Depth of Knowledge for mathematics (Algebra I, Algebra II, and Geometry). Included are examples of verbs (i.e., the action). Using this information as well as the charts, Pennsylvania educators are asked to determine the depth of knowledge of each item and to verify that the depth of knowledge of each item is in alignment with the depth of knowledge of the Assessment Anchor as defined by the Eligible Content.

DEFINITIONS OF WEBB'S DEPTH OF KNOWLEDGE

Level 1 (*Recall*) requires the recall of information such as a fact, definition, term, or a simple procedure, as well as performing a simple algorithm or applying a formula. That is, in mathematics, a one-step, well-defined, and straight algorithmic procedure should be included at this lowest level. Other key words that signify Level 1 include "identify," "recall," "recognize," "use," and "measure." Verbs such as "describe" and "explain" could be classified at different levels, depending on what is to be described and explained.

Level 2 (*Skill/Concept*) requires the engagement of some mental processing beyond a habitual response. A Level 2 item requires students to make some decisions as to how to approach the problem or activity, whereas Level 1 requires students to demonstrate a rote response, perform a well-known algorithm, follow a set procedure (like a recipe), or perform a clearly defined series of steps. Keywords that generally distinguish a Level 2 item include "classify," "organize," "estimate," "make observations," "collect and display data," and "compare data." These actions imply more than one step. For example, to compare data requires first identifying characteristics of objects or phenomena and then grouping or ordering the objects. Some action verbs, such as "explain," "describe," or "interpret," could be classified at different levels depending on the object of the action. For example, interpreting information from a simple graph, or reading information from the graph, are also at Level 2. Interpreting information from a complex graph that requires some decisions on what features of the graph need to be considered and how information from the graph can be aggregated is at Level 3. Level 2 activities are not limited only to number skills, but may involve visualization skills and probability skills. Other Level 2 activities include noticing or describing non-trivial patterns; explaining the purpose and use of experimental procedures; carrying out experimental procedures; making observations and collecting data; classifying, organizing, and comparing data; and organizing and displaying data in tables, graphs, and charts.

Level 3 (*Strategic Thinking*) requires reasoning, planning, using evidence, and a higher level of thinking than the previous two levels. In most instances, requiring students to explain their thinking is at Level 3. Activities that require students to make conjectures are also at this level. The cognitive demands at Level 3 are complex and abstract. The complexity does not result from the fact that there are multiple answers, a possibility for both Levels 1 and 2, but because the task requires more demanding reasoning. An activity, however, that has more than one possible answer and requires students to justify the response they give would most likely be at Level 3. Other Level 3 activities include drawing conclusions from observations; citing evidence and developing a logical argument for concepts; explaining phenomena in terms of concepts; and deciding which concepts to apply in order to solve a complex problem.

Level 4 (*Extended Thinking*) requires complex reasoning, planning, developing, and thinking most likely over an extended period of time. The extended time period is not a distinguishing factor if the required work is only repetitive and does not require applying significant conceptual understanding and higher-order thinking. For example, if a student has to take the water temperature from a river each day for a month and then construct a graph, this would be classified as a Level 2. However, if the student is to conduct a river study that requires taking into consideration a number of variables, this would be a Level 4. At Level 4, the cognitive demands of the task should be high and the work should be very complex. Students should be required to make several connections—relate ideas *within* the content area or *among* content areas—and have to select one approach among many alternatives on how the situation should be solved, in order to be at this highest level. Level 4 activities include designing *and* conducting experiments and projects; developing and proving conjectures; making connections between a finding and related concepts and phenomena; combining and synthesizing ideas into new concepts; and critiquing experimental designs.

Note: Multiple-choice and constructed-response items can be written at a depth-of-knowledge Level 4; however, to design an item in this format is difficult, as it would require research, investigation, and application, often over an extended period of time (e.g., performance-based tasks; portfolios; research studies/projects).

(Webb, N. 1997, 1999, 2002, 2005, 2006)

Table A–1. Bloom's Taxonomy – Algebra I

Categories (1956)	Definition	Examples of Action Words*
Knowledge	Student remembers, or recalls appropriate previously learned information.	define; identify; name; select; state; order; (involves a one-step problem)
Comprehension	Student translates, comprehends, or interprets information based on prior learning.	convert; estimate; explain; express; factor; generalize; give example; identify; indicate; locate; picture; (involves two or more steps)
Application	Student selects, transfers, and uses data and principles to complete a task or problem with minimum directions.	apply; choose; compute; employ; interpret; graph; modify; operate; plot; practice; solve; use; (involves three or more steps)
Analysis	Student distinguishes, classifies, and relates assumptions, hypotheses, evidence, or structure of a statement or question.	compare; contrast; correlate; differentiate; discriminate; examine; infer; maximize; minimize; prioritize; subdivide; test
Synthesis	Student originates, integrates, and combines ideas into a product, plan, or proposal that is new to him or her.	arrange; collect; construct; design; develop; formulate; organize; set up; prepare; plan; propose; create experiment and record data
Evaluation	Student appraises, assesses, or critiques on a basis of specific standards and criteria.	appraise; assess; defend estimate; evaluate; judge; predict; rate; validate; verify

Table A–2.Webb's Depth of Knowledge – Algebra I

Categories	Definition	Example of Action Words*
Recall	Student recalls facts, information, procedures, or definitions.	define; identify; name; select; state; order; one step
Basic Application of Skill/Concept	Student uses information, conceptual knowledge, and procedures.	apply; choose; compute; employ; interpret; graph; modify; operate; plot; practice; solve; use; two or more steps
Strategic Thinking	Student uses reasoning and develops a plan or sequence of steps; process has some complexity.	compare; contrast; correlate; differentiate; discriminate; examine; infer; maximize; minimize; prioritize; subdivide; test
Extended Thinking	Student conducts an investigation, needs time to think and process multiple conditions of the problem or task. (The item/task generally requires several days or weeks to complete.)	arrange; collect; construct; design; develop; formulate; organize; set up; prepare; plan; propose; create experiment and record data

*Some action words (verbs) can be classified at different depth-of-knowledge levels depending on the context of the item and the complexity of the action.

BIOLOGY DEPTH OF KNOWLEDGE

BIOLOGY DEPTH OF KNOWLEDGE

Note: "Knowledge" can refer both to content knowledge and knowledge of scientific processes. This meaning of knowledge is consistent with the *National Science Education Standards* (NSES), which terms "Science as Inquiry" as its first Content Standard.

Committees of Pennsylvania educators review each Keystone Exam item, not only to determine whether or not the item measures what it is intended to measure, but also to determine whether or not the item aligns with the cognitive level or depth of knowledge of the Assessment Anchor as defined by the Eligible Content. The information below provides a definition of the four depth-of-knowledge levels. The charts at the end of the section also provide a comparison between Bloom's Taxonomy and Webb's Depth of Knowledge for biology. Included are examples of verbs (i.e., the action). Using this information as well as the charts, Pennsylvania educators are asked to determine the depth of knowledge of each item and to verify that the depth of knowledge of each item is in alignment with the depth of knowledge of the Assessment Anchor as defined by the Eligible Content.

DEFINITIONS OF WEBB'S DEPTH OF KNOWLEDGE

Level 1 (*Recall*) requires the recall of information, such as a fact, definition, term, or a simple procedure, as well as performance of a simple science process or procedure. Level 1 only requires students to demonstrate a rote response, use a well-known formula, follow a set procedure (like a recipe), or perform a clearly defined series of steps. A "simple" procedure is well defined and typically involves only one step. Verbs such as "identify," "recall," "recognize," "use," "calculate," and "measure" generally represent cognitive work at the recall level. Simple word problems that can be directly translated into and solved by a formula are considered Level 1. Verbs such as "describe" and "explain" could be classified at different depth-of-knowledge levels, depending on the complexity of what is to be described and explained.

A student answering a Level 1 item either knows the answer or does not: that is, the item does not need to be "figured out" or "solved." In other words, if the knowledge necessary to answer an item automatically provides the answer to it, then the item is at Level 1. If the knowledge needed to answer the item is not automatically provided in the stem, the item is at least at Level 2. Some examples that represent but do not constitute all Level 1 performance are as follows:

- Recall or recognize a fact, term, or property.
- Represent in words or diagrams a scientific concept or relationship.
- Provide or recognize a standard scientific representation for simple phenomenon.
- Perform a routine procedure, such as measuring length.

Level 2 (*Skills and Concepts*) requires the engagement of some mental processing beyond recalling. The content knowledge or process involved is **more complex** than in Level 1. Items require students to make some decisions as to how to approach the question or problem. Keywords that generally distinguish a Level 2 item include "classify," "organize," "estimate," "make observations," "collect and display data," and "compare data." These actions imply **more than one step**. For example, to compare data requires first identifying characteristics of the objects or phenomena and then grouping or ordering the objects. Level 2 activities include making observations and collecting data; classifying, organizing, and comparing data; and organizing and displaying data in tables, graphs, and charts. Some action verbs, such as "explain," "describe," or "interpret," could be classified at different depth-of-knowledge levels, depending on the complexity of the action. For example, interpreting information from a simple graph, which requires reading information from the graph, is a Level 2. An item that requires interpretation from a complex graph, such as making decisions regarding features of the graph that need to be considered and how information from the graph can be aggregated, is at Level 3. Some examples that represent but do not constitute all of Level 2 performance are as follows:

- Specify and explain the relationship between facts, terms, properties, or variables.
- Describe and explain examples and non-examples of science concepts.
- Select a procedure according to specified criteria and perform it.
- Formulate a routine problem, given data and conditions.
- Organize, represent, and interpret data.

Level 3 (*Strategic Thinking*) requires reasoning, planning, using evidence, and a higher level of thinking than the previous two levels. The cognitive demands at Level 3 are complex and abstract. The complexity does not result only from the fact that there could be multiple answers, a possibility for both Levels 1 and 2, but because the multi-step task requires more demanding reasoning. In most instances, requiring students to explain their thinking is at Level 3; requiring a very simple explanation or a word or two should be at Level 2. An activity that has more than one possible answer and requires students to justify the response they give would most likely be a Level 3. Experimental designs in Level 3 typically involve more than one dependent variable. Other Level 3 activities include drawing conclusions from observations; citing evidence and developing a logical argument for concepts; explaining phenomena in terms of concepts; and using concepts to solve non-routine problems. Some examples that represent but do not constitute all Level 3 performance are as follows:

- Identify research questions and design investigations for a scientific problem.
- Solve non-routine problems.
- Develop a scientific model for a complex situation.
- Form conclusions from experimental data.

Level 4 (*Extended Thinking*) requires high cognitive demands and complexity. Students are required to make several connections—relate ideas within the content area or among content areas—and have to select or devise one approach among many alternatives to solve the problem. Many on-demand assessment instruments will not include any assessment activities that could be classified as Level 4. However, standards, goals, and objectives can be stated in such a way as to expect students to perform extended thinking. "Develop generalizations of the results obtained and the strategies used and apply them to new problem situations," is an example of a grade 8 objective that is a Level 4. Many, but not all, performance assessments and open-ended assessment activities requiring significant thought will be Level 4.

Level 4 involves complex reasoning, experimental design and planning, and probably will require an extended period of time either for the science investigation required by an objective, or for carrying out the multiple steps of an assessment item. However, the extended time period is not a distinguishing factor if the required work is only repetitive and does not require applying significant conceptual understanding and higher-order thinking. For example, if a student is asked to take the water temperature from a river each day for a month and then construct a graph, this would be classified as a Level 2 activity. However, if the student conducts a river study that requires taking into consideration a number of variables, this would be a Level 4. Some examples that represent but do not constitute all Level 4 performance are as follows:

- Based on data provided from a complex experiment that is novel to the student, deduct the fundamental relationship between several controlled variables.
- Conduct an investigation, from specifying a problem to designing and carrying out an experiment, to analyzing its data and forming conclusions.

Note: Multiple-choice and constructed-response items can be written at a depth-of-knowledge Level 4; however, to design an item in this format is difficult, as it would require research, investigation, and application, often over an extended period of time (e.g. performance-based tasks, portfolios, research studies/projects).

(Webb, N. 1997, 1999, 2002, 2005, 2006)

Table A–3. Bloom's Taxonomy – Biology

Categories (1956)	Definition	Examples of Action Words*
Knowledge	Student remembers, or recalls appropriate previously learned information.	identify; recall; observe; recognize; use; calculate; measure; order
Comprehension	Student translates, comprehends, or interprets information based on prior learning.	explain; interpret; describe; classify; identify; recognize; predict
Application	Student selects, transfers, and uses data and principles to complete a task or problem with minimum directions.	apply; classify; experiment; interpret; use; order; calculate
Analysis	Student distinguishes, classifies, and relates assumptions, hypotheses, evidence, or structure of a statement or question.	analyze; order; explain; classify; arrange; compare; contrast; infer; calculate; categorize; examine; experiment; question; test
Synthesis	Student originates, integrates, and combines ideas into a product, plan, or proposal that is new to him or her.	combine; arrange; rearrange; modify; invent; design; construct; organize; predict; infer; conclude; create; experiment and record data
Evaluation	Student appraises, assesses, or critiques on a basis of specific standards and criteria.	evaluate; measure; explain; compare; summarize; predict; test decide; rate; conclude

Table A–4. Webb's Depth of Knowledge – Biology

Categories	Definition	Examples of Action Words*
Recall	Student recalls facts, information, procedures, or definitions.	identify; recall; observe; recognize; use; calculate; measure; order
Basic Application of Skill/Concept	Student uses information, conceptual knowledge, and procedures.	explain; interpret; describe; classify; identify; order; recognize; predict; apply; use; calculate; organize; estimate; observe; collect; and display data
Strategic Thinking	Student uses reasoning and develops a plan or sequence of steps; process has some complexity.	analyze; order; explain; classify; arrange; compare; contrast; infer; interpret; calculate; categorize; examine; experiment; question; predict; evaluate; test
Extended Thinking	Student conducts an investigation, needs time to think and process multiple conditions of the problem or task. (The item/task generally requires several days or weeks to complete.)	combine; arrange; rearrange; propose; evaluate; modify; invent; design; construct; organize; predict; infer; conclude; evaluate; create; experiment and record data

*Some action words (verbs) can be classified at different depth-of-knowledge levels depending on the context of the item and the complexity of the action.

LITERATURE DEPTH OF KNOWLEDGE

LITERATURE DEPTH OF KNOWLEDGE

Note: The levels are based on Valencia and Wixson (2000, pp. 909–935).

Committees of Pennsylvania educators review each Keystone Exam item, not only to determine whether or not the item measures what it is intended to measure, but also to determine whether or not the item aligns with the cognitive level or depth of knowledge of the Assessment Anchor as defined by the Eligible Content. The information below provides a definition of the four depth-of-knowledge levels. The charts at the end of the section also provide a comparison between Bloom's Taxonomy and Webb's Depth of Knowledge for literature. Included are examples of verbs (i.e., the action). Using this information as well as the charts, Pennsylvania educators are asked to determine the depth of knowledge of each item and to verify that the depth of knowledge of each item is in alignment with the depth of knowledge of the Assessment Anchor as defined by the Eligible Content.

DEFINITIONS OF WEBB'S DEPTH OF KNOWLEDGE

Level 1 requires students to receive or recite facts or to use simple skills or abilities. Oral reading that does not include analysis of the text, as well as basic comprehension of a text, is included. Items require only a shallow understanding of the text presented and often consist of verbatim recall from text, slight paraphrasing of specific details from the text, or simple understanding of a single word or phrase. Some examples that represent but do not constitute all Level 1 performance are as follows:

- Support ideas by reference to verbatim or only slightly paraphrased details from the text.
- Use a dictionary to find the meanings of words.
- Recognize figurative language in a reading passage.

Level 2 requires the engagement of some mental processing beyond recalling or reproducing a response; it requires both comprehension and subsequent processing of text or portions of text. Inter-sentence analysis of inference is required. Some important concepts are covered, but not in a complex way. Content curriculum standards and items at this level may include words such as summarize, interpret, infer, classify, organize, collect, display, compare, and determine whether fact or opinion. Literal main ideas are stressed. A Level 2 item may require students to apply skills and concepts that are covered in Level 1. However, items require closer understanding of text, possibly through the item's paraphrasing of both the question and the answer. Some examples that represent but do not constitute all Level 2 performance are as follows:

- Use context cues to identify the meaning of unfamiliar words, phrases, and expressions that could otherwise have multiple meanings.
- Predict a logical outcome based on information in a selection.
- Identify and summarize the major events in a narrative.

Level 3 requires deeper knowledge. Students are encouraged to go beyond the text; however, they are still required to show understanding of the ideas in the text. Students may be encouraged to explain, generalize, or connect ideas. Content curriculum standards and items (Assessment Anchors as defined by the Eligible Content) at Level 3 involve reasoning and planning. Students must be able to support their thinking. Items may involve abstract theme identification, inference across an entire passage, or students' application of prior knowledge. Items may also involve more superficial connections between texts. Some examples that represent but do not constitute all Level 3 performance are as follows:

- Explain or recognize how the author's purpose affects the interpretation of a selection.
- Summarize information from multiple sources to address a specific topic.
- Analyze and describe the characteristics of various types of literature.

Level 4 requires higher-order thinking and deep knowledge. The content curriculum standard or item at this level will probably require an extended activity, with extended time provided for completing it. The extended time period is not a distinguishing factor if the required work is only repetitive and does not require the application of significant conceptual understanding and higher-order thinking. Students take information from at least one passage of a text and are asked to apply this information to a new task. They may also be asked to develop hypotheses and perform complex analyses of the connections among texts. Some examples that represent but do not constitute all Level 4 performance are as follows:

- Analyze and synthesize information from more than one source.
- Examine and explain alternative perspectives across a variety of sources.
- Describe and illustrate how common themes are found across texts from different cultures.

Note: Multiple-choice and constructed-response items can be written at a depth-of-knowledge Level 4; however, to design an item in this format is difficult, as it would require research, investigation, and application, often over an extended period of time (e.g. performance-based tasks, portfolios, research studies/projects).

(Webb, N. 2005; Valencia and Wixson, 2000)

Table A–5. Bloom's Taxonomy – Literature

Categories (1956)	Definition	Examples of Action Words*
Knowledge	Student remembers, or recalls appropriate previously learned information.	define; identify; name; recall; recognize; select; tell
Comprehension	Student translates, comprehends, or interprets information based on prior learning.	describe; distinguish; explain; identify; indicate; interpret; locate; recognize; restate; summarize
Application	Student selects, transfers, and uses data and principles to complete a task or problem with minimum directions.	apply; choose; demonstrate; determine; interpret; inform; select; show; use
Analysis	Student distinguishes, classifies, and relates assumptions, hypotheses, evidence, or structure of a statement or question.	analyze; characterize; compare; contrast; discriminate; distinguish; explain; infer
Synthesis	Student originates, integrates, and combines ideas into a product, plan, or proposal that is new to him or her.	compose; create; develop; formulate; generalize; organize
Evaluation	Student appraises, assesses, or critiques on a basis of specific standards and criteria.	assess; conclude; convince; defend; evaluate; explain; justify; predict; prove; support

Table A–6. Webb's Depth of Knowledge – Literature

Categories	Definition	Examples of Action Words*
Recall	Student recalls facts, information, procedures, or definitions.	define; identify; locate; name; recall; recognize; sequence; tell
Basic Application of Skill/Concept	Student uses information, conceptual knowledge, and procedures.	apply; compare; comprehend; identify; describe; determine; infer; interpret; predict; summarize; use
Strategic Thinking	Student uses reasoning and develops a plan or sequence of steps; process has some complexity.	analyze; cite evidence; compare; contrast; draw conclusions; explain; generalize; infer; interpret; evaluate; recognize; summarize; support
Extended Thinking	Student conducts an investigation, needs time to think and process multiple conditions of the problem or task. (The item/task generally requires several days or weeks to complete.)	describe and illustrate; evaluate; examine and explain; analyze; synthesize

*Some action words (verbs) can be classified at different depth-of-knowledge levels depending on the context of the item and the complexity of the action.

APPENDIX B: GENERAL SCORING GUIDELINES

ALGEBRA I

ALGEBRA I CONSTRUCTED-RESPONSE QUESTIONS

GENERAL DESCRIPTION OF SCORING GUIDELINES

4 Points

- The response demonstrates a *thorough* understanding of the mathematical concepts and procedures required by the task.
- The response provides correct answer(s) with clear and complete mathematical procedures shown and a correct explanation, as required by the task. Response may contain a minor "blemish" or omission in work or explanation that does not detract from demonstrating a *thorough* understanding.

3 Points

- The response demonstrates a *general* understanding of the mathematical concepts and procedures required by the task.
- The response and explanation (as required by the task) are mostly complete and correct. The response may have minor errors or omissions that do not detract from demonstrating a *general* understanding.

2 Points

- The response demonstrates a *partial* understanding of the mathematical concepts and procedures required by the task.
- The response is somewhat correct with *partial* understanding of the required mathematical concepts and/or procedures demonstrated and/or explained. The response may contain some work that is incomplete or unclear.

1 Point

- The response demonstrates a *minimal* understanding of the mathematical concepts and procedures required by the task.

0 Points

- The response has no correct answer and *insufficient* evidence to demonstrate any understanding of the mathematical concepts and procedures required by the task.

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BIOLOGY

BIOLOGY MODULE 1

BIOLOGY CONSTRUCTED-RESPONSE QUESTIONS

GENERAL DESCRIPTION OF SCORING GUIDELINES

3 Points

- The response demonstrates a *thorough* understanding of the scientific content, concepts, and/or procedures required by the task(s).
- The response provides a clear, complete, and correct response as required by the task(s). The response may contain a minor blemish or omission in work or explanation that does not detract from demonstrating a *thorough* understanding.

2 Points

- The response demonstrates a *partial* understanding of the scientific content, concepts, and/or procedures required by the task(s).
- The response is somewhat correct with *partial* understanding of the required scientific content, concepts, and/or procedures demonstrated and/or explained. The response may contain some work that is incomplete or unclear.

1 Point

- The response demonstrates a *minimal* understanding of the scientific content, concepts, and/or procedures required by the task(s).
- The response is somewhat correct with *minimal* understanding of the required scientific content, concepts, and/or procedures demonstrated and/or explained. The response may contain some work that is incomplete or unclear.

0 Points

- The response provides *insufficient* evidence to demonstrate any understanding of the scientific content, concepts, and/or procedures as required by the task(s).
- The response may show only information copied or rephrased from the question or *insufficient* correct information to receive a score of 1.

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LITERATURE

LITERATURE CONSTRUCTED-RESPONSE QUESTIONS

GENERAL DESCRIPTION OF SCORING GUIDELINES

3 Points

- The response provides a clear, complete, and accurate answer to the task.
- The response provides relevant and specific information from the passage.

2 Points

- The response provides a partial answer to the task.
- The response provides limited information from the passage and may include inaccuracies.

1 Point

- The response provides a minimal answer to the task.
- The response provides little or no information from the passage and may include inaccuracies.

OR

- The response relates minimally to the task.

0 Points

- The response is totally incorrect or irrelevant or contains insufficient information to demonstrate comprehension.

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APPENDIX C: ITEM AND TEST DEVELOPMENT PROCESS FOR THE KEYSTONE EXAMS

Table C–1. Item and Test Development Process for the Keystone Exams

Step	Description
1. Review Guiding Documentation	Each year item and test development specialists meet internally to review all guiding documentation related to the Keystone Exams. Documentation reviewed includes the test design blueprints, the Keystone Assessment Anchors and Eligible Content, the test item specifications, the test style specifications (style guide), and all test content descriptions.
2. Meet with PDE to Confirm Understanding of Program	The goal of the meeting each year is to ensure that item and test development teams have a clear understanding of PDE's vision for test development. A successful development cycle requires a clear understanding of Pennsylvania's content-area test specifications and of any unique interpretations of the Keystone Assessment Anchors (if any).
3. Create Preliminary Test Item Development Plan	Item and test development specialists generate a preliminary development plan which includes an overview of the program, the internal and external (PDE) review and approval processes, a projected schedule for development of test items—including the number of test items to be developed for review by PDE and subsequent review by the committees of Pennsylvania educators. Item and test development specialists also generate strategies for securing passages and developing passage-based items, etc.
4. Meet with PDE to Finalize Test Item Development Plan	Over the course of the meeting, item and test development specialists verify all steps in the development process including timelines and schedules for test item/test development.
5. Analyze Item Bank	Existing test items in the current Keystone Exams Item Bank are reviewed for technical psychometric quality as well as for their match to the Assessment Anchors. During this phase, test development specialists also make a tally of the test items by Assessment Anchor—including test development specialists' best thinking regarding the number of usable test items in the existing item bank. A tally is also made of the number of usable passages, as well as other stimulus prompts in the bank, including science scenarios.
6. Refine Test Item Development Plan to Include Writers and Subcontractors	Item and test development specialists identify the writers who will write the test items (test development specialists or other professional item writers, subcontractors, etc.), the estimated number of writers needed, the qualifications of writers, and the approximate number of test items to be submitted by each source.
7. Train Item Writers	Item and test development specialists train item writers, as needed. Item writers who have written for the Keystone Exams in the past receive updated information, as needed.

Table C–1 (continued). Item and Test Development Process for the Keystone Exams

Step	Description
8. Write and Review Items	Test items are written by item writers after training is complete, and feedback is provided by the item and test development specialists to item writers on a regular basis. As test items are written, they are reviewed and edited in a series of internal reviews. Item and test development specialists review and edit items to include, but not limited to, the following: match to Assessment Anchor/Eligible Content, relevance to purpose, accuracy of content, item difficulty, interest level, depth of knowledge and cognitive complexity, adherence to the principles of Universal Design, and freedom from issues of bias/fairness/sensitivity. At the same time, the process of procuring permissions also begins, including securing permissions for passages, art, etc.
9. Enter Test Items into Database	Upon acceptance from item writers, test items are entered into the item management system, IDEAS (*Item Development and Educational Assessment System*). Item data stored in the system database includes, but is not limited to, the following: readability, cognitive level, estimated level of difficulty, alignment to assessment anchors, and correlation to stimulus passages.
10. Prepare Item Set for Sample Item Review by PDE	Item and test development specialists prepare a subset of the items for review by PDE.
11. PDE Conducts Sample Item Review	After a subset of the items is submitted to PDE for review, PDE reviews the items and provides feedback to item and test development teams via a conference call. Items are revised per PDE feedback.
12. Continue to Write and Review Items	The remaining items are written, and feedback is provided by the item and test development specialists to item writers on a regular basis. Items are entered into the item management system, IDEAS (*Item Development and Educational Assessment System*) (See step 8 and step 9).
13. Review Items Prior to Test Item Review and Validation Sessions	Prior to New Item Content Review, all items are submitted to PDE for review. Item and test development specialists incorporate all PDE feedback, and PDE-requested edits to items are made.
14. Prepare for Test Item Review Sessions (the New Item Content Review and the Bias, Fairness, and Sensitivity Review)	Item and test development specialists prepare all items and stimulus passages for review by the New Item Content Review Committee (consisting of Pennsylvania educators) and by the separate Bias, Fairness, and Sensitivity Committee (consisting of a panel of experts). Item and test development specialists also prepare training materials needed for training committee members to review items for content or for bias, fairness, and sensitivity issues. All training materials and other ancillary materials (e.g. agendas, presentations, etc.) are also developed and then submitted to PDE for review and approval. Invitations are also sent to Pennsylvania educators and national experts from PDE-approved committee lists.

Table C–1 (continued). Item and Test Development Process for the Keystone Exams

Step	Description
15. Conduct Test Item Review Sessions (the New Item Content Review and the Bias, Fairness, and Sensitivity Review)	Committees of Pennsylvania educators and national experts review items in two meetings: one addressing item content and quality, the other addressing bias, fairness, and sensitivity. PDE, with support from item and test development specialists, presents training on how to review new test items for content considerations or bias/fairness/sensitivity issues. At the New Item Content Review, suggested edits to test items are made and/or replacement test items are written during the actual item review so that both the committee and the PDE are able to observe changes to the test items and approve the test items during the committee review process. At the Bias, Fairness, and Sensitivity Review, experts in bias, fairness, and sensitivity review all test items and passages and come to a consensus about any issues that are noted. At both meetings the results are carefully documented.
16. Conduct Item Review Resolution and Cleanup	Following the conclusion of the New Item Content Review Committee meetings, PDE re-examines the consensus changes suggested by the committee members during the New Item Content Review Committee meetings. DRC item and test development specialists then record all of PDE's follow-up decisions and changes. During this cleanup process, PDE either accepts the changes as requested by the committee, or PDE rejects the decision of the committee. If a committee decision is rejected, PDE provides an alternate decision for DRC to implement. During this cleanup process, PDE also interprets the report from the Bias, Fairness, and Sensitivity Committee meetings and subsequently applies changes to test items and passages. DRC item and test development specialists then apply the changes to the test items and passages per PDE's decisions.
17. Submit Field Test Items for Final Sign-Off	PDE-approved changes are applied to the items, non-permissioned passages, prompts, etc. (Changes reflect PDE's arbitration of the committee decisions.) Once all revisions to the items, non-permissioned passage text, and/or the art used by test items and passages are completed, the test items are submitted to PDE for final review and sign-off. (Changes requested to permissioned passages are sought from the publisher of record, and, if approved by the copyright holders, changes are implemented.) [PDE's approval process for field test items generally occurs simultaneously with PDE's approval of the core test forms. See step 25.]
To follow the path for new field test items, skip to step 22. OR To follow the chronological test development path, continue with step 18.	

Table C–1 (continued). Item and Test Development Process for the Keystone Exams

Step	Description
18. Review Results of the Field Test	Following the administration of a field test form and the subsequent rangefinding and field test scoring processes for field test items, performance data for all field test items are analyzed by DRC psychometricians and test development specialists. Test item performance data that meet certain triggering criteria are flagged for additional reviews by test development specialists. Flagged field test items with extreme performance data are considered psychometrically unusable and are removed from future operational consideration. Field test items with marginal performance data are prepared for the Field Test Item Data Review meeting.
19. Prepare for Field Test Item Data Review	Test development specialists prepare all items and stimulus passages for review by the Field Test Item Data Review Committee (which consists of Pennsylvania educators). Psychometricians also prepare training materials needed for training committee members to review items for their performance. All training materials and other ancillary materials (e.g. agendas, presentations, etc.) are submitted to PDE for review and approval. Invitations are also sent to Pennsylvania educators from PDE-approved committee lists.
20. Conduct Field Test Item Data Review	Committees of Pennsylvania educators review the performance data of flagged field test items. Psychometricians present training on how to review field test items based on their performance data. At the Item Data Review, committee members examine the performance of the items and determine whether the field test item is technically sound and appropriate for use on an operational Keystone Exams test. Since test items cannot be modified at the Field Test Item Data Review, the committee can either accept an item as is or the committee can reject the item.
21. Conduct Field Test Item Data Review Reconciliation	Following the conclusion of the Field Test Item Data Review Committee meetings, PDE re-examines the consensus decisions (accept or reject) suggested by the committee members during the Field Test Item Data Review Committee meetings. Test development specialists record all of PDE's follow-up decisions and changes. During this cleanup process, PDE either accepts the decisions of the data review committee, or PDE rejects the decisions of the data review committee. If a committee decision is not accepted, PDE provides an alternate decision for test development specialists to implement. All PDE-approved changes to the test items status (accepted or rejected) are incorporated into the *Item Development and Educational Assessment System*, IDEAS.
22. Select Items to Fill Core, Field Test, and Equating Block Positions in Core and Field Test Forms	After the PDE-approved changes to the new field test items is completed AND the results of the prior field test have been finalized following data review, test development specialists collaborate with psychometricians to follow the Test Design Blueprints and build requirements to make the initial selection of items for core and field-test positions for all test forms. In later administrations, core-to-core linking items will also be selected during this step.

Table C–1 (continued). Item and Test Development Process for the Keystone Exams

Step	Description
23. Review Core and Equating Block Selections	After test content and psychometric requirements have been achieved for core, the core items are provided to PDE for review and approval. Any changes to the content of the core requested by PDE are balanced with psychometric requirements until all core positions are approved by PDE, test development specialists, and psychometricians.
24. Construct Test Forms	Items, passages, and test components are assembled into forms using the form construction and typesetting function of DRC's *Item Development and Educational Assessment System*, IDEAS. Forms are reviewed internally for style and formatting requirements.
25. Review Typeset Forms	After forms are constructed in IDEAS, draft hard copies of the forms are produced and presented to PDE for review and approval. Any changes to the content of the core requested by PDE are balanced with psychometric requirements until all core positions are approved by PDE, test development specialists, and psychometricians. PDE also re-reviews all field test items appearing in the test forms. DRC applies changes to the field test items as required.
26. Print Test Forms	Following PDE's approval of the test forms, DRC completes a series of final proofing of all test forms. Final forms (along with ancillary materials) are then approved for printing.
27. Assemble Documentation of Test Materials	Metadata for each test item and form is documented and proofed, including: grade, form, session/section, item sequence, reporting category, Assessment Anchor, Descriptor, Eligible Content, number of points, item type, number of answer options, item usage, stimulus ID, etc.
To follow the path for new field test items, return to step 18.	

APPENDIX D: ITEM AND DATA REVIEW CARD EXAMPLES

ITEM REVIEW CARD EXAMPLE

Standard: Compare and contrast cellular structures and their functions in prokaryotic and eukaryotic cells.

1. [illegible]

A. [illegible]

B. [illegible]

C. [illegible]

D. [illegible]

PA Keystone Item Card

Item ID	[illegible]
Content Area	Science
Course	Biology
Scenario ID	
Scenario Title	
Grade	HS
KAACS Standards	BIO.A.1.2.1
Item Type	Multiple Choice
Points	1
Depth of Knowledge	2
Est Difficulty	Medium
Key	D

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DATA REVIEW CARD EXAMPLE

Standard: Compare and/or order any real numbers (rational and irrational may be mixed).

PA Keystone Data Card

1.

Item ID	
Content Area	Mathematics
Course	Algebra I
Passage ID	
Passage Title	
Grade	HS
Standards	KAACS: A1.1.1.1.1
Item Type	Multiple Choice
Points	1
Calculator	Yes
Depth of Knowledge	2
Est Difficulty	High
Key	A
Focus	

A:
B:
C:
D:

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PA3 - Data Card continued

Administration

Name	Use Function	Rptg Flag	Seq	Period	Year	Day	Session	Calc	Model/Ext	Grade
							1	Yes		HS

Traditional Statistics

N	P-Val	Mean	Item Total Corr
	0.36		0.23

Fit Statistics

Outfit t	Infit t	Outfit MnSq	Infit MnSq	Chi-sq	Deg Free	Mean Sq	Fit
9.6	8.2	1.22	1.12				

IRT Statistics

Label	Final	Final S.E.	Preliminary	Preliminary S.E.
Location	1.09	0.04		

Distractor/Step Specific

Label	Proportion	Corr	Avg Meas	Step Meas
A*	0.36	0.23		
B	0.28	-0.05		
C	0.19	-0.13		
D	0.17	-0.10		
MULTS	0.00			
OMITS	0.00			

DIF Analysis

Category	Bias Code	Num Value	N - Ref	N - Focal
MALEFEMALE	A-	-0.23	2174	2029
PAPERONLINE	A-	-0.18	3320	893
WHITEBLACK	A-	-0.46	3392	389

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APPENDIX E: ITEM RATING SHEET AND CRITERIA GUIDELINES

ITEM RATING SHEET

Reviewer Signature: _____

Item Rating Sheet

Content Area: _____ **Module:** _____

May 2012	Content Alignment	Rigor Level Alignment				Technical Design			Universal Design		STATUS
Harrisburg, PA	Standards	Grade	Difficulty	Depth of Knowledge	Source of Challenge	Correct Answer	Distractors	Graphics	Language Demand	Bias	Acceptance Status
Unique ID number	—Higher —Lower —None	—Above —At —Below	—High —Medium —Low	—Recall —Application —Strategic Thinking	—Yes —No	—Yes —No	—Yes —No —N/A	—Yes —No —N/A	—Yes —No	—Yes —No	— Approved as is — Accepted with suggested revisions — Dissenting View

ITEM REVIEW CRITERIA GUIDELINES

The purpose of this form is to provide guidelines to the item review process in terms of item characteristics that are essential in building a fair and balanced assessment. Use these guidelines in conjunction with the Item Rating Sheet when recording your feedback on individual items.

Content Alignment		Options
Standards, Anchors, Eligible Content	Does the content of the item align with the Standard/Anchor/Eligible Content? Each item was written to assess a particular Standard/Anchor/ Eligible Content statement which is indicated on the individual Item Card. Consider the degree to which the item is, in fact, aligned with the indicated eligible content. In making this judgment, it is important to consider whether the **content** is aligned (e.g., do the eligible content and the item both deal with fractions) and whether the required **performance** is aligned (e.g., if the eligible content calls for a comparison to be made, is this reflected in the item).	**HIGHER**—Aligns to the higher level of the EC **LOWER**—Aligns to the lower level of the EC **NONE**—No alignment with EC

Rigor Level Alignment		Options
Grade	Is the item grade-level appropriate? Is the content consistent with the experiences of a student at the grade level assessed? Is the challenge level appropriate for the grade?	**ABOVE** Grade Level **AT** Grade Level **BELOW** Grade Level
Difficulty	Do you agree with the item's difficulty rating? Item Difficulty is indicated as Low, Medium, and High. Is your rating in agreement with the difficulty rating on the Item Form?	**HIGH** **MEDIUM** **LOW**
Depth of Knowledge	Depth of Knowledge is based on the alignment work of Norman Webb. Rate each item based on the cognitive demand, using the following levels: 1. Recall – ***Recall*** of a fact, information, or procedure. 2. Basic Application of Skill or Concept – ***Use*** of information, conceptual knowledge, procedures, two or more steps, etc. 3. Strategic Thinking – Requires reasoning, developing a plan or sequence of steps; has some complexity; more than one possible answer. 4. Extended Thinking – Requires an investigation, time to think and process multiple conditions of the problem or task, and more than 10 minutes to do non-routine manipulations. (This level is generally not assessed in on-demand assessments.)	**4** = Extended Thinking **3** = Strategic Thinking **2** = Basic Application **1** = Recall

Rigor Level Alignment		Options
Source of Challenge	Is the source of challenge appropriately targeted to the content? The hardest part of the item (i.e., source of challenge) should be the content that is targeted. For example, in mathematics, the mathematics should be the major source of challenge rather than the wording or graphic. Students should not give an incorrect answer to a mathematics item because the reading level is too high or a graphic is flawed. Conversely, students should not give correct answers for reasons such as prior knowledge that make the answer to the question obvious (e.g., if the question asks which country has the largest population and students are to read a graph that includes China, there is no need to read the graph to answer the question).	**Y** = Yes **N** = No

Technical Design		Options
Correct Answer	Is there one clear, correct answer option? There should be no other answer that "could" be correct. CAUTION: This does not mean that "good" distractors are unfair.	**Y** = Yes **N** = No
Distractors	Are distractors fair and appropriate? Distractors that are appropriate offer students reasonable choices that can be arrived at by making common errors. There should be no distractors that make no sense at all. It should be possible to examine each option and to reason how a student with some deficiency in knowledge or skill could choose it. The distractors should be formatted according to acceptable standards of test construction (e.g., a phrase that is common to each distractor should be in the stem).	**Y** = Yes **N** = No **N/A** = OE items do not have distractors
Graphics	Are the graphics clear and accurate?	**Y** = Yes **N** = No **N/A** = No graphic

Universal Design		Options
Language Demand	Is language clear, well-formatted, and precise? Does the item use correct terminology for the content area? In order for all students to enter into the questions of the assessment, they must be able to understand them. If the items are formatted poorly, use unnecessarily complex words or phrases, or use figures or layouts that are difficult to understand, some students will give incorrect answers due to these factors rather than the content that is being assessed.	**Y** = Yes **N** = No
Bias	Is the item free of bias? All students will not be able to enter into the assessment if bias considerations are not resolved. Does the item contain clear bias problems? *A thorough, independent bias review* (separate from this meeting) *will be completed for all items*.	**Y** = Yes **N** = No

Status		Options
Acceptance Status	This is an overall judgment about the item. Based on the consensus of the committee, indicate whether the item was approved without revision to the content of the item or whether the item was accepted by the committee after revision of the content of the item. If there is a dissenting view (opposed to the committee consensus), record a	**—Approved** as is **—Accepted** with suggested revisions

	brief explanation of the dissenting view on the back of the Item Rating Sheet.	**—Dissenting View**

NOTES:

- If you leave a box blank on the Item Rating Sheet, it will be recorded to indicate that you did not have any specific feedback for that item or issue.
- If you object to the consensus of the committee, please note this on the item rating sheet and then record a brief explanation of the dissenting view on the back of the Item Rating Sheet.
- **Do NOT remove any items from the item binder at any time.**
- You must sign your item rating sheet.

APPENDIX F: KEYSTONE EXAMS TALLY SHEETS

ALGEBRA I–WINTER 2012/2013

Keystone Exam **Algebra I**

Reporting Category	Assessment Anchor	Descriptor (Sub-anchor)	Eligible Content	Focus	Items: Number of Core Items MC	Items: Number of Core Items CR	Points: Core Points MC	Points: Core Points CR
A1.1: Operations and Linear Equations & Inequalities	1			**Operations with Real Numbers and Expressions**	0	1	0	4
	1	1	1	Compare and/or order any real numbers.	1	0	1	0
	1	1	2	Simplify square roots.	0	0	0	0
	1	2	1	Find the Greatest Common Factor (GCF) and/or the Least Common Multiple (LCM) for sets of monomials.	0	0	0	0
	1	3	1	Simplify/evaluate expressions involving properties/laws of exponents, roots, and/or absolute values to solve problems.	1	0	1	0
	1	4	1	Use estimation to solve problems.	1	0	1	0
	1	5	1	Add, subtract, and/or multiply polynomial expressions (express answers in simplest form).	1	0	1	0
	1	5	2	Factor algebraic expressions, including difference of squares and trinomials.	1	0	1	0
	1	5	3	Simplify/reduce a rational algebraic expression.	0	0	0	0
	Total For Assessment Anchor A1.1.1				5	1	5	4
	2			**Linear Equations**	0	1	0	4
	2	1	1	Write, solve, and/or apply a linear equation.	1	0	1	0
	2	1	2	Use and/or identify an algebraic property to justify any step in an equation-solving process.	1	0	1	0
	2	1	3	Interpret solutions to problems in the context of the problem situation.	1	0	1	0
	2	2	1	Write and/or solve a system of linear equations (including problem situations) using graphing, substitution, and/or elimination.	2	0	2	0
	2	2	2	Interpret solutions to problems in the context of the problem situation.	1	0	1	0
	Total For Assessment Anchor A1.1.2				6	1	6	4
	3			**Linear Inequalities**	0	1	0	4
	3	1	1	Write or solve compound inequalities and/or graph their solution sets on a number line .	1	0	1	0
	3	1	2	Identify or graph the solution set to a linear inequality on a number line.	2	0	2	0
	3	1	3	Interpret solutions to problems in the context of the problem situation.	2	0	2	0
	3	2	1	Write and/or solve a system of linear inequalities using graphing.	0	0	0	0
	3	2	2	Interpret solutions to problems in the context of the problem situation.	2	0	2	0
	Total For Assessment Anchor A1.1.3				7	1	7	4
Total For Reporting Category A1.1					18	3	18	12

Keystone Exam **Algebra I**

Reporting Category	Assessment Anchor	Descriptor (Sub-anchor)	Eligible Content	Focus	Items: Number of Core Items MC	Items: Number of Core Items CR	Points: Core Points MC	Points: Core Points CR
A1.2: Linear Functions and Data Organizations	1			**Functions**	0	1	0	4
	1	1	1	Analyze a set of data for the existence of a pattern and represent the pattern algebraically and/or graphically.	1	0	1	0
	1	1	2	Determine whether a relation is a function, given a set of points or a graph.	1	0	1	0
	1	1	3	Identify the domain or range of a relation.	1	0	1	0
	1	2	1	Create, interpret, and/or use the equation, graph, or table of a linear function.	1	0	1	0
	1	2	2	Translate from one representation of a linear function to another.	2	0	2	0
	Total For Assessment Anchor A1.2.1				6	1	6	4
	2			**Coordinate Geometry**	0	1	0	4
	2	1	1	Identify, describe, and/or use constant rates of change.	1	0	1	0
	2	1	2	Apply the concept of linear rate of change (slope) to solve problems.	1	0	1	0
	2	1	3	Write or identify a linear equation when given...	1	0	1	0
	2	1	4	Determine the slope and/or y-intercept represented by a linear equation or graph.	2	0	2	0
	2	2	1	Draw, identify, find, and/or write an equation for a line of best fit for a scatter plot.	1	0	1	0
	Total For Assessment Anchor A1.2.2				6	1	6	4
	3			**Data Analysis**	0	1	0	4
	3	1	1	Calculate and/or interpret the range, quartiles, and interquartile range of data.	1	0	1	0
	3	2	1	Estimate or calculate to make predictions based on a circle, line, bar graph, measures of central tendency, or other representations.	1	0	1	0
	3	2	2	Analyze data, make predictions, and/or answer questions based on displayed data.	3	0	3	0
	3	2	3	Make predictions using the equations or graphs of best-fit lines of scatter plots.	1	0	1	0
	3	3	1	Find probabilities for compound events.	0	0	0	0
	Total For Assessment Anchor A1.2.3				6	1	6	4
Total For Reporting Category A1.2					18	3	18	12

ALGEBRA I–SPRING 2013

Keystone Exam **Algebra I**

Reporting Category	Assessment Anchor	Descriptor (Sub-	Eligible Content	Focus	Items: Number of Core Items MC	Items: Number of Core Items CR	Points: Core Points MC	Points: Core Points CR
A1.1: Operations and Linear Equations & Inequalities	1			**Operations with Real Numbers and Expressions**	0	0	0	0
	1	1	1	Compare and/or order any real numbers.	1	0	1	0
	1	1	2	Simplify square roots.	0	0	0	0
	1	2	1	Find the Greatest Common Factor (GCF) and/or the Least Common Multiple (LCM) for sets of monomials.	0	0	0	0
	1	3	1	Simplify/evaluate expressions involving properties/laws of exponents, roots, and/or absolute values to solve problems.	2	0	2	0
	1	4	1	Use estimation to solve problems.	1	0	1	0
	1	5	1	Add, subtract, and/or multiply polynomial expressions (express answers in simplest form).	1	0	1	0
	1	5	2	Factor algebraic expressions, including difference of squares and trinomials.	0	0	0	0
	1	5	3	Simplify/reduce a rational algebraic expression.	1	0	1	0
	Total For Assessment Anchor A1.1.1				6	0	6	0
	2			**Linear Equations**	0	2	0	8
	2	1	1	Write, solve, and/or apply a linear equation.	1	0	1	0
	2	1	2	Use and/or identify an algebraic property to justify any step in an equation-solving process.	0	0	0	0
	2	1	3	Interpret solutions to problems in the context of the problem situation.	1	0	1	0
	2	2	1	Write and/or solve a system of linear equations (including problem situations) using graphing, substitution, and/or elimination.	1	0	1	0
	2	2	2	Interpret solutions to problems in the context of the problem situation.	1	0	1	0
	Total For Assessment Anchor A1.1.2				4	2	4	8
	3			**Linear Inequalities**	0	1	0	4
	3	1	1	Write or solve compound inequalities and/or graph their solution sets on a number line .	2	0	2	0
	3	1	2	Identify or graph the solution set to a linear inequality on a number line.	2	0	2	0
	3	1	3	Interpret solutions to problems in the context of the problem situation.	1	0	1	0
	3	2	1	Write and/or solve a system of linear inequalities using graphing.	1	0	1	0
	3	2	2	Interpret solutions to problems in the context of the problem situation.	2	0	2	0
	Total For Assessment Anchor A1.1.3				8	1	8	4
Total For Reporting Category A1.1					18	3	18	12

Keystone Exam **Algebra I**

Reporting Category	Assessment Anchor	Descriptor (Sub-anchor)	Eligible Content	Focus	Items: Number of Core Items MC	Items: Number of Core Items CR	Points: Core Points MC	Points: Core Points CR
A1.2: Linear Functions and Data Organizations	1			**Functions**	0	1	0	4
	1	1	1	Analyze a set of data for the existence of a pattern and represent the pattern algebraically and/or graphically.	2	0	2	0
	1	1	2	Determine whether a relation is a function, given a set of points or a graph.	2	0	2	0
	1	1	3	Identify the domain or range of a relation.	1	0	1	0
	1	2	1	Create, interpret, and/or use the equation, graph, or table of a linear function.	2	0	2	0
	1	2	2	Translate from one representation of a linear function to another.	1	0	1	0
	Total For Assessment Anchor A1.2.1				8	1	8	4
	2			**Coordinate Geometry**	0	1	0	4
	2	1	1	Identify, describe, and/or use constant rates of change.	2	0	2	0
	2	1	2	Apply the concept of linear rate of change (slope) to solve problems.	1	0	1	0
	2	1	3	Write or identify a linear equation when given...	2	0	2	0
	2	1	4	Determine the slope and/or y-intercept represented by a linear equation or graph.	1	0	1	0
	2	2	1	Draw, identify, find, and/or write an equation for a line of best fit for a scatter plot.	2	0	2	0
	Total For Assessment Anchor A1.2.2				8	1	8	4
	3			**Data Analysis**	0	1	0	4
	3	1	1	Calculate and/or interpret the range, quartiles, and interquartile range of data.	1	0	1	0
	3	2	1	Estimate or calculate to make predictions based on a circle, line, bar graph, measures of central tendency, or other representations.	0	0	0	0
	3	2	2	Analyze data, make predictions, and/or answer questions based on displayed data.	0	0	0	0
	3	2	3	Make predictions using the equations or graphs of best-fit lines of scatter plots.	1	0	1	0
	3	3	1	Find probabilities for compound events.	0	0	0	0
	Total For Assessment Anchor A1.2.3				2	1	2	4
Total For Reporting Category A1.2					18	3	18	12

ALGEBRA I–SUMMER 2013

Keystone Exam **Algebra I**

Reporting Category	Assessment Anchor	Descriptor (Sub-anchor)	Eligible Content	Focus	Items: Number of Core Items MC	Items: Number of Core Items CR	Points: Core Points MC	Points: Core Points CR
A1.1: Operations and Linear Equations & Inequalities	1			**Operations with Real Numbers and Expressions**	0	1	0	4
	1	1	1	Compare and/or order any real numbers.	0	0	0	0
	1	1	2	Simplify square roots.	0	0	0	0
	1	2	1	Find the Greatest Common Factor (GCF) and/or the Least Common Multiple (LCM) for sets of monomials.	1	0	1	0
	1	3	1	Simplify/evaluate expressions involving properties/laws of exponents, roots, and/or absolute values to solve problems.	1	0	1	0
	1	4	1	Use estimation to solve problems.	0	0	0	0
	1	5	1	Add, subtract, and/or multiply polynomial expressions (express answers in simplest form).	0	0	0	0
	1	5	2	Factor algebraic expressions, including difference of squares and trinomials.	0	0	0	0
	1	5	3	Simplify/reduce a rational algebraic expression.	0	0	0	0
	Total For Assessment Anchor A1.1.1				2	1	2	4
	2			**Linear Equations**	0	2	0	8
	2	1	1	Write, solve, and/or apply a linear equation.	2	0	2	0
	2	1	2	Use and/or identify an algebraic property to justify any step in an equation-solving process.	2	0	2	0
	2	1	3	Interpret solutions to problems in the context of the problem situation.	1	0	1	0
	2	2	1	Write and/or solve a system of linear equations (including problem situations) using graphing, substitution, and/or elimination.	2	0	2	0
	2	2	2	Interpret solutions to problems in the context of the problem situation.	1	0	1	0
	Total For Assessment Anchor A1.1.2				8	2	8	8
	3			**Linear Inequalities**	0	0	0	0
	3	1	1	Write or solve compound inequalities and/or graph their solution sets on a number line .	1	0	1	0
	3	1	2	Identify or graph the solution set to a linear inequality on a number line.	2	0	2	0
	3	1	3	Interpret solutions to problems in the context of the problem situation.	1	0	1	0
	3	2	1	Write and/or solve a system of linear inequalities using graphing.	2	0	2	0
	3	2	2	Interpret solutions to problems in the context of the problem situation.	2	0	2	0
	Total For Assessment Anchor A1.1.3				8	0	8	0
Total For Reporting Category A1.1					18	3	18	12

Keystone Exam **Algebra I**

Reporting Category	Assessment Anchor	Descriptor (Sub-anchor)	Eligible Content	Focus	Items: Number of Core Items MC	Items: Number of Core Items CR	Points: Core Points MC	Points: Core Points CR
A1.2: Linear Functions and Data Organizations	1			**Functions**	0	2	0	8
	1	1	1	Analyze a set of data for the existence of a pattern and represent the pattern algebraically and/or graphically.	1	0	1	0
	1	1	2	Determine whether a relation is a function, given a set of points or a graph.	1	0	1	0
	1	1	3	Identify the domain or range of a relation.	0	0	0	0
	1	2	1	Create, interpret, and/or use the equation, graph, or table of a linear function.	2	0	2	0
	1	2	2	Translate from one representation of a linear function to another.	1	0	1	0
	Total For Assessment Anchor A1.2.1				5	2	5	8
	2			**Coordinate Geometry**	0	0	0	0
	2	1	1	Identify, describe, and/or use constant rates of change.	2	0	2	0
	2	1	2	Apply the concept of linear rate of change (slope) to solve problems.	2	0	2	0
	2	1	3	Write or identify a linear equation when given...	2	0	2	0
	2	1	4	Determine the slope and/or y-intercept represented by a linear equation or graph.	2	0	2	0
	2	2	1	Draw, identify, find, and/or write an equation for a line of best fit for a scatter plot.	2	0	2	0
	Total For Assessment Anchor A1.2.2				10	0	10	0
	3			**Data Analysis**	0	1	0	4
	3	1	1	Calculate and/or interpret the range, quartiles, and interquartile range of data.	1	0	1	0
	3	2	1	Estimate or calculate to make predictions based on a circle, line, bar graph, measures of central tendency, or other representations.	0	0	0	0
	3	2	2	Analyze data, make predictions, and/or answer questions based on displayed data.	1	0	1	0
	3	2	3	Make predictions using the equations or graphs of best-fit lines of scatter plots.	1	0	1	0
	3	3	1	Find probabilities for compound events.	0	0	0	0
	Total For Assessment Anchor A1.2.3				3	1	3	4
Total For Reporting Category A1.2					18	3	18	12

BIOLOGY–WINTER 2012/2013

Keystone Exam **Biology**

Reporting Category	Assessment Anchor	Descriptor (Sub-anchor)	Eligible Content	Focus	Items: Number of Core Items MC	Items: Number of Core Items CR	Points: Core Points MC	Points: Core Points CR
BIO.A: Basic Biological Principles	1			**Basic Biological Principles**	0	0	0	0
	1	1	1	Describe the characteristics of life shared by all prokaryotic and eukaryotic organisms.	3	0	3	0
	1	2	1	Compare cellular structures and their functions in prokaryotic and eukaryotic cells.	2	0	2	0
	1	2	2	Describe and interpret relationships between structure and function at various levels of biological organization.	3	0	3	0
	Total For Assessment Anchor BIO.A.1				8	0	8	0
	2			**The Chemical Basis for Life**	0	0	0	0
	2	1	1	Describe the unique properties of water and how these properties support life on Earth.	1	0	1	0
	2	2	1	Explain how carbon is uniquely suited to form biological macromolecules.	1	0	1	0
	2	2	2	Describe how biological macromolecules form from monomers.	1	0	1	0
	2	2	3	Compare the structure and function of carbohydrates, lipids, proteins, and nucleic acids in organisms.	0	1	0	3
	2	3	1	Describe the role of an enzyme as a catalyst in regulating a specific biochemical reaction.	1	0	1	0
	2	3	2	Explain how factors such as pH, temperature, and concentration levels can affect enzyme function.	2	0	2	0
	Total For Assessment Anchor BIO.A.2				6	1	6	3
	3			**Bioenergetics**	0	0	0	0
	3	1	1	Describe the fundamental roles of plastids (e.g., chloroplasts) and mitochondria in energy transformations.	2	0	2	0
	3	2	1	Compare the basic transformation of energy during photosynthesis and cellular respiration.	2	0	2	0
	3	2	2	Describe the role of ATP in biochemical reactions.	1	1	1	3
	Total For Assessment Anchor BIO.A.3				5	1	5	3
	4			**Homeostasis and Transport**	0	0	0	0
	4	1	1	Describe how the structure of the plasma membrane allows it to function as a regulatory structure and/or protective barrier for a cell.	2	0	2	0
	4	1	2	Compare the mechanisms that transport materials across the plasma membrane.	1	0	1	0
	4	1	3	Describe how membrane-bound cellular organelles.	0	1	0	3
	4	2	1	Explain how organisms maintain homeostasis.	2	0	2	0
	Total For Assessment Anchor BIO.A.4				5	1	5	3
Total For Reporting Category BIO.A					24	3	24	9

Keystone Exam **Biology**

Reporting Category	Assessment Anchor	Descriptor (Sub-anchor)	Eligible Content	Focus	Items: Number of Core Items MC	Items: Number of Core Items CR	Points: Core Points MC	Points: Core Points CR
BIO.B: Cell Growth and Reproduction	1			**Cell Growth and Reproduction**	0	0	0	0
	1	1	1	Describe the events that occur during the cell cycle: interphase, nuclear division.	1	0	1	0
	1	1	2	Compare the processes and outcomes of mitotic and meiotic nuclear divisions.	1	0	1	0
	1	2	1	Describe how the process of DNA replication results in the transmission and/or conservation of genetic information.	3	0	3	0
	1	2	2	Explain the functional relationships between DNA, genes, alleles, and chromosomes and their roles in inheritance.	2	0	2	0
	Total For Assessment Anchor BIO.B.1				7	0	7	0
	2			**Genetics**	0	0	0	0
	2	1	1	Describe and/or predict observed patterns of inheritance.	0	1	0	3
	2	1	2	Describe processes that can alter composition or number of chromosomes.	1	0	1	0
	2	2	1	Describe how the processes of transcription and translation are similar in all organisms.	1	0	1	0
	2	2	2	Describe the role of ribosomes, endoplasmic reticulum, Golgi apparatus, and the nucleus in the production of specific types of proteins.	1	0	1	0
	2	3	1	Describe how genetic mutations alter the DNA sequence and may or may not affect phenotype.	1	0	1	0
	2	4	1	Explain how genetic engineering has impacted the fields of medicine, forensics, and agriculture.	1	0	1	0
	Total For Assessment Anchor BIO.B.2				5	1	5	3
	3			**Theory of Evolution**	0	0	0	0
	3	1	1	Explain how natural selection can impact allele frequencies of a population.	2	0	2	0
	3	1	2	Describe the factors that can contribute to the development of new species.	1	0	1	0
	3	1	3	Explain how genetic mutations may result in genotypic and phenotypic variations within a population.	1	0	1	0
	3	2	1	Interpret evidence supporting the theory of evolution.	1	0	1	0
	3	3	1	Distinguish between the scientific terms: hypothesis, inference, law, theory, principle, fact, and observation.	1	1	1	3
	Total For Assessment Anchor BIO.B.3				6	1	6	3
	4			**Ecology**	0	0	0	0
	4	1	1	Describe the levels of ecological organization.	1	0	1	0
	4	1	2	Describe characteristic biotic and abiotic components of aquatic and terrestrial ecosystems.	1	0	1	0
	4	2	1	Describe how energy flows through an ecosystem.	0	1	0	3
	4	2	2	Describe biotic interactions in an ecosystem.	1	0	1	0
	4	2	3	Describe how matter recycles through an ecosystem.	1	0	1	0
	4	2	4	Describe how ecosystems change in response to natural and human disturbances.	1	0	1	0
	4	2	5	Describe the effects of limiting factors on population dynamics and potential species extinction.	1	0	1	0
	Total For Assessment Anchor BIO.B.4				6	1	6	3
Total For Assessment Anchor BIO.B					24	3	24	9

BIOLOGY–SPRING 2013

Keystone Exam **Biology**

Reporting Category	Assessment Anchor	Descriptor (Sub-anchor)	Eligible Content	Focus	Items: Number of Core Items MC	Items: Number of Core Items CR	Points: Core Points MC	Points: Core Points CR
BIO.A: Basic Biological Principles	1			**Basic Biological Principles**	0	0	0	0
	1	1	1	Describe the characteristics of life shared by all prokaryotic and eukaryotic organisms.	1	0	1	0
	1	2	1	Compare cellular structures and their functions in prokaryotic and eukaryotic cells.	2	0	2	0
	1	2	2	Describe and interpret relationships between structure and function at various levels of biological organization.	3	0	3	0
	Total For Assessment Anchor BIO.A.1				6	0	6	0
	2			**The Chemical Basis for Life**	0	0	0	0
	2	1	1	Describe the unique properties of water and how these properties support life on Earth.	1	0	1	0
	2	2	1	Explain how carbon is uniquely suited to form biological macromolecules.	1	0	1	0
	2	2	2	Describe how biological macromolecules form from monomers.	2	0	2	0
	2	2	3	Compare the structure and function of carbohydrates, lipids, proteins, and nucleic acids in organisms.	2	0	2	0
	2	3	1	Describe the role of an enzyme as a catalyst in regulating a specific biochemical reaction.	0	1	0	3
	2	3	2	Explain how factors such as pH, temperature, and concentration levels can affect enzyme function.	1	0	1	0
	Total For Assessment Anchor BIO.A.2				7	1	7	3
	3			**Bioenergetics**	0	0	0	0
	3	1	1	Describe the fundamental roles of plastids (e.g., chloroplasts) and mitochondria in energy transformations.	1	0	1	0
	3	2	1	Compare the basic transformation of energy during photosynthesis and cellular respiration.	2	1	2	3
	3	2	2	Describe the role of ATP in biochemical reactions.	2	0	2	0
	Total For Assessment Anchor BIO.A.3				5	1	5	3
	4			**Homeostasis and Transport**	0	0	0	0
	4	1	1	Describe how the structure of the plasma membrane allows it to function as a regulatory structure and/or protective barrier for a cell.	1	0	1	0
	4	1	2	Compare the mechanisms that transport materials across the plasma membrane.	2	0	2	0
	4	1	3	Describe how membrane-bound cellular organelles.	1	0	1	0
	4	2	1	Explain how organisms maintain homeostasis.	2	1	2	3
	Total For Assessment Anchor BIO.A.4				6	1	6	3
Total For Reporting Category BIO.A					24	3	24	9

Keystone Exam **Biology**

Reporting Category	Assessment Anchor	Descriptor (Sub-anchor)	Eligible Content	Focus	Items: Number of Core Items MC	Items: Number of Core Items CR	Points: Core Points MC	Points: Core Points CR
BIO.B: Cell Growth and Reproduction	1			**Cell Growth and Reproduction**	0	0	0	0
	1	1	1	Describe the events that occur during the cell cycle: interphase, nuclear division.	1	0	1	0
	1	1	2	Compare the processes and outcomes of mitotic and meiotic nuclear divisions.	2	0	2	0
	1	2	1	Describe how the process of DNA replication results in the transmission and/or conservation of genetic information.	2	0	2	0
	1	2	2	Explain the functional relationships between DNA, genes, alleles, and chromosomes and their roles in inheritance.	1	0	1	0
	Total For Assessment Anchor BIO.B.1				6	0	6	0
	2			**Genetics**	0	0	0	0
	2	1	1	Describe and/or predict observed patterns of inheritance.	1	0	1	0
	2	1	2	Describe processes that can alter composition or number of chromosomes.	1	0	1	0
	2	2	1	Describe how the processes of transcription and translation are similar in all organisms.	1	0	1	0
	2	2	2	Describe the role of ribosomes, endoplasmic reticulum, Golgi apparatus, and the nucleus in the production of specific types of proteins.	2	0	2	0
	2	3	1	Describe how genetic mutations alter the DNA sequence and may or may not affect phenotype.	1	0	1	0
	2	4	1	Explain how genetic engineering has impacted the fields of medicine, forensics, and agriculture.	0	1	0	3
	Total For Assessment Anchor BIO.B.2				6	1	6	3
	3			**Theory of Evolution**	0	0	0	0
	3	1	1	Explain how natural selection can impact allele frequencies of a population.	2	0	2	0
	3	1	2	Describe the factors that can contribute to the development of new species.	1	0	1	0
	3	1	3	Explain how genetic mutations may result in genotypic and phenotypic variations within a population.	1	0	1	0
	3	2	1	Interpret evidence supporting the theory of evolution.	1	0	1	0
	3	3	1	Distinguish between the scientific terms: hypothesis, inference, law, theory, principle, fact, and observation.	0	1	0	3
	Total For Assessment Anchor BIO.B.3				5	1	5	3
	4			**Ecology**	0	0	0	0
	4	1	1	Describe the levels of ecological organization.	1	0	1	0
	4	1	2	Describe characteristic biotic and abiotic components of aquatic and terrestrial ecosystems.	1	0	1	0
	4	2	1	Describe how energy flows through an ecosystem.	1	0	1	0
	4	2	2	Describe biotic interactions in an ecosystem.	2	0	2	0
	4	2	3	Describe how matter recycles through an ecosystem.	1	0	1	0
	4	2	4	Describe how ecosystems change in response to natural and human disturbances.	0	1	0	3
	4	2	5	Describe the effects of limiting factors on population dynamics and potential species extinction.	1	0	1	0
	Total For Assessment Anchor BIO.B.4				7	1	7	3
Total For Assessment Anchor BIO.B					24	3	24	9

BIOLOGY–SUMMER 2013

Keystone Exam **Biology**

Reporting Category	Assessment Anchor	Descriptor (Sub-anchor)	Eligible Content	Focus	Items: Number of Core Items MC	Items: Number of Core Items CR	Points: Core Points MC	Points: Core Points CR
BIO.A: Basic Biological Principles	1			**Basic Biological Principles**	0	0	0	0
	1	1	1	Describe the characteristics of life shared by all prokaryotic and eukaryotic organisms.	2	0	2	0
	1	2	1	Compare cellular structures and their functions in prokaryotic and eukaryotic cells.	2	1	2	3
	1	2	2	Describe and interpret relationships between structure and function at various levels of biological organization.	1	0	1	0
	Total For Assessment Anchor BIO.A.1				5	1	5	3
	2			**The Chemical Basis for Life**	0	0	0	0
	2	1	1	Describe the unique properties of water and how these properties support life on Earth.	2	0	2	0
	2	2	1	Explain how carbon is uniquely suited to form biological macromolecules.	1	0	1	0
	2	2	2	Describe how biological macromolecules form from monomers.	2	0	2	0
	2	2	3	Compare the structure and function of carbohydrates, lipids, proteins, and nucleic acids in organisms.	1	0	1	0
	2	3	1	Describe the role of an enzyme as a catalyst in regulating a specific biochemical reaction.	2	0	2	0
	2	3	2	Explain how factors such as pH, temperature, and concentration levels can affect enzyme function.	0	1	0	3
	Total For Assessment Anchor BIO.A.2				8	1	8	3
	3			**Bioenergetics**	0	0	0	0
	3	1	1	Describe the fundamental roles of plastids (e.g., chloroplasts) and mitochondria in energy transformations.	2	0	2	0
	3	2	1	Compare the basic transformation of energy during photosynthesis and cellular respiration.	2	0	2	0
	3	2	2	Describe the role of ATP in biochemical reactions.	2	0	2	0
	Total For Assessment Anchor BIO.A.3				6	0	6	0
	4			**Homeostasis and Transport**	0	0	0	0
	4	1	1	Describe how the structure of the plasma membrane allows it to function as a regulatory structure and/or protective barrier for a cell.	2	1	2	3
	4	1	2	Compare the mechanisms that transport materials across the plasma membrane.	1	0	1	0
	4	1	3	Describe how membrane-bound cellular organelles.	1	0	1	0
	4	2	1	Explain how organisms maintain homeostasis.	1	0	1	0
	Total For Assessment Anchor BIO.A.4				5	1	5	3
Total For Reporting Category BIO.A					24	3	24	9

Keystone Exam **Biology**

Reporting Category	Assessment Anchor	Descriptor (Sub-anchor)	Eligible Content	Focus	Items: Number of Core Items MC	Items: Number of Core Items CR	Points: Core Points MC	Points: Core Points CR
BIO.B: Cell Growth and Reproduction	1			**Cell Growth and Reproduction**	0	0	0	0
	1	1	1	Describe the events that occur during the cell cycle: interphase, nuclear division.	2	0	2	0
	1	1	2	Compare the processes and outcomes of mitotic and meiotic nuclear divisions.	1	0	1	0
	1	2	1	Describe how the process of DNA replication results in the transmission and/or conservation of genetic information.	2	0	2	0
	1	2	2	Explain the functional relationships between DNA, genes, alleles, and chromosomes and their roles in inheritance.	1	0	1	0
	Total For Assessment Anchor BIO.B.1				6	0	6	0
	2			**Genetics**	0	0	0	0
	2	1	1	Describe and/or predict observed patterns of inheritance.	2	0	2	0
	2	1	2	Describe processes that can alter composition or number of chromosomes.	1	0	1	0
	2	2	1	Describe how the processes of transcription and translation are similar in all organisms.	1	0	1	0
	2	2	2	Describe the role of ribosomes, endoplasmic reticulum, Golgi apparatus, and the nucleus in the production of specific types of proteins.	1	0	1	0
	2	3	1	Describe how genetic mutations alter the DNA sequence and may or may not affect phenotype.	2	0	2	0
	2	4	1	Explain how genetic engineering has impacted the fields of medicine, forensics, and agriculture.	1	0	1	0
	Total For Assessment Anchor BIO.B.2				8	0	8	0
	3			**Theory of Evolution**	0	0	0	0
	3	1	1	Explain how natural selection can impact allele frequencies of a population.	1	1	1	3
	3	1	2	Describe the factors that can contribute to the development of new species.	1	0	1	0
	3	1	3	Explain how genetic mutations may result in genotypic and phenotypic variations within a population.	1	0	1	0
	3	2	1	Interpret evidence supporting the theory of evolution.	1	0	1	0
	3	3	1	Distinguish between the scientific terms: hypothesis, inference, law, theory, principle, fact, and observation.	1	0	1	0
	Total For Assessment Anchor BIO.B.3				5	1	5	3
	4			**Ecology**	0	0	0	0
	4	1	1	Describe the levels of ecological organization.	1	0	1	0
	4	1	2	Describe characteristic biotic and abiotic components of aquatic and terrestrial ecosystems.	1	0	1	0
	4	2	1	Describe how energy flows through an ecosystem.	0	1	0	3
	4	2	2	Describe biotic interactions in an ecosystem.	1	0	1	0
	4	2	3	Describe how matter recycles through an ecosystem.	1	0	1	0
	4	2	4	Describe how ecosystems change in response to natural and human disturbances.	1	0	1	0
	4	2	5	Describe the effects of limiting factors on population dynamics and potential species extinction.	0	1	0	3
	Total For Assessment Anchor BIO.B.4				5	2	5	6
Total For Assessment Anchor BIO.B					24	3	24	9

LITERATURE–WINTER 2012/2013

Keystone Exam **Literature**

Reporting Category	Assessment Anchor	Descriptor (Sub-anchor)	Eligible Content	Focus	Items: Number of Core Items MC	Items: Number of Core Items CR	Points: Core Points MC	Points: Core Points CR
L.F: Fiction	1			**Reading for Meaning—Fiction**	0	0	0	0
	1	1	1	Identify and/or analyze the author's intended purpose of a text.	1	0	1	0
	1	1	2	Explain, describe, and/or analyze examples of a text that support the author's intended purpose.	0	0	0	0
	1	1	3	Analyze, interpret, and evaluate how authors use techniques and elements of fiction to effectively communicate an idea or concept.	1	1	1	3
	1	2	1	Identify and/or apply a synonym or antonym of a word used in a text.	2	0	2	0
	1	2	2	Identify how the meaning of a word is changed when an affix is added; identify the meaning of a word with an affix from a text.	0	0	0	0
	1	2	3	Use context clues to determine or clarify the meaning of unfamiliar, multiple-meaning, or ambiguous words.	1	0	1	0
	1	2	4	Draw conclusions about connotations of words.	0	0	0	0
	1	3	1	Identify and/or explain stated or implied main ideas and relevant supporting details from a text.	1	0	1	0
	1	3	2	Summarize the key details and events of a fictional text, in part or as a whole.	0	0	0	0
	Total For Assessment Anchor L.F.1				6	1	6	3
	2			**Analyzing and Interpreting Literature—Fiction**	0	0	0	0
	2	1	1	Make inferences and/or draw conclusions based on analysis of a text.	1	1	1	3
	2	1	2	Cite evidence from a text to support generalizations.	1	0	1	0
	2	2	1	Analyze how literary form relates to and/or influences meaning of a text.	0	0	0	0
	2	2	2	Compare and evaluate the characteristics that distinguish fiction from literary nonfiction.	0	0	0	0
	2	2	3	Explain, interpret, compare, describe, analyze, and/or evaluate connections between texts.	0	0	0	0
	2	2	4	Compare and evaluate the characteristics that distinguish narrative, poetry, and drama.	0	0	0	0
	2	3	1	Explain, interpret, compare, describe, analyze, and/or evaluate character in a variety of fiction:	3	1	3	3
	2	3	2	Explain, interpret, compare, describe, analyze, and/or evaluate setting in a variety of fiction:	0	0	0	0
	2	3	3	Explain, interpret, compare, describe, analyze, and/or evaluate plot in a variety of fiction:	1	0	1	0
	2	3	4	Explain, interpret, compare, describe, analyze, and/or evaluate theme in a variety of fiction:	0	0	0	0
	2	3	5	Explain, interpret, compare, describe, analyze, and/or evaluate tone, style, and/or mood in a variety of fiction:	0	0	0	0
	2	3	6	Explain, interpret, compare, describe, analyze, and/or evaluate point of view in a variety of fiction:	1	0	1	0
	2	4	1	Interpret and analyze works from a variety of genres for literary, historical, and/or cultural significance.	0	0	0	0
	2	5	1	Identify, explain, interpret, describe, and/or analyze the effects of personification, simile, metaphor, hyperbole, satire, foreshadowing, flashback, imagery, allegory, symbolism, dialect, allusion, and irony in a text.	4	0	4	0
	2	5	2	Identify, explain, and analyze the structure of poems and sound devices.	0	0	0	0
	2	5	3	Identify and analyze how stage directions, monologue, dialogue, soliloquy, and dialect support dramatic script.	0	0	0	0
	Total For Assessment Anchor L.F.2				11	2	11	6
Total For Reporting Category L.F					17	3	17	9

Keystone Exam **Literature**

Reporting Category	Assessment Anchor	Descriptor (Sub-anchor)	Eligible Content	Focus	Items: Number of Core Items MC	Items: Number of Core Items CR	Points: Core Points MC	Points: Core Points CR
L.N: Nonfiction	1			**Reading for Meaning—Nonfiction**	0	0	0	0
	1	1	1	Identify and/or analyze the author's intended purpose of a text.	0	0	0	0
	1	1	2	Explain, describe, and/or analyze examples of a text that support the author's intended purpose.	1	1	1	3
	1	1	3	Analyze, interpret, and evaluate how authors use techniques and elements of nonfiction to effectively communicate an idea or concept.	1	0	1	0
	1	1	4	Explain how an author's use of key words or phrases in text informs and influences the reader.	0	0	0	0
	1	2	1	Identify and/or apply a synonym or antonym of a word used in a text.	0	0	0	0
	1	2	2	Identify how the meaning of a word is changed when an affix is added; identify the meaning of a word with an affix from a text.	0	0	0	0
	1	2	3	Use context clues to determine or clarify the meaning of unfamiliar, multiple-meaning, or ambiguous words.	0	0	0	0
	1	2	4	Draw conclusions about connotations of words.	0	0	0	0
	1	3	1	Identify and/or explain stated or implied main ideas and relevant supporting details from a text.	1	0	1	0
	1	3	2	Summarize the key details and events of a nonfictional text, in part or as a whole.	1	0	1	0
	1	3	3	Analyze the interrelationships of ideas and events in text to determine how one idea or event may interact and influence another.	2	0	2	0
	Total For Assessment Anchor L.N.1				6	1	6	3
	2			**Data Analysis**	0	0	0	0
	2	1	1	Make inferences and/or draw conclusions based on analysis of a text.	1	0	1	0
	2	1	2	Cite evidence from a text to support generalizations.	1	0	1	0
	2	2	1	Analyze how literary form relates to and/or influences meaning of a text.	0	0	0	0
	2	2	2	Compare and evaluate the characteristics that distinguish fiction from literary nonfiction.	0	0	0	0
	2	2	3	Explain, interpret, compare, describe, analyze, and/or evaluate connections between texts.	0	0	0	0
	2	3	1	Explain, interpret, compare, describe, analyze, and/or evaluate character in a variety of nonfiction:	0	0	0	0
	2	3	2	Explain, interpret, compare, describe, analyze, and/or evaluate setting in a variety of nonfiction:	1	0	1	0
	2	3	3	Explain, interpret, compare, describe, analyze, and/or evaluate plot in a variety of nonfiction:	0	0	0	0
	2	3	4	Explain, interpret, compare, describe, analyze, and/or evaluate theme in a variety of nonfiction:	0	0	0	0
	2	3	5	Explain, interpret, compare, describe, analyze, and/or evaluate tone, style, and/or mood in a variety of nonfiction:	1	0	1	0
	2	3	6	Explain, interpret, compare, describe, analyze, and/or evaluate point of view in a variety of nonfiction:	0	1	0	3
	2	4	1	Identify, analyze, and evaluate the structure and format of complex informational texts.	1	0	1	0
	2	4	2	Identify, explain, compare, interpret, describe, and/or analyze the sequence of steps in a list of directions.	2	0	2	0
	2	4	3	Explain, interpret, and/or analyze the effect of text organization, including headings, graphics, and charts.	2	0	2	0
	2	4	4	Make connections between a text and the content of graphics and charts.	0	0	0	0
	2	4	5	Analyze and evaluate how graphics and charts clarify, simplify, and organize complex informational texts.	1	1	1	3
	2	5	1	Differentiate between fact and opinion.	1	0	1	0
	2	5	2	Explain, interpret, describe, and/or analyze the use of facts and opinions in a text.	0	0	0	0
	2	5	3	Distinguish essential from nonessential information.	0	0	0	0
	2	5	4	Identify, explain, and/or interpret bias and propaganda techniques in nonfictional text.	0	0	0	0
	2	5	5	Explain, describe, and/or analyze the effectiveness of bias (explicit and implicit) and propaganda techniques in nonfictional text.	0	0	0	0
	2	5	6	Explain, interpret, describe, and/or analyze the author's defense of a claim to make a point or construct an argument in nonfictional text.	0	0	0	0
	Total For Assessment Anchor L.N.2				11	2	11	6
Total For Reporting Category L.N					17	3	17	9

LITERATURE–SPRING 2013

Keystone Exam **Literature**

Reporting Category	Assessment Anchor	Descriptor (Sub-anchor)	Eligible Content	Focus	Items: Number of Core Items MC	Items: Number of Core Items CR	Points: Core Points MC	Points: Core Points CR
L.F: Fiction	1			**Reading for Meaning—Fiction**	0	0	0	0
	1	1	1	Identify and/or analyze the author's intended purpose of a text.	1	0	1	0
	1	1	2	Explain, describe, and/or analyze examples of a text that support the author's intended purpose.	1	0	1	0
	1	1	3	Analyze, interpret, and evaluate how authors use techniques and elements of fiction to effectively communicate an idea or concept.	1	0	1	0
	1	2	1	Identify and/or apply a synonym or antonym of a word used in a text.	2	0	2	0
	1	2	2	Identify how the meaning of a word is changed when an affix is added; identify the meaning of a word with an affix from a text.	0	0	0	0
	1	2	3	Use context clues to determine or clarify the meaning of unfamiliar, multiple-meaning, or ambiguous words.	0	0	0	0
	1	2	4	Draw conclusions about connotations of words.	2	0	2	0
	1	3	1	Identify and/or explain stated or implied main ideas and relevant supporting details from a text.	0	0	0	0
	1	3	2	Summarize the key details and events of a fictional text, in part or as a whole.	1	0	1	0
	Total For Assessment Anchor L.F.1				8	0	8	0
	2			**Analyzing and Interpreting Literature—Fiction**	0	0	0	0
	2	1	1	Make inferences and/or draw conclusions based on analysis of a text.	1	1	1	3
	2	1	2	Cite evidence from a text to support generalizations.	1	0	1	0
	2	2	1	Analyze how literary form relates to and/or influences meaning of a text.	1	0	1	0
	2	2	2	Compare and evaluate the characteristics that distinguish fiction from literary nonfiction.	0	0	0	0
	2	2	3	Explain, interpret, compare, describe, analyze, and/or evaluate connections between texts.	0	0	0	0
	2	2	4	Compare and evaluate the characteristics that distinguish narrative, poetry, and drama.	0	0	0	0
	2	3	1	Explain, interpret, compare, describe, analyze, and/or evaluate character in a variety of fiction:	1	0	1	0
	2	3	2	Explain, interpret, compare, describe, analyze, and/or evaluate setting in a variety of fiction:	1	0	1	0
	2	3	3	Explain, interpret, compare, describe, analyze, and/or evaluate plot in a variety of fiction:	0	0	0	0
	2	3	4	Explain, interpret, compare, describe, analyze, and/or evaluate theme in a variety of fiction:	0	0	0	0
	2	3	5	Explain, interpret, compare, describe, analyze, and/or evaluate tone, style, and/or mood in a variety of fiction:	0	1	0	3
	2	3	6	Explain, interpret, compare, describe, analyze, and/or evaluate point of view in a variety of fiction:	2	0	2	0
	2	4	1	Interpret and analyze works from a variety of genres for literary, historical, and/or cultural significance.	1	0	1	0
	2	5	1	Identify, explain, interpret, describe, and/or analyze the effects of personification, simile, metaphor, hyperbole, satire, foreshadowing, flashback, imagery, allegory, symbolism, dialect, allusion, and irony in a text.	1	1	1	3
	2	5	2	Identify, explain, and analyze the structure of poems and sound devices.	0	0	0	0
	2	5	3	Identify and analyze how stage directions, monologue, dialogue, soliloquy, and dialect support dramatic script.	0	0	0	0
	Total For Assessment Anchor L.F.2				9	3	9	9
Total For Reporting Category L.F					17	3	17	9

Keystone Exam **Literature**

Reporting Category	Assessment Anchor	Descriptor (Sub-anchor)	Eligible Content	Focus	Items: Number of Core Items MC	Items: Number of Core Items CR	Points: Core Points MC	Points: Core Points CR
L.N: Nonfiction	1			**Reading for Meaning—Nonfiction**	0	0	0	0
	1	1	1	Identify and/or analyze the author's intended purpose of a text.	1	0	1	0
	1	1	2	Explain, describe, and/or analyze examples of a text that support the author's intended purpose.	2	0	2	0
	1	1	3	Analyze, interpret, and evaluate how authors use techniques and elements of nonfiction to effectively communicate an idea or concept.	0	0	0	0
	1	1	4	Explain how an author's use of key words or phrases in text informs and influences the reader.	0	0	0	0
	1	2	1	Identify and/or apply a synonym or antonym of a word used in a text.	1	0	1	0
	1	2	2	Identify how the meaning of a word is changed when an affix is added; identify the meaning of a word with an affix from a text.	0	0	0	0
	1	2	3	Use context clues to determine or clarify the meaning of unfamiliar, multiple-meaning, or ambiguous words.	1	0	1	0
	1	2	4	Draw conclusions about connotations of words.	1	0	1	0
	1	3	1	Identify and/or explain stated or implied main ideas and relevant supporting details from a text.	1	0	1	0
	1	3	2	Summarize the key details and events of a nonfictional text, in part or as a whole.	0	0	0	0
	1	3	3	Analyze the interrelationships of ideas and events in text to determine how one idea or event may interact and influence another.	1	0	1	0
	Total For Assessment Anchor L.N.1				8	0	8	0
	2			**Data Analysis**	0	0	0	0
	2	1	1	Make inferences and/or draw conclusions based on analysis of a text.	1	1	1	3
	2	1	2	Cite evidence from a text to support generalizations.	0	0	0	0
	2	2	1	Analyze how literary form relates to and/or influences meaning of a text.	0	0	0	0
	2	2	2	Compare and evaluate the characteristics that distinguish fiction from literary nonfiction.	1	0	1	0
	2	2	3	Explain, interpret, compare, describe, analyze, and/or evaluate connections between texts.	3	1	3	3
	2	3	1	Explain, interpret, compare, describe, analyze, and/or evaluate character in a variety of nonfiction:	0	1	0	3
	2	3	2	Explain, interpret, compare, describe, analyze, and/or evaluate setting in a variety of nonfiction:	0	0	0	0
	2	3	3	Explain, interpret, compare, describe, analyze, and/or evaluate plot in a variety of nonfiction:	1	0	1	0
	2	3	4	Explain, interpret, compare, describe, analyze, and/or evaluate theme in a variety of nonfiction:	0	0	0	0
	2	3	5	Explain, interpret, compare, describe, analyze, and/or evaluate tone, style, and/or mood in a variety of nonfiction:	0	0	0	0
	2	3	6	Explain, interpret, compare, describe, analyze, and/or evaluate point of view in a variety of nonfiction:	0	0	0	0
	2	4	1	Identify, analyze, and evaluate the structure and format of complex informational texts.	0	0	0	0
	2	4	2	Identify, explain, compare, interpret, describe, and/or analyze the sequence of steps in a list of directions.	0	0	0	0
	2	4	3	Explain, interpret, and/or analyze the effect of text organization, including headings, graphics, and charts.	0	0	0	0
	2	4	4	Make connections between a text and the content of graphics and charts.	0	0	0	0
	2	4	5	Analyze and evaluate how graphics and charts clarify, simplify, and organize complex informational texts.	0	0	0	0
	2	5	1	Differentiate between fact and opinion.	1	0	1	0
	2	5	2	Explain, interpret, describe, and/or analyze the use of facts and opinions in a text.	1	0	1	0
	2	5	3	Distinguish essential from nonessential information.	0	0	0	0
	2	5	4	Identify, explain, and/or interpret bias and propaganda techniques in nonfictional text.	0	0	0	0
	2	5	5	Explain, describe, and/or analyze the effectiveness of bias (explicit and implicit) and propaganda techniques in nonfictional text.	1	0	1	0
	2	5	6	Explain, interpret, describe, and/or analyze the author's defense of a claim to make a point or construct an argument in nonfictional text.	0	0	0	0
	Total For Assessment Anchor L.N.2				9	3	9	9
Total For Reporting Category L.N					17	3	17	9

LITERATURE–SUMMER 2013

Keystone Exam **Literature**

Reporting Category	Assessment Anchor	Descriptor (Sub-anchor)	Eligible Content	Focus	Items: Number of Core Items MC	Items: Number of Core Items CR	Points: Core Points MC	Points: Core Points CR
L.F: Fiction	1			**Reading for Meaning—Fiction**	0	0	0	0
	1	1	1	Identify and/or analyze the author's intended purpose of a text.	1	0	1	0
	1	1	2	Explain, describe, and/or analyze examples of a text that support the author's intended purpose.	1	0	1	0
	1	1	3	Analyze, interpret, and evaluate how authors use techniques and elements of fiction to effectively communicate an idea or concept.	1	0	1	0
	1	2	1	Identify and/or apply a synonym or antonym of a word used in a text.	2	0	2	0
	1	2	2	Identify how the meaning of a word is changed when an affix is added; identify the meaning of a word with an affix from a text.	0	0	0	0
	1	2	3	Use context clues to determine or clarify the meaning of unfamiliar, multiple-meaning, or ambiguous words.	1	0	1	0
	1	2	4	Draw conclusions about connotations of words.	0	0	0	0
	1	3	1	Identify and/or explain stated or implied main ideas and relevant supporting details from a text.	0	0	0	0
	1	3	2	Summarize the key details and events of a fictional text, in part or as a whole.	0	0	0	0
	Total For Assessment Anchor L.F.1				6	0	6	0
	2			**Analyzing and Interpreting Literature—Fiction**	0	0	0	0
	2	1	1	Make inferences and/or draw conclusions based on analysis of a text.	3	0	3	0
	2	1	2	Cite evidence from a text to support generalizations.	1	0	1	0
	2	2	1	Analyze how literary form relates to and/or influences meaning of a text.	0	0	0	0
	2	2	2	Compare and evaluate the characteristics that distinguish fiction from literary nonfiction.	0	0	0	0
	2	2	3	Explain, interpret, compare, describe, analyze, and/or evaluate connections between texts.	0	0	0	0
	2	2	4	Compare and evaluate the characteristics that distinguish narrative, poetry, and drama.	1	0	1	0
	2	3	1	Explain, interpret, compare, describe, analyze, and/or evaluate character in a variety of fiction:	3	1	3	3
	2	3	2	Explain, interpret, compare, describe, analyze, and/or evaluate setting in a variety of fiction:	0	2	0	6
	2	3	3	Explain, interpret, compare, describe, analyze, and/or evaluate plot in a variety of fiction:	1	0	1	0
	2	3	4	Explain, interpret, compare, describe, analyze, and/or evaluate theme in a variety of fiction:	1	0	1	0
	2	3	5	Explain, interpret, compare, describe, analyze, and/or evaluate tone, style, and/or mood in a variety of fiction:	0	0	0	0
	2	3	6	Explain, interpret, compare, describe, analyze, and/or evaluate point of view in a variety of fiction:	0	0	0	0
	2	4	1	Interpret and analyze works from a variety of genres for literary, historical, and/or cultural significance.	0	0	0	0
	2	5	1	Identify, explain, interpret, describe, and/or analyze the effects of personification, simile, metaphor, hyperbole, satire, foreshadowing, flashback, imagery, allegory, symbolism, dialect, allusion, and irony in a text.	1	0	1	0
	2	5	2	Identify, explain, and analyze the structure of poems and sound devices.	0	0	0	0
	2	5	3	Identify and analyze how stage directions, monologue, dialogue, soliloquy, and dialect support dramatic script.	0	0	0	0
	Total For Assessment Anchor L.F.2				11	3	11	9
Total For Reporting Category L.F					17	3	17	9

Keystone Exam **Literature**

Reporting Category	Assessment Anchor	Descriptor (Sub-anchor)	Eligible Content	Focus	Items: Number of Core Items MC	Items: Number of Core Items CR	Points: Core Points MC	Points: Core Points CR
L.N: Nonfiction	1			**Reading for Meaning—Nonfiction**	0	0	0	0
	1	1	1	Identify and/or analyze the author's intended purpose of a text.	1	0	1	0
	1	1	2	Explain, describe, and/or analyze examples of a text that support the author's intended purpose.	0	0	0	0
	1	1	3	Analyze, interpret, and evaluate how authors use techniques and elements of nonfiction to effectively communicate an idea or concept.	0	0	0	0
	1	1	4	Explain how an author's use of key words or phrases in text informs and influences the reader.	1	0	1	0
	1	2	1	Identify and/or apply a synonym or antonym of a word used in a text.	1	0	1	0
	1	2	2	Identify how the meaning of a word is changed when an affix is added; identify the meaning of a word with an affix from a text.	1	0	1	0
	1	2	3	Use context clues to determine or clarify the meaning of unfamiliar, multiple-meaning, or ambiguous words.	1	0	1	0
	1	2	4	Draw conclusions about connotations of words.	0	0	0	0
	1	3	1	Identify and/or explain stated or implied main ideas and relevant supporting details from a text.	2	0	2	0
	1	3	2	Summarize the key details and events of a nonfictional text, in part or as a whole.	0	0	0	0
	1	3	3	Analyze the interrelationships of ideas and events in text to determine how one idea or event may interact and influence another.	0	0	0	0
	Total For Assessment Anchor L.N.1				7	0	7	0
	2			**Data Analysis**	0	0	0	0
	2	1	1	Make inferences and/or draw conclusions based on analysis of a text.	2	1	2	3
	2	1	2	Cite evidence from a text to support generalizations.	0	0	0	0
	2	2	1	Analyze how literary form relates to and/or influences meaning of a text.	1	0	1	0
	2	2	2	Compare and evaluate the characteristics that distinguish fiction from literary nonfiction.	0	0	0	0
	2	2	3	Explain, interpret, compare, describe, analyze, and/or evaluate connections between texts.	0	0	0	0
	2	3	1	Explain, interpret, compare, describe, analyze, and/or evaluate character in a variety of nonfiction:	1	0	1	0
	2	3	2	Explain, interpret, compare, describe, analyze, and/or evaluate setting in a variety of nonfiction:	0	0	0	0
	2	3	3	Explain, interpret, compare, describe, analyze, and/or evaluate plot in a variety of nonfiction:	0	0	0	0
	2	3	4	Explain, interpret, compare, describe, analyze, and/or evaluate theme in a variety of nonfiction:	1	0	1	0
	2	3	5	Explain, interpret, compare, describe, analyze, and/or evaluate tone, style, and/or mood in a variety of nonfiction:	0	0	0	0
	2	3	6	Explain, interpret, compare, describe, analyze, and/or evaluate point of view in a variety of nonfiction:	0	1	0	3
	2	4	1	Identify, analyze, and evaluate the structure and format of complex informational texts.	1	0	1	0
	2	4	2	Identify, explain, compare, interpret, describe, and/or analyze the sequence of steps in a list of directions.	0	0	0	0
	2	4	3	Explain, interpret, and/or analyze the effect of text organization, including headings, graphics, and charts.	1	0	1	0
	2	4	4	Make connections between a text and the content of graphics and charts.	1	0	1	0
	2	4	5	Analyze and evaluate how graphics and charts clarify, simplify, and organize complex informational texts.	1	1	1	3
	2	5	1	Differentiate between fact and opinion.	1	0	1	0
	2	5	2	Explain, interpret, describe, and/or analyze the use of facts and opinions in a text.	0	0	0	0
	2	5	3	Distinguish essential from nonessential information.	0	0	0	0
	2	5	4	Identify, explain, and/or interpret bias and propaganda techniques in nonfictional text.	0	0	0	0
	2	5	5	Explain, describe, and/or analyze the effectiveness of bias (explicit and implicit) and propaganda techniques in nonfictional text.	0	0	0	0
	2	5	6	Explain, interpret, describe, and/or analyze the author's defense of a claim to make a point or construct an argument in nonfictional text.	0	0	0	0
	Total For Assessment Anchor L.N.2				10	3	10	9
Total For Reporting Category L.N					17	3	17	9

APPENDIX G: KEYSTONE EXAMS MODULE LAYOUT PLANS

Table G–1. Winter 2012/2013, Spring 2013, and Summer 2013 Algebra I Keystone Exams Section Layout Plan

	Module	Number of MC	Estimated MC Item Breakdown	Number of CR	Estimated CR Item Breakdown	Testing Time	Administration Time
Algebra I	1	23	18—Common (Core) Items 5—Embedded Field Test Items	4	3—Common (Core) Items 1—Embedded Field Test Items	75	85
	2	23	18—Common (Core) Items 5—Embedded Field Test Items	4	3—Common (Core) Items 1—Embedded Field Test Items	75	85

Table G–2. Winter 2012/2013, Spring 2013, and Summer 2013 Biology Keystone Exams Section Layout Plan

	Module	Number of MC	Estimated MC Item Breakdown	Number of CR	Estimated CR Item Breakdown	Testing Time	Administration Time
Biology	1	32	24—Common (Core) Items; 8—Embedded Field Test Items	4	3—Common (Core) Items 1—Embedded Field Test Items	72	82
	2	32	24—Common (Core) Items; 8—Embedded Field Test Items	4	3—Common (Core) Items 1—Embedded Field Test Items	72	82

Table G–3. Winter 2012/2013, Spring 2013, and Summer 2013 Literature Keystone Exams Section Layout Plan

	Module	Number of MC	Estimated MC Item Breakdown	Number of CR	Estimated CR Item Breakdown	Testing Time	Administration Time
Literature	1	23	17—Common (Core) Items 6—Embedded Field Test Items	4	3—Common (Core) Items 1—Embedded Field Test Items	73	83
	2	23	17—Common (Core) Items 6—Embedded Field Test Items	4	3—Common (Core) Items 1—Embedded Field Test Items	73	83

APPENDIX H: MEAN RAW SCORES BY FORM

Table H–1. Mean Raw Scores by Form

Column Heading	Definition
Form	Form
N	Number of students
L	Length
Pts	Points possible
Min	Minimum
Max	Maximum
Mean	Mean
Med	Median
SD	Standard deviation

ALGEBRA I: SPRING

Table H–2. Algebra I Mean Raw Scores by Form Table

Form	*N*	L	Pts	Min	Max	Mean	Med	*SD*
All	157811	42	60	0	60	30.0	29	13.3
1	10082	42	60	2	60	29.0	28	13.6
2	9199	42	60	3	60	30.1	29	13.2
3	9211	42	60	3	60	30.3	30	13.3
4	9186	42	60	2	59	30.2	29	13.0
5	9137	42	60	3	60	30.6	30	13.3
6	9293	42	60	1	60	30.3	30	13.3
7	9194	42	60	2	60	30.3	30	13.3
8	9271	42	60	2	60	30.2	30	13.2
9	9226	42	60	1	60	30.2	30	13.1
10	9169	42	60	2	60	29.9	29	13.1
11	6493	42	60	1	60	29.9	29	13.2
12	6494	42	60	2	60	29.8	29	13.3
13	6540	42	60	2	60	30.3	30	13.4
14	6538	42	60	2	60	29.9	29	13.3
15	6399	42	60	2	60	29.9	29	13.3
16	6471	42	60	1	60	29.9	29	13.4
17	6472	42	60	2	59	29.8	29	13.5
18	6510	42	60	0	60	30.1	29	13.4
19	6438	42	60	2	60	30.1	30	13.3
20	6488	42	60	1	60	29.7	29	13.3

BIOLOGY: SPRING

Table H–3. Biology Mean Raw Scores by Form Table

Form	*N*	L	Pts	Min	Max	Mean	Med	*SD*
All	134995	54	66	2	66	34.5	34	13.0
1	8901	54	66	3	64	33.6	33	13.5
2	8115	54	66	4	65	34.6	34	12.9
3	8149	54	66	2	64	34.7	35	12.9
4	8109	54	66	5	65	34.6	35	13.0
5	8062	54	66	2	65	34.8	34	12.9
6	8058	54	66	5	65	34.7	35	12.8
7	8129	54	66	4	65	34.8	35	13.0
8	8072	54	66	4	66	34.9	35	12.9
9	8060	54	66	5	65	35.0	35	13.0
10	8065	54	66	5	65	35.3	35	13.1
11	5347	54	66	4	66	34.3	34	13.0
12	5368	54	66	3	65	34.2	34	13.0
13	5341	54	66	4	64	34.1	34	13.0
14	5353	54	66	5	63	34.3	34	12.9
15	5360	54	66	5	64	34.0	34	13.1
16	5217	54	66	5	64	34.4	35	13.0
17	5191	54	66	4	65	33.9	34	12.9
18	5356	54	66	4	64	34.4	34	13.0
19	5364	54	66	4	65	34.6	35	13.2
20	5378	54	66	3	65	34.3	34	13.2

LITERATURE: SPRING

Table H–4. Literature Mean Raw Scores by Form Table

Form	*N*	L	Pts	Min	Max	Mean	Med	*SD*
All	117830	40	52	2	52	32.4	34	9.7
1	7124	40	52	3	51	32.8	34.5	9.5
2	7067	40	52	2	51	32.8	34	9.5
3	7089	40	52	4	52	32.5	34	9.6
4	7061	40	52	2	52	32.6	34	9.6
5	7019	40	52	2	52	32.6	34	9.5
6	6992	40	52	4	52	32.5	34	9.5
7	7017	40	52	2	52	32.3	34	9.7
8	7040	40	52	3	51	32.6	34	9.6
9	7026	40	52	3	51	32.8	34	9.5
10	6972	40	52	2	52	32.6	34	9.5
11	4744	40	52	4	51	32.2	34	10.0
12	4714	40	52	2	51	32.0	34	10.2
13	4742	40	52	3	51	32.3	34	10.0
14	4690	40	52	3	51	32.2	34	9.7
15	4730	40	52	4	52	32.3	34	9.8
16	4768	40	52	3	51	32.5	34	9.9
17	4723	40	52	4	52	32.2	34	10.0
18	4789	40	52	4	52	32.3	34	9.8
19	4752	40	52	3	51	32.1	33	9.8
20	4771	40	52	3	51	32.0	34	10.0

APPENDIX I: DEMOGRAPHIC AND ACCOMMODTION DATA

WINTER 2012/2013

Students Assessed on the Winter 2012/2013 Keystone: Algebra I

	Other*	Gr.6	Gr.7	Gr.8	Gr.9	Gr.10	Gr.11	Gr.12	Total
	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct
Number of PPT processed	804	6	141	3,392	29,921	57,210	100,138	141	191,753
Number of CBT processed	0	1	45	731	4,126	6,673	14,454	14	26,044
Total tests processed	804	7	186	4,123	34,047	63,883	114,592	155	217,797
Students with a total test score	764 95.0	6 85.7	185 99.5	4,104 99.5	33,548 98.5	62,373 97.6	112,446 98.1	126 81.3	213,552 98.1
Number of tests processed without a total score	40 5.0	1 14.3	1 0.5	19 0.5	499 1.5	1,510 2.4	2,146 1.9	29 18.7	4,245 1.9

*Other combines students coded as (1) below Grade 6, (2) ungraded, or (3) without a coded grade

Students Assessed on the Winter 2012/2013 Keystone: Biology

	Other*	Gr.8	Gr.9	Gr.10	Gr.11	Gr.12	Total
	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct
Number of PPT processed	644	3	3,100	37,782	87,432	119	129,080
Number of CBT processed	0	1	820	5,729	14,644	7	21,201
Total tests processed	644	4	3,920	43,511	102,076	126	150,281
Students with a total test score	596 92.5	4 100.0	3,779 96.4	42,669 98.1	99,806 97.8	109 86.5	146,963 97.8
Number of tests processed without a total score	48 7.5	0 0.0	141 3.6	842 1.9	2,270 2.2	17 13.5	3,318 2.2

*Other combines students coded as (1) below Grade 8, (2) ungraded, or (3) without a coded grade

Students Assessed on the Winter 2012/2013 Keystone: Literature

	Other*	Gr.8	Gr.9	Gr.10	Gr.11	Gr.12	Total
	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct
Number of PPT processed	642	3	2,592	21,021	99,093	131	123,482
Number of CBT processed	0	1	591	2,845	14,599	10	18,046
Total tests processed	642	4	3,183	23,866	113,692	141	141,528
Students with a total test score	605 94.2	3 75.0	3,089 97.0	23,294 97.6	111,579 98.1	113 80.1	138,683 98.0
Number of tests processed without a total score	37 5.8	1 25.0	94 3.0	572 2.4	2,113 1.9	28 19.9	2,845 2.0

*Other combines students coded as (1) below Grade 8, (2) ungraded, or (3) without a coded grade

Counts of Students without Scores on the Winter 2012/2013 Keystone: Algebra I

Reason for Non-Assessment	Other*	Gr.6	Gr.7	Gr.8	Gr.9	Gr.10	Gr.11	Gr.12	Total
	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct
Extended absence from school	23 57.5	0 0.0	0 0.0	7 36.8	182 36.5	484 32.1	766 35.7	7 24.1	1,469 34.6
Absent without make-up	0 0.0	0 0.0	0 0.0	1 5.3	53 10.6	192 12.7	222 10.3	1 3.4	469 11.0
Non-attempt	13 32.5	0 0.0	1 100.0	1 5.3	158 31.7	589 39.0	654 30.5	6 20.7	1,422 33.5
Medical emergency	2 5.0	0 0.0	0 0.0	5 26.3	49 9.8	98 6.5	207 9.6	1 3.4	362 8.5
Other reasons	2 5.0	1 100.0	0 0.0	5 26.3	57 11.4	147 9.7	297 13.8	14 48.3	523 12.3
Total not assessed	40	1	1	19	499	1,510	2,146	29	4,245

*Other combines students coded as (1) below Grade 6, (2) ungraded, or (3) without a coded grade

Counts of Students without Scores on the Winter 2012/2013 Keystone: Biology

Reason for Non-Assessment	Other*	Gr.8	Gr.9	Gr.10	Gr.11	Gr.12	Total
	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct
Extended absence from school	22 45.8	0 0.0	76 53.9	286 34.0	805 35.5	7 41.2	1,196 36.0
Absent without make-up	5 10.4	0 0.0	13 9.2	114 13.5	330 14.5	2 11.8	464 14.0
Non-attempt	14 29.2	0 0.0	32 22.7	290 34.4	626 27.6	4 23.5	966 29.1
Medical emergency	1 2.1	0 0.0	4 2.8	80 9.5	212 9.3	0 0.0	297 9.0
Other reasons	6 12.5	0 0.0	16 11.3	72 8.6	297 13.1	4 23.5	395 11.9
Total not assessed	48	0	141	842	2,270	17	3,318

*Other combines students coded as (1) below Grade 8, (2) ungraded, or (3) without a coded grade

Counts of Students without Scores on the Winter 2012/2013 Keystone: Literature

Reason for Non-Assessment	Other*	Gr.8	Gr.9	Gr.10	Gr.11	Gr.12	Total
	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct
Extended absence from school	20 54.1	1 100.0	41 43.6	176 30.8	749 35.4	10 35.7	997 35.0
Absent without make-up	1 2.7	0 0.0	18 19.1	137 24.0	314 14.9	2 7.1	472 16.6
Non-attempt	12 32.4	0 0.0	26 27.7	181 31.6	529 25.0	8 28.6	756 26.6
ELL in first year in U.S. schools	0 0.0	0 0.0	0 0.0	0 0.0	5 0.2	0 0.0	5 0.2
Medical emergency	0 0.0	0 0.0	2 2.1	40 7.0	211 10.0	0 0.0	253 8.9
Other reasons	4 10.8	0 0.0	7 7.4	38 6.6	305 14.4	8 28.6	362 12.7
Total not assessed	37	1	94	572	2,113	28	2,845

*Other combines students coded as (1) below Grade 8, (2) ungraded, or (3) without a coded grade

Demographic Characteristics of Students taking the Winter 2012/2013 Keystone: Algebra I

Demographic or Educational Characteristic	Other*	Gr.6	Gr.7	Gr.8	Gr.9	Gr.10	Gr.11	Gr.12	Total
	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct
Gender									
Female	22 2.9	1 16.7	65 35.1	1,936 47.2	17,031 50.8	31,063 49.8	55,412 49.3	57 45.2	105,587 49.4
Male	21 2.7	5 83.3	120 64.9	2,167 52.8	16,468 49.1	31,165 50.0	56,946 50.6	69 54.8	106,961 50.1
Race/Ethnicity									
American Indian/Alaskan Native (not Hispanic)	0 0.0	0 0.0	0 0.0	5 0.1	27 0.1	91 0.1	149 0.1	1 0.8	273 0.1
Asian (not Hispanic)	1 0.1	2 33.3	26 14.1	325 7.9	1,286 3.8	2,173 3.5	3,917 3.5	3 2.4	7,733 3.6
Black or African American (not Hispanic)	6 0.8	0 0.0	4 2.2	99 2.4	2,762 8.2	10,941 17.5	14,632 13.0	54 42.9	28,498 13.3
Hispanic (any race)	5 0.7	0 0.0	0 0.0	79 1.9	1,734 5.2	5,403 8.7	7,992 7.1	18 14.3	15,231 7.1
Multi-Racial (not Hispanic)	2 0.3	0 0.0	0 0.0	49 1.2	446 1.3	852 1.4	1,280 1.1	2 1.6	2,631 1.2
White (not Hispanic)	11 1.4	4 66.7	154 83.2	3,541 86.3	26,639 79.4	41,823 67.1	83,958 74.7	47 37.3	156,177 73.1
Native Hawaiian or Other Pacific Islander (not Hispanic)	0 0.0	0 0.0	0 0.0	3 0.1	12 0.0	35 0.1	74 0.1	0 0.0	124 0.1
Educational Category and Other Demographic Groups									
IEP (not gifted)	22 2.9	0 0.0	3 1.6	85 2.1	1,626 4.8	7,361 11.8	14,053 12.5	26 20.6	23,176 10.9
Exited IEP in last 2 years	0 0.0	0 0.0	7 3.8	110 2.7	544 1.6	911 1.5	1,446 1.3	3 2.4	3,021 1.4
Title I	17 2.2	2 33.3	12 6.5	201 4.9	2,483 7.4	10,558 16.9	15,516 13.8	55 43.7	28,844 13.5
Title III served	10 1.3	0 0.0	0 0.0	3 0.1	231 0.7	1,350 2.2	2,031 1.8	4 3.2	3,629 1.7
Title III not served	0 0.0	0 0.0	0 0.0	3 0.1	29 0.1	140 0.2	190 0.2	1 0.8	363 0.2
Migrant student	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	27 0.0	61 0.1	0 0.0	88 0.0
ELL (enrolled after 5/24/12)	3 0.4	0 0.0	0 0.0	1 0.0	49 0.1	200 0.3	335 0.3	0 0.0	588 0.3
ELL (enrolled on or before 5/24/12)	9 1.2	0 0.0	0 0.0	5 0.1	211 0.6	1,294 2.1	1,891 1.7	5 4.0	3,415 1.6

Demographic Characteristics of Students taking the Winter 2012/2013 Keystone: Algebra I (continued)

Demographic or Educational Characteristic	Other*	Gr.6	Gr.7	Gr.8	Gr.9	Gr.10	Gr.11	Gr.12	Total
	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct
Exited ESL/bilingual program and in first year of monitoring	2 0.3	1 16.7	0 0.0	2 0.0	70 0.2	275 0.4	333 0.3	0 0.0	683 0.3
Exited ESL/bilingual program and in 2nd year of monitoring	3 0.4	0 0.0	1 0.5	9 0.2	83 0.2	198 0.3	409 0.4	1 0.8	704 0.3
Former ELL no longer monitored	0 0.0	0 0.0	2 1.1	46 1.1	504 1.5	1,207 1.9	1,901 1.7	5 4.0	3,665 1.7
Foreign exchange student	0 0.0	0 0.0	0 0.0	0 0.0	1 0.0	21 0.0	78 0.1	0 0.0	100 0.0
Economically disadvantaged	12 1.6	1 16.7	12 6.5	450 11.0	8,575 25.6	24,645 39.5	37,586 33.4	79 62.7	71,360 33.4
Historically Underperforming Subgroup	40 5.2	1 16.7	15 8.1	525 12.8	9,564 28.5	28,363 45.5	45,255 40.2	91 72.2	83,854 39.3
Enrollment in school of residence after 10/1/12	17 2.2	0 0.0	0 0.0	8 0.2	183 0.5	650 1.0	1,142 1.0	10 7.9	2,010 0.9
Enrollment in district of residence after 10/1/12	10 1.3	0 0.0	0 0.0	4 0.1	121 0.4	413 0.7	865 0.8	5 4.0	1,418 0.7
Enrollment as PA resident after 10/1/12	6 0.8	0 0.0	0 0.0	1 0.0	55 0.2	186 0.3	337 0.3	3 2.4	588 0.3
Enrollment in school of residence after 10/1/11 but on/before 10/1/12	2 0.3	2 33.3	10 5.4	135 3.3	7,575 22.6	11,932 19.1	16,110 14.3	57 45.2	35,823 16.8
Enrollment in district of residence after 10/1/11 but on/before 10/1/12	2 0.3	1 16.7	1 0.5	97 2.4	2,650 7.9	4,177 6.7	6,615 5.9	22 17.5	13,565 6.4
Home schooled	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
Court/agency placed	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	10 0.0	78 0.1	0 0.0	88 0.0
Number of assessed students	764	6	185	4,104	33,548	62,373	112,446	126	213,552

*Other combines students coded as (1) below Grade 6, (2) ungraded, or (3) without a coded grade

Demographic Characteristics of Students taking the Winter 2012/2013 Keystone: Biology

Demographic or Educational Characteristic	Other*	Gr.8	Gr.9	Gr.10	Gr.11	Gr.12	Total
	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct
Gender							
Female	47 7.9	1 25.0	1,799 47.6	21,572 50.6	49,189 49.3	48 44.0	72,656 49.4
Male	36 6.0	3 75.0	1,976 52.3	21,027 49.3	50,475 50.6	58 53.2	73,575 50.1
Race/Ethnicity							
American Indian/Alaskan Native (not Hispanic)	0 0.0	0 0.0	4 0.1	51 0.1	136 0.1	1 0.9	192 0.1
Asian (not Hispanic)	0 0.0	0 0.0	137 3.6	1,825 4.3	3,427 3.4	4 3.7	5,393 3.7
Black or African American (not Hispanic)	5 0.8	0 0.0	473 12.5	5,472 12.8	13,265 13.3	49 45.0	19,264 13.1
Hispanic (any race)	2 0.3	0 0.0	403 10.7	2,461 5.8	7,087 7.1	16 14.7	9,969 6.8
Multi-Racial (not Hispanic)	1 0.2	0 0.0	54 1.4	577 1.4	1,176 1.2	2 1.8	1,810 1.2
White (not Hispanic)	13 2.2	4 100.0	2,698 71.4	31,718 74.3	74,277 74.4	33 30.3	108,743 74.0
Native Hawaiian or Other Pacific Islander (not Hispanic)	0 0.0	0 0.0	2 0.1	17 0.0	70 0.1	0 0.0	89 0.1
Educational Category and Other Demographic Groups							
IEP (not gifted)	15 2.5	0 0.0	448 11.9	4,342 10.2	13,019 13.0	24 22.0	17,848 12.1
Exited IEP in last 2 years	1 0.2	1 25.0	58 1.5	664 1.6	1,278 1.3	0 0.0	2,002 1.4
Title I	16 2.7	0 0.0	496 13.1	4,379 10.3	13,851 13.9	45 41.3	18,787 12.8
Title III served	6 1.0	0 0.0	62 1.6	506 1.2	1,822 1.8	5 4.6	2,401 1.6
Title III not served	0 0.0	0 0.0	9 0.2	46 0.1	165 0.2	1 0.9	221 0.2
Migrant student	0 0.0	0 0.0	0 0.0	8 0.0	49 0.0	0 0.0	57 0.0
ELL (enrolled after 5/24/12)	3 0.5	0 0.0	12 0.3	67 0.2	295 0.3	1 0.9	378 0.3
ELL (enrolled on or before 5/24/12)	4 0.7	0 0.0	58 1.5	486 1.1	1,699 1.7	5 4.6	2,252 1.5

Demographic Characteristics of Students taking the Winter 2012/2013 Keystone: Biology (continued)

Demographic or Educational Characteristic	Other*	Gr.8	Gr.9	Gr.10	Gr.11	Gr.12	Total
	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct
Exited ESL/bilingual program and in first year of monitoring	0 0.0	0 0.0	7 0.2	166 0.4	319 0.3	0 0.0	492 0.3
Exited ESL/bilingual program and in 2nd year of monitoring	0 0.0	0 0.0	18 0.5	114 0.3	382 0.4	1 0.9	515 0.4
Former ELL no longer monitored	0 0.0	0 0.0	76 2.0	770 1.8	1,729 1.7	3 2.8	2,578 1.8
Foreign exchange student	0 0.0	0 0.0	0 0.0	9 0.0	67 0.1	0 0.0	76 0.1
Economically disadvantaged	7 1.2	0 0.0	1,336 35.4	13,053 30.6	34,134 34.2	60 55.0	48,590 33.1
Historically Underperforming Subgroup	26 4.4	0 0.0	1,536 40.6	15,367 36.0	41,137 41.2	73 67.0	58,139 39.6
Enrollment in school of residence after 10/1/12	7 1.2	1 25.0	53 1.4	299 0.7	1,039 1.0	7 6.4	1,406 1.0
Enrollment in district of residence after 10/1/12	7 1.2	1 25.0	37 1.0	195 0.5	777 0.8	1 0.9	1,018 0.7
Enrollment as PA resident after 10/1/12	5 0.8	0 0.0	22 0.6	77 0.2	296 0.3	1 0.9	401 0.3
Enrollment in school of residence after 10/1/11 but on/before 10/1/12	8 1.3	0 0.0	1,299 34.4	6,418 15.0	15,103 15.1	47 43.1	22,875 15.6
Enrollment in district of residence after 10/1/11 but on/before 10/1/12	8 1.3	0 0.0	542 14.3	1,996 4.7	5,988 6.0	16 14.7	8,550 5.8
Home schooled	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
Court/agency placed	0 0.0	0 0.0	0 0.0	7 0.0	57 0.1	1 0.9	65 0.0
Number of assessed students	596	4	3,779	42,669	99,806	109	146,963

*Other combines students coded as (1) below Grade 8, (2) ungraded, or (3) without a coded grade

Demographic Characteristics of Students taking the Winter 2012/2013 Keystone: Literature

Demographic or Educational Characteristic	Other*	Gr.8	Gr.9	Gr.10	Gr.11	Gr.12	Total
	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct
Gender							
Female	13 2.1	2 66.7	1,417 45.9	11,429 49.1	54,756 49.1	56 49.6	67,673 48.8
Male	15 2.5	1 33.3	1,671 54.1	11,833 50.8	56,675 50.8	56 49.6	70,251 50.7
Race/Ethnicity							
American Indian/Alaskan Native (not Hispanic)	0 0.0	0 0.0	1 0.0	35 0.2	147 0.1	2 1.8	185 0.1
Asian (not Hispanic)	0 0.0	0 0.0	172 5.6	645 2.8	3,905 3.5	2 1.8	4,724 3.4
Black or African American (not Hispanic)	6 1.0	1 33.3	852 27.6	3,536 15.2	14,548 13.0	47 41.6	18,990 13.7
Hispanic (any race)	2 0.3	0 0.0	155 5.0	1,746 7.5	7,673 6.9	19 16.8	9,595 6.9
Multi-Racial (not Hispanic)	4 0.7	0 0.0	53 1.7	310 1.3	1,302 1.2	2 1.8	1,671 1.2
White (not Hispanic)	8 1.3	2 66.7	1,853 60.0	16,700 71.7	83,425 74.8	39 34.5	102,027 73.6
Native Hawaiian or Other Pacific Islander (not Hispanic)	0 0.0	0 0.0	0 0.0	13 0.1	72 0.1	0 0.0	85 0.1
Educational Category and Other Demographic Groups							
IEP (not gifted)	15 2.5	0 0.0	474 15.3	2,870 12.3	14,233 12.8	26 23.0	17,618 12.7
Exited IEP in last 2 years	0 0.0	1 33.3	53 1.7	353 1.5	1,446 1.3	2 1.8	1,855 1.3
Title I	12 2.0	1 33.3	458 14.8	2,409 10.3	15,444 13.8	47 41.6	18,371 13.2
Title III served	5 0.8	0 0.0	68 2.2	328 1.4	1,831 1.6	3 2.7	2,235 1.6
Title III not served	0 0.0	0 0.0	6 0.2	32 0.1	163 0.1	1 0.9	202 0.1
Migrant student	0 0.0	0 0.0	0 0.0	3 0.0	59 0.1	0 0.0	62 0.0
ELL (enrolled after 5/24/12)	2 0.3	0 0.0	21 0.7	58 0.2	208 0.2	0 0.0	289 0.2
ELL (enrolled on or before 5/24/12)	4 0.7	0 0.0	52 1.7	304 1.3	1,791 1.6	4 3.5	2,155 1.6

Demographic Characteristics of Students taking the Winter 2012/2013 Keystone: Literature (continued)

Demographic or Educational Characteristic	Other*	Gr.8	Gr.9	Gr.10	Gr.11	Gr.12	Total
	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct
Exited ESL/bilingual program and in first year of monitoring	0 0.0	0 0.0	12 0.4	94 0.4	332 0.3	0 0.0	438 0.3
Exited ESL/bilingual program and in 2nd year of monitoring	0 0.0	0 0.0	19 0.6	40 0.2	406 0.4	1 0.9	466 0.3
Former ELL no longer monitored	0 0.0	0 0.0	68 2.2	334 1.4	1,909 1.7	4 3.5	2,315 1.7
Foreign exchange student	0 0.0	0 0.0	1 0.0	9 0.0	68 0.1	0 0.0	78 0.1
Economically disadvantaged	6 1.0	0 0.0	1,379 44.6	8,077 34.7	37,159 33.3	70 61.9	46,691 33.7
Historically Underperforming Subgroup	26 4.3	0 0.0	1,609 52.1	9,560 41.0	44,852 40.2	82 72.6	56,129 40.5
Enrollment in school of residence after 10/1/12	9 1.5	1 33.3	53 1.7	264 1.1	1,118 1.0	7 6.2	1,452 1.0
Enrollment in district of residence after 10/1/12	8 1.3	1 33.3	44 1.4	189 0.8	828 0.7	4 3.5	1,074 0.8
Enrollment as PA resident after 10/1/12	5 0.8	0 0.0	24 0.8	72 0.3	312 0.3	3 2.7	416 0.3
Enrollment in school of residence after 10/1/11 but on/before 10/1/12	1 0.2	1 33.3	1,490 48.2	3,188 13.7	15,567 14.0	51 45.1	20,298 14.6
Enrollment in district of residence after 10/1/11 but on/before 10/1/12	1 0.2	1 33.3	513 16.6	1,569 6.7	6,394 5.7	16 14.2	8,494 6.1
Home schooled	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
Court/agency placed	0 0.0	0 0.0	0 0.0	5 0.0	72 0.1	0 0.0	77 0.1
Number of assessed students	605	3	3,089	23,294	111,579	113	138,683

*Other combines students coded as (1) below Grade 8, (2) ungraded, or (3) without a coded grade

Incidence of Presentation Accommodations Received on the Winter 2012/2013 Keystone: Algebra I

Type of Presentation Accommodation	PPT	CBT	Total
	N/Pct	N/Pct	N/Pct
Braille format	11 0.0	N/A N/A	11 0.0
Large print format	55 0.0	N/A N/A	55 0.0
Electronic screen reader	5 0.0	N/A N/A	5 0.0
Test directions read aloud	1,487 0.8	171 0.7	1,658 0.8
Test directions signed, interpreted for ELL, or recorded	89 0.0	3 0.0	92 0.0
Test items/questions read aloud	1,210 0.6	149 0.6	1,359 0.6
Test items/questions signed, interpreted for ELL, or recorded	53 0.0	4 0.0	57 0.0
Amplification device	11 0.0	2 0.0	13 0.0
Magnification device	12 0.0	2 0.0	14 0.0
Reading windows; reading guides	3 0.0	N/A N/A	3 0.0
Other (per Accommodations Guidelines)	30 0.0	69 0.3	99 0.0
Spanish version	533 0.3	N/A N/A	533 0.2
Online Accommodations Received			
Audio recording	N/A N/A	365 1.4	365 0.2
Color Chooser	N/A N/A	13 0.1	13 0.0
Number of assessed students	187,656	25,896	213,552

Incidence of Presentation Accommodations Received on the Winter 2012/2013 Keystone: Biology

Type of Presentation Accommodation	PPT	CBT	Total
	N/Pct	N/Pct	N/Pct
Braille format	8 0.0	N/A N/A	8 0.0
Large print format	44 0.0	N/A N/A	44 0.0
Electronic screen reader	2 0.0	N/A N/A	2 0.0
Test directions read aloud	974 0.8	170 0.8	1,144 0.8
Test directions signed, interpreted for ELL, or recorded	30 0.0	2 0.0	32 0.0
Test items/questions read aloud	880 0.7	165 0.8	1,045 0.7
Test items/questions signed, interpreted for ELL, or recorded	22 0.0	3 0.0	25 0.0
Amplification device	6 0.0	3 0.0	9 0.0
Magnification device	8 0.0	2 0.0	10 0.0
Reading windows; reading guides	5 0.0	N/A N/A	5 0.0
Other (per Accommodations Guidelines)	37 0.0	216 1.0	253 0.2
Spanish version	407 0.3	N/A N/A	407 0.3
Online Accommodations Received			
Audio recording	N/A N/A	481 2.3	481 0.3
Color Chooser	N/A N/A	149 0.7	149 0.1
Number of assessed students	125,889	21,074	146,963

Incidence of Presentation Accommodations Received on the Winter 2012/2013 Keystone: Literature

Type of Presentation Accommodation	PPT	CBT	Total
	N/Pct	N/Pct	N/Pct
Braille format	9 0.0	N/A N/A	9 0.0
Large print format	39 0.0	N/A N/A	39 0.0
Electronic screen reader	4 0.0	N/A N/A	4 0.0
Test directions read aloud	1,028 0.9	144 0.8	1,172 0.8
Test directions signed, interpreted for ELL, or recorded	29 0.0	0 0.0	29 0.0
Amplification device	7 0.0	2 0.0	9 0.0
Magnification device	10 0.0	1 0.0	11 0.0
Reading windows; reading guides	16 0.0	N/A N/A	16 0.0
Other (per Accommodations Guidelines)	44 0.0	37 0.2	81 0.1
Online Accommodations Received			
Color Chooser	N/A N/A	13 0.1	13 0.0
Number of assessed students	120,751	17,932	138,683

Incidence of Response Accommodations Received on the Winter 2012/2013 Keystone: Algebra I

Type of Response Accommodation	PPT	CBT	Total
	N/Pct	N/Pct	N/Pct
Test administrator marked multiple-choice responses at student's direction	47 0.0	9 0.0	56 0.0
Test administrator scribed open-ended responses at student's direction	54 0.0	11 0.0	65 0.0
Test administrator transcribed student responses	89 0.0	10 0.0	99 0.0
Qualified interpreter translated, transcribed, and/or scribed student's signed responses	N/A N/A	N/A N/A	N/A N/A
Qualified interpreter translated, transcribed, and/or scribed ELL student responses	38 0.0	0 0.0	38 0.0
Keyboard, word processor, or computer	15 0.0	N/A N/A	15 0.0
Brailler/Notetaker	3 0.0	N/A N/A	3 0.0
Augmentative communication device	1 0.0	0 0.0	1 0.0
Audio recording of student responses	0 0.0	0 0.0	0 0.0
Electronic screen reader	3 0.0	N/A N/A	3 0.0
Manipulative - Winter only	4 0.0	0 0.0	4 0.0
Translation dictionary for ELL student	173 0.1	4 0.0	177 0.1
Other (per Accommodations Guidelines)	26 0.0	18 0.1	44 0.0
Number of assessed students	187,656	25,896	213,552

Incidence of Response Accommodations Received on the Winter 2012/2013 Keystone: Biology

Type of Response Accommodation	PPT	CBT	Total
	N/Pct	N/Pct	N/Pct
Test administrator marked multiple-choice responses at student's direction	42 0.0	9 0.0	51 0.0
Test administrator scribed open-ended responses at student's direction	46 0.0	11 0.1	57 0.0
Test administrator transcribed student responses	78 0.1	9 0.0	87 0.1
Qualified interpreter translated, transcribed, and/or scribed student's signed responses	N/A N/A	N/A N/A	N/A N/A
Qualified interpreter translated, transcribed, and/or scribed ELL student responses	2 0.0	0 0.0	2 0.0
Keyboard, word processor, or computer	19 0.0	N/A N/A	19 0.0
Brailler/Notetaker	4 0.0	N/A N/A	4 0.0
Augmentative communication device	1 0.0	0 0.0	1 0.0
Audio recording of student responses	0 0.0	0 0.0	0 0.0
Electronic screen reader	3 0.0	N/A N/A	3 0.0
Manipulative - Winter only	1 0.0	0 0.0	1 0.0
Translation dictionary for ELL student	176 0.1	4 0.0	180 0.1
Other (per Accommodations Guidelines)	6 0.0	19 0.1	25 0.0
Number of assessed students	125,889	21,074	146,963

Incidence of Response Accommodations Received on the Winter 2012/2013 Keystone: Literature

Type of Response Accommodation	PPT	CBT	Total
	N/Pct	N/Pct	N/Pct
Test administrator marked multiple-choice responses at student's direction	38 0.0	9 0.1	47 0.0
Test administrator scribed open-ended responses at student's direction	54 0.0	11 0.1	65 0.0
Test administrator transcribed student responses	97 0.1	9 0.1	106 0.1
Keyboard, word processor, or computer	37 0.0	N/A N/A	37 0.0
Brailler/Notetaker	5 0.0	N/A N/A	5 0.0
Augmentative communication device	0 0.0	0 0.0	0 0.0
Audio recording of student responses	0 0.0	0 0.0	0 0.0
Electronic screen reader	2 0.0	N/A N/A	2 0.0
Other (per Accommodations Guidelines)	18 0.0	20 0.1	38 0.0
Number of assessed students	120,751	17,932	138,683

Incidence of Setting Accommodations Received on the Winter 2012/2013 Keystone: Algebra I

Type of Setting Accommodation	PPT	CBT	Total
	N/Pct	N/Pct	N/Pct
Hospital/home setting	44 0.0	1 0.0	45 0.0
Tested in separate setting - Winter only	4,638 2.5	235 0.9	4,873 2.3
One-on-one setting	N/A N/A	N/A N/A	N/A N/A
Small group setting	8,377 4.5	690 2.7	9,067 4.2
Other (per Accommodations Guidelines)	46 0.0	25 0.1	71 0.0
Number of assessed students	187,656	25,896	213,552

Incidence of Setting Accommodations Received on the Winter 2012/2013 Keystone: Biology

Type of Setting Accommodation	PPT	CBT	Total
	N/Pct	N/Pct	N/Pct
Hospital/home setting	23 0.0	0 0.0	23 0.0
Tested in separate setting - Winter only	3,545 2.8	242 1.1	3,787 2.6
One-on-one setting	N/A N/A	N/A N/A	N/A N/A
Small group setting	6,245 5.0	648 3.1	6,893 4.7
Other (per Accommodations Guidelines)	35 0.0	26 0.1	61 0.0
Number of assessed students	125,889	21,074	146,963

Incidence of Setting Accommodations Received on the Winter 2012/2013 Keystone: Literature

Type of Setting Accommodation	PPT	CBT	Total
	N/Pct	N/Pct	N/Pct
Hospital/home setting	19 0.0	1 0.0	20 0.0
Tested in separate setting - Winter only	3,520 2.9	222 1.2	3,742 2.7
One-on-one setting	N/A N/A	N/A N/A	N/A N/A
Small group setting	6,390 5.3	520 2.9	6,910 5.0
Other (per Accommodations Guidelines)	21 0.0	27 0.2	48 0.0
Number of assessed students	120,751	17,932	138,683

Incidence of Timing Accommodations Received on the Winter 2012/2013 Keystone: Algebra I

Type of Timing Accommodation	PPT	CBT	Total
	N/Pct	N/Pct	N/Pct
Extended time	14,399 7.7	590 2.3	14,989 7.0
Frequent breaks	570 0.3	203 0.8	773 0.4
Changed test schedule	186 0.1	8 0.0	194 0.1
Other (per Accommodations Guidelines)	N/A N/A	N/A N/A	N/A N/A
Number of assessed students	187,656	25,896	213,552

Incidence of Timing Accommodations Received on the Winter 2012/2013 Keystone: Biology

Type of Timing Accommodation	PPT	CBT	Total
	N/Pct	N/Pct	N/Pct
Extended time	3,458 2.7	507 2.4	3,965 2.7
Frequent breaks	343 0.3	192 0.9	535 0.4
Changed test schedule	108 0.1	12 0.1	120 0.1
Other (per Accommodations Guidelines)	N/A N/A	N/A N/A	N/A N/A
Number of assessed students	125,889	21,074	146,963

Incidence of Timing Accommodations Received on the Winter 2012/2013 Keystone: Literature

Type of Timing Accommodation	PPT	CBT	Total
	N/Pct	N/Pct	N/Pct
Extended time	7,526 6.2	476 2.7	8,002 5.8
Frequent breaks	446 0.4	186 1.0	632 0.5
Changed test schedule	104 0.1	8 0.0	112 0.1
Other (per Accommodations Guidelines)	N/A N/A	N/A N/A	N/A N/A
Number of assessed students	120,751	17,932	138,683

Accommodation Rate for Non-IEP and IEP Students on the Winter 2012/2013 Keystone

Course Tested	Student Subgroup Tested	PPT	CBT	Total
		N/Pct	N/Pct	N/Pct
Algebra I	**Non-IEP Students**	166,951	23,425	190,376
	Non-Accommodated	154,447 92.5	23,224 99.1	177,671 93.3
	Accommodated	12,504 7.5	201 0.9	12,705 6.7
	IEP Students	20,705	2,471	23,176
	Non-Accommodated	11,275 54.5	1,484 60.1	12,759 55.1
	Accommodated	9,430 45.5	987 39.9	10,417 44.9
Biology	**Non-IEP Students**	110,493	18,622	129,115
	Non-Accommodated	107,660 97.4	18,285 98.2	125,945 97.5
	Accommodated	2,833 2.6	337 1.8	3,170 2.5
	IEP Students	15,396	2,452	17,848
	Non-Accommodated	8,554 55.6	1,455 59.3	10,009 56.1
	Accommodated	6,842 44.4	997 40.7	7,839 43.9
Literature	**Non-IEP Students**	105,138	15,927	121,065
	Non-Accommodated	99,032 94.2	15,811 99.3	114,843 94.9
	Accommodated	6,106 5.8	116 0.7	6,222 5.1
	IEP Students	15,613	2,005	17,618
	Non-Accommodated	8,528 54.6	1,341 66.9	9,869 56.0
	Accommodated	7,085 45.4	664 33.1	7,749 44.0

Incidence of IEP and ELL Students Receiving Accommodations on the Winter 2012/2013 Keystone: Algebra I

Classification of Students Regarding IEP and ELL					
Accommodation Received by Administration Mode		General Education (non-IEP or ELL)	IEP and non-ELL	ELL and non-IEP	Both IEP and ELL
		N/Pct	N/Pct	N/Pct	N/Pct
PPT	Test items/questions read aloud	69 0.0	1,083 5.3	34 1.0	24 5.4
	Small group setting	770 0.5	7,217 35.6	271 7.9	119 27.0
	Extended time	10,899 6.7	2,875 14.2	557 16.3	68 15.4
	Frequent breaks	75 0.0	485 2.4	2 0.1	8 1.8
	Number assessed	163,530	20,264	3,421	441
CBT	Test items/questions read aloud	9 0.0	138 5.6	1 0.8	1 5.3
	Small group setting	31 0.1	652 26.6	2 1.6	5 26.3
	Extended time	136 0.6	427 17.4	23 18.9	4 21.1
	Frequent breaks	10 0.0	192 7.8	0 0.0	1 5.3
	Number assessed	23,303	2,452	122	19
Total	Test items/questions read aloud	78 0.0	1,221 5.4	35 1.0	25 5.4
	Small group setting	801 0.4	7,869 34.6	273 7.7	124 27.0
	Extended time	11,035 5.9	3,302 14.5	580 16.4	72 15.7
	Frequent breaks	85 0.0	677 3.0	2 0.1	9 2.0
	Number assessed	186,833	22,716	3,543	460

Incidence of IEP and ELL Students Receiving Accommodations on the Winter 2012/2013 Keystone: Biology

Classification of Students Regarding IEP and ELL					
Accommodation Received by Administration Mode		General Education (non-IEP or ELL)	IEP and non-ELL	ELL and non-IEP	Both IEP and ELL
		N/Pct	N/Pct	N/Pct	N/Pct
PPT	Test items/questions read aloud	33 0.0	795 5.3	35 1.6	17 5.6
	Small group setting	482 0.4	5,493 36.4	193 8.8	77 25.3
	Extended time	1,757 1.6	1,404 9.3	271 12.3	26 8.6
	Frequent breaks	42 0.0	297 2.0	0 0.0	4 1.3
	Number assessed	108,296	15,092	2,197	304
CBT	Test items/questions read aloud	9 0.0	155 6.4	0 0.0	1 3.8
	Small group setting	23 0.1	618 25.5	3 2.9	4 15.4
	Extended time	53 0.3	426 17.6	22 21.4	6 23.1
	Frequent breaks	11 0.1	180 7.4	0 0.0	1 3.8
	Number assessed	18,519	2,426	103	26
Total	Test items/questions read aloud	42 0.0	950 5.4	35 1.5	18 5.5
	Small group setting	505 0.4	6,111 34.9	196 8.5	81 24.5
	Extended time	1,810 1.4	1,830 10.4	293 12.7	32 9.7
	Frequent breaks	53 0.0	477 2.7	0 0.0	5 1.5
	Number assessed	126,815	17,518	2,300	330

Incidence of IEP and ELL Students Receiving Accommodations on the Winter 2012/2013 Keystone: Literature

Classification of Students Regarding IEP and ELL					
Accommodation Received by Administration Mode		General Education (non-IEP or ELL)	IEP and non-ELL	ELL and non-IEP	Both IEP and ELL
		N/Pct	N/Pct	N/Pct	N/Pct
PPT	Small group setting	584 0.6	5,557 36.3	157 7.7	92 31.7
	Extended time	5,056 4.9	2,071 13.5	358 17.5	41 14.1
	Frequent breaks	67 0.1	373 2.4	1 0.0	5 1.7
	Number assessed	103,089	15,323	2,049	290
CBT	Small group setting	20 0.1	497 25.0	1 1.1	2 11.8
	Extended time	77 0.5	372 18.7	24 27.3	3 17.6
	Frequent breaks	11 0.1	174 8.8	0 0.0	1 5.9
	Number assessed	15,839	1,988	88	17
Total	Small group setting	604 0.5	6,054 35.0	158 7.4	94 30.6
	Extended time	5,133 4.3	2,443 14.1	382 17.9	44 14.3
	Frequent breaks	78 0.1	547 3.2	1 0.0	6 2.0
	Number assessed	118,928	17,311	2,137	307

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Students Assessed on the Summer 2013 Keystone: Algebra I

	Other*	Gr.6	Gr.7	Gr.8	Gr.9	Gr.10	Gr.11	Gr.12	Total
	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct
Number of PPT processed	29	0	8	188	616	588	255	13	1,697
Number of CBT processed	0	0	8	82	202	172	62	10	536
Total tests processed	29	0	16	270	818	760	317	23	2,233
Students with a total test score	28 96.6	0 0.0	16 100.0	259 95.9	794 97.1	707 93.0	306 96.5	21 91.3	2,131 95.4
Number of tests processed without a total score	1 3.4	0 0.0	0 0.0	11 4.1	24 2.9	53 7.0	11 3.5	2 8.7	102 4.6

*Other combines students coded as (1) below Grade 6, (2) ungraded, or (3) without a coded grade

Students Assessed on the Summer 2013 Keystone: Biology

	Other*	Gr.8	Gr.9	Gr.10	Gr.11	Gr.12	Total
	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct
Number of PPT processed	2	30	202	344	256	18	852
Number of CBT processed	0	0	55	172	76	11	314
Total tests processed	2	30	257	516	332	29	1,166
Students with a total test score	2 100.0	30 100.0	233 90.7	453 87.8	322 97.0	29 100.0	1,069 91.7
Number of tests processed without a total score	0 0.0	0 0.0	24 9.3	63 12.2	10 3.0	0 0.0	97 8.3

*Other combines students coded as (1) below Grade 8, (2) ungraded, or (3) without a coded grade

Students Assessed on the Summer 2013 Keystone: Literature

	Other*	Gr.8	Gr.9	Gr.10	Gr.11	Gr.12	Total
	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct
Number of PPT processed	1	0	56	369	143	8	577
Number of CBT processed	0	0	54	92	58	11	215
Total tests processed	1	0	110	461	201	19	792
Students with a total test score	1 100.0	0 0.0	98 89.1	432 93.7	192 95.5	19 100.0	742 93.7
Number of tests processed without a total score	0 0.0	0 0.0	12 10.9	29 6.3	9 4.5	0 0.0	50 6.3

*Other combines students coded as (1) below Grade 8, (2) ungraded, or (3) without a coded grade

Counts of Students without Scores on the Summer 2013 Keystone: Algebra I

Reason for Non-Assessment	Other*	Gr.6	Gr.7	Gr.8	Gr.9	Gr.10	Gr.11	Gr.12	Total
	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct
Extended absence from school	0 0.0	0 0.0	0 0.0	10 90.9	17 70.8	45 84.9	8 72.7	0 0.0	80 78.4
Absent without make-up	0 0.0	0 0.0	0 0.0	0 0.0	2 8.3	0 0.0	2 18.2	1 50.0	5 4.9
Non-attempt	1 100.0	0 0.0	0 0.0	1 9.1	5 20.8	7 13.2	1 9.1	1 50.0	16 15.7
Medical emergency	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
Other reasons	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	1 1.9	0 0.0	0 0.0	1 1.0
Total not assessed	1	0	0	11	24	53	11	2	102

*Other combines students coded as (1) below Grade 6, (2) ungraded, or (3) without a coded grade

Counts of Students without Scores on the Summer 2013 Keystone: Biology

Reason for Non-Assessment	Other*	Gr.8	Gr.9	Gr.10	Gr.11	Gr.12	Total
	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct
Extended absence from school	0 0.0	0 0.0	24 100.0	60 95.2	7 70.0	0 0.0	91 93.8
Absent without make-up	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
Non-attempt	0 0.0	0 0.0	0 0.0	3 4.8	2 20.0	0 0.0	5 5.2
Medical emergency	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
Other reasons	0 0.0	0 0.0	0 0.0	0 0.0	1 10.0	0 0.0	1 1.0
Total not assessed	0	0	24	63	10	0	97

*Other combines students coded as (1) below Grade 8, (2) ungraded, or (3) without a coded grade

Counts of Students without Scores on the Summer 2013 Keystone: Literature

Reason for Non-Assessment	Other*	Gr.8	Gr.9	Gr.10	Gr.11	Gr.12	Total
	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct
Extended absence from school	0 0.0	0 0.0	12 100.0	25 86.2	7 77.8	0 0.0	44 88.0
Absent without make-up	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
Non-attempt	0 0.0	0 0.0	0 0.0	4 13.8	2 22.2	0 0.0	6 12.0
ELL in first year in U.S. schools	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
Medical emergency	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
Other reasons	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
Total not assessed	0	0	12	29	9	0	50

*Other combines students coded as (1) below Grade 8, (2) ungraded, or (3) without a coded grade

Demographic Characteristics of Students taking the Summer 2013 Keystone: Algebra I

Demographic or Educational Characteristic	Other*	Gr.6	Gr.7	Gr.8	Gr.9	Gr.10	Gr.11	Gr.12	Total
	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct
Gender									
Female	14 50.0	0 0.0	10 62.5	129 49.8	367 46.2	352 49.8	155 50.7	5 23.8	1,032 48.4
Male	6 21.4	0 0.0	6 37.5	129 49.8	377 47.5	332 47.0	130 42.5	14 66.7	994 46.6
Race/Ethnicity									
American Indian/ Alaskan Native (not Hispanic)	0 0.0	0 0.0	0 0.0	1 0.4	2 0.3	0 0.0	0 0.0	0 0.0	3 0.1
Asian (not Hispanic)	1 3.6	0 0.0	0 0.0	4 1.5	16 2.0	9 1.3	1 0.3	1 4.8	32 1.5
Black or African American (not Hispanic)	5 17.9	0 0.0	0 0.0	27 10.4	92 11.6	172 24.3	39 12.7	8 38.1	343 16.1
Hispanic (any race)	6 21.4	0 0.0	0 0.0	5 1.9	37 4.7	22 3.1	25 8.2	1 4.8	96 4.5
Multi-Racial (not Hispanic)	0 0.0	0 0.0	0 0.0	4 1.5	9 1.1	15 2.1	4 1.3	0 0.0	32 1.5
White (not Hispanic)	8 28.6	0 0.0	16 100.0	215 83.0	566 71.3	447 63.2	184 60.1	9 42.9	1,445 67.8
Native Hawaiian or Other Pacific Islander (not Hispanic)	0 0.0	0 0.0	0 0.0	2 0.8	0 0.0	0 0.0	0 0.0	0 0.0	2 0.1
Educational Category and Other Demographic Groups									
IEP (not gifted)	2 7.1	0 0.0	0 0.0	9 3.5	123 15.5	101 14.3	65 21.2	9 42.9	309 14.5
Exited IEP in last 2 years	0 0.0	0 0.0	0 0.0	2 0.8	10 1.3	19 2.7	1 0.3	0 0.0	32 1.5
Title I	0 0.0	0 0.0	0 0.0	20 7.7	96 12.1	244 34.5	53 17.3	10 47.6	423 19.8
Title III served	0 0.0	0 0.0	0 0.0	1 0.4	3 0.4	5 0.7	6 2.0	0 0.0	15 0.7
Title III not served	0 0.0	0 0.0	5 31.3	69 26.6	80 10.1	23 3.3	16 5.2	0 0.0	193 9.1
Migrant student	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
ELL (enrolled after 5/24/12)	0 0.0	0 0.0	0 0.0	0 0.0	1 0.1	4 0.6	2 0.7	0 0.0	7 0.3
ELL (enrolled on or before 5/24/12)	0 0.0	0 0.0	0 0.0	1 0.4	3 0.4	3 0.4	3 1.0	0 0.0	10 0.5

Demographic Characteristics of Students taking the Summer 2013 Keystone: Algebra I (continued)

Demographic or Educational Characteristic	Other*	Gr.6	Gr.7	Gr.8	Gr.9	Gr.10	Gr.11	Gr.12	Total
	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct
Exited ESL/bilingual program and in first year of monitoring	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	2 0.3	0 0.0	0 0.0	2 0.1
Exited ESL/bilingual program and in 2nd year of monitoring	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	1 0.3	1 4.8	2 0.1
Former ELL no longer monitored	0 0.0	0 0.0	4 25.0	7 2.7	13 1.6	3 0.4	1 0.3	0 0.0	28 1.3
Foreign exchange student	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
Economically disadvantaged	1 3.6	0 0.0	1 6.3	43 16.6	187 23.6	244 34.5	105 34.3	11 52.4	592 27.8
Historically Underperforming Subgroup	2 7.1	0 0.0	1 6.3	51 19.7	269 33.9	307 43.4	142 46.4	13 61.9	785 36.8
Enrollment in school of residence after 10/1/12	0 0.0	0 0.0	5 31.3	10 3.9	26 3.3	24 3.4	29 9.5	9 42.9	103 4.8
Enrollment in district of residence after 10/1/12	0 0.0	0 0.0	5 31.3	9 3.5	17 2.1	21 3.0	29 9.5	9 42.9	90 4.2
Enrollment as PA resident after 10/1/12	0 0.0	0 0.0	5 31.3	8 3.1	5 0.6	6 0.8	3 1.0	1 4.8	28 1.3
Enrollment in school of residence after 10/1/11 but on/before 10/1/12	1 3.6	0 0.0	3 18.8	6 2.3	116 14.6	50 7.1	14 4.6	1 4.8	191 9.0
Enrollment in district of residence after 10/1/11 but on/before 10/1/12	0 0.0	0 0.0	0 0.0	6 2.3	54 6.8	44 6.2	13 4.2	1 4.8	118 5.5
Home schooled	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
Court/agency placed	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
Number of assessed students	28	0	16	259	794	707	306	21	2,131

*Other combines students coded as (1) below Grade 6, (2) ungraded, or (3) without a coded grade

Demographic Characteristics of Students taking the Summer 2013 Keystone: Biology

Demographic or Educational Characteristic	Other*	Gr.8	Gr.9	Gr.10	Gr.11	Gr.12	Total
	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct
Gender							
Female	1 50.0	7 23.3	124 53.2	237 52.3	180 55.9	9 31.0	558 52.2
Male	1 50.0	23 76.7	105 45.1	213 47.0	141 43.8	17 58.6	500 46.8
Race/Ethnicity							
American Indian/ Alaskan Native (not Hispanic)	0 0.0	0 0.0	1 0.4	0 0.0	0 0.0	0 0.0	1 0.1
Asian (not Hispanic)	0 0.0	9 30.0	11 4.7	17 3.8	5 1.6	2 6.9	44 4.1
Black or African American (not Hispanic)	0 0.0	2 6.7	42 18.0	51 11.3	102 31.7	9 31.0	206 19.3
Hispanic (any race)	0 0.0	1 3.3	9 3.9	15 3.3	23 7.1	0 0.0	48 4.5
Multi-Racial (not Hispanic)	0 0.0	0 0.0	4 1.7	4 0.9	13 4.0	0 0.0	21 2.0
White (not Hispanic)	2 100.0	18 60.0	162 69.5	363 80.1	177 55.0	15 51.7	737 68.9
Native Hawaiian or Other Pacific Islander (not Hispanic)	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
Educational Category and Other Demographic Groups							
IEP (not gifted)	0 0.0	2 6.7	44 18.9	67 14.8	53 16.5	7 24.1	173 16.2
Exited IEP in last 2 years	0 0.0	4 13.3	4 1.7	10 2.2	9 2.8	2 6.9	29 2.7
Title I	0 0.0	0 0.0	28 12.0	52 11.5	174 54.0	10 34.5	264 24.7
Title III served	0 0.0	0 0.0	5 2.1	1 0.2	3 0.9	0 0.0	9 0.8
Title III not served	0 0.0	0 0.0	0 0.0	44 9.7	0 0.0	0 0.0	44 4.1
Migrant student	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
ELL (enrolled after 5/24/12)	0 0.0	0 0.0	1 0.4	1 0.2	0 0.0	0 0.0	2 0.2
ELL (enrolled on or before 5/24/12)	0 0.0	0 0.0	4 1.7	3 0.7	3 0.9	0 0.0	10 0.9

Demographic Characteristics of Students taking the Summer 2013 Keystone: Biology (continued)

Demographic or Educational Characteristic	Other*	Gr.8	Gr.9	Gr.10	Gr.11	Gr.12	Total
	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct
Exited ESL/bilingual program and in first year of monitoring	0 0.0	1 3.3	0 0.0	2 0.4	0 0.0	0 0.0	3 0.3
Exited ESL/bilingual program and in 2nd year of monitoring	0 0.0	0 0.0	0 0.0	4 0.9	0 0.0	2 6.9	6 0.6
Former ELL no longer monitored	0 0.0	2 6.7	2 0.9	9 2.0	1 0.3	0 0.0	14 1.3
Foreign exchange student	0 0.0	0 0.0	0 0.0	1 0.2	0 0.0	0 0.0	1 0.1
Economically disadvantaged	0 0.0	3 10.0	76 32.6	128 28.3	149 46.3	10 34.5	366 34.2
Historically Underperforming Subgroup	0 0.0	5 16.7	106 45.5	172 38.0	174 54.0	10 34.5	467 43.7
Enrollment in school of residence after 10/1/12	0 0.0	0 0.0	15 6.4	20 4.4	24 7.5	8 27.6	67 6.3
Enrollment in district of residence after 10/1/12	0 0.0	0 0.0	14 6.0	17 3.8	24 7.5	8 27.6	63 5.9
Enrollment as PA resident after 10/1/12	0 0.0	0 0.0	4 1.7	4 0.9	2 0.6	1 3.4	11 1.0
Enrollment in school of residence after 10/1/11 but on/before 10/1/12	0 0.0	0 0.0	19 8.2	18 4.0	16 5.0	1 3.4	54 5.1
Enrollment in district of residence after 10/1/11 but on/before 10/1/12	0 0.0	0 0.0	15 6.4	17 3.8	15 4.7	1 3.4	48 4.5
Home schooled	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
Court/agency placed	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
Number of assessed students	2	30	233	453	322	29	1,069

*Other combines students coded as (1) below Grade 8, (2) ungraded, or (3) without a coded grade

Demographic Characteristics of Students taking the Summer 2013 Keystone: Literature

Demographic or Educational Characteristic	Other*	Gr.8	Gr.9	Gr.10	Gr.11	Gr.12	Total
	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct
Gender							
Female	1 100.0	0 0.0	49 50.0	208 48.1	79 41.1	2 10.5	339 45.7
Male	0 0.0	0 0.0	49 50.0	219 50.7	98 51.0	15 78.9	381 51.3
Race/Ethnicity							
American Indian/ Alaskan Native (not Hispanic)	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
Asian (not Hispanic)	0 0.0	0 0.0	1 1.0	6 1.4	0 0.0	1 5.3	8 1.1
Black or African American (not Hispanic)	0 0.0	0 0.0	11 11.2	122 28.2	26 13.5	8 42.1	167 22.5
Hispanic (any race)	1 100.0	0 0.0	3 3.1	11 2.5	11 5.7	0 0.0	26 3.5
Multi-Racial (not Hispanic)	0 0.0	0 0.0	0 0.0	12 2.8	4 2.1	0 0.0	16 2.2
White (not Hispanic)	0 0.0	0 0.0	83 84.7	265 61.3	125 65.1	8 42.1	481 64.8
Native Hawaiian or Other Pacific Islander (not Hispanic)	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
Educational Category and Other Demographic Groups							
IEP (not gifted)	0 0.0	0 0.0	12 12.2	74 17.1	60 31.3	8 42.1	154 20.8
Exited IEP in last 2 years	0 0.0	0 0.0	0 0.0	8 1.9	1 0.5	2 10.5	11 1.5
Title I	0 0.0	0 0.0	15 15.3	204 47.2	33 17.2	9 47.4	261 35.2
Title III served	0 0.0	0 0.0	0 0.0	1 0.2	2 1.0	0 0.0	3 0.4
Title III not served	0 0.0	0 0.0	0 0.0	31 7.2	6 3.1	0 0.0	37 5.0
Migrant student	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
ELL (enrolled after 5/24/12)	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
ELL (enrolled on or before 5/24/12)	0 0.0	0 0.0	0 0.0	0 0.0	1 0.5	0 0.0	1 0.1

Demographic Characteristics of Students taking the Summer 2013 Keystone: Literature (continued)

Demographic or Educational Characteristic	Other*	Gr.8	Gr.9	Gr.10	Gr.11	Gr.12	Total
	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct	N/Pct
Exited ESL/bilingual program and in first year of monitoring	0 0.0	0 0.0	0 0.0	1 0.2	1 0.5	0 0.0	2 0.3
Exited ESL/bilingual program and in 2nd year of monitoring	0 0.0	0 0.0	0 0.0	1 0.2	0 0.0	1 5.3	2 0.3
Former ELL no longer monitored	0 0.0	0 0.0	1 1.0	3 0.7	0 0.0	0 0.0	4 0.5
Foreign exchange student	0 0.0	0 0.0	0 0.0	1 0.2	0 0.0	0 0.0	1 0.1
Economically disadvantaged	0 0.0	0 0.0	27 27.6	195 45.1	70 36.5	10 52.6	302 40.7
Historically Underperforming Subgroup	0 0.0	0 0.0	34 34.7	232 53.7	104 54.2	12 63.2	382 51.5
Enrollment in school of residence after 10/1/12	1 100.0	0 0.0	6 6.1	27 6.3	26 13.5	10 52.6	70 9.4
Enrollment in district of residence after 10/1/12	1 100.0	0 0.0	6 6.1	22 5.1	26 13.5	10 52.6	65 8.8
Enrollment as PA resident after 10/1/12	1 100.0	0 0.0	0 0.0	5 1.2	5 2.6	2 10.5	13 1.8
Enrollment in school of residence after 10/1/11 but on/before 10/1/12	0 0.0	0 0.0	5 5.1	42 9.7	12 6.3	0 0.0	59 8.0
Enrollment in district of residence after 10/1/11 but on/before 10/1/12	0 0.0	0 0.0	5 5.1	40 9.3	11 5.7	0 0.0	56 7.5
Home schooled	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
Court/agency placed	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
Number of assessed students	1	0	98	432	192	19	742

*Other combines students coded as (1) below Grade 8, (2) ungraded, or (3) without a coded grade

Incidence of Presentation Accommodations Received on the Summer 2013 Keystone: Algebra I

Type of Presentation Accommodation	PPT	CBT	Total
	N/Pct	N/Pct	N/Pct
Braille format	0 0.0	N/A N/A	0 0.0
Large print format	0 0.0	N/A N/A	0 0.0
Electronic screen reader	0 0.0	N/A N/A	0 0.0
Some test items/questions read aloud	6 0.4	0 0.0	6 0.3
All test items/questions read aloud	6 0.4	0 0.0	6 0.3
Test items/questions signed	0 0.0	0 0.0	0 0.0
Test items/questions interpreted for ELL student	0 0.0	0 0.0	0 0.0
Amplification device	0 0.0	0 0.0	0 0.0
Magnification device	0 0.0	0 0.0	0 0.0
Color overlay	0 0.0	N/A N/A	0 0.0
Other (per Accommodations Guidelines)	0 0.0	0 0.0	0 0.0
Spanish version	0 0.0	N/A N/A	0 0.0
Online Accommodations Received			
Audio recording	N/A N/A	8 1.5	8 0.4
Color Chooser	N/A N/A	0 0.0	0 0.0
Number of assessed students	1,597	534	2,131

Incidence of Presentation Accommodations Received on the Summer 2013 Keystone: Biology

Type of Presentation Accommodation	PPT	CBT	Total
	N/Pct	N/Pct	N/Pct
Braille format	1 0.1	N/A N/A	1 0.1
Large print format	0 0.0	N/A N/A	0 0.0
Electronic screen reader	1 0.1	N/A N/A	1 0.1
Some test items/questions read aloud	5 0.7	0 0.0	5 0.5
All test items/questions read aloud	0 0.0	0 0.0	0 0.0
Test items/questions signed	0 0.0	0 0.0	0 0.0
Test items/questions interpreted for ELL student	0 0.0	0 0.0	0 0.0
Amplification device	0 0.0	0 0.0	0 0.0
Magnification device	0 0.0	0 0.0	0 0.0
Color overlay	0 0.0	N/A N/A	0 0.0
Other (per Accommodations Guidelines)	0 0.0	0 0.0	0 0.0
Spanish version	1 0.1	N/A N/A	1 0.1
Online Accommodations Received			
Audio recording	N/A N/A	6 1.9	6 0.6
Color Chooser	N/A N/A	0 0.0	0 0.0
Number of assessed students	756	313	1,069

Incidence of Presentation Accommodations Received on the Summer 2013 Keystone: Literature

Type of Presentation Accommodation	PPT	CBT	Total
	N/Pct	N/Pct	N/Pct
Braille format	0 0.0	N/A N/A	0 0.0
Large print format	0 0.0	N/A N/A	0 0.0
Electronic screen reader	0 0.0	N/A N/A	0 0.0
Amplification device	0 0.0	0 0.0	0 0.0
Magnification device	0 0.0	0 0.0	0 0.0
Color overlay	0 0.0	N/A N/A	0 0.0
Other (per Accommodations Guidelines)	0 0.0	0 0.0	0 0.0
Online Accommodations Received			
Color Chooser	N/A N/A	0 0.0	0 0.0
Number of assessed students	527	215	742

Incidence of Response Accommodations Received on the Summer 2013 Keystone: Algebra I

Type of Response Accommodation	PPT	CBT	Total
	N/Pct	N/Pct	N/Pct
Test administrator marked multiple-choice responses at student's direction	0 0.0	0 0.0	0 0.0
Test administrator scribed open-ended responses at student's direction	1 0.1	0 0.0	1 0.0
Test administrator transcribed student responses	1 0.1	0 0.0	1 0.0
Qualified interpreter translated, transcribed, and/or scribed student's signed responses	0 0.0	0 0.0	0 0.0
Qualified interpreter translated, transcribed, and/or scribed ELL student responses	0 0.0	0 0.0	0 0.0
Keyboard, word processor, or computer	1 0.1	N/A N/A	1 0.0
Brailler/Notetaker	0 0.0	N/A N/A	0 0.0
Augmentative communication device	0 0.0	0 0.0	0 0.0
Audio recording of student responses	0 0.0	0 0.0	0 0.0
Electronic screen reader	0 0.0	N/A N/A	0 0.0
Manipulative - Winter only	N/A N/A	N/A N/A	N/A N/A
Translation dictionary for ELL student	0 0.0	0 0.0	0 0.0
Other (per Accommodations Guidelines)	0 0.0	0 0.0	0 0.0
Number of assessed students	1,597	534	2,131

Incidence of Response Accommodations Received on the Summer 013 Keystone: Biology

Type of Response Accommodation	PPT	CBT	Total
	N/Pct	N/Pct	N/Pct
Test administrator marked multiple-choice responses at student's direction	0 0.0	0 0.0	0 0.0
Test administrator scribed open-ended responses at student's direction	0 0.0	0 0.0	0 0.0
Test administrator transcribed student responses	1 0.1	0 0.0	1 0.1
Qualified interpreter translated, transcribed, and/or scribed student's signed responses	0 0.0	0 0.0	0 0.0
Qualified interpreter translated, transcribed, and/or scribed ELL student responses	0 0.0	0 0.0	0 0.0
Keyboard, word processor, or computer	1 0.1	N/A N/A	1 0.1
Brailler/Notetaker	1 0.1	N/A N/A	1 0.1
Augmentative communication device	0 0.0	0 0.0	0 0.0
Audio recording of student responses	0 0.0	0 0.0	0 0.0
Electronic screen reader	1 0.1	N/A N/A	1 0.1
Manipulative - Winter only	N/A N/A	N/A N/A	N/A N/A
Translation dictionary for ELL student	1 0.1	0 0.0	1 0.1
Other (per Accommodations Guidelines)	0 0.0	0 0.0	0 0.0
Number of assessed students	756	313	1,069

Incidence of Response Accommodations Received on the Summer 2013 Keystone: Literature

Type of Response Accommodation	PPT	CBT	Total
	N/Pct	N/Pct	N/Pct
Test administrator marked multiple-choice responses at student's direction	0 0.0	0 0.0	0 0.0
Test administrator scribed open-ended responses at student's direction	1 0.2	0 0.0	1 0.1
Test administrator transcribed student responses	0 0.0	0 0.0	0 0.0
Keyboard, word processor, or computer	0 0.0	N/A N/A	0 0.0
Brailler/Notetaker	0 0.0	N/A N/A	0 0.0
Augmentative communication device	0 0.0	0 0.0	0 0.0
Audio recording of student responses	0 0.0	0 0.0	0 0.0
Electronic screen reader	0 0.0	N/A N/A	0 0.0
Other (per Accommodations Guidelines)	0 0.0	0 0.0	0 0.0
Number of assessed students	527	215	742

Incidence of Setting Accommodations Received on the Summer 2013 Keystone: Algebra I

Type of Setting Accommodation	PPT	CBT	Total
	N/Pct	N/Pct	N/Pct
Hospital/home setting	0 0.0	0 0.0	0 0.0
Tested in separate setting - Winter only	N/A N/A	N/A N/A	N/A N/A
One-on-one setting	5 0.3	0 0.0	5 0.2
Small group setting	85 5.3	23 4.3	108 5.1
Other (per Accommodations Guidelines)	0 0.0	0 0.0	0 0.0
Number of assessed students	1,597	534	2,131

Incidence of Setting Accommodations Received on the Summer 2013 Keystone: Biology

Type of Setting Accommodation	PPT	CBT	Total
	N/Pct	N/Pct	N/Pct
Hospital/home setting	0 0.0	0 0.0	0 0.0
Tested in separate setting - Winter only	N/A N/A	N/A N/A	N/A N/A
One-on-one setting	8 1.1	0 0.0	8 0.7
Small group setting	23 3.0	14 4.5	37 3.5
Other (per Accommodations Guidelines)	0 0.0	0 0.0	0 0.0
Number of assessed students	756	313	1,069

Incidence of Setting Accommodations Received on the Summer 2013 Keystone: Literature

Type of Setting Accommodation	PPT	CBT	Total
	N/Pct	N/Pct	N/Pct
Hospital/home setting	0 0.0	0 0.0	0 0.0
Tested in separate setting - Winter only	N/A N/A	N/A N/A	N/A N/A
One-on-one setting	1 0.2	0 0.0	1 0.1
Small group setting	55 10.4	4 1.9	59 8.0
Other (per Accommodations Guidelines)	0 0.0	0 0.0	0 0.0
Number of assessed students	527	215	742

Incidence of Timing Accommodations Received on the Summer 2013 Keystone: Algebra I

Type of Timing Accommodation	PPT	CBT	Total
	N/Pct	N/Pct	N/Pct
Extended time	42 2.6	34 6.4	76 3.6
Frequent breaks	7 0.4	3 0.6	10 0.5
Changed test schedule	0 0.0	0 0.0	0 0.0
Other (per Accommodations Guidelines)	0 0.0	0 0.0	0 0.0
Number of assessed students	1,597	534	2,131

Incidence of Timing Accommodations Received on the Summer 2013 Keystone: Biology

Type of Timing Accommodation	PPT	CBT	Total
	N/Pct	N/Pct	N/Pct
Extended time	6 0.8	9 2.9	15 1.4
Frequent breaks	18 2.4	1 0.3	19 1.8
Changed test schedule	1 0.1	0 0.0	1 0.1
Other (per Accommodations Guidelines)	0 0.0	0 0.0	0 0.0
Number of assessed students	756	313	1,069

Incidence of Timing Accommodations Received on the Summer 2013 Keystone: Literature

Type of Timing Accommodation	PPT	CBT	Total
	N/Pct	N/Pct	N/Pct
Extended time	3 0.6	2 0.9	5 0.7
Frequent breaks	3 0.6	0 0.0	3 0.4
Changed test schedule	0 0.0	0 0.0	0 0.0
Other (per Accommodations Guidelines)	0 0.0	0 0.0	0 0.0
Number of assessed students	527	215	742

Accommodation Rate for Non-IEP and IEP Students on the Summer 2013 Keystone

Course Tested	Student Subgroup Tested	PPT	CBT	Total
		N/Pct	N/Pct	N/Pct
Algebra I	**Non-IEP Students**	1,365	457	1,822
	Non-Accommodated	1,318 96.6	429 93.9	1,747 95.9
	Accommodated	47 3.4	28 6.1	75 4.1
	IEP Students	232	77	309
	Non-Accommodated	160 69.0	55 71.4	215 69.6
	Accommodated	72 31.0	22 28.6	94 30.4
Biology	**Non-IEP Students**	635	261	896
	Non-Accommodated	632 99.5	249 95.4	881 98.3
	Accommodated	3 0.5	12 4.6	15 1.7
	IEP Students	121	52	173
	Non-Accommodated	89 73.6	38 73.1	127 73.4
	Accommodated	32 26.4	14 26.9	46 26.6
Literature	**Non-IEP Students**	418	170	588
	Non-Accommodated	409 97.8	167 98.2	576 98.0
	Accommodated	9 2.2	3 1.8	12 2.0
	IEP Students	109	45	154
	Non-Accommodated	62 56.9	42 93.3	104 67.5
	Accommodated	47 43.1	3 6.7	50 32.5

Incidence of IEP and ELL Students Receiving Accommodations on the Summer 2013 Keystone: Algebra I

Classification of Students Regarding IEP and ELL					
Accommodation Received by Administration Mode		General Education (non-IEP or ELL)	IEP and non-ELL	ELL and non-IEP	Both IEP and ELL
		N/Pct	N/Pct	N/Pct	N/Pct
PPT	Some test items/questions read aloud	0 0.0	6 2.6	0 0.0	0 0.0
	All test items/questions read aloud	0 0.0	6 2.6	0 0.0	0 0.0
	Small group setting	24 1.8	61 26.4	0 0.0	0 0.0
	Extended time	25 1.8	14 6.1	2 22.2	1 100.0
	Frequent breaks	0 0.0	7 3.0	0 0.0	0 0.0
	Number assessed	1,356	231	9	1
CBT	Some test items/questions read aloud	0 0.0	0 0.0	0 0.0	0 0.0
	All test items/questions read aloud	0 0.0	0 0.0	0 0.0	0 0.0
	Small group setting	8 1.8	14 18.4	0 0.0	1 100.0
	Extended time	24 5.3	10 13.2	0 0.0	0 0.0
	Frequent breaks	1 0.2	2 2.6	0 0.0	0 0.0
	Number assessed	451	76	6	1
Total	Some test items/questions read aloud	0 0.0	6 2.0	0 0.0	0 0.0
	All test items/questions read aloud	0 0.0	6 2.0	0 0.0	0 0.0
	Small group setting	32 1.8	75 24.4	0 0.0	1 50.0
	Extended time	49 2.7	24 7.8	2 13.3	1 50.0
	Frequent breaks	1 0.1	9 2.9	0 0.0	0 0.0
	Number assessed	1,807	307	15	2

Incidence of IEP and ELL Students Receiving Accommodations on the Summer 2013 Keystone: Biology

Classification of Students Regarding IEP and ELL					
Accommodation Received by Administration Mode		General Education (non-IEP or ELL)	IEP and non-ELL	ELL and non-IEP	Both IEP and ELL
		N/Pct	N/Pct	N/Pct	N/Pct
PPT	Some test items/questions read aloud	0 0.0	5 4.2	0 0.0	0 0.0
	All test items/questions read aloud	0 0.0	0 0.0	0 0.0	0 0.0
	Small group setting	0 0.0	23 19.2	0 0.0	0 0.0
	Extended time	1 0.2	4 3.3	0 0.0	1 100.0
	Frequent breaks	0 0.0	18 15.0	0 0.0	0 0.0
	Number assessed	627	120	8	1
CBT	Some test items/questions read aloud	0 0.0	0 0.0	0 0.0	0 0.0
	All test items/questions read aloud	0 0.0	0 0.0	0 0.0	0 0.0
	Small group setting	6 2.3	7 13.7	0 0.0	1 100.0
	Extended time	7 2.7	2 3.9	0 0.0	0 0.0
	Frequent breaks	0 0.0	1 2.0	0 0.0	0 0.0
	Number assessed	259	51	2	1
Total	Some test items/questions read aloud	0 0.0	5 2.9	0 0.0	0 0.0
	All test items/questions read aloud	0 0.0	0 0.0	0 0.0	0 0.0
	Small group setting	6 0.7	30 17.5	0 0.0	1 50.0
	Extended time	8 0.9	6 3.5	0 0.0	1 50.0
	Frequent breaks	0 0.0	19 11.1	0 0.0	0 0.0
	Number assessed	886	171	10	2

Incidence of IEP and ELL Students Receiving Accommodations on the Summer 2013 Keystone: Literature

Classification of Students Regarding IEP and ELL					
Accommodation Received by Administration Mode		General Education (non-IEP or ELL)	IEP and non-ELL	ELL and non-IEP	Both IEP and ELL
		N/Pct	N/Pct	N/Pct	N/Pct
PPT	Small group setting	9 2.2	46 42.2	0 0.0	0 0.0
	Extended time	0 0.0	3 2.8	0 0.0	0 0.0
	Frequent breaks	0 0.0	3 2.8	0 0.0	0 0.0
	Number assessed	417	109	1	0
CBT	Small group setting	1 0.6	3 6.7	0 0.0	0 0.0
	Extended time	2 1.2	0 0.0	0 0.0	0 0.0
	Frequent breaks	0 0.0	0 0.0	0 0.0	0 0.0
	Number assessed	170	45	0	0
Total	Small group setting	10 1.7	49 31.8	0 0.0	0 0.0
	Extended time	2 0.3	3 1.9	0 0.0	0 0.0
	Frequent breaks	0 0.0	3 1.9	0 0.0	0 0.0
	Number assessed	587	154	1	0

APPENDIX J: ITEM STATISTICS

Table J–1. Item Statistics

Column Heading	Definition
Ref	Reference line number
ID	Item ID
Form	Test form
N	Number of students
PVal	*P*-Value
P( )	Proportion selecting given response (- = blank)
ITCorr	Item total correlation
Corr( )	Correlation of options/points and total test score
Meas	Rasch item difficulty measure estimate
SEM	Standard error of Rasch item difficulty measure estimate
z	*z* fit statistic
MS	Mean square fit statistic
M/F	Male/Female DIF code
W/B	White/Black DIF code
W/H	White/Hispanic DIF code
O/P	Online computer-based test/paper-pencil-based test DIF code

Table J–2. Algebra I Multiple-Choice Item Statistics: Winter

Item Information			Classical													Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(A)	P(B)	P(C)	P(D)	P(-)	P(*)	ITCorr	Corr(A)	Corr(B)	Corr(C)	Corr(D)	Meas	SEM	*z*	MS	*z*	MS
1	605197	0	215160	0.85	0.07	0.85	0.06	0.02	0.00	0.00	0.41	-0.27	0.41	-0.24	-0.15	-1.20	0.01	-9.90	0.84	-9.90	0.71
2	605171	0	215160	0.69	0.09	0.69	0.13	0.08	0.00	0.00	0.45	-0.28	0.45	-0.22	-0.20	-0.05	0.01	-9.90	0.92	-9.90	0.87
3	605261	0	215160	0.72	0.19	0.06	0.72	0.02	0.00	0.00	0.41	-0.24	-0.25	0.41	-0.17	0.08	0.01	-9.90	0.93	-9.90	0.87
4	605184	0	215160	0.34	0.34	0.15	0.30	0.20	0.01	0.00	0.17	0.17	-0.09	0.06	-0.18	1.12	0.01	9.90	1.24	9.90	1.37
5	605090	0	215160	0.56	0.56	0.15	0.16	0.14	0.00	0.00	0.32	0.32	-0.25	-0.17	-0.03	0.47	0.01	9.90	1.14	9.90	1.17
6	605255	0	215160	0.83	0.02	0.07	0.08	0.83	0.00	0.00	0.46	-0.20	-0.27	-0.28	0.46	-0.87	0.01	-9.90	0.77	-9.90	0.64
7	605211	0	215160	0.52	0.52	0.11	0.16	0.20	0.00	0.00	0.57	0.57	-0.24	-0.32	-0.22	0.87	0.01	-9.90	0.85	-9.90	0.84
8	605132	0	215160	0.41	0.12	0.37	0.10	0.41	0.00	0.00	0.41	-0.24	-0.16	-0.17	0.41	0.85	0.01	7.18	1.01	8.93	1.03
9	605076	0	215160	0.75	0.75	0.06	0.09	0.10	0.00	0.00	0.43	0.43	-0.22	-0.26	-0.20	-0.39	0.01	-9.90	0.90	-9.90	0.82
10	605249	0	215160	0.82	0.04	0.06	0.08	0.82	0.01	0.00	0.52	-0.24	-0.25	-0.31	0.52	-1.01	0.01	-9.90	0.80	-9.90	0.65
11	605116	0	215160	0.61	0.18	0.61	0.09	0.11	0.01	0.00	0.39	-0.25	0.39	-0.26	-0.04	-0.03	0.01	9.90	1.10	9.90	1.14
12	605188	0	215160	0.49	0.10	0.27	0.14	0.49	0.01	0.00	0.25	-0.24	0.08	-0.23	0.25	0.74	0.01	9.90	1.22	9.90	1.31
13	605094	0	215160	0.72	0.16	0.04	0.08	0.72	0.01	0.00	0.45	-0.24	-0.20	-0.24	0.45	-0.67	0.01	9.90	1.08	9.90	1.07
14	605218	0	215160	0.55	0.55	0.19	0.17	0.07	0.01	0.00	0.50	0.50	-0.26	-0.22	-0.19	0.64	0.01	-9.90	0.92	-9.90	0.90
15	605169	0	215160	0.73	0.07	0.13	0.73	0.07	0.01	0.00	0.44	-0.16	-0.29	0.44	-0.20	-0.40	0.01	-9.90	0.93	-9.90	0.88
16	605133	0	215160	0.63	0.18	0.63	0.08	0.11	0.01	0.00	0.34	-0.18	0.34	-0.21	-0.08	-0.22	0.01	9.90	1.23	9.90	1.27
17	605307	0	215160	0.80	0.09	0.07	0.80	0.03	0.01	0.00	0.46	-0.26	-0.24	0.46	-0.20	-1.18	0.01	9.90	1.05	-9.90	0.91
18	605265	0	215160	0.67	0.01	0.10	0.67	0.21	0.01	0.00	0.51	-0.15	-0.20	0.51	-0.37	1.03	0.01	9.90	1.06	9.90	1.12
19	605123	0	215160	0.90	0.03	0.06	0.90	0.01	0.00	0.00	0.27	-0.15	-0.18	0.27	-0.09	-1.42	0.01	-9.90	0.83	-9.90	0.83
20	605066	0	215160	0.61	0.61	0.14	0.07	0.18	0.00	0.00	0.46	0.46	-0.17	-0.28	-0.25	0.28	0.01	-9.90	0.96	-9.90	0.96
21	605115	0	215160	0.72	0.11	0.72	0.13	0.05	0.00	0.00	0.56	-0.29	0.56	-0.35	-0.21	-0.60	0.01	-9.90	0.91	-9.90	0.78
22	605260	0	215160	0.72	0.05	0.16	0.72	0.07	0.00	0.00	0.38	-0.22	-0.26	0.38	-0.11	-0.51	0.01	9.90	1.06	9.90	1.12
23	605127	0	215160	0.69	0.04	0.22	0.69	0.05	0.00	0.00	0.47	-0.20	-0.30	0.47	-0.25	-0.36	0.01	-3.06	0.99	-9.90	0.92
24	605194	0	215160	0.82	0.82	0.03	0.12	0.03	0.00	0.00	0.41	0.41	-0.21	-0.27	-0.18	-0.91	0.01	-9.90	0.88	-9.90	0.79
25	605266	0	215160	0.73	0.04	0.19	0.04	0.73	0.00	0.00	0.52	-0.24	-0.38	-0.18	0.52	-0.83	0.01	7.58	1.03	-9.90	0.92
26	605192	0	215160	0.44	0.22	0.16	0.18	0.44	0.01	0.00	0.24	0.05	-0.16	-0.22	0.24	0.91	0.01	9.90	1.21	9.90	1.30
27	605241	0	215160	0.53	0.53	0.18	0.24	0.06	0.00	0.00	0.12	0.12	-0.14	0.01	-0.04	0.47	0.01	9.90	1.39	9.90	1.57
28	605071	0	215160	0.58	0.19	0.14	0.58	0.08	0.00	0.00	0.50	-0.25	-0.28	0.50	-0.15	0.54	0.01	-9.90	0.92	-9.90	0.90
29	605096	0	215160	0.59	0.14	0.59	0.18	0.09	0.01	0.00	0.35	-0.16	0.35	-0.20	-0.12	0.43	0.01	9.90	1.09	9.90	1.11
30	605250	0	215160	0.51	0.51	0.27	0.17	0.05	0.00	0.00	0.47	0.47	-0.25	-0.21	-0.17	1.04	0.01	-7.25	0.98	3.61	1.01
31	605080	0	215160	0.53	0.53	0.02	0.11	0.34	0.00	0.00	0.47	0.47	-0.18	-0.24	-0.27	0.39	0.01	-1.97	1.00	-8.36	0.97

Item Information			Classical													Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(A)	P(B)	P(C)	P(D)	P(-)	P(*)	ITCorr	Corr(A)	Corr(B)	Corr(C)	Corr(D)	Meas	SEM	*z*	MS	*z*	MS
32	605095	0	215160	0.45	0.09	0.45	0.39	0.06	0.01	0.00	0.48	-0.10	0.48	-0.31	-0.21	0.91	0.01	-9.90	0.93	-9.90	0.95
33	605081	0	215160	0.53	0.17	0.53	0.23	0.06	0.00	0.00	0.23	-0.19	0.23	-0.02	-0.10	0.79	0.01	9.90	1.24	9.90	1.36
34	605259	0	215160	0.58	0.20	0.08	0.14	0.58	0.01	0.00	0.42	-0.23	-0.26	-0.11	0.42	0.36	0.01	9.13	1.02	8.27	1.03
35	605061	0	215160	0.80	0.08	0.06	0.80	0.05	0.00	0.00	0.52	-0.30	-0.28	0.52	-0.23	-1.15	0.01	-9.90	0.96	-9.90	0.79
36	605104	0	215160	0.87	0.05	0.03	0.87	0.04	0.00	0.00	0.48	-0.27	-0.22	0.48	-0.27	-1.64	0.01	-9.90	0.86	-9.90	0.59

Table J–3. Biology Multiple-Choice Item Statistics: Winter

Item Information			Classical													Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(A)	P(B)	P(C)	P(D)	P(-)	P(*)	ITCorr	Corr(A)	Corr(B)	Corr(C)	Corr(D)	Meas	SEM	*z*	MS	*z*	MS
1	610879	0	148667	0.73	0.73	0.18	0.06	0.03	0.00	0.00	0.40	0.40	-0.29	-0.18	-0.14	-0.88	0.01	-9.90	0.88	-9.90	0.82
2	618060	0	148667	0.69	0.07	0.07	0.17	0.69	0.00	0.00	0.27	-0.19	-0.06	-0.16	0.27	-0.74	0.01	9.90	1.05	9.90	1.09
3	607721	0	148667	0.48	0.07	0.30	0.16	0.48	0.00	0.00	0.43	-0.11	-0.24	-0.20	0.43	0.48	0.01	-9.90	0.96	-9.90	0.97
4	611163	0	148667	0.66	0.66	0.07	0.15	0.12	0.00	0.00	0.39	0.39	-0.22	-0.19	-0.19	-0.51	0.01	-9.90	0.94	-9.90	0.89
5	607797	0	148667	0.68	0.24	0.04	0.68	0.04	0.00	0.00	0.31	-0.14	-0.23	0.31	-0.19	-0.64	0.01	1.22	1.00	4.62	1.02
6	611452	0	148667	0.40	0.04	0.40	0.33	0.22	0.00	0.00	0.28	-0.16	0.28	-0.11	-0.13	0.93	0.01	9.90	1.16	9.90	1.21
7	610456	0	148667	0.72	0.03	0.72	0.06	0.19	0.00	0.00	0.31	-0.16	0.31	-0.21	-0.16	-0.98	0.01	9.90	1.04	-0.02	1.00
8	611158	0	148667	0.55	0.55	0.23	0.04	0.17	0.00	0.00	0.34	0.34	-0.23	-0.16	-0.11	0.23	0.01	9.90	1.03	9.90	1.03
9	610485	0	148667	0.58	0.10	0.14	0.58	0.18	0.00	0.00	0.44	-0.18	-0.25	0.44	-0.20	-0.09	0.01	-9.90	0.92	-9.90	0.88
10	611023	0	148667	0.41	0.15	0.31	0.41	0.13	0.00	0.00	0.42	-0.16	-0.18	0.42	-0.19	0.75	0.01	-9.90	0.96	-2.17	0.99
11	607723	0	148667	0.67	0.67	0.18	0.09	0.05	0.00	0.00	0.42	0.42	-0.17	-0.28	-0.21	-0.51	0.01	-9.90	0.90	-9.90	0.85
12	611443	0	148667	0.52	0.22	0.10	0.16	0.52	0.00	0.00	0.36	0.01	-0.25	-0.28	0.36	0.46	0.01	9.90	1.05	9.90	1.06
13	610878	0	148667	0.91	0.03	0.02	0.03	0.91	0.00	0.00	0.36	-0.20	-0.18	-0.20	0.36	-2.10	0.01	-9.90	0.72	-9.90	0.50
14	611155	0	148667	0.61	0.06	0.27	0.06	0.61	0.00	0.00	0.42	-0.22	-0.24	-0.17	0.42	-0.32	0.01	-9.90	0.93	-9.90	0.89
15	610897	0	148667	0.34	0.34	0.15	0.29	0.21	0.00	0.00	0.25	0.25	-0.16	0.14	-0.30	0.82	0.01	9.90	1.07	9.90	1.11
16	611391	0	148667	0.30	0.29	0.17	0.30	0.23	0.00	0.00	0.24	-0.29	-0.14	0.24	0.19	0.96	0.01	9.90	1.04	9.90	1.11
17	635795	0	148667	0.46	0.20	0.16	0.46	0.17	0.00	0.00	0.39	-0.25	-0.15	0.39	-0.09	0.27	0.01	-9.90	0.97	-9.90	0.97
18	609428	0	148667	0.42	0.30	0.42	0.20	0.07	0.00	0.00	0.22	-0.13	0.22	-0.02	-0.14	0.41	0.01	9.90	1.12	9.90	1.14
19	607719	0	148667	0.58	0.58	0.22	0.05	0.14	0.00	0.00	0.46	0.46	-0.27	-0.20	-0.19	-0.18	0.01	-9.90	0.91	-9.90	0.87
20	607693	0	148667	0.62	0.18	0.62	0.07	0.13	0.00	0.00	0.46	-0.22	0.46	-0.22	-0.22	-0.33	0.01	-9.90	0.90	-9.90	0.86
21	611030	0	148667	0.34	0.19	0.22	0.24	0.34	0.00	0.00	0.22	-0.12	0.01	-0.13	0.22	0.94	0.01	9.90	1.13	9.90	1.19
22	611016	0	148667	0.41	0.09	0.33	0.17	0.41	0.00	0.00	0.41	-0.20	-0.11	-0.23	0.41	0.81	0.01	-9.12	0.98	1.18	1.00
23	613876	0	148667	0.33	0.33	0.18	0.20	0.28	0.00	0.00	0.37	0.37	-0.11	-0.19	-0.11	0.76	0.01	-9.90	0.94	-9.90	0.96
24	611445	0	148667	0.56	0.12	0.23	0.08	0.56	0.00	0.00	0.43	-0.20	-0.17	-0.26	0.43	-0.20	0.01	-9.90	0.95	-9.90	0.91
25	608099	0	148667	0.76	0.03	0.11	0.10	0.76	0.00	0.00	0.40	-0.16	-0.19	-0.28	0.40	-1.07	0.01	-9.90	0.88	-9.90	0.80
26	607754	0	148667	0.39	0.39	0.25	0.13	0.22	0.00	0.00	0.42	0.42	-0.29	-0.27	0.03	0.67	0.01	-9.90	0.94	-9.90	0.94
27	608020	0	148667	0.56	0.37	0.56	0.05	0.02	0.00	0.00	0.38	-0.27	0.38	-0.20	-0.09	-0.14	0.01	-8.32	0.98	-8.47	0.97
28	608247	0	148667	0.63	0.07	0.16	0.63	0.13	0.00	0.00	0.44	-0.22	-0.24	0.44	-0.19	-0.26	0.01	-9.90	0.89	-9.90	0.85
29	608295	0	148667	0.68	0.19	0.68	0.09	0.04	0.00	0.00	0.23	-0.15	0.23	-0.03	-0.20	-0.56	0.01	9.90	1.06	9.90	1.12
30	611411	0	148667	0.47	0.14	0.13	0.26	0.47	0.00	0.00	0.22	-0.04	-0.14	-0.12	0.22	0.30	0.01	9.90	1.14	9.90	1.16
31	611412	0	148667	0.36	0.25	0.36	0.22	0.18	0.00	0.00	0.17	-0.07	0.17	-0.10	-0.02	0.77	0.01	9.90	1.15	9.90	1.21

Item Information			Classical													Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(A)	P(B)	P(C)	P(D)	P(-)	P(*)	ITCorr	Corr(A)	Corr(B)	Corr(C)	Corr(D)	Meas	SEM	*z*	MS	*z*	MS
32	611609	0	148667	0.53	0.14	0.18	0.15	0.53	0.00	0.00	0.44	-0.08	-0.27	-0.25	0.44	0.41	0.01	-9.90	0.97	-9.90	0.95
33	608278	0	148667	0.33	0.29	0.26	0.33	0.12	0.00	0.00	0.13	-0.01	-0.02	0.13	-0.15	0.85	0.01	9.90	1.16	9.90	1.25
34	611474	0	148667	0.54	0.16	0.54	0.12	0.18	0.00	0.00	0.45	-0.20	0.45	-0.24	-0.19	0.12	0.01	-9.90	0.92	-9.90	0.90
35	610876	0	148667	0.65	0.12	0.17	0.65	0.06	0.00	0.00	0.36	-0.22	-0.14	0.36	-0.19	-0.53	0.01	-3.39	0.99	-8.12	0.97
36	607753	0	148667	0.25	0.15	0.45	0.25	0.15	0.00	0.00	0.21	-0.19	0.05	0.21	-0.13	1.21	0.01	8.62	1.03	9.90	1.14
37	611420	0	148667	0.60	0.06	0.23	0.60	0.10	0.00	0.00	0.43	-0.20	-0.20	0.43	-0.24	-0.21	0.01	-9.90	0.92	-9.90	0.89
38	611421	0	148667	0.49	0.18	0.13	0.19	0.49	0.00	0.00	0.43	-0.14	-0.25	-0.19	0.43	0.70	0.01	9.90	1.04	9.90	1.06
39	610915	0	148667	0.73	0.10	0.73	0.12	0.05	0.00	0.00	0.45	-0.25	0.45	-0.23	-0.22	-0.85	0.01	-9.90	0.86	-9.90	0.77
40	607827	0	148667	0.62	0.11	0.14	0.62	0.13	0.00	0.00	0.47	-0.23	-0.20	0.47	-0.25	-0.47	0.01	-9.90	0.91	-9.90	0.85
41	611620	0	148667	0.54	0.24	0.11	0.54	0.11	0.00	0.00	0.42	-0.19	-0.22	0.42	-0.17	0.27	0.01	-9.90	0.96	-9.90	0.94
42	609822	0	148667	0.59	0.14	0.59	0.11	0.15	0.00	0.00	0.39	-0.23	0.39	-0.28	-0.05	-0.30	0.01	-9.90	0.97	-9.90	0.95
43	611060	0	148667	0.50	0.50	0.17	0.15	0.17	0.00	0.00	0.41	0.41	-0.24	-0.19	-0.11	0.34	0.01	-9.90	0.97	-9.17	0.97
44	607762	0	148667	0.22	0.30	0.35	0.22	0.13	0.00	0.00	0.16	0.00	-0.13	0.16	-0.01	1.09	0.01	-6.22	0.98	9.90	1.10
45	610864	0	148667	0.56	0.11	0.56	0.22	0.10	0.00	0.00	0.36	-0.12	0.36	-0.18	-0.20	-0.03	0.01	-3.65	0.99	-4.95	0.98
46	608252	0	148667	0.59	0.24	0.08	0.59	0.09	0.00	0.00	0.35	-0.12	-0.26	0.35	-0.16	-0.07	0.01	-4.87	0.99	4.84	1.02
47	609823	0	148667	0.34	0.31	0.27	0.34	0.07	0.00	0.00	0.33	0.03	-0.26	0.33	-0.19	0.38	0.01	4.25	1.01	8.63	1.03
48	611067	0	148667	0.59	0.59	0.09	0.11	0.21	0.00	0.00	0.41	0.41	-0.23	-0.18	-0.18	-0.18	0.01	-9.90	0.95	-9.90	0.93

Table J–4. Literature Multiple-Choice Item Statistics: Winter

Item Information			Classical													Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(A)	P(B)	P(C)	P(D)	P(-)	P(*)	ITCorr	Corr(A)	Corr(B)	Corr(C)	Corr(D)	Meas	SEM	*z*	MS	*z*	MS
1	614624	0	140478	0.88	0.04	0.03	0.04	0.88	0.00	0.00	0.36	-0.20	-0.24	-0.15	0.36	-1.07	0.01	-9.90	0.84	-9.90	0.82
2	614623	0	140478	0.75	0.75	0.02	0.02	0.21	0.00	0.00	0.33	0.33	-0.19	-0.18	-0.23	-0.30	0.01	9.90	1.13	9.90	1.13
3	614625	0	140478	0.64	0.23	0.07	0.05	0.64	0.00	0.00	0.27	-0.07	-0.20	-0.24	0.27	0.47	0.01	9.90	1.14	9.90	1.19
4	614618	0	140478	0.76	0.08	0.76	0.10	0.07	0.00	0.00	0.40	-0.20	0.40	-0.22	-0.22	-0.24	0.01	-5.52	0.98	-9.90	0.90
5	614621	0	140478	0.71	0.08	0.17	0.71	0.04	0.00	0.00	0.40	-0.24	-0.20	0.40	-0.21	0.04	0.01	-1.88	0.99	-9.90	0.94
6	614619	0	140478	0.41	0.41	0.10	0.25	0.24	0.00	0.00	0.27	0.27	-0.24	-0.06	-0.08	1.68	0.01	9.90	1.12	9.90	1.29
7	614622	0	140478	0.79	0.11	0.79	0.07	0.03	0.00	0.00	0.34	-0.15	0.34	-0.23	-0.19	-0.33	0.01	-1.11	1.00	-5.47	0.96
8	614627	0	140478	0.52	0.15	0.17	0.52	0.16	0.00	0.00	0.27	-0.06	-0.25	0.27	-0.05	0.86	0.01	9.90	1.18	9.90	1.28
9	614671	0	140478	0.78	0.08	0.78	0.08	0.06	0.00	0.00	0.42	-0.19	0.42	-0.27	-0.19	-0.84	0.01	9.90	1.26	9.90	1.26
10	614662	0	140478	0.68	0.05	0.18	0.08	0.68	0.00	0.00	0.42	-0.20	-0.19	-0.26	0.42	0.09	0.01	9.45	1.03	4.75	1.03
11	614663	0	140478	0.76	0.05	0.13	0.76	0.06	0.00	0.00	0.43	-0.29	-0.22	0.43	-0.18	-0.30	0.01	-5.26	0.98	-5.77	0.96
12	614667	0	140478	0.56	0.06	0.56	0.24	0.13	0.00	0.00	0.35	-0.26	0.35	-0.08	-0.21	0.61	0.01	9.90	1.11	9.90	1.13
13	614668	0	140478	0.79	0.79	0.05	0.08	0.07	0.00	0.00	0.45	0.45	-0.20	-0.24	-0.25	-0.57	0.01	0.45	1.00	-9.90	0.88
14	614664	0	140478	0.74	0.74	0.05	0.02	0.18	0.01	0.00	0.30	0.30	-0.27	-0.25	-0.07	-0.37	0.01	9.90	1.21	9.90	1.45
15	614665	0	140478	0.86	0.02	0.05	0.07	0.86	0.01	0.00	0.49	-0.23	-0.32	-0.25	0.49	-1.29	0.01	1.16	1.01	-9.90	0.82
16	614661	0	140478	0.53	0.23	0.08	0.53	0.15	0.01	0.00	0.33	-0.21	-0.19	0.33	-0.06	0.75	0.01	9.90	1.13	9.90	1.18
17	614669	0	140478	0.84	0.05	0.06	0.04	0.84	0.01	0.00	0.49	-0.26	-0.23	-0.30	0.49	-1.07	0.01	-0.57	1.00	-9.90	0.86
18	612408	0	140478	0.88	0.05	0.03	0.88	0.03	0.00	0.00	0.46	-0.29	-0.27	0.46	-0.21	-1.06	0.01	-9.90	0.74	-9.90	0.56
19	612400	0	140478	0.73	0.08	0.73	0.10	0.08	0.00	0.00	0.42	-0.29	0.42	-0.22	-0.15	0.20	0.01	-9.90	0.91	-9.90	0.88
20	612403	0	140478	0.74	0.14	0.07	0.74	0.05	0.00	0.00	0.19	0.05	-0.30	0.19	-0.12	-0.01	0.01	9.90	1.18	9.90	1.48
21	616847	0	140478	0.78	0.06	0.78	0.10	0.05	0.00	0.00	0.46	-0.26	0.46	-0.24	-0.23	0.18	0.01	-9.90	0.80	-9.90	0.71
22	612402	0	140478	0.51	0.15	0.24	0.09	0.51	0.00	0.00	0.30	-0.14	-0.11	-0.19	0.30	1.17	0.01	9.90	1.11	9.90	1.19
23	612406	0	140478	0.80	0.04	0.06	0.09	0.80	0.00	0.00	0.41	-0.25	-0.17	-0.24	0.41	-0.08	0.01	-9.90	0.83	-9.90	0.82
24	612405	0	140478	0.73	0.73	0.05	0.03	0.18	0.00	0.00	0.38	0.38	-0.28	-0.28	-0.14	0.05	0.01	-4.83	0.98	3.64	1.02
25	612446	0	140478	0.52	0.52	0.25	0.17	0.05	0.00	0.00	0.41	0.41	-0.21	-0.20	-0.17	1.15	0.01	-7.60	0.98	3.02	1.01
26	612457	0	140478	0.80	0.80	0.04	0.13	0.03	0.00	0.00	0.37	0.37	-0.21	-0.20	-0.18	-0.38	0.01	-9.90	0.96	-0.60	1.00
27	612463	0	140478	0.70	0.10	0.08	0.12	0.70	0.00	0.00	0.47	-0.20	-0.31	-0.19	0.47	0.00	0.01	-6.40	0.98	-7.84	0.95
28	612461	0	140478	0.66	0.10	0.07	0.17	0.66	0.00	0.00	0.47	-0.29	-0.26	-0.17	0.47	0.31	0.01	-9.90	0.94	-9.90	0.91
29	612459	0	140478	0.65	0.65	0.18	0.11	0.06	0.00	0.00	0.41	0.41	-0.15	-0.26	-0.21	-0.09	0.01	9.90	1.20	9.90	1.25
30	612464	0	140478	0.65	0.24	0.04	0.65	0.06	0.00	0.00	0.45	-0.24	-0.30	0.45	-0.20	0.34	0.01	-9.90	0.96	-9.90	0.93
31	616845	0	140478	0.82	0.04	0.82	0.06	0.08	0.00	0.00	0.53	-0.26	0.53	-0.31	-0.27	-0.51	0.01	-9.90	0.76	-9.90	0.62

Item Information			Classical													Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(A)	P(B)	P(C)	P(D)	P(-)	P(*)	ITCorr	Corr(A)	Corr(B)	Corr(C)	Corr(D)	Meas	SEM	*z*	MS	*z*	MS
32	612466	0	140478	0.71	0.04	0.12	0.71	0.12	0.00	0.00	0.46	-0.28	-0.22	0.46	-0.22	-0.11	0.01	-1.24	1.00	3.49	1.02
33	612456	0	140478	0.62	0.06	0.62	0.19	0.12	0.01	0.00	0.33	-0.26	0.33	-0.14	-0.10	0.51	0.01	9.90	1.11	9.90	1.20
34	612462	0	140478	0.75	0.75	0.12	0.07	0.06	0.01	0.00	0.50	0.50	-0.24	-0.30	-0.24	-0.05	0.01	-9.90	0.85	-9.90	0.76

Table J–5. Algebra I Multiple-Choice Item Statistics: Spring

Item Information			Classical													DIF				Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(A)	P(B)	P(C)	P(D)	P(-)	P(*)	ITCorr	Corr(A)	Corr(B)	Corr(C)	Corr(D)	M/F	W/B	W/H	O/P	Meas	SEM	*z*	MS	*z*	MS
1	605231	0	247978	0.70	0.07	0.14	0.09	0.70	0.00	0.00	0.43	-0.22	-0.23	-0.21	0.43					-0.54	0.00	-9.90	0.91	-9.90	0.84
2	605216	0	247978	0.61	0.11	0.18	0.61	0.10	0.00	0.00	0.35	-0.15	-0.23	0.35	-0.12					-0.23	0.00	6.00	1.01	5.13	1.01
3	631616	0	247978	0.47	0.31	0.10	0.10	0.47	0.00	0.00	0.22	0.00	-0.11	-0.25	0.22					0.49	0.00	9.90	1.08	9.90	1.10
4	605214	0	247978	0.47	0.21	0.47	0.19	0.12	0.00	0.00	0.20	0.00	0.20	-0.17	-0.09					0.73	0.00	9.90	1.11	9.90	1.15
5	633399	0	247978	0.44	0.26	0.15	0.44	0.15	0.00	0.00	0.41	-0.19	-0.20	0.41	-0.12					0.51	0.00	-9.90	0.94	-9.90	0.93
6	631602	0	247978	0.41	0.27	0.19	0.41	0.13	0.00	0.00	0.31	-0.12	-0.21	0.31	-0.05					0.75	0.00	0.86	1.00	8.19	1.02
7	632146	0	247978	0.66	0.66	0.09	0.16	0.10	0.00	0.00	0.40	0.40	-0.20	-0.23	-0.17					-0.31	0.00	-9.90	0.92	-9.90	0.90
8	605205	0	247978	0.31	0.14	0.30	0.24	0.31	0.00	0.00	0.30	-0.16	-0.04	-0.15	0.30					1.33	0.00	-5.11	0.99	9.90	1.04
9	605085	0	247978	0.50	0.17	0.12	0.50	0.20	0.00	0.00	0.32	-0.13	-0.22	0.32	-0.09					0.52	0.00	5.45	1.01	3.09	1.01
10	632149	0	247978	0.66	0.14	0.66	0.11	0.08	0.01	0.00	0.42	-0.20	0.42	-0.25	-0.16					-0.80	0.00	9.90	1.14	9.90	1.08
11	605292	0	247978	0.42	0.42	0.24	0.21	0.12	0.01	0.00	0.34	0.34	-0.24	-0.08	-0.07					0.79	0.00	-9.90	0.98	-1.20	1.00
12	632366	0	247978	0.48	0.48	0.31	0.12	0.08	0.01	0.00	0.41	0.41	-0.16	-0.22	-0.20					0.22	0.00	-9.90	0.97	-9.90	0.96
13	605237	0	247978	0.66	0.11	0.15	0.66	0.07	0.01	0.00	0.42	-0.25	-0.20	0.42	-0.17					-0.39	0.00	-9.90	0.93	-9.90	0.88
14	605244	0	247978	0.38	0.26	0.38	0.21	0.14	0.01	0.00	0.19	0.01	0.19	-0.12	-0.11					0.93	0.00	9.90	1.09	9.90	1.13
15	633257	0	247978	0.56	0.08	0.13	0.22	0.56	0.01	0.00	0.48	-0.21	-0.26	-0.20	0.48					0.12	0.00	-9.90	0.89	-9.90	0.86
16	633532	0	247978	0.46	0.17	0.46	0.18	0.18	0.01	0.00	0.35	-0.05	0.35	-0.17	-0.21					0.50	0.00	-9.90	0.98	-2.57	1.00
17	605108	0	247978	0.60	0.14	0.09	0.60	0.17	0.01	0.00	0.43	-0.16	-0.22	0.43	-0.23					-0.15	0.00	-9.90	0.95	-9.90	0.91
18	633250	0	247978	0.59	0.59	0.24	0.10	0.06	0.01	0.00	0.41	0.41	-0.16	-0.24	-0.20					-0.48	0.00	9.90	1.13	9.90	1.11
19	605179	0	247978	0.59	0.14	0.59	0.19	0.08	0.00	0.00	0.46	-0.26	0.46	-0.28	-0.10					-0.54	0.00	9.90	1.13	9.90	1.10
20	605277	0	247978	0.62	0.05	0.17	0.62	0.16	0.00	0.00	0.39	-0.19	-0.29	0.39	-0.09					-0.30	0.00	2.26	1.00	-5.02	0.99
21	605268	0	247978	0.45	0.16	0.14	0.25	0.45	0.00	0.00	0.31	-0.10	-0.16	-0.15	0.31					0.79	0.00	9.90	1.02	9.90	1.03
22	632160	0	247978	0.35	0.45	0.11	0.35	0.08	0.00	0.00	0.26	-0.06	-0.22	0.26	-0.10					1.36	0.00	9.90	1.09	9.90	1.21
23	605147	0	247978	0.56	0.56	0.20	0.13	0.11	0.00	0.00	0.35	0.35	-0.18	-0.21	-0.09					0.71	0.00	9.90	1.03	9.90	1.05
24	632360	0	247978	0.59	0.18	0.07	0.16	0.59	0.00	0.00	0.43	-0.14	-0.21	-0.27	0.43					-0.15	0.00	-9.90	0.95	-9.90	0.93
25	605110	0	247978	0.72	0.06	0.12	0.10	0.72	0.00	0.00	0.47	-0.22	-0.27	-0.24	0.47					-0.62	0.00	-9.90	0.85	-9.90	0.77
26	605150	0	247978	0.37	0.37	0.07	0.08	0.47	0.00	0.00	0.41	0.41	-0.17	-0.14	-0.23					0.96	0.00	-9.90	0.91	-9.90	0.92
27	605157	0	247978	0.35	0.03	0.35	0.21	0.42	0.00	0.00	0.29	-0.18	0.29	-0.09	-0.14					1.02	0.00	-8.13	0.99	8.76	1.02
28	605163	0	247978	0.56	0.56	0.15	0.19	0.09	0.01	0.00	0.46	0.46	-0.22	-0.20	-0.23					0.07	0.00	-9.90	0.91	-9.90	0.87
29	605233	0	247978	0.35	0.19	0.38	0.35	0.07	0.00	0.00	0.25	-0.17	-0.03	0.25	-0.14					1.21	0.00	9.90	1.05	9.90	1.12
30	632153	0	247978	0.65	0.65	0.14	0.13	0.07	0.01	0.00	0.49	0.49	-0.26	-0.23	-0.23					-0.65	0.00	6.21	1.01	-9.90	0.94
31	605167	0	247978	0.40	0.14	0.17	0.29	0.40	0.01	0.00	0.29	-0.19	-0.22	0.03	0.29					0.88	0.00	9.90	1.02	9.90	1.04

Item Information			Classical													DIF				Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(A)	P(B)	P(C)	P(D)	P(-)	P(*)	ITCorr	Corr(A)	Corr(B)	Corr(C)	Corr(D)	M/F	W/B	W/H	O/P	Meas	SEM	*z*	MS	*z*	MS
32	605099	0	247978	0.44	0.18	0.22	0.16	0.44	0.01	0.00	0.39	-0.12	-0.25	-0.10	0.39					1.03	0.00	6.49	1.01	6.40	1.01
33	633533	0	247978	0.52	0.24	0.52	0.13	0.11	0.00	0.00	0.39	-0.07	0.39	-0.27	-0.22					0.30	0.00	-9.90	0.95	-9.90	0.94
34	640270	0	247978	0.45	0.09	0.17	0.28	0.45	0.01	0.00	0.45	-0.17	-0.21	-0.20	0.45					0.58	0.00	-9.90	0.90	-9.90	0.88
35	605276	0	247978	0.62	0.11	0.62	0.18	0.09	0.00	0.00	0.39	-0.14	0.39	-0.22	-0.18					-0.56	0.00	9.90	1.11	9.90	1.09
36	605275	0	247978	0.58	0.16	0.12	0.58	0.14	0.01	0.00	0.39	-0.14	-0.23	0.39	-0.18					0.02	0.00	-9.90	0.96	-9.90	0.93
37	605183	1	10082	0.13	0.13	0.69	0.04	0.15	0.00	0.00	0.17	0.17	-0.01	-0.14	-0.08	A-	A+	A+	A+	2.77	0.07	0.45	1.02	6.09	1.54
38	640542	1	10082	0.76	0.06	0.08	0.11	0.76	0.00	0.00	0.46	-0.20	-0.25	-0.28	0.46	B+	A-	C-	A+	-0.78	0.06	-6.49	0.82	-6.73	0.71
39	640530	1	10082	0.75	0.75	0.03	0.07	0.15	0.00	0.00	0.53	0.53	-0.15	-0.25	-0.40	A-	A-	B-	A-	-0.75	0.06	-8.29	0.78	-8.86	0.64
40	640641	1	10082	0.43	0.09	0.43	0.25	0.23	0.00	0.00	0.33	-0.12	0.33	-0.24	-0.06	A+	A+	A+	A+	0.89	0.05	0.98	1.02	2.11	1.05
41	640625	1	10082	0.44	0.24	0.44	0.16	0.15	0.00	0.00	0.44	-0.18	0.44	-0.16	-0.23	A-	A+	A-	A-	0.83	0.05	-6.11	0.90	-4.48	0.90
42	641450	1	10082	0.44	0.25	0.17	0.44	0.14	0.00	0.00	0.23	-0.11	-0.10	0.23	-0.08	A+	A+	A-	A+	0.83	0.05	6.56	1.12	6.43	1.16
43	641506	1	10082	0.77	0.03	0.05	0.15	0.77	0.00	0.00	0.41	-0.20	-0.25	-0.24	0.41	A-	A-	B-	A-	-0.87	0.06	-3.88	0.89	-4.78	0.78
44	641512	1	10082	0.37	0.17	0.36	0.37	0.10	0.00	0.00	0.17	-0.14	0.01	0.17	-0.12	A-	A-	A-	A+	1.15	0.05	9.51	1.19	9.90	1.30
45	641478	1	10082	0.57	0.21	0.11	0.10	0.57	0.00	0.00	0.48	-0.31	-0.18	-0.18	0.48	A-	A-	A-	A+	0.19	0.05	-5.27	0.91	-5.24	0.87
46	641448	1	10082	0.44	0.44	0.18	0.15	0.23	0.00	0.00	0.37	0.37	-0.09	-0.21	-0.18	A+	A-	A+	A+	0.84	0.05	-1.60	0.97	-1.04	0.98
47	640531	2	9199	0.22	0.22	0.24	0.19	0.35	0.00	0.00	0.16	0.16	-0.14	-0.04	0.02	A-	A+	A+	A-	2.05	0.06	1.48	1.05	5.15	1.25
48	640583	2	9199	0.39	0.21	0.24	0.39	0.16	0.00	0.00	0.09	-0.10	0.04	0.09	-0.04	A+	A+	A+	A+	1.15	0.05	9.38	1.17	9.90	1.28
49	640554	2	9199	0.38	0.24	0.38	0.18	0.19	0.00	0.00	0.19	-0.01	0.19	-0.16	-0.05	A-	A-	A+	A+	1.18	0.05	5.85	1.11	6.66	1.17
50	640607	2	9199	0.20	0.12	0.49	0.18	0.20	0.00	0.00	0.11	-0.19	0.15	-0.14	0.11	A-	A+	A-	A-	2.20	0.06	2.81	1.10	6.36	1.35
51	640567	2	9199	0.31	0.15	0.32	0.21	0.31	0.01	0.00	0.11	-0.09	0.02	-0.07	0.11	A-	A-	A-	A-	1.53	0.05	5.53	1.13	6.59	1.22
52	641445	2	9199	0.76	0.76	0.11	0.08	0.05	0.00	0.00	0.40	0.40	-0.26	-0.20	-0.16	A+	A-	A-	A-	-0.68	0.06	-4.37	0.88	-4.88	0.80
53	641540	2	9199	0.54	0.06	0.27	0.54	0.13	0.00	0.00	0.15	-0.10	-0.06	0.15	-0.06	A+	A+	A-	A-	0.44	0.05	8.45	1.14	8.66	1.20
54	641461	2	9199	0.77	0.08	0.77	0.10	0.04	0.00	0.00	0.50	-0.25	0.50	-0.32	-0.22	A-	A-	B-	A+	-0.75	0.06	-6.75	0.81	-8.15	0.67
55	641493	2	9199	0.35	0.23	0.35	0.27	0.15	0.00	0.00	0.22	-0.03	0.22	-0.11	-0.11	A-	A+	A-	A+	1.32	0.05	6.12	1.12	6.88	1.20
56	641434	2	9199	0.35	0.25	0.20	0.35	0.20	0.00	0.00	0.20	-0.09	-0.11	0.20	-0.04	A+	A+	A+	A+	1.36	0.05	4.17	1.08	5.51	1.16
57	640631	3	9211	0.31	0.31	0.30	0.28	0.10	0.00	0.00	0.28	0.28	-0.10	-0.12	-0.10	A-	A-	A-	A+	1.57	0.05	1.53	1.04	3.26	1.11
58	640561	3	9211	0.68	0.06	0.68	0.10	0.16	0.00	0.00	0.55	-0.26	0.55	-0.28	-0.30	A+	A-	A-	A+	-0.23	0.05	-9.38	0.81	-8.69	0.73
59	640559	3	9211	0.24	0.27	0.27	0.22	0.24	0.00	0.00	0.19	-0.06	-0.13	0.02	0.19	A+	A-	A-	A-	2.01	0.06	1.35	1.04	3.60	1.17
60	640579	3	9211	0.35	0.35	0.16	0.25	0.24	0.00	0.00	0.32	0.32	-0.12	-0.17	-0.09	A+	A-	A+	A+	1.38	0.05	0.11	1.00	1.46	1.04
61	605072	3	9211	0.64	0.09	0.64	0.13	0.13	0.00	0.00	0.43	-0.16	0.43	-0.25	-0.21	A+	A-	A-	A+	-0.05	0.05	-5.10	0.90	-4.60	0.86
62	641504	3	9211	0.36	0.16	0.26	0.36	0.23	0.00	0.00	0.31	-0.19	-0.16	0.31	-0.02	A-	A-	A-	A-	1.33	0.05	0.78	1.02	3.31	1.10
63	641472	3	9211	0.57	0.57	0.26	0.12	0.06	0.00	0.00	0.39	0.39	-0.15	-0.25	-0.18	A+	A-	A+	A-	0.34	0.05	-3.12	0.95	-2.42	0.94

Item Information			Classical													DIF				Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(A)	P(B)	P(C)	P(D)	P(-)	P(*)	ITCorr	Corr(A)	Corr(B)	Corr(C)	Corr(D)	M/F	W/B	W/H	O/P	Meas	SEM	*z*	MS	*z*	MS
64	641484	3	9211	0.31	0.44	0.14	0.11	0.31	0.00	0.00	0.33	-0.04	-0.19	-0.22	0.33	A-	A-	A+	A+	1.58	0.05	0.56	1.01	0.86	1.03
65	641525	3	9211	0.32	0.05	0.37	0.26	0.32	0.00	0.00	0.35	-0.17	-0.15	-0.11	0.35	A-	A-	A-	A+	1.52	0.05	1.96	1.04	4.79	1.16
66	641435	3	9211	0.63	0.21	0.10	0.63	0.06	0.00	0.00	0.48	-0.22	-0.32	0.48	-0.20	A+	A-	A+	B+	0.03	0.05	-7.79	0.86	-5.07	0.86
67	640563	4	9186	0.54	0.14	0.54	0.19	0.13	0.00	0.00	0.33	-0.11	0.33	-0.19	-0.16	A+	A-	A-	A+	0.44	0.05	0.71	1.01	0.87	1.02
68	640564	4	9186	0.47	0.08	0.22	0.23	0.47	0.00	0.00	0.32	-0.17	-0.26	-0.01	0.32	A-	A-	A-	A+	0.76	0.05	1.20	1.02	1.04	1.02
69	640572	4	9186	0.39	0.26	0.19	0.39	0.16	0.00	0.00	0.34	-0.19	-0.13	0.34	-0.08	A+	A-	A-	A+	1.14	0.05	0.66	1.01	1.62	1.04
70	640614	4	9186	0.67	0.67	0.09	0.15	0.09	0.00	0.00	0.45	0.45	-0.22	-0.22	-0.24	A-	A-	A-	A+	-0.18	0.05	-5.73	0.89	-5.52	0.83
71	640626	4	9186	0.32	0.26	0.32	0.31	0.11	0.00	0.00	0.26	-0.10	0.26	-0.09	-0.12	A+	A+	A-	A+	1.50	0.05	1.83	1.04	3.88	1.13
72	641426	4	9186	0.45	0.20	0.23	0.12	0.45	0.00	0.00	0.24	0.02	-0.16	-0.18	0.24	A+	A+	A+	A+	0.85	0.05	5.24	1.09	4.87	1.11
73	641531	4	9186	0.77	0.04	0.08	0.77	0.11	0.00	0.00	0.38	-0.21	-0.20	0.38	-0.20	A-	A-	A-	A+	-0.77	0.06	-3.52	0.90	-4.07	0.82
74	641513	4	9186	0.24	0.54	0.14	0.08	0.24	0.00	0.00	0.29	0.03	-0.25	-0.20	0.29	A-	A+	A+	A-	1.95	0.06	-1.54	0.96	0.59	1.02
75	641539	4	9186	0.32	0.28	0.32	0.24	0.16	0.00	0.00	0.19	-0.10	0.19	-0.02	-0.09	A-	A-	A-	A-	1.51	0.05	4.33	1.10	6.15	1.21
76	641447	4	9186	0.69	0.12	0.69	0.07	0.12	0.00	0.00	0.43	-0.19	0.43	-0.25	-0.22	A+	A+	A+	A+	-0.26	0.05	-6.25	0.87	-5.82	0.81
77	640545	5	9137	0.52	0.10	0.52	0.05	0.33	0.00	0.00	0.56	-0.19	0.56	-0.26	-0.34	A-	A-	A-	A-	0.59	0.05	-9.90	0.82	-9.90	0.79
78	640538	5	9137	0.23	0.22	0.35	0.20	0.23	0.00	0.00	0.33	-0.06	-0.17	-0.09	0.33	A-	A-	A-	A-	2.06	0.06	-0.56	0.98	2.08	1.10
79	640628	5	9137	0.22	0.03	0.22	0.70	0.06	0.00	0.00	0.30	-0.08	0.30	-0.19	-0.10	A-	A-	A-	A-	2.16	0.06	-1.19	0.96	3.23	1.16
80	640556	5	9137	0.36	0.53	0.36	0.06	0.05	0.00	0.00	0.00	0.18	0.00	-0.18	-0.20	A-	A+	A-	A+	1.35	0.05	9.90	1.32	9.90	1.51
81	640591	5	9137	0.77	0.77	0.10	0.04	0.08	0.00	0.00	0.35	0.35	-0.21	-0.17	-0.17	A-	A-	A+	A+	-0.75	0.06	-1.71	0.95	-1.23	0.94
82	605273	5	9137	0.91	0.03	0.03	0.91	0.02	0.00	0.00	0.36	-0.24	-0.21	0.36	-0.15	A+	A-	A-	B+	-1.95	0.08	-4.26	0.76	-6.68	0.47
83	641536	5	9137	0.61	0.05	0.61	0.27	0.07	0.00	0.00	0.22	-0.25	0.22	-0.02	-0.16	A+	A-	A-	A-	0.17	0.05	4.73	1.09	4.15	1.12
84	641454	5	9137	0.52	0.32	0.52	0.02	0.14	0.00	0.00	0.43	-0.21	0.43	-0.19	-0.25	A+	A-	A-	A+	0.59	0.05	-3.87	0.94	-3.45	0.92
85	641438	5	9137	0.37	0.14	0.24	0.25	0.37	0.00	0.00	0.26	-0.21	0.00	-0.12	0.26	A+	A+	A+	A-	1.28	0.05	1.96	1.04	1.76	1.05
86	641532	5	9137	0.82	0.04	0.09	0.82	0.05	0.00	0.00	0.34	-0.19	-0.19	0.34	-0.17	A-	B-	A-	B+	-1.07	0.06	-3.70	0.87	-3.80	0.79
87	640543	6	9293	0.80	0.04	0.11	0.80	0.04	0.00	0.00	0.31	-0.20	-0.13	0.31	-0.21	A-	A-	A-	A+	-0.95	0.06	-1.06	0.96	-1.42	0.93
88	640560	6	9293	0.19	0.14	0.31	0.19	0.36	0.00	0.00	0.11	-0.16	-0.14	0.11	0.16	A-	A+	A+	A+	2.29	0.06	3.60	1.13	8.77	1.52
89	640536	6	9293	0.44	0.23	0.44	0.13	0.19	0.00	0.00	0.27	-0.06	0.27	-0.21	-0.10	A+	A-	A-	A+	0.92	0.05	1.51	1.02	1.69	1.04
90	640617	6	9293	0.51	0.17	0.51	0.07	0.25	0.00	0.00	0.31	-0.18	0.31	-0.20	-0.08	A+	A+	A+	A+	0.60	0.05	0.43	1.01	-0.16	1.00
91	640533	6	9293	0.32	0.32	0.10	0.18	0.40	0.00	0.00	0.05	0.05	-0.05	-0.01	-0.01	A-	A-	A-	A-	1.54	0.05	9.90	1.23	9.90	1.39
92	641534	6	9293	0.47	0.11	0.47	0.15	0.27	0.00	0.00	0.29	-0.10	0.29	-0.15	-0.13	A-	A-	A-	A-	0.78	0.05	3.65	1.06	3.66	1.08
93	641516	6	9293	0.24	0.09	0.50	0.18	0.24	0.00	0.00	0.16	-0.15	0.07	-0.15	0.16	A-	A-	A-	A+	2.00	0.06	3.09	1.09	6.26	1.29
94	641467	6	9293	0.29	0.26	0.19	0.29	0.26	0.00	0.00	0.36	-0.02	-0.18	0.36	-0.18	B-	A-	A+	A-	1.66	0.05	-1.71	0.96	0.78	1.03
95	641485	6	9293	0.20	0.20	0.22	0.43	0.15	0.00	0.00	-0.02	-0.02	-0.07	0.21	-0.19	A-	A+	A-	A+	2.24	0.06	5.37	1.19	9.90	1.65

Item Information			Classical													DIF				Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(A)	P(B)	P(C)	P(D)	P(-)	P(*)	ITCorr	Corr(A)	Corr(B)	Corr(C)	Corr(D)	M/F	W/B	W/H	O/P	Meas	SEM	*z*	MS	*z*	MS
96	641473	6	9293	0.53	0.17	0.53	0.13	0.17	0.00	0.00	0.40	-0.17	0.40	-0.19	-0.18	A-	A+	A-	A+	0.52	0.05	-3.36	0.95	-3.67	0.92
97	640619	7	9194	0.39	0.39	0.20	0.26	0.15	0.00	0.00	0.20	0.20	-0.12	0.01	-0.14	A+	A+	A-	A-	1.17	0.05	4.88	1.09	4.69	1.13
98	640548	7	9194	0.80	0.05	0.08	0.07	0.80	0.00	0.00	0.46	-0.23	-0.26	-0.24	0.46	A-	A-	A-	A-	-0.93	0.06	-4.21	0.87	-5.37	0.73
99	640534	7	9194	0.46	0.46	0.20	0.25	0.08	0.00	0.00	0.37	0.37	-0.15	-0.21	-0.12	A+	A+	A+	A-	0.82	0.05	-0.98	0.98	-0.51	0.99
100	640557	7	9194	0.41	0.28	0.18	0.41	0.13	0.00	0.00	0.30	-0.13	-0.18	0.30	-0.07	A+	A-	A+	A-	1.05	0.05	1.84	1.03	2.08	1.05
101	640537	7	9194	0.45	0.06	0.45	0.41	0.07	0.00	0.00	0.32	-0.21	0.32	-0.11	-0.19	A+	A-	A-	A+	0.86	0.05	1.79	1.03	2.16	1.05
102	641433	7	9194	0.69	0.12	0.69	0.09	0.10	0.00	0.00	0.43	-0.15	0.43	-0.27	-0.23	A+	A-	A+	A+	-0.27	0.05	-5.04	0.89	-5.39	0.82
103	641477	7	9194	0.49	0.06	0.17	0.27	0.49	0.00	0.00	0.21	-0.21	-0.11	-0.03	0.21	A-	A-	A-	A-	0.69	0.05	7.58	1.13	6.82	1.16
104	641521	7	9194	0.29	0.44	0.17	0.29	0.09	0.00	0.00	0.27	-0.15	-0.06	0.27	-0.07	A-	A-	A-	A+	1.69	0.05	1.71	1.04	4.01	1.15
105	641463	7	9194	0.37	0.18	0.19	0.24	0.37	0.01	0.00	0.30	-0.06	-0.14	-0.16	0.30	A+	A+	A-	A+	1.25	0.05	1.12	1.02	1.89	1.05
106	641505	7	9194	0.59	0.11	0.15	0.59	0.15	0.00	0.00	0.41	-0.30	-0.24	0.41	-0.06	A-	A-	A-	A+	0.23	0.05	-2.49	0.96	-1.56	0.96
107	640571	8	9271	0.34	0.34	0.24	0.25	0.17	0.00	0.00	0.10	0.10	0.11	-0.22	0.01	A-	A-	A-	A+	1.39	0.05	9.90	1.22	9.90	1.35
108	640532	8	9271	0.34	0.35	0.34	0.14	0.16	0.00	0.00	0.16	-0.01	0.16	-0.13	-0.06	A-	A-	A-	A+	1.40	0.05	5.91	1.12	6.89	1.21
109	640562	8	9271	0.36	0.36	0.17	0.21	0.26	0.00	0.00	0.35	0.35	-0.19	-0.20	-0.04	A+	A+	A+	A-	1.28	0.05	-1.70	0.97	-0.37	0.99
110	640546	8	9271	0.72	0.05	0.13	0.10	0.72	0.00	0.00	0.47	-0.24	-0.24	-0.25	0.47	A+	A-	A-	A+	-0.43	0.05	-7.34	0.83	-7.07	0.75
111	640566	8	9271	0.34	0.30	0.34	0.13	0.22	0.00	0.00	0.18	0.01	0.18	-0.20	-0.05	A-	A-	A+	A+	1.39	0.05	6.83	1.14	7.07	1.21
112	641481	8	9271	0.73	0.10	0.08	0.73	0.09	0.00	0.00	0.48	-0.34	-0.18	0.48	-0.20	A+	A-	A-	A+	-0.49	0.05	-6.57	0.84	-6.39	0.77
113	641441	8	9271	0.47	0.18	0.11	0.23	0.47	0.00	0.00	0.27	-0.14	-0.10	-0.11	0.27	A-	A-	A-	A+	0.77	0.05	5.50	1.09	5.74	1.13
114	641538	8	9271	0.53	0.20	0.53	0.19	0.07	0.00	0.00	0.35	-0.20	0.35	-0.18	-0.08	A-	A-	A-	A-	0.48	0.05	-0.15	1.00	-0.27	0.99
115	641515	8	9271	0.47	0.47	0.20	0.14	0.19	0.00	0.00	0.34	0.34	-0.08	-0.13	-0.23	A-	A-	A-	A+	0.76	0.05	0.57	1.01	0.78	1.02
116	641489	8	9271	0.33	0.34	0.33	0.21	0.12	0.00	0.00	0.23	-0.07	0.23	-0.07	-0.13	A-	A-	A-	A+	1.45	0.05	2.01	1.04	3.21	1.10
117	640541	9	9226	0.37	0.32	0.37	0.18	0.13	0.00	0.00	0.21	0.00	0.21	-0.16	-0.12	A-	A-	A-	A+	1.26	0.05	5.05	1.10	5.61	1.16
118	640622	9	9226	0.55	0.12	0.55	0.20	0.12	0.00	0.00	0.32	-0.24	0.32	-0.08	-0.15	A-	A-	A-	A+	0.41	0.05	0.07	1.00	0.63	1.01
119	640580	9	9226	0.28	0.26	0.19	0.26	0.28	0.00	0.00	0.18	-0.01	-0.05	-0.13	0.18	A-	A-	A+	A-	1.70	0.05	3.05	1.08	5.46	1.21
120	640547	9	9226	0.51	0.30	0.09	0.51	0.09	0.00	0.00	0.46	-0.29	-0.26	0.46	-0.07	A+	A-	A-	A+	0.57	0.05	-7.64	0.88	-6.90	0.86
121	640639	9	9226	0.28	0.28	0.14	0.27	0.31	0.00	0.00	0.25	0.25	-0.21	-0.15	0.06	A+	A-	A-	A+	1.72	0.05	2.45	1.06	4.92	1.19
122	641502	9	9226	0.49	0.24	0.10	0.17	0.49	0.00	0.00	0.38	-0.21	-0.20	-0.10	0.38	A-	B-	A-	A+	0.68	0.05	-1.29	0.98	-1.12	0.98
123	641518	9	9226	0.67	0.04	0.06	0.67	0.23	0.00	0.00	0.37	-0.19	-0.21	0.37	-0.20	A-	A-	A-	A+	-0.18	0.05	-1.59	0.97	-1.96	0.94
124	641499	9	9226	0.20	0.18	0.45	0.16	0.20	0.00	0.00	0.13	-0.15	0.15	-0.19	0.13	A+	A-	A+	A+	2.19	0.06	6.30	1.23	7.55	1.43
125	641453	9	9226	0.60	0.16	0.09	0.15	0.60	0.00	0.00	0.51	-0.22	-0.24	-0.27	0.51	A-	A-	A+	A+	0.17	0.05	-9.09	0.85	-8.21	0.80
126	641443	9	9226	0.30	0.21	0.30	0.31	0.18	0.00	0.00	0.28	-0.09	0.28	-0.08	-0.13	A-	A+	A+	A-	1.64	0.05	-0.01	1.00	3.03	1.11
127	640590	10	9169	0.59	0.06	0.28	0.59	0.07	0.00	0.00	0.23	-0.21	-0.04	0.23	-0.18	A-	A+	A-	A+	0.21	0.05	5.55	1.10	6.60	1.18

Item Information			Classical													DIF				Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(A)	P(B)	P(C)	P(D)	P(-)	P(*)	ITCorr	Corr(A)	Corr(B)	Corr(C)	Corr(D)	M/F	W/B	W/H	O/P	Meas	SEM	*z*	MS	*z*	MS
128	640558	10	9169	0.21	0.25	0.34	0.19	0.21	0.00	0.00	0.27	-0.14	-0.04	-0.07	0.27	A-	A+	A-	A+	2.14	0.06	0.20	1.01	3.84	1.20
129	640615	10	9169	0.28	0.24	0.24	0.24	0.28	0.00	0.00	0.21	0.03	-0.16	-0.09	0.21	A-	A-	A-	A+	1.68	0.05	3.29	1.08	4.85	1.18
130	640578	10	9169	0.48	0.19	0.24	0.48	0.09	0.00	0.00	0.39	-0.17	-0.22	0.39	-0.10	A+	A+	A-	A+	0.73	0.05	-0.77	0.99	-0.39	0.99
131	640604	10	9169	0.78	0.78	0.09	0.08	0.04	0.00	0.00	0.51	0.51	-0.31	-0.29	-0.21	A+	A-	A-	A+	-0.83	0.06	-8.03	0.77	-8.50	0.63
132	641495	10	9169	0.63	0.13	0.63	0.12	0.11	0.00	0.00	0.38	-0.14	0.38	-0.26	-0.15	A+	A+	A+	A+	0.02	0.05	-1.39	0.97	-1.45	0.96
133	641500	10	9169	0.29	0.11	0.29	0.31	0.29	0.00	0.00	0.15	-0.16	0.15	-0.04	0.01	A-	A-	A-	A+	1.65	0.05	6.97	1.18	9.90	1.43
134	641476	10	9169	0.44	0.26	0.15	0.44	0.15	0.00	0.00	0.41	-0.23	-0.19	0.41	-0.09	A-	A-	A-	A+	0.92	0.05	-3.04	0.95	-1.85	0.96
135	641451	10	9169	0.67	0.67	0.10	0.18	0.05	0.00	0.00	0.44	0.44	-0.20	-0.27	-0.20	B-	A-	A-	A+	-0.19	0.05	-5.06	0.90	-5.02	0.84
136	641430	10	9169	0.22	0.22	0.46	0.15	0.17	0.00	0.00	0.12	0.12	0.14	-0.19	-0.14	A-	A-	A-	A-	2.09	0.06	1.90	1.06	5.37	1.27
137	640535	11	6493	0.76	0.04	0.07	0.76	0.13	0.00	0.00	0.46	-0.16	-0.25	0.46	-0.30	A-	A-	A-	A-	-0.70	0.06	-5.90	0.84	-6.33	0.73
138	640540	11	6493	0.58	0.27	0.06	0.10	0.58	0.00	0.00	0.34	-0.13	-0.24	-0.17	0.34	A-	A-	A-	A+	0.25	0.05	1.00	1.02	0.23	1.01
139	640569	11	6493	0.61	0.61	0.13	0.16	0.10	0.00	0.00	0.47	0.47	-0.24	-0.24	-0.20	A-	A-	A-	A+	0.11	0.05	-7.04	0.88	-6.52	0.83
140	640612	11	6493	0.43	0.43	0.08	0.44	0.05	0.00	0.00	0.47	0.47	-0.19	-0.29	-0.16	A+	A+	A+	A+	0.92	0.05	-6.25	0.90	-5.29	0.88
141	640640	11	6493	0.39	0.07	0.11	0.43	0.39	0.00	0.00	0.13	-0.18	-0.26	0.13	0.13	A+	A-	A+	A-	1.12	0.05	9.05	1.17	8.49	1.23
142	641442	11	6493	0.17	0.17	0.24	0.52	0.07	0.00	0.00	0.17	0.17	-0.05	-0.03	-0.11	A-	A-	A-	A-	2.43	0.06	0.80	1.03	5.35	1.34
143	641501	11	6493	0.27	0.12	0.27	0.29	0.32	0.00	0.00	0.24	0.01	0.24	-0.18	-0.05	A-	A-	A-	A-	1.78	0.05	-0.68	0.98	0.46	1.02
144	641470	11	6493	0.81	0.08	0.05	0.81	0.05	0.00	0.00	0.46	-0.27	-0.25	0.46	-0.22	A+	A+	A-	A+	-1.07	0.06	-5.53	0.81	-7.18	0.64
145	641456	11	6493	0.44	0.12	0.09	0.44	0.35	0.00	0.00	0.25	-0.07	-0.29	0.25	-0.04	A-	A-	A-	A+	0.90	0.05	4.70	1.08	5.97	1.14
146	641498	11	6493	0.43	0.36	0.43	0.11	0.10	0.00	0.00	0.42	-0.23	0.42	-0.11	-0.22	A-	A-	A-	A+	0.93	0.05	-3.57	0.94	-2.57	0.94
147	640627	12	6494	0.28	0.13	0.25	0.34	0.28	0.00	0.00	0.27	-0.11	-0.11	-0.08	0.27	A+	A-	A+	A-	1.70	0.05	-1.54	0.96	0.53	1.02
148	640618	12	6494	0.51	0.29	0.51	0.13	0.07	0.00	0.00	0.42	-0.11	0.42	-0.30	-0.23	A-	A-	A-	A-	0.55	0.05	-5.57	0.91	-5.06	0.89
149	640592	12	6494	0.43	0.22	0.23	0.43	0.12	0.00	0.00	0.41	-0.24	-0.16	0.41	-0.10	A+	A-	A+	A-	0.94	0.05	-3.60	0.94	-2.74	0.94
150	640599	12	6494	0.49	0.20	0.13	0.49	0.17	0.00	0.00	0.23	-0.19	-0.11	0.23	0.00	A-	A-	A+	A+	0.64	0.05	6.01	1.10	6.28	1.14
151	640587	12	6494	0.40	0.09	0.13	0.39	0.40	0.00	0.00	0.26	-0.26	-0.18	0.02	0.26	A+	A-	A-	A-	1.10	0.05	2.93	1.05	4.03	1.10
152	641509	12	6494	0.12	0.12	0.16	0.15	0.57	0.00	0.00	0.17	0.17	0.23	-0.20	-0.13	C-	A-	A+	A+	2.90	0.07	2.69	1.14	5.40	1.47
153	641466	12	6494	0.68	0.68	0.15	0.10	0.07	0.00	0.00	0.41	0.41	-0.26	-0.24	-0.10	A-	A-	A-	A-	-0.26	0.05	-4.54	0.90	-4.20	0.86
154	641432	12	6494	0.46	0.10	0.46	0.27	0.16	0.00	0.00	0.31	-0.19	0.31	-0.10	-0.14	A-	A-	A-	A+	0.79	0.05	0.93	1.02	1.23	1.03
155	641480	12	6494	0.43	0.11	0.29	0.17	0.43	0.00	0.00	0.40	-0.20	-0.12	-0.21	0.40	A-	A+	A+	A+	0.91	0.05	-2.67	0.96	-1.78	0.96
156	645199	12	6494	0.81	0.05	0.09	0.81	0.04	0.00	0.00	0.46	-0.24	-0.28	0.46	-0.23	A-	C-	C-	B+	-1.06	0.06	-6.93	0.77	-8.17	0.60
157	640544	13	6540	0.44	0.44	0.07	0.14	0.34	0.00	0.00	0.21	0.21	-0.15	-0.25	0.05	A+	A-	A-	A+	0.90	0.05	6.11	1.11	5.84	1.14
158	640605	13	6540	0.75	0.15	0.75	0.05	0.05	0.00	0.00	0.46	-0.25	0.46	-0.26	-0.24	A+	A-	A-	A+	-0.62	0.06	-4.69	0.88	-5.61	0.77
159	640593	13	6540	0.49	0.12	0.16	0.23	0.49	0.00	0.00	0.45	-0.20	-0.25	-0.16	0.45	A+	A-	A-	A+	0.68	0.05	-6.12	0.90	-5.72	0.88

Item Information			Classical													DIF				Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(A)	P(B)	P(C)	P(D)	P(-)	P(*)	ITCorr	Corr(A)	Corr(B)	Corr(C)	Corr(D)	M/F	W/B	W/H	O/P	Meas	SEM	*z*	MS	*z*	MS
160	640575	13	6540	0.16	0.52	0.23	0.16	0.09	0.00	0.00	0.15	0.04	-0.09	0.15	-0.12	A+	A-	A-	A-	2.58	0.06	1.43	1.06	5.42	1.38
161	640555	13	6540	0.52	0.07	0.08	0.52	0.33	0.00	0.00	0.43	-0.14	-0.15	0.43	-0.30	A-	A-	A-	A+	0.55	0.05	-4.61	0.93	-3.89	0.91
162	641482	13	6540	0.47	0.17	0.12	0.24	0.47	0.00	0.00	0.55	-0.19	-0.26	-0.27	0.55	C-	C-	A-	A+	0.79	0.05	-9.11	0.85	-7.89	0.83
163	641519	13	6540	0.27	0.16	0.46	0.27	0.11	0.00	0.00	0.21	-0.35	0.17	0.21	-0.15	A-	A-	A-	A-	1.79	0.05	2.82	1.07	3.94	1.16
164	641474	13	6540	0.62	0.62	0.17	0.13	0.07	0.00	0.00	0.38	0.38	-0.24	-0.12	-0.20	A+	A-	A-	A+	0.06	0.05	-0.57	0.99	0.20	1.01
165	641492	13	6540	0.47	0.09	0.25	0.47	0.19	0.00	0.00	0.29	-0.16	-0.10	0.29	-0.14	A+	A-	A+	A+	0.77	0.05	2.92	1.05	2.62	1.06
166	641437	13	6540	0.62	0.12	0.22	0.04	0.62	0.00	0.00	0.39	-0.26	-0.15	-0.20	0.39	A+	A-	A+	A+	0.07	0.05	-2.57	0.95	-2.21	0.94
167	640602	14	6538	0.48	0.11	0.21	0.20	0.48	0.00	0.00	0.28	-0.26	0.15	-0.29	0.28	A-	A-	A-	A+	0.71	0.05	4.36	1.07	4.46	1.10
168	640539	14	6538	0.20	0.61	0.20	0.13	0.05	0.00	0.00	0.13	0.10	0.13	-0.18	-0.17	A-	A-	A-	A+	2.19	0.06	3.40	1.12	7.03	1.40
169	640642	14	6538	0.31	0.31	0.37	0.19	0.13	0.00	0.00	0.17	0.17	0.00	-0.10	-0.11	A+	A-	A-	A+	1.56	0.05	7.13	1.17	9.00	1.33
170	640568	14	6538	0.30	0.30	0.15	0.26	0.29	0.00	0.00	0.25	0.25	-0.09	-0.11	-0.07	A+	A-	A-	A+	1.58	0.05	2.78	1.06	5.01	1.18
171	640610	14	6538	0.39	0.15	0.14	0.39	0.32	0.00	0.00	0.22	-0.08	-0.19	0.22	-0.03	A-	A-	A-	A+	1.15	0.05	6.38	1.12	7.00	1.19
172	641497	14	6538	0.37	0.37	0.33	0.12	0.18	0.00	0.00	0.43	0.43	-0.12	-0.20	-0.22	A-	A+	A+	A-	1.26	0.05	-6.19	0.89	-3.86	0.90
173	641464	14	6538	0.15	0.42	0.38	0.15	0.05	0.00	0.00	0.04	0.13	-0.10	0.04	-0.14	A-	A-	A-	A-	2.61	0.07	1.41	1.06	7.04	1.53
174	641524	14	6538	0.43	0.27	0.43	0.21	0.09	0.00	0.00	0.40	-0.30	0.40	-0.10	-0.10	A-	A-	A-	A+	0.93	0.05	-3.10	0.95	-1.83	0.96
175	641428	14	6538	0.67	0.67	0.06	0.09	0.18	0.00	0.00	0.52	0.52	-0.25	-0.27	-0.28	A+	A+	A+	A+	-0.22	0.05	-9.35	0.81	-8.51	0.74
176	641460	14	6538	0.60	0.08	0.22	0.60	0.09	0.00	0.00	0.51	-0.24	-0.27	0.51	-0.24	A-	A-	A-	A+	0.14	0.05	-9.03	0.84	-8.26	0.80
177	640623	15	6399	0.41	0.09	0.11	0.41	0.39	0.00	0.00	0.21	-0.18	-0.25	0.21	0.06	A+	A-	A+	A+	1.05	0.05	5.17	1.09	5.85	1.14
178	640576	15	6399	0.54	0.27	0.12	0.07	0.54	0.00	0.00	0.58	-0.37	-0.19	-0.24	0.58	A+	A-	A-	A+	0.43	0.05	-9.90	0.81	-9.90	0.78
179	640606	15	6399	0.17	0.22	0.42	0.17	0.19	0.00	0.00	0.02	0.01	-0.04	0.02	0.03	A-	A-	A-	A-	2.42	0.06	2.85	1.11	9.04	1.62
180	640574	15	6399	0.21	0.15	0.54	0.21	0.09	0.00	0.00	0.11	-0.11	0.09	0.11	-0.17	A-	A+	A+	A-	2.13	0.06	0.62	1.02	6.04	1.32
181	640616	15	6399	0.39	0.29	0.39	0.19	0.13	0.00	0.00	0.20	-0.07	0.20	-0.09	-0.08	A+	A+	A+	A+	1.14	0.05	5.67	1.10	6.24	1.16
182	641457	15	6399	0.58	0.09	0.58	0.21	0.11	0.00	0.00	0.53	-0.23	0.53	-0.28	-0.26	A-	A-	A-	A+	0.22	0.05	-9.23	0.85	-8.42	0.81
183	641508	15	6399	0.26	0.21	0.26	0.51	0.02	0.00	0.00	0.09	0.19	0.09	-0.21	-0.10	A+	A-	A+	A+	1.83	0.05	8.14	1.23	9.40	1.42
184	641535	15	6399	0.55	0.14	0.19	0.55	0.11	0.00	0.00	0.34	-0.22	-0.24	0.34	0.01	A-	A-	A-	A+	0.40	0.05	-0.88	0.99	-0.48	0.99
185	641427	15	6399	0.39	0.14	0.34	0.39	0.13	0.00	0.00	0.42	-0.18	-0.22	0.42	-0.12	A-	A-	A+	A+	1.13	0.05	-3.33	0.94	-2.01	0.95
186	641496	15	6399	0.59	0.08	0.12	0.21	0.59	0.00	0.00	0.31	-0.14	-0.15	-0.16	0.31	A-	A-	A-	A+	0.22	0.05	0.69	1.01	0.77	1.02
187	640597	16	6471	0.75	0.09	0.75	0.10	0.05	0.00	0.00	0.46	-0.23	0.46	-0.28	-0.20	A-	A+	A+	A+	-0.66	0.06	-4.38	0.88	-4.68	0.80
188	605308	16	6471	0.60	0.60	0.32	0.04	0.03	0.00	0.00	0.27	0.27	-0.13	-0.18	-0.19	A+	A+	A-	A-	0.12	0.05	2.53	1.05	3.18	1.09
189	640632	16	6471	0.42	0.29	0.26	0.03	0.42	0.00	0.00	0.38	-0.29	-0.06	-0.15	0.38	A-	A-	B-	A+	1.02	0.05	-0.20	1.00	-0.51	0.99
190	640609	16	6471	0.46	0.24	0.46	0.17	0.13	0.00	0.00	0.38	-0.07	0.38	-0.26	-0.18	A+	A-	A-	A+	0.78	0.05	-2.91	0.95	-2.19	0.95
191	640624	16	6471	0.21	0.24	0.21	0.21	0.33	0.00	0.00	-0.06	-0.10	0.04	-0.06	0.11	A+	A+	A+	A-	2.14	0.06	6.19	1.21	9.90	1.64

Item Information			Classical													DIF				Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(A)	P(B)	P(C)	P(D)	P(-)	P(*)	ITCorr	Corr(A)	Corr(B)	Corr(C)	Corr(D)	M/F	W/B	W/H	O/P	Meas	SEM	*z*	MS	*z*	MS
192	641522	16	6471	0.74	0.04	0.06	0.15	0.74	0.00	0.00	0.53	-0.23	-0.23	-0.35	0.53	A+	A+	A-	A+	-0.62	0.06	-8.87	0.78	-9.07	0.65
193	641490	16	6471	0.28	0.28	0.25	0.31	0.16	0.00	0.00	0.17	0.17	0.09	-0.22	-0.04	A+	A-	A-	A+	1.72	0.05	3.96	1.10	5.61	1.22
194	641444	16	6471	0.65	0.07	0.65	0.08	0.19	0.00	0.00	0.47	-0.24	0.47	-0.23	-0.25	A+	A+	A+	A+	-0.12	0.05	-6.01	0.88	-5.66	0.83
195	641510	16	6471	0.48	0.19	0.14	0.48	0.18	0.00	0.00	0.45	-0.17	-0.27	0.45	-0.15	B-	B-	A-	A+	0.69	0.05	-4.59	0.93	-4.04	0.91
196	641459	16	6471	0.45	0.45	0.11	0.22	0.21	0.00	0.00	0.20	0.20	-0.09	0.00	-0.16	A+	A+	A+	A+	0.84	0.05	6.99	1.12	6.13	1.14
197	640585	17	6472	0.30	0.30	0.36	0.19	0.14	0.00	0.00	0.27	0.27	-0.04	-0.16	-0.12	A-	A-	A+	A-	1.56	0.05	0.49	1.01	2.05	1.07
198	640601	17	6472	0.51	0.28	0.11	0.51	0.10	0.00	0.00	0.49	-0.29	-0.22	0.49	-0.15	A-	C-	A-	A+	0.54	0.05	-6.33	0.90	-5.61	0.89
199	640573	17	6472	0.36	0.27	0.22	0.36	0.14	0.00	0.00	0.24	0.00	-0.18	0.24	-0.10	A+	A-	A+	A+	1.27	0.05	2.33	1.05	4.75	1.13
200	640595	17	6472	0.46	0.13	0.14	0.46	0.28	0.00	0.00	0.38	-0.18	-0.23	0.38	-0.11	A+	A-	A-	A+	0.81	0.05	-1.53	0.98	-1.07	0.98
201	640629	17	6472	0.60	0.60	0.08	0.21	0.11	0.00	0.00	0.43	0.43	-0.25	-0.16	-0.25	A-	A-	A-	A+	0.14	0.05	-4.66	0.92	-3.12	0.92
202	605282	17	6472	0.58	0.07	0.22	0.12	0.58	0.00	0.00	0.44	-0.26	-0.21	-0.18	0.44	A+	A+	A-	A+	0.24	0.05	-6.16	0.90	-5.55	0.88
203	641507	17	6472	0.25	0.23	0.20	0.25	0.32	0.00	0.00	-0.15	0.14	-0.14	-0.15	0.13	A-	A-	A+	A+	1.90	0.06	9.90	1.38	9.90	1.71
204	641462	17	6472	0.38	0.38	0.31	0.16	0.16	0.00	0.00	0.29	0.29	-0.01	-0.20	-0.16	A-	A+	A+	A-	1.20	0.05	1.47	1.03	2.85	1.08
205	641479	17	6472	0.37	0.13	0.31	0.37	0.19	0.00	0.00	0.13	-0.18	0.00	0.13	0.00	A-	A-	A-	A+	1.23	0.05	8.95	1.18	9.73	1.28
206	605102	17	6472	0.57	0.12	0.57	0.15	0.16	0.00	0.00	0.31	-0.14	0.31	-0.17	-0.12	A+	A+	A+	A+	0.27	0.05	0.74	1.01	-0.10	1.00
207	640553	18	6510	0.54	0.19	0.11	0.15	0.54	0.00	0.00	0.49	-0.22	-0.26	-0.19	0.49	A+	A-	A-	A+	0.42	0.05	-7.03	0.89	-6.26	0.86
208	640638	18	6510	0.49	0.24	0.14	0.49	0.13	0.00	0.00	0.26	-0.01	-0.24	0.26	-0.12	A-	A-	A-	A+	0.70	0.05	5.18	1.09	4.51	1.11
209	640608	18	6510	0.43	0.14	0.43	0.29	0.13	0.01	0.00	0.28	-0.07	0.28	-0.14	-0.14	A-	A-	A-	A-	0.94	0.05	3.20	1.05	3.47	1.09
210	640603	18	6510	0.57	0.18	0.07	0.57	0.18	0.00	0.00	0.38	-0.18	-0.18	0.38	-0.19	A-	A-	A-	A+	0.29	0.05	-2.92	0.95	-2.29	0.94
211	640565	18	6510	0.77	0.77	0.15	0.05	0.03	0.00	0.00	0.47	0.47	-0.31	-0.23	-0.22	A+	A-	A-	A+	-0.74	0.06	-5.58	0.84	-5.86	0.74
212	641468	18	6510	0.46	0.07	0.33	0.13	0.46	0.00	0.00	0.52	-0.22	-0.30	-0.17	0.52	A-	A+	A+	A-	0.83	0.05	-9.65	0.85	-5.38	0.88
213	641503	18	6510	0.16	0.48	0.24	0.12	0.16	0.00	0.00	0.09	0.05	-0.09	-0.06	0.09	A-	A+	A+	A-	2.52	0.06	1.27	1.05	6.88	1.49
214	641446	18	6510	0.81	0.03	0.07	0.81	0.09	0.00	0.00	0.47	-0.20	-0.24	0.47	-0.31	A+	A-	A-	A+	-1.01	0.06	-5.61	0.82	-6.31	0.68
215	641429	18	6510	0.42	0.42	0.14	0.23	0.21	0.00	0.00	0.41	0.41	-0.18	-0.22	-0.12	A+	A-	A+	A+	1.00	0.05	-3.80	0.94	-3.75	0.91
216	641486	18	6510	0.35	0.12	0.35	0.17	0.36	0.00	0.00	0.31	-0.12	0.31	-0.12	-0.13	A-	A-	B-	A-	1.34	0.05	0.90	1.02	2.23	1.07
217	640600	19	6438	0.56	0.09	0.22	0.56	0.13	0.00	0.00	0.38	-0.32	-0.13	0.38	-0.12	A+	A-	A-	A-	0.34	0.05	-1.65	0.97	-1.61	0.96
218	640596	19	6438	0.71	0.04	0.24	0.71	0.02	0.00	0.00	0.47	-0.19	-0.37	0.47	-0.15	A-	B-	C-	A+	-0.41	0.05	-6.48	0.85	-6.35	0.77
219	640570	19	6438	0.63	0.08	0.63	0.16	0.13	0.00	0.00	0.43	-0.28	0.43	-0.17	-0.20	A-	A-	A-	A-	0.01	0.05	-4.44	0.92	-4.45	0.87
220	640528	19	6438	0.51	0.51	0.13	0.16	0.20	0.00	0.00	0.39	0.39	-0.10	-0.27	-0.15	A+	A-	A-	A+	0.58	0.05	-1.75	0.97	-1.61	0.96
221	605172	19	6438	0.46	0.46	0.27	0.10	0.16	0.00	0.00	0.37	0.37	-0.19	-0.12	-0.17	A+	A-	A-	A-	0.80	0.05	-3.31	0.95	-2.98	0.93
222	641517	19	6438	0.22	0.28	0.25	0.22	0.25	0.00	0.00	0.15	-0.08	0.13	0.15	-0.18	A-	A-	A-	A-	2.11	0.06	2.76	1.09	6.11	1.32
223	641488	19	6438	0.25	0.25	0.49	0.14	0.13	0.00	0.00	0.10	0.10	0.22	-0.26	-0.19	A+	A+	A+	A-	1.92	0.06	4.06	1.12	6.16	1.28

Item Information			Classical													DIF				Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(A)	P(B)	P(C)	P(D)	P(-)	P(*)	ITCorr	Corr(A)	Corr(B)	Corr(C)	Corr(D)	M/F	W/B	W/H	O/P	Meas	SEM	*z*	MS	*z*	MS
224	641458	19	6438	0.36	0.36	0.26	0.26	0.12	0.00	0.00	0.36	0.36	-0.27	-0.04	-0.10	A-	A-	A-	A-	1.30	0.05	-1.76	0.97	-0.13	1.00
225	641449	19	6438	0.55	0.11	0.55	0.13	0.20	0.00	0.00	0.36	-0.19	0.36	-0.17	-0.14	A+	A+	A-	A+	0.39	0.05	0.12	1.00	-0.66	0.98
226	641533	19	6438	0.30	0.25	0.30	0.36	0.10	0.00	0.00	0.27	-0.16	0.27	0.00	-0.17	A-	A-	A-	A+	1.63	0.05	3.99	1.10	7.62	1.29
227	640584	20	6488	0.57	0.13	0.57	0.17	0.13	0.00	0.00	0.43	-0.15	0.43	-0.24	-0.20	A-	A-	A+	A+	0.27	0.05	-3.27	0.95	-2.36	0.94
228	640589	20	6488	0.68	0.20	0.06	0.68	0.06	0.00	0.00	0.41	-0.23	-0.25	0.41	-0.16	A+	A-	A-	A+	-0.30	0.05	-3.36	0.93	-2.64	0.91
229	640577	20	6488	0.63	0.15	0.15	0.63	0.07	0.00	0.00	0.40	-0.16	-0.23	0.40	-0.21	A-	A-	A-	A+	-0.02	0.05	-2.78	0.95	-3.04	0.91
230	640582	20	6488	0.57	0.13	0.08	0.23	0.57	0.00	0.00	0.47	-0.26	-0.24	-0.20	0.47	A-	A-	A-	A+	0.29	0.05	-7.06	0.89	-5.83	0.86
231	640529	20	6488	0.62	0.12	0.62	0.16	0.10	0.00	0.00	0.35	-0.09	0.35	-0.19	-0.24	A-	A-	A-	A+	0.05	0.05	-2.01	0.96	-1.74	0.95
232	641475	20	6488	0.45	0.45	0.26	0.12	0.18	0.00	0.00	0.35	0.35	-0.18	-0.21	-0.06	A+	A-	A+	A+	0.85	0.05	0.35	1.01	2.10	1.05
233	641431	20	6488	0.28	0.12	0.11	0.48	0.28	0.00	0.00	0.35	-0.22	-0.18	-0.06	0.35	A-	A-	A-	A+	1.68	0.05	-2.42	0.94	-0.08	1.00
234	641523	20	6488	0.62	0.08	0.07	0.23	0.62	0.00	0.00	0.48	-0.16	-0.24	-0.30	0.48	A-	A-	A-	A+	0.03	0.05	-6.04	0.89	-5.44	0.85
235	641436	20	6488	0.46	0.06	0.13	0.46	0.35	0.00	0.00	0.38	-0.23	-0.25	0.38	-0.10	A-	A-	A-	A+	0.79	0.05	-0.71	0.99	0.51	1.01
236	641439	20	6488	0.39	0.41	0.39	0.07	0.13	0.00	0.00	0.17	-0.05	0.17	-0.01	-0.15	A-	A-	A-	A-	1.11	0.05	5.54	1.10	6.07	1.17

Table J–6. Biology Multiple-Choice Item Statistics: Spring

Item Information			Classical													DIF				Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(A)	P(B)	P(C)	P(D)	P(-)	P(*)	ITCorr	Corr(A)	Corr(B)	Corr(C)	Corr(D)	M/F	W/B	W/H	O/P	Meas	SEM	*z*	MS	*z*	MS
1	635782	0	180917	0.55	0.13	0.55	0.14	0.18	0.00	0.00	0.35	-0.18	0.35	-0.21	-0.11					-0.03	0.01	-1.55	1.00	-5.57	0.99
2	635763	0	180917	0.47	0.22	0.47	0.23	0.07	0.00	0.00	0.21	-0.17	0.21	0.00	-0.14					0.46	0.01	9.90	1.13	9.90	1.16
3	607738	0	180917	0.49	0.49	0.15	0.23	0.12	0.00	0.00	0.38	0.38	-0.17	-0.15	-0.19					0.22	0.01	-9.90	0.97	-9.90	0.96
4	607724	0	180917	0.52	0.18	0.10	0.52	0.19	0.00	0.00	0.34	-0.26	-0.17	0.34	-0.04					0.07	0.01	6.83	1.01	2.17	1.01
5	610880	0	180917	0.59	0.19	0.09	0.14	0.59	0.00	0.00	0.39	-0.16	-0.23	-0.17	0.39					-0.16	0.01	-9.90	0.96	-9.90	0.93
6	610887	0	180917	0.49	0.21	0.11	0.19	0.49	0.00	0.00	0.41	-0.11	-0.25	-0.21	0.41					0.28	0.01	-9.90	0.94	-9.90	0.94
7	610459	0	180917	0.57	0.07	0.25	0.12	0.57	0.00	0.00	0.41	-0.18	-0.23	-0.17	0.41					0.03	0.01	-9.90	0.94	-9.90	0.92
8	634307	0	180917	0.51	0.51	0.15	0.22	0.12	0.00	0.00	0.34	0.34	-0.05	-0.23	-0.18					0.08	0.01	2.35	1.00	4.79	1.01
9	611387	0	180917	0.57	0.16	0.06	0.57	0.21	0.00	0.00	0.38	-0.23	-0.21	0.38	-0.13					0.28	0.01	-8.85	0.98	-8.98	0.98
10	635602	0	180917	0.52	0.13	0.07	0.28	0.52	0.00	0.00	0.40	-0.27	-0.23	-0.11	0.40					-0.06	0.01	-9.90	0.97	-9.90	0.95
11	607082	0	180917	0.67	0.12	0.67	0.13	0.08	0.00	0.00	0.45	-0.18	0.45	-0.29	-0.20					-0.52	0.01	-9.90	0.87	-9.90	0.81
12	607081	0	180917	0.76	0.76	0.12	0.05	0.07	0.00	0.00	0.33	0.33	-0.18	-0.18	-0.17					-1.08	0.01	-9.90	0.95	-9.90	0.92
13	607103	0	180917	0.73	0.06	0.73	0.10	0.10	0.00	0.00	0.48	-0.22	0.48	-0.27	-0.24					-0.87	0.01	-9.90	0.83	-9.90	0.73
14	635783	0	180917	0.60	0.60	0.10	0.13	0.17	0.00	0.00	0.46	0.46	-0.24	-0.23	-0.18					-0.29	0.01	-9.90	0.91	-9.90	0.85
15	609427	0	180917	0.65	0.65	0.07	0.10	0.18	0.00	0.00	0.47	0.47	-0.28	-0.23	-0.20					-0.36	0.01	-9.90	0.85	-9.90	0.80
16	607789	0	180917	0.43	0.16	0.24	0.17	0.43	0.01	0.00	0.44	-0.14	-0.12	-0.29	0.44					0.54	0.01	-9.90	0.92	-9.90	0.92
17	635799	0	180917	0.64	0.64	0.12	0.17	0.07	0.00	0.00	0.47	0.47	-0.28	-0.19	-0.23					-0.58	0.01	-9.90	0.91	-9.90	0.86
18	610483	0	180917	0.32	0.21	0.24	0.32	0.22	0.01	0.00	0.32	-0.13	-0.20	0.32	-0.02					0.93	0.01	-9.90	0.96	9.39	1.03
19	607706	0	180917	0.50	0.18	0.15	0.15	0.50	0.01	0.00	0.47	-0.20	-0.21	-0.21	0.47					0.38	0.01	-9.90	0.91	-9.90	0.89
20	635786	0	180917	0.47	0.17	0.23	0.47	0.12	0.01	0.00	0.34	-0.15	-0.12	0.34	-0.18					0.40	0.01	4.56	1.01	5.32	1.01
21	610882	0	180917	0.53	0.19	0.53	0.15	0.12	0.01	0.00	0.42	-0.17	0.42	-0.23	-0.16					-0.12	0.01	-9.90	0.97	-9.90	0.94
22	612579	0	180917	0.54	0.20	0.16	0.54	0.10	0.01	0.00	0.34	-0.12	-0.21	0.34	-0.13					-0.13	0.01	9.90	1.02	1.13	1.00
23	607720	0	180917	0.53	0.53	0.11	0.14	0.22	0.01	0.00	0.43	0.43	-0.24	-0.23	-0.13					0.00	0.01	-9.90	0.94	-9.90	0.91
24	610907	0	180917	0.50	0.50	0.16	0.13	0.20	0.01	0.00	0.42	0.42	-0.20	-0.21	-0.15					-0.01	0.01	-9.90	0.96	-9.90	0.93
25	608019	0	180917	0.51	0.51	0.11	0.20	0.17	0.00	0.00	0.44	0.44	-0.25	-0.19	-0.16					0.16	0.01	-9.90	0.92	-9.90	0.91
26	608274	0	180917	0.59	0.59	0.29	0.07	0.05	0.00	0.00	0.31	0.31	-0.17	-0.17	-0.12					-0.23	0.01	9.90	1.03	9.90	1.06
27	607578	0	180917	0.34	0.29	0.34	0.27	0.11	0.00	0.00	0.26	-0.11	0.26	-0.11	-0.09					0.67	0.01	5.91	1.01	9.90	1.04
28	608286	0	180917	0.43	0.43	0.16	0.25	0.15	0.00	0.00	0.27	0.27	-0.22	-0.04	-0.10					0.36	0.01	9.90	1.06	9.90	1.07
29	611436	0	180917	0.44	0.44	0.24	0.21	0.12	0.00	0.00	0.29	0.29	-0.02	-0.29	-0.05					0.33	0.01	9.90	1.04	9.90	1.06
30	610913	0	180917	0.71	0.03	0.03	0.24	0.71	0.00	0.00	0.40	-0.21	-0.21	-0.26	0.40					-0.76	0.01	-9.90	0.91	-9.90	0.87
31	612588	0	180917	0.43	0.26	0.19	0.13	0.43	0.00	0.00	0.43	-0.08	-0.28	-0.20	0.43					0.37	0.01	-9.90	0.92	-9.90	0.91

Item Information			Classical													DIF				Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(A)	P(B)	P(C)	P(D)	P(-)	P(*)	ITCorr	Corr(A)	Corr(B)	Corr(C)	Corr(D)	M/F	W/B	W/H	O/P	Meas	SEM	*z*	MS	*z*	MS
32	609389	0	180917	0.68	0.08	0.11	0.13	0.68	0.00	0.00	0.53	-0.25	-0.27	-0.28	0.53					-0.37	0.01	-9.90	0.77	-9.90	0.71
33	607752	0	180917	0.63	0.13	0.63	0.16	0.08	0.00	0.00	0.36	-0.10	0.36	-0.19	-0.25					-0.43	0.01	-9.90	0.97	-9.90	0.97
34	610895	0	180917	0.61	0.13	0.11	0.15	0.61	0.00	0.00	0.39	-0.16	-0.22	-0.19	0.39					-0.28	0.01	-9.90	0.94	-9.90	0.92
35	610453	0	180917	0.82	0.04	0.07	0.07	0.82	0.00	0.00	0.25	-0.16	-0.10	-0.14	0.25					-1.45	0.01	-9.90	0.94	4.87	1.03
36	610452	0	180917	0.68	0.10	0.14	0.68	0.08	0.00	0.00	0.41	-0.21	-0.26	0.41	-0.13					-0.57	0.01	-9.90	0.90	-9.90	0.88
37	611921	0	180917	0.73	0.08	0.73	0.14	0.05	0.00	0.00	0.41	-0.22	0.41	-0.22	-0.19					-1.02	0.01	-9.90	0.94	-9.90	0.85
38	612587	0	180917	0.58	0.15	0.09	0.58	0.18	0.00	0.00	0.43	-0.26	-0.24	0.43	-0.12					-0.09	0.01	-9.90	0.92	-9.90	0.88
39	610904	0	180917	0.47	0.30	0.13	0.47	0.10	0.00	0.00	0.34	-0.07	-0.24	0.34	-0.18					0.27	0.01	3.13	1.01	-0.42	1.00
40	611072	0	180917	0.63	0.13	0.13	0.11	0.63	0.00	0.00	0.40	-0.13	-0.20	-0.24	0.40					-0.37	0.01	-9.90	0.93	-9.90	0.94
41	611150	0	180917	0.49	0.30	0.14	0.49	0.06	0.00	0.00	0.37	-0.09	-0.28	0.37	-0.18					0.13	0.01	-8.00	0.99	-9.90	0.97
42	608383	0	180917	0.39	0.39	0.29	0.24	0.08	0.00	0.00	0.41	0.41	-0.25	-0.06	-0.21					0.76	0.01	-9.90	0.94	-9.90	0.96
43	611398	0	180917	0.34	0.13	0.19	0.33	0.34	0.00	0.00	0.32	-0.22	-0.19	0.01	0.32					0.59	0.01	-9.90	0.98	-9.52	0.98
44	611611	0	180917	0.34	0.34	0.26	0.23	0.16	0.00	0.00	0.31	0.31	-0.02	-0.14	-0.21					1.01	0.01	9.90	1.02	9.90	1.08
45	611926	0	180917	0.46	0.21	0.46	0.23	0.10	0.00	0.00	0.42	-0.15	0.42	-0.20	-0.20					0.07	0.01	-9.90	0.96	-9.90	0.94
46	635601	0	180917	0.60	0.16	0.60	0.09	0.14	0.00	0.00	0.41	-0.21	0.41	-0.19	-0.19					-0.35	0.01	-9.90	0.95	-9.90	0.93
47	608283	0	180917	0.70	0.06	0.11	0.13	0.70	0.00	0.00	0.47	-0.25	-0.24	-0.22	0.47					-0.77	0.01	-9.90	0.86	-9.90	0.81
48	610527	0	180917	0.49	0.49	0.12	0.20	0.18	0.00	0.00	0.40	0.40	-0.22	-0.18	-0.13					0.17	0.01	-9.90	0.96	-9.90	0.94
49	644772	1	8901	0.67	0.13	0.06	0.14	0.67	0.00	0.00	0.46	-0.11	-0.29	-0.30	0.46	A-	A-	A-	A-	-0.54	0.05	-6.02	0.88	-6.05	0.81
50	644770	1	8901	0.37	0.15	0.37	0.34	0.13	0.00	0.00	0.29	-0.16	0.29	-0.03	-0.19	A-	A-	A-	A-	0.90	0.05	2.72	1.05	4.79	1.14
51	641176	1	8901	0.46	0.46	0.14	0.09	0.31	0.00	0.00	0.25	0.25	-0.20	-0.13	-0.04	A+	A-	A-	A-	0.47	0.05	5.57	1.10	4.34	1.10
52	641200	1	8901	0.53	0.20	0.13	0.14	0.53	0.00	0.00	0.36	-0.12	-0.25	-0.13	0.36	A-	A-	A-	A+	0.15	0.05	1.28	1.02	1.20	1.03
53	642332	1	8901	0.40	0.27	0.05	0.40	0.27	0.00	0.00	0.40	-0.26	-0.19	0.40	-0.07	A+	A+	A+	A-	0.75	0.05	-1.83	0.97	0.01	1.00
54	642323	1	8901	0.48	0.09	0.48	0.20	0.22	0.00	0.00	0.33	-0.19	0.33	-0.16	-0.08	A-	A-	A-	A+	0.38	0.05	1.39	1.02	1.36	1.03
55	643364	1	8901	0.29	0.29	0.24	0.20	0.26	0.01	0.00	0.34	0.34	-0.11	-0.07	-0.16	A-	A-	A+	A-	1.35	0.05	-0.61	0.99	2.35	1.09
56	643374	1	8901	0.39	0.27	0.16	0.39	0.17	0.00	0.00	0.28	-0.04	-0.16	0.28	-0.14	A-	A+	A-	A+	0.81	0.05	3.89	1.08	4.69	1.13
57	644433	1	8901	0.39	0.32	0.17	0.39	0.11	0.00	0.00	0.21	0.02	-0.21	0.21	-0.09	A+	A-	A-	A+	0.80	0.05	7.87	1.16	7.93	1.22
58	610863	1	8901	0.51	0.51	0.27	0.14	0.08	0.00	0.00	0.40	0.40	-0.15	-0.23	-0.19	A+	A-	A-	A-	0.22	0.05	-1.45	0.98	-2.09	0.95
59	611045	1	8901	0.44	0.44	0.18	0.21	0.18	0.00	0.00	0.43	0.43	-0.15	-0.21	-0.17	A+	A+	A-	A-	0.60	0.05	-4.13	0.93	-3.60	0.92
60	641278	1	8901	0.63	0.04	0.24	0.09	0.63	0.00	0.00	0.41	-0.24	-0.18	-0.25	0.41	A+	B-	A-	A+	-0.31	0.05	-3.27	0.94	-2.81	0.92
61	641282	1	8901	0.48	0.20	0.12	0.20	0.48	0.00	0.00	0.37	-0.21	-0.18	-0.10	0.37	A-	A-	A+	A-	0.41	0.05	-2.08	0.96	-1.96	0.96
62	642361	1	8901	0.35	0.31	0.12	0.21	0.35	0.00	0.00	0.37	0.00	-0.28	-0.21	0.37	A-	A-	A-	A+	1.01	0.05	0.63	1.01	1.13	1.03
63	642875	1	8901	0.40	0.40	0.15	0.10	0.34	0.00	0.00	0.23	0.23	-0.04	-0.20	-0.06	A-	A-	A-	A+	0.76	0.05	8.41	1.17	7.97	1.21

Item Information			Classical													DIF				Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(A)	P(B)	P(C)	P(D)	P(-)	P(*)	ITCorr	Corr(A)	Corr(B)	Corr(C)	Corr(D)	M/F	W/B	W/H	O/P	Meas	SEM	*z*	MS	*z*	MS
64	643790	1	8901	0.22	0.31	0.30	0.22	0.17	0.00	0.00	0.08	0.00	-0.07	0.08	0.00	A-	A+	A+	A-	1.80	0.06	4.27	1.14	8.30	1.46
65	644771	2	8115	0.56	0.12	0.56	0.18	0.15	0.00	0.00	0.33	-0.21	0.33	-0.13	-0.13	A+	A-	A-	A+	0.08	0.05	2.24	1.04	1.69	1.04
66	608384	2	8115	0.35	0.35	0.16	0.19	0.29	0.00	0.00	0.30	0.30	-0.22	-0.03	-0.11	A-	A-	A-	A-	1.08	0.05	0.77	1.02	2.16	1.06
67	641269	2	8115	0.85	0.05	0.08	0.85	0.02	0.00	0.00	0.36	-0.24	-0.20	0.36	-0.16	A+	B-	B-	A+	-1.61	0.07	-2.17	0.91	-3.28	0.78
68	641255	2	8115	0.23	0.13	0.51	0.12	0.23	0.00	0.00	0.25	-0.20	0.04	-0.17	0.25	A-	A+	A-	A-	1.73	0.06	-0.41	0.99	2.92	1.13
69	642855	2	8115	0.47	0.27	0.10	0.47	0.16	0.00	0.00	0.15	0.00	-0.17	0.15	-0.05	A+	A+	A+	A-	0.49	0.05	8.79	1.16	7.93	1.18
70	642333	2	8115	0.51	0.26	0.51	0.09	0.14	0.00	0.00	0.37	-0.26	0.37	-0.15	-0.06	A+	A+	A-	A-	0.33	0.05	-3.08	0.95	-3.02	0.94
71	643773	2	8115	0.42	0.14	0.13	0.42	0.30	0.00	0.00	0.24	-0.13	-0.14	0.24	-0.04	A-	A+	A-	A+	0.73	0.05	4.39	1.08	5.74	1.14
72	643778	2	8115	0.34	0.22	0.24	0.34	0.19	0.01	0.00	0.10	0.02	-0.08	0.10	-0.04	A-	A-	A-	A+	1.15	0.05	6.96	1.15	7.63	1.24
73	643342	2	8115	0.74	0.03	0.05	0.18	0.74	0.00	0.00	0.48	-0.19	-0.21	-0.34	0.48	A-	A-	A+	A-	-0.83	0.06	-5.06	0.87	-6.01	0.76
74	610863	2	8115	0.56	0.56	0.26	0.12	0.05	0.00	0.00	0.38	0.38	-0.19	-0.21	-0.15	A-	A-	A-	A-	0.09	0.05	-2.66	0.95	-3.18	0.93
75	640681	2	8115	0.53	0.10	0.53	0.17	0.20	0.00	0.00	0.35	-0.17	0.35	-0.20	-0.12	A+	A-	A-	A-	0.23	0.05	-0.72	0.99	-0.54	0.99
76	641189	2	8115	0.45	0.45	0.24	0.18	0.13	0.00	0.00	0.21	0.21	-0.10	-0.05	-0.13	A+	A+	A-	A+	0.59	0.05	7.33	1.13	7.13	1.17
77	642368	2	8115	0.19	0.38	0.16	0.19	0.26	0.00	0.00	-0.01	0.11	-0.15	-0.01	0.03	A+	A-	A-	A+	2.03	0.06	5.25	1.19	9.90	1.66
78	642379	2	8115	0.50	0.50	0.14	0.09	0.26	0.00	0.00	0.33	0.33	-0.21	-0.22	-0.06	A-	A-	A-	A+	0.35	0.05	-1.19	0.98	-0.88	0.98
79	643333	2	8115	0.21	0.18	0.21	0.21	0.39	0.00	0.00	-0.09	-0.18	-0.09	-0.10	0.31	A-	A+	A+	A-	1.89	0.06	7.52	1.26	9.90	1.75
80	644021	2	8115	0.67	0.09	0.67	0.07	0.17	0.00	0.00	0.49	-0.17	0.49	-0.29	-0.27	A+	A-	A-	A-	-0.43	0.05	-5.62	0.88	-4.82	0.85
81	644723	3	8149	0.44	0.13	0.11	0.44	0.31	0.00	0.00	0.38	-0.20	-0.21	0.38	-0.11	A-	A+	A+	A-	0.66	0.05	-3.02	0.95	-2.35	0.95
82	644718	3	8149	0.50	0.50	0.09	0.18	0.23	0.00	0.00	0.37	0.37	-0.25	-0.11	-0.16	A-	A-	A-	A-	0.40	0.05	-0.32	0.99	-0.75	0.98
83	640665	3	8149	0.40	0.08	0.42	0.40	0.11	0.00	0.00	0.35	-0.21	-0.22	0.35	-0.03	A-	A+	A-	A-	0.86	0.05	-2.37	0.96	-1.19	0.97
84	641184	3	8149	0.63	0.63	0.08	0.09	0.19	0.00	0.00	0.36	0.36	-0.24	-0.27	-0.07	A+	A-	A-	A+	-0.27	0.05	-0.99	0.98	-0.02	1.00
85	642315	3	8149	0.33	0.36	0.21	0.33	0.09	0.00	0.00	0.31	0.03	-0.32	0.31	-0.08	A-	A+	A-	A+	1.20	0.05	2.12	1.04	3.17	1.10
86	642319	3	8149	0.69	0.10	0.08	0.69	0.13	0.00	0.00	0.47	-0.23	-0.25	0.47	-0.23	A-	A-	A-	A-	-0.56	0.05	-5.47	0.88	-5.92	0.81
87	642856	3	8149	0.34	0.13	0.34	0.14	0.39	0.01	0.00	0.28	-0.21	0.28	-0.22	0.04	A-	A-	A-	A-	1.14	0.05	0.22	1.00	1.74	1.05
88	642863	3	8149	0.48	0.10	0.21	0.48	0.20	0.00	0.00	0.28	-0.19	-0.07	0.28	-0.12	A+	A-	A-	A+	0.47	0.05	1.15	1.02	1.49	1.03
89	610865	3	8149	0.31	0.46	0.31	0.16	0.07	0.00	0.00	0.07	-0.01	0.07	0.05	-0.17	A+	A+	A+	A-	1.30	0.05	7.26	1.17	8.90	1.31
90	643343	3	8149	0.78	0.05	0.07	0.10	0.78	0.00	0.00	0.47	-0.24	-0.21	-0.28	0.47	A+	A-	A-	A-	-1.09	0.06	-3.25	0.90	-4.24	0.80
91	640682	3	8149	0.34	0.22	0.18	0.25	0.34	0.00	0.00	0.38	-0.23	-0.23	0.01	0.38	A-	A-	A+	A-	1.13	0.05	-2.92	0.94	-1.73	0.95
92	641265	3	8149	0.59	0.59	0.16	0.15	0.09	0.00	0.00	0.43	0.43	-0.17	-0.25	-0.19	A+	A-	A-	A+	-0.04	0.05	-5.06	0.91	-5.47	0.87
93	641275	3	8149	0.55	0.17	0.12	0.15	0.55	0.00	0.00	0.37	-0.13	-0.12	-0.25	0.37	A-	A-	A-	A+	0.13	0.05	-2.12	0.96	-1.39	0.97
94	642372	3	8149	0.81	0.05	0.07	0.07	0.81	0.00	0.00	0.40	-0.21	-0.21	-0.21	0.40	A+	A-	A-	B+	-1.29	0.06	-4.96	0.83	-5.02	0.74
95	642898	3	8149	0.56	0.20	0.08	0.56	0.16	0.00	0.00	0.30	-0.24	-0.24	0.30	0.05	A-	A-	A-	A-	0.11	0.05	2.76	1.05	2.76	1.06

Item Information			Classical													DIF				Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(A)	P(B)	P(C)	P(D)	P(-)	P(*)	ITCorr	Corr(A)	Corr(B)	Corr(C)	Corr(D)	M/F	W/B	W/H	O/P	Meas	SEM	*z*	MS	*z*	MS
96	643395	3	8149	0.41	0.29	0.41	0.10	0.20	0.00	0.00	0.21	-0.10	0.21	-0.22	0.03	A+	A-	A-	A-	0.80	0.05	4.31	1.08	3.76	1.09
97	644719	4	8109	0.39	0.39	0.23	0.23	0.14	0.00	0.00	0.35	0.35	-0.17	-0.08	-0.18	A-	A-	A+	A+	0.87	0.05	-1.58	0.97	-0.57	0.99
98	644726	4	8109	0.52	0.52	0.10	0.31	0.07	0.00	0.00	0.34	0.34	-0.27	-0.06	-0.22	A-	A-	A+	A+	0.29	0.05	-0.42	0.99	-0.30	0.99
99	641260	4	8109	0.71	0.11	0.71	0.08	0.10	0.00	0.00	0.32	-0.14	0.32	-0.18	-0.17	A-	A-	A-	A+	-0.65	0.05	-0.47	0.99	0.35	1.01
100	642316	4	8109	0.65	0.65	0.04	0.08	0.22	0.00	0.00	0.44	0.44	-0.22	-0.23	-0.24	A-	A-	A-	A+	-0.38	0.05	-3.97	0.92	-4.06	0.88
101	641179	4	8109	0.29	0.22	0.29	0.22	0.26	0.00	0.00	0.18	-0.17	0.18	-0.16	0.13	A-	A-	A-	A-	1.41	0.05	3.18	1.08	6.38	1.24
102	642320	4	8109	0.62	0.09	0.18	0.62	0.10	0.00	0.00	0.33	-0.28	-0.10	0.33	-0.13	A+	A+	A-	A+	-0.22	0.05	0.13	1.00	1.89	1.05
103	643370	4	8109	0.46	0.23	0.46	0.11	0.20	0.00	0.00	0.38	-0.06	0.38	-0.22	-0.23	A-	A-	A-	A+	0.57	0.05	-3.65	0.94	-2.76	0.94
104	643408	4	8109	0.34	0.28	0.12	0.25	0.34	0.01	0.00	0.25	-0.01	-0.21	-0.09	0.25	A-	A-	A-	A-	1.12	0.05	2.04	1.04	3.72	1.11
105	643345	4	8109	0.51	0.19	0.51	0.15	0.15	0.00	0.00	0.30	-0.09	0.30	-0.20	-0.12	A+	A-	A-	A+	0.34	0.05	3.51	1.06	3.80	1.08
106	610873	4	8109	0.55	0.08	0.12	0.24	0.55	0.00	0.00	0.35	-0.17	-0.25	-0.10	0.35	A-	A-	A-	A-	0.11	0.05	0.55	1.01	1.24	1.03
107	608293	4	8109	0.62	0.18	0.08	0.12	0.62	0.00	0.00	0.32	-0.09	-0.28	-0.13	0.32	A-	A-	A-	A+	-0.20	0.05	0.11	1.00	0.15	1.00
108	641286	4	8109	0.40	0.18	0.29	0.40	0.13	0.00	0.00	0.22	-0.12	-0.10	0.22	-0.04	A+	A+	A-	A-	0.85	0.05	6.44	1.12	7.20	1.18
109	642339	4	8109	0.36	0.32	0.12	0.36	0.20	0.00	0.00	0.28	-0.10	-0.22	0.28	-0.03	A+	A-	A-	A-	1.04	0.05	2.42	1.05	2.88	1.08
110	642362	4	8109	0.41	0.08	0.38	0.12	0.41	0.00	0.00	0.12	-0.16	0.04	-0.09	0.12	A+	A-	A-	A+	0.79	0.05	9.15	1.17	7.68	1.19
111	642899	4	8109	0.41	0.14	0.18	0.26	0.41	0.00	0.00	0.40	0.01	-0.25	-0.23	0.40	A-	A-	A-	A+	0.78	0.05	-2.50	0.96	-1.84	0.96
112	643787	4	8109	0.36	0.36	0.24	0.25	0.15	0.00	0.00	0.28	0.28	-0.12	-0.12	-0.08	A-	A-	A+	A-	1.01	0.05	-0.61	0.99	0.41	1.01
113	644725	5	8062	0.46	0.17	0.46	0.23	0.14	0.00	0.00	0.17	-0.05	0.17	-0.09	-0.07	A-	A-	A+	A+	0.57	0.05	9.42	1.17	8.42	1.19
114	644733	5	8062	0.44	0.24	0.15	0.16	0.44	0.00	0.00	0.46	-0.13	-0.23	-0.24	0.46	A+	A-	A+	A-	0.64	0.05	-7.28	0.88	-6.08	0.87
115	641272	5	8062	0.38	0.38	0.17	0.23	0.22	0.00	0.00	0.22	0.22	-0.14	-0.01	-0.12	A-	A+	A+	A+	0.94	0.05	4.73	1.09	5.93	1.16
116	642328	5	8062	0.63	0.63	0.13	0.08	0.16	0.00	0.00	0.45	0.45	-0.20	-0.19	-0.26	A-	A-	A-	A+	-0.24	0.05	-4.32	0.92	-4.34	0.88
117	642842	5	8062	0.47	0.47	0.11	0.12	0.30	0.01	0.00	0.31	0.31	-0.14	-0.23	-0.07	A-	A-	A-	A+	0.52	0.05	1.25	1.02	1.32	1.03
118	642321	5	8062	0.50	0.21	0.50	0.18	0.11	0.00	0.00	0.28	-0.14	0.28	-0.04	-0.19	A-	A+	A-	A-	0.40	0.05	2.62	1.04	2.50	1.05
119	643411	5	8062	0.46	0.23	0.46	0.20	0.10	0.01	0.00	0.32	-0.05	0.32	-0.20	-0.16	A-	A-	A-	A+	0.56	0.05	2.12	1.04	2.01	1.04
120	643776	5	8062	0.20	0.20	0.16	0.32	0.32	0.01	0.00	0.21	0.21	-0.07	-0.09	-0.01	A-	A-	A+	A-	2.00	0.06	-0.41	0.99	3.73	1.20
121	610875	5	8062	0.53	0.14	0.15	0.53	0.17	0.00	0.00	0.41	-0.23	-0.24	0.41	-0.09	A-	A-	A-	A-	0.22	0.05	-3.21	0.95	-3.57	0.92
122	643344	5	8062	0.43	0.43	0.25	0.11	0.20	0.00	0.00	0.13	0.13	-0.02	-0.17	0.01	A-	A-	A-	A-	0.70	0.05	9.89	1.18	8.92	1.21
123	611404	5	8062	0.25	0.25	0.25	0.18	0.32	0.00	0.00	0.26	0.26	-0.14	-0.11	-0.01	A-	A+	A-	A-	1.63	0.05	0.39	1.01	3.62	1.15
124	612598	5	8062	0.57	0.04	0.57	0.08	0.30	0.00	0.00	0.32	-0.23	0.32	-0.17	-0.14	A+	A-	A-	A+	0.04	0.05	0.69	1.01	0.73	1.02
125	642387	5	8062	0.50	0.13	0.50	0.25	0.12	0.00	0.00	0.30	-0.18	0.30	-0.14	-0.07	A-	A-	A-	A-	0.40	0.05	2.94	1.05	2.73	1.06
126	642859	5	8062	0.57	0.15	0.09	0.19	0.57	0.00	0.00	0.53	-0.23	-0.27	-0.25	0.53	A+	A-	A+	A-	0.04	0.05	-8.69	0.86	-7.90	0.82
127	642869	5	8062	0.30	0.30	0.24	0.38	0.08	0.00	0.00	0.12	0.12	-0.17	0.13	-0.17	A+	A-	A-	A-	1.38	0.05	5.86	1.14	7.60	1.28

Item Information			Classical													DIF				Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(A)	P(B)	P(C)	P(D)	P(-)	P(*)	ITCorr	Corr(A)	Corr(B)	Corr(C)	Corr(D)	M/F	W/B	W/H	O/P	Meas	SEM	*z*	MS	*z*	MS
128	644029	5	8062	0.86	0.86	0.04	0.05	0.04	0.00	0.00	0.45	0.45	-0.25	-0.27	-0.21	A+	B-	B-	A+	-1.68	0.07	-5.03	0.79	-7.32	0.56
129	644727	6	8058	0.34	0.34	0.16	0.27	0.23	0.00	0.00	0.36	0.36	-0.14	-0.17	-0.11	A-	A+	A+	A-	1.15	0.05	-0.96	0.98	0.09	1.00
130	644732	6	8058	0.40	0.40	0.23	0.18	0.19	0.00	0.00	0.42	0.42	-0.19	-0.18	-0.15	A-	A-	A+	A+	0.86	0.05	-3.94	0.93	-3.03	0.92
131	643792	6	8058	0.31	0.26	0.09	0.35	0.31	0.00	0.00	0.35	0.06	-0.11	-0.32	0.35	A+	A+	A-	A-	1.30	0.05	-0.35	0.99	1.03	1.03
132	642329	6	8058	0.44	0.06	0.10	0.39	0.44	0.00	0.00	0.34	-0.23	-0.27	-0.06	0.34	A-	A-	A-	A-	0.64	0.05	-0.18	1.00	0.38	1.01
133	642851	6	8058	0.75	0.11	0.75	0.05	0.08	0.00	0.00	0.28	-0.12	0.28	-0.18	-0.14	A+	A-	B-	A+	-0.87	0.06	0.82	1.02	1.27	1.06
134	643361	6	8058	0.74	0.04	0.05	0.18	0.74	0.00	0.00	0.40	-0.21	-0.24	-0.21	0.40	A+	A-	A-	A-	-0.81	0.06	-3.15	0.92	-3.39	0.86
135	640667	6	8058	0.62	0.13	0.62	0.14	0.10	0.00	0.00	0.51	-0.26	0.51	-0.27	-0.21	A-	A-	A-	A+	-0.22	0.05	-7.35	0.86	-7.52	0.80
136	643379	6	8058	0.81	0.04	0.04	0.12	0.81	0.00	0.00	0.50	-0.26	-0.25	-0.30	0.50	A+	A-	B-	A+	-1.26	0.06	-6.11	0.80	-7.59	0.63
137	642370	6	8058	0.35	0.32	0.35	0.21	0.12	0.00	0.00	0.25	-0.04	0.25	-0.14	-0.12	A-	A-	A-	A-	1.11	0.05	2.58	1.06	4.56	1.14
138	607105	6	8058	0.40	0.21	0.40	0.16	0.23	0.00	0.00	0.26	-0.16	0.26	-0.09	-0.07	A-	A+	A+	A-	0.84	0.05	3.71	1.07	4.45	1.12
139	607597	6	8058	0.59	0.26	0.59	0.08	0.07	0.00	0.00	0.35	-0.12	0.35	-0.25	-0.20	A-	A-	A-	A+	-0.06	0.05	0.87	1.02	0.43	1.01
140	641193	6	8058	0.61	0.61	0.09	0.14	0.17	0.00	0.00	0.37	0.37	-0.24	-0.31	-0.02	A+	A-	A-	A-	-0.13	0.05	-0.91	0.98	-0.87	0.98
141	642373	6	8058	0.63	0.04	0.19	0.63	0.13	0.00	0.00	0.16	-0.20	-0.04	0.16	-0.04	A-	A-	A-	A+	-0.25	0.05	6.85	1.14	5.93	1.18
142	642894	6	8058	0.23	0.17	0.29	0.30	0.23	0.00	0.00	0.19	-0.15	-0.10	0.05	0.19	A-	A+	A+	A-	1.74	0.06	1.91	1.06	4.44	1.21
143	643334	6	8058	0.48	0.25	0.48	0.17	0.10	0.00	0.00	0.38	-0.13	0.38	-0.21	-0.17	A-	A-	A-	A-	0.46	0.05	-1.73	0.97	-1.59	0.96
144	643784	6	8058	0.33	0.31	0.20	0.17	0.33	0.00	0.00	0.21	-0.01	-0.06	-0.18	0.21	A+	A+	A-	A-	1.21	0.05	4.03	1.09	5.50	1.18
145	644731	7	8129	0.58	0.07	0.23	0.58	0.11	0.00	0.00	0.35	-0.21	-0.15	0.35	-0.18	A-	A-	A-	A-	0.00	0.05	0.12	1.00	-0.46	0.99
146	644732	7	8129	0.47	0.47	0.20	0.17	0.16	0.00	0.00	0.46	0.46	-0.22	-0.20	-0.19	A-	A-	A-	A+	0.51	0.05	-7.84	0.87	-7.57	0.84
147	641177	7	8129	0.59	0.09	0.15	0.59	0.16	0.00	0.00	0.46	-0.23	-0.27	0.46	-0.17	A-	A-	A-	A-	-0.06	0.05	-6.19	0.89	-6.31	0.85
148	641182	7	8129	0.62	0.62	0.07	0.16	0.14	0.00	0.00	0.51	0.51	-0.25	-0.32	-0.18	A+	A-	A-	A+	-0.21	0.05	-8.20	0.85	-7.33	0.81
149	641187	7	8129	0.55	0.18	0.10	0.55	0.17	0.00	0.00	0.31	-0.15	-0.31	0.31	0.00	A-	A-	A-	A-	0.14	0.05	3.09	1.05	3.79	1.09
150	642832	7	8129	0.56	0.16	0.13	0.56	0.14	0.00	0.00	0.47	-0.25	-0.28	0.47	-0.12	A-	A-	A-	A-	0.10	0.05	-5.66	0.90	-5.78	0.87
151	642852	7	8129	0.44	0.27	0.44	0.13	0.16	0.00	0.00	0.32	0.00	0.32	-0.25	-0.19	A-	A-	A+	A-	0.66	0.05	2.00	1.04	2.38	1.05
152	643380	7	8129	0.71	0.11	0.71	0.11	0.07	0.00	0.00	0.47	-0.25	0.47	-0.27	-0.17	A+	A-	A-	A-	-0.65	0.05	-5.56	0.87	-6.02	0.79
153	643335	7	8129	0.41	0.27	0.41	0.20	0.12	0.00	0.00	0.23	-0.12	0.23	-0.11	-0.05	A-	A-	A-	A-	0.79	0.05	6.71	1.13	7.17	1.18
154	607106	7	8129	0.52	0.13	0.16	0.52	0.19	0.00	0.00	0.39	-0.18	-0.26	0.39	-0.10	A-	A-	A-	A-	0.26	0.05	-0.18	1.00	-0.44	0.99
155	641203	7	8129	0.42	0.11	0.42	0.33	0.14	0.00	0.00	0.36	-0.11	0.36	-0.22	-0.12	B-	A-	A-	A+	0.75	0.05	0.15	1.00	0.56	1.01
156	611397	7	8129	0.38	0.38	0.24	0.21	0.16	0.00	0.00	0.27	0.27	-0.06	-0.11	-0.15	A+	A-	A-	A-	0.96	0.05	1.52	1.03	1.62	1.04
157	641268	7	8129	0.51	0.11	0.11	0.51	0.27	0.00	0.00	0.26	-0.25	-0.19	0.26	0.02	A+	A-	A-	A-	0.34	0.05	6.97	1.12	6.90	1.16
158	642374	7	8129	0.30	0.14	0.07	0.30	0.48	0.00	0.00	0.28	-0.17	-0.21	0.28	-0.03	A-	A+	A+	A+	1.37	0.05	0.06	1.00	2.07	1.07
159	643402	7	8129	0.45	0.15	0.24	0.16	0.45	0.00	0.00	0.46	-0.21	-0.16	-0.22	0.46	A+	A-	A+	A-	0.61	0.05	-7.56	0.87	-7.13	0.85

Item Information			Classical													DIF				Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(A)	P(B)	P(C)	P(D)	P(-)	P(*)	ITCorr	Corr(A)	Corr(B)	Corr(C)	Corr(D)	M/F	W/B	W/H	O/P	Meas	SEM	*z*	MS	*z*	MS
160	644022	7	8129	0.55	0.26	0.09	0.10	0.55	0.00	0.00	0.37	-0.17	-0.21	-0.16	0.37	A-	A+	A+	A-	0.14	0.05	-0.22	1.00	-0.41	0.99
161	644738	8	8072	0.25	0.25	0.38	0.21	0.17	0.00	0.00	0.19	0.19	0.08	-0.21	-0.10	A+	A-	A-	A-	1.70	0.06	2.34	1.07	4.39	1.20
162	644729	8	8072	0.61	0.61	0.11	0.14	0.13	0.00	0.00	0.48	0.48	-0.27	-0.22	-0.20	A-	A-	A-	A-	-0.12	0.05	-5.71	0.90	-5.87	0.84
163	641258	8	8072	0.38	0.35	0.38	0.13	0.14	0.00	0.00	0.35	-0.05	0.35	-0.25	-0.18	A-	A+	A+	A-	0.95	0.05	-1.26	0.98	-0.06	1.00
164	641263	8	8072	0.59	0.18	0.12	0.59	0.11	0.00	0.00	0.44	-0.21	-0.23	0.44	-0.19	A-	A-	A-	A-	-0.06	0.05	-3.87	0.93	-4.32	0.89
165	642317	8	8072	0.31	0.52	0.10	0.07	0.31	0.00	0.00	0.53	-0.25	-0.22	-0.19	0.53	A-	A+	A+	A-	1.35	0.05	-8.14	0.82	-5.31	0.83
166	643336	8	8072	0.44	0.20	0.15	0.44	0.20	0.00	0.00	0.17	-0.08	-0.19	0.17	0.05	A-	A-	A-	A-	0.69	0.05	7.88	1.15	7.38	1.18
167	643771	8	8072	0.51	0.09	0.35	0.04	0.51	0.00	0.00	0.29	-0.12	-0.13	-0.21	0.29	A+	A-	A-	A-	0.32	0.05	4.73	1.08	6.11	1.15
168	643375	8	8072	0.51	0.18	0.51	0.20	0.11	0.00	0.00	0.33	-0.08	0.33	-0.25	-0.10	A-	A+	A+	A+	0.33	0.05	1.33	1.02	0.05	1.00
169	608093	8	8072	0.43	0.43	0.28	0.13	0.15	0.00	0.00	0.30	0.30	-0.11	-0.27	-0.02	A-	A-	A-	A-	0.72	0.05	2.33	1.04	2.98	1.07
170	643338	8	8072	0.46	0.21	0.46	0.15	0.19	0.00	0.00	0.30	-0.03	0.30	-0.16	-0.19	A-	A-	A-	A-	0.59	0.05	3.89	1.07	4.17	1.10
171	610531	8	8072	0.42	0.23	0.17	0.17	0.42	0.00	0.00	0.44	-0.10	-0.23	-0.23	0.44	A+	A-	A+	A-	0.75	0.05	-3.27	0.94	-2.72	0.94
172	641190	8	8072	0.36	0.07	0.42	0.14	0.36	0.00	0.00	0.30	-0.18	-0.12	-0.10	0.30	A-	A-	A-	A-	1.05	0.05	2.06	1.04	3.72	1.11
173	641212	8	8072	0.50	0.50	0.17	0.16	0.17	0.00	0.00	0.34	0.34	-0.20	-0.24	0.00	A-	A-	A+	A-	0.41	0.05	1.33	1.02	1.91	1.04
174	642348	8	8072	0.80	0.03	0.13	0.80	0.04	0.00	0.00	0.40	-0.15	-0.29	0.40	-0.19	A+	A-	A-	A+	-1.22	0.06	-2.65	0.91	-3.51	0.81
175	642382	8	8072	0.57	0.13	0.57	0.23	0.06	0.00	0.00	0.43	-0.23	0.43	-0.18	-0.24	A-	A-	A-	A-	0.05	0.05	-3.05	0.95	-3.67	0.91
176	644026	8	8072	0.55	0.55	0.11	0.19	0.15	0.00	0.00	0.51	0.51	-0.20	-0.24	-0.26	A-	A-	A-	A+	0.17	0.05	-7.33	0.88	-7.05	0.84
177	644752	9	8060	0.50	0.50	0.31	0.13	0.07	0.00	0.00	0.27	0.27	-0.02	-0.23	-0.21	A+	A+	A+	A-	0.39	0.05	3.21	1.05	3.58	1.07
178	644747	9	8060	0.27	0.15	0.27	0.13	0.44	0.00	0.00	0.30	-0.20	0.30	-0.28	0.08	A-	A-	A-	A-	1.51	0.05	-0.65	0.98	2.48	1.09
179	642318	9	8060	0.39	0.39	0.26	0.06	0.29	0.00	0.00	0.52	0.52	-0.26	-0.19	-0.19	A-	A-	A-	A+	0.93	0.05	-9.52	0.84	-7.29	0.84
180	635780	9	8060	0.65	0.14	0.10	0.65	0.11	0.00	0.00	0.40	-0.16	-0.23	0.40	-0.21	A+	A-	A-	A-	-0.32	0.05	-2.39	0.95	-3.30	0.91
181	642324	9	8060	0.30	0.14	0.30	0.44	0.11	0.00	0.00	0.02	-0.19	0.02	0.26	-0.22	A-	A+	A-	A-	1.35	0.05	7.77	1.19	8.66	1.30
182	642335	9	8060	0.48	0.10	0.23	0.48	0.19	0.00	0.00	0.37	-0.27	-0.19	0.37	-0.05	A+	A-	A-	A+	0.48	0.05	-0.98	0.98	-0.82	0.98
183	643365	9	8060	0.42	0.13	0.42	0.36	0.08	0.00	0.00	0.33	-0.22	0.33	-0.05	-0.21	A-	A+	A+	A-	0.79	0.05	-0.93	0.98	-0.43	0.99
184	643376	9	8060	0.42	0.20	0.14	0.42	0.24	0.00	0.00	0.21	-0.07	-0.13	0.21	-0.07	A-	A+	A+	A+	0.79	0.05	4.97	1.09	5.26	1.12
185	643337	9	8060	0.38	0.36	0.38	0.14	0.12	0.00	0.00	0.18	0.05	0.18	-0.25	-0.06	A+	A-	A+	A-	0.96	0.05	5.31	1.10	5.28	1.13
186	608094	9	8060	0.25	0.25	0.42	0.26	0.07	0.00	0.00	0.13	0.13	0.06	-0.11	-0.15	A-	A+	A+	A-	1.67	0.06	0.23	1.01	2.10	1.09
187	611616	9	8060	0.34	0.34	0.21	0.28	0.16	0.00	0.00	0.20	0.20	0.09	-0.15	-0.15	A-	A-	A-	A-	1.17	0.05	3.84	1.08	4.07	1.12
188	640683	9	8060	0.32	0.37	0.32	0.19	0.11	0.00	0.00	0.22	0.12	0.22	-0.23	-0.20	A+	A+	A+	A-	1.24	0.05	1.42	1.03	3.14	1.10
189	642340	9	8060	0.35	0.21	0.25	0.35	0.18	0.00	0.00	0.15	-0.10	-0.13	0.15	0.08	A+	A-	A+	A-	1.11	0.05	4.09	1.08	5.50	1.16
190	641276	9	8060	0.43	0.43	0.11	0.36	0.09	0.00	0.00	0.08	0.08	-0.14	0.17	-0.24	A+	A-	A+	A+	0.71	0.05	9.90	1.24	9.90	1.27
191	642900	9	8060	0.52	0.04	0.14	0.52	0.30	0.00	0.00	0.28	-0.23	-0.15	0.28	-0.08	A-	A-	A+	A+	0.29	0.05	3.40	1.06	2.47	1.05

Item Information			Classical													DIF				Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(A)	P(B)	P(C)	P(D)	P(-)	P(*)	ITCorr	Corr(A)	Corr(B)	Corr(C)	Corr(D)	M/F	W/B	W/H	O/P	Meas	SEM	*z*	MS	*z*	MS
192	643397	9	8060	0.49	0.33	0.05	0.49	0.12	0.00	0.00	0.33	-0.07	-0.25	0.33	-0.23	A+	A-	A-	A-	0.45	0.05	0.90	1.01	0.83	1.02
193	644752	10	8065	0.48	0.48	0.32	0.13	0.07	0.00	0.00	0.30	0.30	-0.04	-0.23	-0.21	A+	A-	A+	A+	0.50	0.05	3.01	1.05	2.86	1.06
194	644755	10	8065	0.52	0.16	0.10	0.52	0.22	0.00	0.00	0.42	-0.05	-0.30	0.42	-0.25	A-	A-	A-	A-	0.32	0.05	-1.98	0.97	-1.40	0.97
195	641198	10	8065	0.65	0.16	0.09	0.65	0.11	0.00	0.00	0.50	-0.22	-0.28	0.50	-0.26	A-	A-	A-	A-	-0.32	0.05	-6.60	0.87	-7.40	0.79
196	642847	10	8065	0.49	0.49	0.15	0.16	0.20	0.00	0.00	0.40	0.40	-0.22	-0.19	-0.12	A-	A+	A-	A-	0.47	0.05	-0.69	0.99	-0.89	0.98
197	642325	10	8065	0.46	0.10	0.19	0.25	0.46	0.00	0.00	0.51	-0.19	-0.37	-0.11	0.51	A-	A-	A-	A-	0.61	0.05	-6.95	0.88	-6.10	0.87
198	642864	10	8065	0.66	0.14	0.12	0.66	0.08	0.00	0.00	0.48	-0.28	-0.21	0.48	-0.21	A-	A+	A-	A+	-0.36	0.05	-5.19	0.89	-5.85	0.83
199	643366	10	8065	0.63	0.08	0.09	0.19	0.63	0.00	0.00	0.47	-0.25	-0.23	-0.22	0.47	A+	A-	A-	A+	-0.23	0.05	-5.74	0.89	-5.98	0.84
200	643779	10	8065	0.68	0.07	0.10	0.68	0.14	0.00	0.00	0.48	-0.28	-0.25	0.48	-0.21	A+	A-	A-	A+	-0.50	0.05	-5.96	0.87	-6.39	0.80
201	644616	10	8065	0.61	0.61	0.12	0.18	0.09	0.00	0.00	0.37	0.37	-0.21	-0.21	-0.10	A+	A+	A-	A-	-0.12	0.05	1.58	1.03	0.85	1.02
202	608261	10	8065	0.49	0.17	0.18	0.16	0.49	0.00	0.00	0.45	-0.06	-0.28	-0.24	0.45	A+	A-	A+	A-	0.48	0.05	-4.78	0.92	-3.89	0.92
203	607093	10	8065	0.36	0.12	0.13	0.38	0.36	0.00	0.00	0.25	-0.22	-0.30	0.12	0.25	A+	A+	A+	A+	1.08	0.05	4.69	1.10	4.57	1.13
204	642369	10	8065	0.48	0.13	0.19	0.48	0.20	0.00	0.00	0.17	-0.21	-0.09	0.17	0.05	A+	A-	A-	A-	0.51	0.05	8.69	1.16	9.04	1.21
205	642375	10	8065	0.53	0.53	0.10	0.11	0.26	0.00	0.00	0.13	0.13	-0.16	-0.19	0.11	A+	A-	A-	A-	0.28	0.05	9.90	1.22	9.90	1.29
206	642860	10	8065	0.56	0.11	0.16	0.16	0.56	0.00	0.00	0.46	-0.15	-0.22	-0.26	0.46	A+	A-	A-	A+	0.13	0.05	-4.86	0.92	-4.68	0.89
207	643390	10	8065	0.46	0.19	0.15	0.19	0.46	0.00	0.00	0.44	-0.25	-0.16	-0.16	0.44	A+	A+	A+	A+	0.59	0.05	-5.16	0.91	-4.96	0.89
208	644030	10	8065	0.88	0.03	0.88	0.04	0.05	0.00	0.00	0.42	-0.21	0.42	-0.22	-0.25	A+	B-	A-	A+	-1.91	0.07	-3.93	0.81	-5.72	0.59
209	644946	11	5347	0.46	0.46	0.15	0.22	0.16	0.00	0.00	0.43	0.43	-0.23	-0.20	-0.14	A-	A-	A+	A-	0.51	0.05	-5.33	0.91	-4.52	0.90
210	644757	11	5347	0.60	0.21	0.60	0.12	0.07	0.00	0.00	0.45	-0.18	0.45	-0.26	-0.23	A-	A-	A-	A-	-0.14	0.05	-4.88	0.91	-5.54	0.86
211	641270	11	5347	0.61	0.61	0.10	0.11	0.19	0.00	0.00	0.48	0.48	-0.22	-0.19	-0.28	A-	A-	A-	A+	-0.18	0.05	-6.92	0.87	-7.03	0.82
212	608268	11	5347	0.53	0.12	0.16	0.53	0.18	0.00	0.00	0.37	-0.21	-0.18	0.37	-0.13	A+	A-	A-	A+	0.18	0.05	0.70	1.01	-0.39	0.99
213	642841	11	5347	0.64	0.64	0.19	0.08	0.09	0.00	0.00	0.42	0.42	-0.23	-0.28	-0.13	A-	A+	A-	A-	-0.33	0.05	-2.46	0.95	-2.97	0.91
214	641185	11	5347	0.46	0.13	0.24	0.16	0.46	0.00	0.00	0.48	-0.19	-0.28	-0.14	0.48	A-	A-	A-	A+	0.54	0.05	-6.74	0.89	-5.64	0.88
215	642848	11	5347	0.63	0.08	0.63	0.07	0.22	0.00	0.00	0.45	-0.14	0.45	-0.23	-0.28	A-	A-	A-	A-	-0.29	0.05	-3.00	0.94	-4.25	0.88
216	643409	11	5347	0.49	0.49	0.17	0.22	0.12	0.00	0.00	0.44	0.44	-0.26	-0.12	-0.22	A+	A-	A+	A-	0.39	0.05	-5.00	0.92	-4.63	0.90
217	643357	11	5347	0.35	0.35	0.15	0.42	0.07	0.00	0.00	0.03	0.03	-0.15	0.15	-0.11	A+	A-	A-	A-	1.04	0.05	9.90	1.23	9.90	1.33
218	609431	11	5347	0.45	0.22	0.45	0.16	0.16	0.00	0.00	0.27	-0.04	0.27	-0.23	-0.08	A+	A-	A-	A-	0.57	0.05	4.24	1.07	4.25	1.10
219	607584	11	5347	0.32	0.05	0.08	0.32	0.55	0.00	0.00	0.09	-0.23	-0.23	0.09	0.14	A+	A-	A-	A-	1.21	0.05	8.99	1.21	9.90	1.36
220	608250	11	5347	0.63	0.63	0.16	0.10	0.10	0.00	0.00	0.44	0.44	-0.22	-0.28	-0.14	A-	B-	A-	A+	-0.28	0.05	-4.75	0.91	-3.62	0.90
221	642883	11	5347	0.39	0.21	0.39	0.23	0.17	0.00	0.00	0.22	-0.05	0.22	-0.13	-0.07	A-	A+	A-	A-	0.88	0.05	4.97	1.10	5.71	1.15
222	642376	11	5347	0.44	0.16	0.21	0.18	0.44	0.00	0.00	0.49	-0.21	-0.20	-0.21	0.49	A+	A-	A-	A+	0.61	0.05	-6.83	0.89	-5.65	0.88
223	643404	11	5347	0.47	0.12	0.47	0.22	0.19	0.00	0.00	0.36	-0.16	0.36	-0.20	-0.09	A+	A-	A+	A-	0.49	0.05	-0.16	1.00	0.06	1.00

Item Information			Classical													DIF				Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(A)	P(B)	P(C)	P(D)	P(-)	P(*)	ITCorr	Corr(A)	Corr(B)	Corr(C)	Corr(D)	M/F	W/B	W/H	O/P	Meas	SEM	*z*	MS	*z*	MS
224	643391	11	5347	0.29	0.29	0.24	0.27	0.19	0.00	0.00	0.16	0.16	0.03	-0.10	-0.09	A+	A+	A-	A-	1.36	0.05	5.59	1.14	7.33	1.28
225	644762	12	5368	0.36	0.36	0.16	0.37	0.11	0.00	0.00	0.27	0.27	-0.23	0.01	-0.15	A-	A-	A-	A+	1.01	0.05	2.81	1.05	3.89	1.11
226	644985	12	5368	0.30	0.22	0.30	0.25	0.23	0.00	0.00	0.15	0.00	0.15	-0.05	-0.11	A-	A-	A-	A-	1.30	0.05	4.07	1.09	5.66	1.19
227	641180	12	5368	0.56	0.13	0.11	0.56	0.19	0.00	0.00	0.39	-0.16	-0.21	0.39	-0.18	A-	A-	A+	A+	0.05	0.05	-2.78	0.95	-3.12	0.93
228	641261	12	5368	0.23	0.19	0.17	0.42	0.23	0.00	0.00	0.11	-0.02	-0.13	0.03	0.11	A-	A+	A+	A-	1.75	0.06	2.23	1.07	5.36	1.25
229	642846	12	5368	0.26	0.13	0.35	0.25	0.26	0.00	0.00	0.07	0.05	0.09	-0.18	0.07	A-	A-	A-	A-	1.52	0.05	6.63	1.18	8.11	1.34
230	642836	12	5368	0.65	0.14	0.17	0.65	0.04	0.00	0.00	0.46	-0.21	-0.29	0.46	-0.19	A-	A-	B-	A-	-0.40	0.05	-5.24	0.90	-5.62	0.84
231	643362	12	5368	0.48	0.13	0.48	0.20	0.19	0.00	0.00	0.34	-0.23	0.34	-0.26	0.04	A+	A-	A-	A-	0.43	0.05	0.33	1.01	0.27	1.01
232	643410	12	5368	0.25	0.23	0.25	0.24	0.27	0.00	0.00	0.21	-0.02	0.21	-0.14	-0.04	A-	A+	A+	A-	1.59	0.05	-0.14	1.00	3.24	1.13
233	644453	12	5368	0.34	0.34	0.44	0.18	0.04	0.00	0.00	0.06	0.06	0.14	-0.18	-0.13	A+	A-	A-	A-	1.10	0.05	8.64	1.18	8.48	1.26
234	643341	12	5368	0.67	0.09	0.10	0.67	0.14	0.00	0.00	0.54	-0.27	-0.29	0.54	-0.24	A+	A-	A-	A-	-0.46	0.05	-8.52	0.83	-8.54	0.75
235	642350	12	5368	0.61	0.05	0.04	0.61	0.30	0.00	0.00	0.20	-0.21	-0.19	0.20	-0.02	A+	A+	A+	A-	-0.19	0.05	6.83	1.13	6.16	1.17
236	642384	12	5368	0.56	0.56	0.22	0.12	0.09	0.00	0.00	0.37	0.37	-0.12	-0.16	-0.27	A-	A-	A-	A-	0.05	0.05	-2.20	0.96	-1.80	0.96
237	642897	12	5368	0.33	0.15	0.24	0.28	0.33	0.00	0.00	0.25	-0.17	0.01	-0.13	0.25	A+	A-	A-	A+	1.18	0.05	2.62	1.06	3.31	1.10
238	643785	12	5368	0.43	0.43	0.38	0.14	0.05	0.00	0.00	0.22	0.22	-0.02	-0.24	-0.07	A+	A+	A-	A-	0.68	0.05	5.92	1.10	5.55	1.13
239	644023	12	5368	0.34	0.34	0.23	0.30	0.13	0.00	0.00	0.33	0.33	-0.11	-0.12	-0.15	A+	A+	A+	A-	1.09	0.05	-1.25	0.98	0.64	1.02
240	644034	12	5368	0.29	0.12	0.20	0.29	0.39	0.00	0.00	0.16	-0.20	-0.16	0.16	0.13	A+	A+	A+	A-	1.38	0.05	3.41	1.08	6.33	1.23
241	644784	13	5341	0.19	0.19	0.26	0.38	0.17	0.00	0.00	0.07	0.07	-0.16	0.07	0.02	A-	A-	A-	A-	2.00	0.06	0.91	1.03	6.33	1.38
242	644778	13	5341	0.52	0.08	0.27	0.52	0.13	0.00	0.00	0.45	-0.26	-0.23	0.45	-0.15	A-	A+	A+	A+	0.23	0.05	-5.49	0.91	-5.25	0.89
243	642346	13	5341	0.41	0.41	0.13	0.21	0.24	0.00	0.00	0.33	0.33	-0.23	-0.19	-0.01	A-	A-	A+	A+	0.74	0.05	1.61	1.03	1.91	1.05
244	642837	13	5341	0.49	0.11	0.29	0.10	0.49	0.00	0.00	0.42	-0.25	-0.14	-0.22	0.42	A-	A+	A+	A-	0.38	0.05	-3.33	0.94	-3.33	0.93
245	642861	13	5341	0.58	0.12	0.18	0.58	0.12	0.00	0.00	0.40	-0.21	-0.20	0.40	-0.14	A+	A-	A-	A-	-0.03	0.05	-2.61	0.95	-2.91	0.93
246	643371	13	5341	0.55	0.11	0.21	0.13	0.55	0.00	0.00	0.54	-0.23	-0.30	-0.21	0.54	A-	A-	A-	A-	0.11	0.05	-9.90	0.83	-9.75	0.79
247	643384	13	5341	0.55	0.08	0.09	0.26	0.55	0.00	0.00	0.39	-0.21	-0.27	-0.12	0.39	A+	A-	A-	A+	0.07	0.05	-0.87	0.98	-1.24	0.97
248	643793	13	5341	0.45	0.27	0.19	0.45	0.09	0.00	0.00	0.31	-0.21	0.01	0.31	-0.21	A-	A-	A-	A-	0.57	0.05	3.04	1.05	3.22	1.07
249	643340	13	5341	0.40	0.40	0.22	0.23	0.15	0.00	0.00	0.20	0.20	-0.20	-0.07	0.04	A-	A+	A-	A-	0.83	0.05	4.97	1.09	5.52	1.14
250	643339	13	5341	0.46	0.34	0.11	0.09	0.46	0.00	0.00	0.19	0.03	-0.15	-0.20	0.19	A+	A+	A+	A+	0.53	0.05	9.70	1.18	9.01	1.21
251	607581	13	5341	0.40	0.32	0.23	0.40	0.04	0.00	0.00	0.24	-0.04	-0.17	0.24	-0.12	A-	A+	A+	A-	0.80	0.05	5.20	1.10	7.23	1.19
252	640685	13	5341	0.20	0.19	0.36	0.20	0.25	0.00	0.00	0.01	-0.29	0.17	0.01	0.07	A-	A-	A-	A+	1.94	0.06	4.36	1.15	9.90	1.63
253	642902	13	5341	0.67	0.07	0.13	0.13	0.67	0.00	0.00	0.47	-0.26	-0.24	-0.21	0.47	A-	B-	B-	A+	-0.51	0.05	-5.68	0.88	-4.91	0.84
254	643398	13	5341	0.54	0.12	0.15	0.18	0.54	0.00	0.00	0.50	-0.16	-0.28	-0.23	0.50	B+	A-	A+	A+	0.15	0.05	-9.17	0.85	-8.61	0.81
255	657189	13	5341	0.58	0.15	0.16	0.58	0.12	0.00	0.00	0.34	-0.17	-0.20	0.34	-0.09	A+	A-	A-	A+	-0.02	0.05	1.84	1.03	0.60	1.01

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Ref	ID	Form	*N*	PVal	P(A)	P(B)	P(C)	P(D)	P(-)	P(*)	ITCorr	Corr(A)	Corr(B)	Corr(C)	Corr(D)	M/F	W/B	W/H	O/P	Meas	SEM	*z*	MS	*z*	MS
256	644027	13	5341	0.52	0.14	0.52	0.18	0.16	0.00	0.00	0.44	-0.20	0.44	-0.27	-0.11	A-	A-	A-	A+	0.25	0.05	-3.81	0.94	-3.71	0.92
257	644783	14	5353	0.29	0.29	0.46	0.14	0.11	0.00	0.00	0.20	0.20	-0.16	-0.01	-0.02	A-	A-	A-	A+	1.41	0.05	4.05	1.10	5.44	1.21
258	644780	14	5353	0.43	0.26	0.14	0.18	0.43	0.00	0.00	0.43	-0.10	-0.20	-0.25	0.43	A-	A-	A+	A-	0.69	0.05	-4.95	0.92	-2.99	0.93
259	641188	14	5353	0.35	0.35	0.39	0.07	0.19	0.00	0.00	0.08	0.08	0.07	-0.18	-0.06	A-	A-	A-	A+	1.08	0.05	8.75	1.19	8.66	1.27
260	642838	14	5353	0.45	0.13	0.13	0.30	0.45	0.00	0.00	0.30	-0.07	-0.13	-0.18	0.30	A+	A-	A+	A+	0.60	0.05	4.86	1.09	5.13	1.12
261	642853	14	5353	0.41	0.05	0.41	0.18	0.35	0.00	0.00	0.40	-0.21	0.40	-0.21	-0.14	B-	A+	A-	A+	0.75	0.05	-3.42	0.94	-1.49	0.96
262	643372	14	5353	0.47	0.16	0.20	0.16	0.47	0.00	0.00	0.52	-0.24	-0.17	-0.26	0.52	A-	A-	A-	A+	0.48	0.05	-8.50	0.86	-7.35	0.85
263	643377	14	5353	0.32	0.18	0.15	0.35	0.32	0.01	0.00	0.32	-0.16	-0.27	0.04	0.32	A+	A+	A+	A+	1.22	0.05	0.71	1.02	2.95	1.10
264	643772	14	5353	0.70	0.07	0.10	0.13	0.70	0.00	0.00	0.39	-0.27	-0.21	-0.12	0.39	A+	A-	A-	A+	-0.64	0.05	-2.90	0.93	-2.30	0.92
265	644428	14	5353	0.58	0.13	0.12	0.58	0.17	0.00	0.00	0.42	-0.26	-0.21	0.42	-0.13	A-	A-	A+	A-	-0.02	0.05	-2.34	0.96	-2.51	0.94
266	609475	14	5353	0.61	0.05	0.61	0.28	0.06	0.00	0.00	0.31	-0.24	0.31	-0.07	-0.26	A+	A+	A+	A-	-0.16	0.05	1.23	1.02	2.77	1.07
267	608317	14	5353	0.56	0.56	0.07	0.33	0.04	0.00	0.00	0.16	0.16	-0.24	0.06	-0.23	A-	A-	A-	A-	0.09	0.05	9.90	1.19	9.59	1.24
268	612600	14	5353	0.43	0.14	0.35	0.09	0.43	0.00	0.00	0.27	-0.23	0.02	-0.24	0.27	A+	A-	A+	A-	0.69	0.05	4.00	1.07	4.27	1.10
269	641213	14	5353	0.24	0.26	0.29	0.22	0.24	0.00	0.00	0.19	-0.14	0.12	-0.18	0.19	A+	A+	A-	A-	1.67	0.06	1.13	1.03	3.67	1.17
270	641209	14	5353	0.57	0.13	0.22	0.07	0.57	0.00	0.00	0.41	-0.14	-0.19	-0.29	0.41	A+	A-	A-	A-	0.00	0.05	-2.53	0.96	-2.20	0.95
271	642903	14	5353	0.57	0.15	0.57	0.12	0.16	0.00	0.00	0.32	-0.16	0.32	-0.25	-0.05	A-	A-	A-	A-	0.00	0.05	1.32	1.02	1.12	1.03
272	643399	14	5353	0.75	0.75	0.06	0.10	0.09	0.00	0.00	0.53	0.53	-0.27	-0.30	-0.25	A+	A-	A-	A-	-0.91	0.06	-6.75	0.82	-7.74	0.70
273	644776	15	5360	0.54	0.54	0.07	0.20	0.18	0.00	0.00	0.35	0.35	-0.23	-0.10	-0.19	A-	A-	A-	A+	0.11	0.05	0.55	1.01	-0.19	1.00
274	644779	15	5360	0.44	0.19	0.44	0.20	0.18	0.00	0.00	0.28	-0.08	0.28	-0.21	-0.07	A+	A+	A+	A-	0.60	0.05	2.70	1.05	2.77	1.06
275	640662	15	5360	0.40	0.25	0.17	0.19	0.40	0.00	0.00	0.42	-0.22	-0.18	-0.10	0.42	A+	A-	A-	A-	0.82	0.05	-3.73	0.93	-3.18	0.92
276	641183	15	5360	0.35	0.10	0.12	0.42	0.35	0.00	0.00	0.06	-0.09	-0.13	0.08	0.06	A+	A-	A+	A+	1.03	0.05	9.90	1.24	9.90	1.32
277	641264	15	5360	0.50	0.08	0.13	0.50	0.28	0.01	0.00	0.38	-0.20	-0.32	0.38	-0.05	A-	A-	A-	A+	0.32	0.05	-1.56	0.97	-1.95	0.96
278	642854	15	5360	0.29	0.29	0.20	0.32	0.19	0.01	0.00	0.31	0.31	-0.10	-0.07	-0.15	A-	A-	A+	A-	1.37	0.05	-1.54	0.96	1.58	1.06
279	643378	15	5360	0.39	0.33	0.20	0.39	0.08	0.01	0.00	0.35	-0.17	-0.07	0.35	-0.21	A-	A-	A+	A+	0.85	0.05	-2.31	0.96	-0.99	0.98
280	643382	15	5360	0.61	0.61	0.09	0.16	0.14	0.00	0.00	0.48	0.48	-0.25	-0.29	-0.14	A+	A-	A-	A-	-0.18	0.05	-5.47	0.90	-4.87	0.87
281	644615	15	5360	0.41	0.19	0.41	0.29	0.11	0.00	0.00	0.20	-0.12	0.20	-0.07	-0.06	A+	A+	A-	A+	0.77	0.05	9.06	1.17	9.31	1.24
282	609476	15	5360	0.51	0.24	0.51	0.14	0.12	0.00	0.00	0.42	-0.25	0.42	-0.13	-0.19	A-	A-	A-	A+	0.30	0.05	-4.14	0.93	-3.41	0.93
283	641281	15	5360	0.64	0.06	0.64	0.10	0.19	0.00	0.00	0.44	-0.19	0.44	-0.25	-0.22	A-	A-	A-	A+	-0.37	0.05	-5.15	0.90	-5.52	0.84
284	642358	15	5360	0.30	0.19	0.18	0.30	0.34	0.00	0.00	0.14	-0.08	-0.21	0.14	0.10	A-	A-	A+	A+	1.32	0.05	6.91	1.17	9.26	1.34
285	642364	15	5360	0.30	0.17	0.14	0.39	0.30	0.00	0.00	0.24	-0.23	-0.24	0.12	0.24	A+	A-	A-	A-	1.32	0.05	1.66	1.04	1.64	1.06
286	642371	15	5360	0.59	0.16	0.15	0.59	0.09	0.00	0.00	0.43	-0.16	-0.23	0.43	-0.23	A+	A-	A-	A-	-0.12	0.05	-3.70	0.93	-2.86	0.93
287	643789	15	5360	0.36	0.12	0.31	0.36	0.20	0.00	0.00	0.26	-0.05	-0.18	0.26	-0.05	A+	A+	A-	A+	1.01	0.05	3.51	1.07	5.33	1.15

Item Information			Classical													DIF				Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(A)	P(B)	P(C)	P(D)	P(-)	P(*)	ITCorr	Corr(A)	Corr(B)	Corr(C)	Corr(D)	M/F	W/B	W/H	O/P	Meas	SEM	*z*	MS	*z*	MS
288	644031	15	5360	0.58	0.22	0.07	0.13	0.58	0.00	0.00	0.33	-0.05	-0.16	-0.29	0.33	A-	A-	A-	A+	-0.03	0.05	0.30	1.01	1.51	1.04
289	644777	16	5217	0.36	0.28	0.36	0.20	0.16	0.00	0.00	0.15	0.05	0.15	-0.16	-0.08	A+	A+	A-	A+	1.02	0.05	6.71	1.14	6.75	1.20
290	644781	16	5217	0.34	0.10	0.34	0.44	0.12	0.00	0.00	0.17	-0.19	0.17	0.09	-0.20	A+	A-	A+	A+	1.15	0.05	5.31	1.12	7.03	1.23
291	640664	16	5217	0.34	0.33	0.13	0.19	0.34	0.00	0.00	0.27	0.01	-0.21	-0.15	0.27	A-	A-	A+	A-	1.15	0.05	3.00	1.06	5.15	1.16
292	641259	16	5217	0.61	0.12	0.09	0.17	0.61	0.00	0.00	0.45	-0.16	-0.25	-0.24	0.45	A+	A-	A-	A+	-0.19	0.05	-5.22	0.90	-4.88	0.87
293	642336	16	5217	0.47	0.14	0.26	0.47	0.13	0.00	0.00	0.34	-0.25	-0.06	0.34	-0.15	A-	A-	A-	A+	0.51	0.05	-0.31	0.99	0.68	1.01
294	643367	16	5217	0.54	0.11	0.54	0.25	0.10	0.01	0.00	0.38	-0.11	0.38	-0.22	-0.19	A+	A-	A+	A+	0.18	0.05	-1.46	0.97	-2.00	0.95
295	643780	16	5217	0.50	0.50	0.18	0.14	0.17	0.01	0.00	0.36	0.36	-0.19	-0.18	-0.09	A-	A+	A+	A-	0.33	0.05	0.03	1.00	-0.41	0.99
296	643791	16	5217	0.51	0.12	0.51	0.24	0.12	0.01	0.00	0.22	-0.05	0.22	-0.09	-0.14	A-	A-	A-	A+	0.31	0.05	5.84	1.10	5.23	1.12
297	644728	16	5217	0.72	0.12	0.08	0.72	0.08	0.00	0.00	0.40	-0.23	-0.24	0.40	-0.14	A+	A-	A-	A+	-0.75	0.06	-3.04	0.92	-4.05	0.84
298	612595	16	5217	0.65	0.11	0.16	0.65	0.08	0.00	0.00	0.48	-0.18	-0.32	0.48	-0.20	A+	A+	A+	A+	-0.37	0.05	-6.67	0.87	-6.81	0.80
299	610528	16	5217	0.33	0.14	0.14	0.38	0.33	0.00	0.00	0.32	-0.12	-0.23	-0.05	0.32	A-	A-	A-	A-	1.19	0.05	0.06	1.00	1.37	1.04
300	641205	16	5217	0.79	0.07	0.06	0.79	0.08	0.00	0.00	0.48	-0.25	-0.26	0.48	-0.25	A+	A-	A+	A+	-1.20	0.06	-5.68	0.82	-6.30	0.69
301	642359	16	5217	0.46	0.46	0.16	0.27	0.11	0.00	0.00	0.21	0.21	0.00	-0.15	-0.09	A-	A-	A+	A+	0.52	0.05	6.69	1.12	6.04	1.14
302	642365	16	5217	0.31	0.07	0.31	0.55	0.07	0.00	0.00	0.22	-0.15	0.22	-0.03	-0.17	A+	A-	A-	A+	1.29	0.05	3.53	1.08	5.75	1.20
303	642377	16	5217	0.67	0.67	0.13	0.15	0.04	0.00	0.00	0.35	0.35	-0.19	-0.13	-0.23	A+	A-	A-	A+	-0.45	0.05	-0.93	0.98	-0.30	0.99
304	642884	16	5217	0.46	0.06	0.46	0.09	0.39	0.00	0.00	0.26	-0.24	0.26	-0.25	0.01	A-	A-	A-	A+	0.55	0.05	5.80	1.10	5.79	1.13
305	644665	17	5191	0.30	0.05	0.18	0.30	0.48	0.00	0.00	0.03	-0.12	-0.03	0.03	0.05	A+	A+	A-	A-	1.31	0.05	6.84	1.16	8.58	1.31
306	608258	17	5191	0.31	0.16	0.23	0.30	0.31	0.00	0.00	0.24	-0.15	-0.17	0.04	0.24	A+	A+	A-	A+	1.22	0.05	3.26	1.07	4.61	1.15
307	640669	17	5191	0.24	0.26	0.38	0.24	0.12	0.00	0.00	0.07	-0.17	0.13	0.07	-0.06	A+	A-	A+	A-	1.64	0.06	4.61	1.13	9.26	1.44
308	641178	17	5191	0.27	0.35	0.21	0.27	0.17	0.00	0.00	0.19	0.01	-0.12	0.19	-0.11	A-	A-	A-	A-	1.45	0.05	2.08	1.05	6.48	1.26
309	641199	17	5191	0.49	0.49	0.10	0.11	0.29	0.01	0.00	0.20	0.20	-0.18	-0.17	0.02	A+	A-	A+	A+	0.37	0.05	5.73	1.09	5.16	1.11
310	642866	17	5191	0.42	0.42	0.17	0.17	0.23	0.01	0.00	0.34	0.34	-0.11	-0.30	-0.01	A-	A-	A-	A+	0.69	0.05	-1.99	0.97	-1.39	0.97
311	642327	17	5191	0.41	0.41	0.22	0.25	0.11	0.01	0.00	0.27	0.27	-0.20	0.02	-0.16	A-	A+	A-	A+	0.74	0.05	4.75	1.08	5.84	1.14
312	643775	17	5191	0.45	0.15	0.16	0.24	0.45	0.01	0.00	0.30	-0.09	-0.22	-0.07	0.30	A+	A-	A-	A-	0.57	0.05	0.35	1.01	0.32	1.01
313	644724	17	5191	0.38	0.38	0.17	0.35	0.11	0.00	0.00	0.26	0.26	-0.22	-0.05	-0.06	A-	A-	A-	A-	0.89	0.05	1.10	1.02	2.03	1.05
314	612597	17	5191	0.40	0.36	0.08	0.40	0.16	0.00	0.00	0.26	0.03	-0.27	0.26	-0.18	A-	A+	A+	A-	0.77	0.05	2.80	1.05	3.19	1.08
315	641195	17	5191	0.37	0.09	0.22	0.37	0.31	0.00	0.00	0.13	-0.22	-0.06	0.13	0.06	A-	A-	A-	A+	0.92	0.05	8.62	1.17	8.92	1.24
316	641288	17	5191	0.44	0.14	0.22	0.44	0.21	0.00	0.00	0.25	-0.16	-0.12	0.25	-0.03	A+	A-	A-	A+	0.61	0.05	5.66	1.10	6.83	1.15
317	642378	17	5191	0.59	0.17	0.05	0.18	0.59	0.00	0.00	0.50	-0.28	-0.19	-0.25	0.50	A-	A-	A+	A-	-0.09	0.05	-7.86	0.87	-7.63	0.83
318	642873	17	5191	0.60	0.60	0.13	0.23	0.05	0.00	0.00	0.37	0.37	-0.28	-0.12	-0.15	A+	A-	A-	A+	-0.14	0.05	-2.30	0.96	-2.12	0.95
319	642885	17	5191	0.62	0.10	0.10	0.18	0.62	0.00	0.00	0.37	-0.16	-0.22	-0.16	0.37	A+	A-	A-	A-	-0.24	0.05	-1.34	0.98	-1.43	0.96

Item Information			Classical													DIF				Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(A)	P(B)	P(C)	P(D)	P(-)	P(*)	ITCorr	Corr(A)	Corr(B)	Corr(C)	Corr(D)	M/F	W/B	W/H	O/P	Meas	SEM	*z*	MS	*z*	MS
320	643407	17	5191	0.58	0.10	0.58	0.17	0.15	0.00	0.00	0.46	-0.22	0.46	-0.19	-0.24	A-	A-	A-	A-	-0.04	0.05	-6.37	0.89	-6.47	0.86
321	644769	18	5356	0.42	0.18	0.20	0.42	0.19	0.00	0.00	0.35	-0.02	-0.23	0.35	-0.18	A-	A-	A+	A+	0.71	0.05	0.10	1.00	1.07	1.03
322	608259	18	5356	0.39	0.39	0.24	0.17	0.20	0.00	0.00	0.40	0.40	-0.14	-0.22	-0.13	A-	A-	A+	A-	0.88	0.05	-4.90	0.91	-3.38	0.92
323	607714	18	5356	0.14	0.50	0.14	0.14	0.22	0.00	0.00	0.18	0.06	-0.13	0.18	-0.11	A-	A-	A-	A-	2.42	0.07	-2.41	0.90	4.85	1.37
324	640670	18	5356	0.26	0.33	0.08	0.33	0.26	0.00	0.00	0.25	-0.22	-0.09	0.04	0.25	A-	A-	A-	A+	1.57	0.05	0.57	1.01	2.40	1.10
325	641254	18	5356	0.44	0.25	0.44	0.23	0.08	0.00	0.00	0.31	-0.03	0.31	-0.26	-0.10	A-	A-	A+	A+	0.61	0.05	1.96	1.03	2.77	1.06
326	641271	18	5356	0.56	0.18	0.56	0.05	0.20	0.00	0.00	0.48	-0.21	0.48	-0.22	-0.26	A-	A-	A-	A+	0.04	0.05	-8.37	0.86	-8.04	0.82
327	642843	18	5356	0.59	0.16	0.59	0.09	0.16	0.00	0.00	0.42	-0.18	0.42	-0.29	-0.15	A+	A+	A+	A+	-0.06	0.05	-3.94	0.93	-4.48	0.89
328	642867	18	5356	0.44	0.25	0.10	0.20	0.44	0.00	0.00	0.31	-0.16	-0.14	-0.10	0.31	A+	A-	A-	A+	0.61	0.05	1.68	1.03	1.30	1.03
329	643350	18	5356	0.58	0.58	0.19	0.14	0.08	0.00	0.00	0.46	0.46	-0.16	-0.32	-0.17	A-	A+	A+	B-	-0.04	0.05	-5.28	0.91	-4.31	0.89
330	643351	18	5356	0.37	0.06	0.37	0.21	0.36	0.00	0.00	0.21	-0.23	0.21	-0.03	-0.06	A-	A-	A-	A-	0.99	0.05	4.45	1.09	5.78	1.17
331	642385	18	5356	0.64	0.64	0.16	0.13	0.07	0.00	0.00	0.52	0.52	-0.27	-0.26	-0.25	A-	A-	A-	A-	-0.31	0.05	-8.64	0.84	-7.60	0.79
332	642352	18	5356	0.41	0.14	0.41	0.31	0.14	0.00	0.00	0.38	-0.14	0.38	-0.14	-0.22	A-	A-	A-	A-	0.76	0.05	-0.98	0.98	-0.10	1.00
333	642891	18	5356	0.62	0.12	0.12	0.62	0.14	0.00	0.00	0.32	-0.12	-0.19	0.32	-0.14	A-	A-	A-	A+	-0.22	0.05	2.20	1.04	2.73	1.08
334	644024	18	5356	0.33	0.13	0.43	0.33	0.11	0.00	0.00	0.27	-0.23	0.04	0.27	-0.21	A+	A+	A-	A-	1.18	0.05	3.20	1.07	5.14	1.17
335	643786	18	5356	0.34	0.34	0.09	0.49	0.08	0.00	0.00	0.27	0.27	-0.29	0.02	-0.20	A-	A-	A-	A+	1.13	0.05	2.45	1.05	3.70	1.11
336	644035	18	5356	0.76	0.08	0.06	0.09	0.76	0.00	0.00	0.49	-0.23	-0.24	-0.29	0.49	A+	B-	A-	B+	-1.00	0.06	-6.97	0.82	-6.26	0.73
337	607084	19	5364	0.49	0.20	0.13	0.49	0.17	0.00	0.00	0.24	-0.03	-0.27	0.24	-0.04	A+	A-	A-	A-	0.40	0.05	6.63	1.11	6.30	1.14
338	644761	19	5364	0.32	0.20	0.27	0.32	0.20	0.00	0.00	0.06	-0.04	-0.02	0.06	-0.01	A-	A+	A+	A-	1.22	0.05	9.90	1.23	9.90	1.41
339	640666	19	5364	0.53	0.53	0.19	0.19	0.09	0.00	0.00	0.42	0.42	-0.23	-0.17	-0.19	A-	A-	A-	A+	0.24	0.05	-5.06	0.92	-5.44	0.89
340	643386	19	5364	0.77	0.77	0.05	0.08	0.10	0.00	0.00	0.42	0.42	-0.24	-0.22	-0.23	A+	A-	A-	A+	-1.02	0.06	-4.64	0.86	-3.84	0.82
341	641186	19	5364	0.56	0.12	0.56	0.20	0.13	0.00	0.00	0.32	-0.16	0.32	-0.21	-0.05	A-	A+	A-	A+	0.10	0.05	2.69	1.05	1.72	1.04
342	642844	19	5364	0.52	0.14	0.27	0.07	0.52	0.00	0.00	0.23	-0.16	0.04	-0.29	0.23	A-	A-	A-	A+	0.29	0.05	5.64	1.10	4.39	1.10
343	642342	19	5364	0.52	0.25	0.52	0.12	0.11	0.01	0.00	0.42	-0.16	0.42	-0.20	-0.23	A-	A-	A-	A+	0.28	0.05	-3.46	0.94	-3.56	0.92
344	642314	19	5364	0.63	0.63	0.13	0.11	0.12	0.01	0.00	0.47	0.47	-0.24	-0.23	-0.21	A-	A-	A-	A+	-0.28	0.05	-5.69	0.89	-5.77	0.84
345	613299	19	5364	0.40	0.27	0.40	0.21	0.11	0.00	0.00	0.15	0.02	0.15	-0.11	-0.11	A-	A+	A-	A+	0.82	0.05	9.90	1.19	9.90	1.25
346	645036	19	5364	0.57	0.14	0.09	0.20	0.57	0.00	0.00	0.37	-0.24	-0.22	-0.08	0.37	A+	A-	A+	A-	0.06	0.05	-1.81	0.97	-2.06	0.95
347	607110	19	5364	0.70	0.03	0.14	0.13	0.70	0.00	0.00	0.42	-0.20	-0.22	-0.24	0.42	A+	A-	A-	A+	-0.61	0.05	-3.47	0.92	-2.33	0.92
348	641210	19	5364	0.58	0.23	0.12	0.58	0.07	0.00	0.00	0.45	-0.17	-0.26	0.45	-0.26	A-	A-	A-	A+	-0.01	0.05	-4.36	0.92	-5.02	0.88
349	642353	19	5364	0.30	0.30	0.21	0.19	0.30	0.00	0.00	0.21	0.21	-0.20	-0.22	0.16	A-	A+	A-	A-	1.34	0.05	1.76	1.04	4.24	1.15
350	642367	19	5364	0.62	0.10	0.12	0.16	0.62	0.00	0.00	0.18	-0.14	-0.04	-0.08	0.18	A+	A-	A-	A+	-0.21	0.05	6.45	1.13	7.55	1.23
351	642896	19	5364	0.41	0.05	0.41	0.18	0.35	0.00	0.00	0.30	-0.24	0.30	-0.32	0.07	A-	A-	A-	A+	0.77	0.05	1.52	1.03	2.00	1.05

Item Information			Classical													DIF				Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(A)	P(B)	P(C)	P(D)	P(-)	P(*)	ITCorr	Corr(A)	Corr(B)	Corr(C)	Corr(D)	M/F	W/B	W/H	O/P	Meas	SEM	*z*	MS	*z*	MS
352	642904	19	5364	0.48	0.20	0.11	0.21	0.48	0.00	0.00	0.39	-0.17	-0.27	-0.10	0.39	A-	A-	A-	A+	0.48	0.05	-1.40	0.98	-0.74	0.98
353	644760	20	5378	0.42	0.42	0.23	0.23	0.12	0.00	0.00	0.42	0.42	-0.11	-0.26	-0.16	A-	A-	A-	A+	0.75	0.05	-3.57	0.94	-1.97	0.95
354	607575	20	5378	0.40	0.15	0.26	0.40	0.18	0.00	0.00	0.27	-0.20	-0.02	0.27	-0.13	A-	A+	A+	A+	0.81	0.05	3.70	1.07	4.55	1.12
355	642850	20	5378	0.58	0.05	0.58	0.09	0.29	0.00	0.00	0.39	-0.19	0.39	-0.23	-0.19	A-	A+	A-	A+	-0.02	0.05	-2.18	0.96	-3.43	0.92
356	641262	20	5378	0.18	0.18	0.46	0.13	0.24	0.00	0.00	0.06	0.06	0.08	-0.28	0.07	A-	A+	A+	A-	2.13	0.06	-1.24	0.95	4.63	1.29
357	641181	20	5378	0.59	0.59	0.14	0.16	0.10	0.01	0.00	0.42	0.42	-0.24	-0.20	-0.13	A-	A+	A+	A-	-0.07	0.05	-4.88	0.91	-5.33	0.87
358	643373	20	5378	0.39	0.23	0.17	0.39	0.21	0.01	0.00	0.31	-0.04	-0.20	0.31	-0.12	A+	A+	A+	A+	0.88	0.05	1.32	1.03	2.97	1.08
359	643387	20	5378	0.49	0.16	0.19	0.49	0.16	0.01	0.00	0.38	-0.17	-0.14	0.38	-0.18	A-	A-	A-	A+	0.40	0.05	-1.74	0.97	-1.51	0.97
360	643781	20	5378	0.41	0.10	0.18	0.30	0.41	0.01	0.00	0.25	-0.20	-0.12	-0.02	0.25	A+	A-	A-	A-	0.78	0.05	2.69	1.05	2.63	1.07
361	613300	20	5378	0.46	0.46	0.30	0.15	0.08	0.00	0.00	0.18	0.18	-0.02	-0.11	-0.14	A-	A-	A+	A-	0.52	0.05	7.67	1.14	7.36	1.17
362	645037	20	5378	0.60	0.16	0.60	0.11	0.14	0.00	0.00	0.23	-0.11	0.23	-0.16	-0.06	A+	A-	A+	A-	-0.11	0.05	6.28	1.12	6.68	1.19
363	641202	20	5378	0.72	0.09	0.12	0.72	0.07	0.00	0.00	0.51	-0.26	-0.30	0.51	-0.21	A-	A-	A-	A+	-0.77	0.06	-7.02	0.83	-7.45	0.72
364	641214	20	5378	0.28	0.09	0.25	0.28	0.38	0.00	0.00	0.29	-0.21	-0.08	0.29	-0.06	A+	A+	A+	A-	1.47	0.06	-1.01	0.97	1.20	1.05
365	642857	20	5378	0.37	0.23	0.27	0.13	0.37	0.01	0.00	0.31	-0.11	-0.10	-0.15	0.31	A-	A-	A-	A-	0.97	0.05	0.09	1.00	0.21	1.01
366	642360	20	5378	0.35	0.13	0.16	0.35	0.37	0.01	0.00	0.24	-0.17	-0.28	0.24	0.10	A+	A-	A-	A+	1.09	0.05	2.36	1.05	5.21	1.16
367	642874	20	5378	0.54	0.24	0.54	0.17	0.05	0.01	0.00	0.42	-0.17	0.42	-0.20	-0.23	A+	A-	A+	A+	0.18	0.05	-3.04	0.95	-2.97	0.93
368	644032	20	5378	0.27	0.13	0.53	0.27	0.07	0.00	0.00	0.14	-0.26	0.19	0.14	-0.26	B-	A+	A+	A+	1.48	0.06	6.55	1.18	8.50	1.36

Table J–7. Literature Multiple-Choice Item Statistics: Spring

Item Information			Classical													DIF				Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(A)	P(B)	P(C)	P(D)	P(-)	P(*)	ITCorr	Corr(A)	Corr(B)	Corr(C)	Corr(D)	M/F	W/B	W/H	O/P	Meas	SEM	*z*	MS	*z*	MS
1	610429	0	156302	0.72	0.72	0.08	0.13	0.07	0.00	0.00	0.24	0.24	-0.15	-0.07	-0.16					-0.45	0.01	9.90	1.19	9.90	1.24
2	610427	0	156302	0.49	0.07	0.21	0.49	0.23	0.00	0.00	0.29	-0.21	-0.21	0.29	-0.01					0.58	0.01	9.90	1.07	9.90	1.08
3	610415	0	156302	0.62	0.20	0.07	0.10	0.62	0.00	0.00	0.39	-0.19	-0.23	-0.18	0.39					0.11	0.01	1.89	1.00	-9.35	0.97
4	610414	0	156302	0.42	0.06	0.43	0.08	0.42	0.00	0.00	0.34	-0.16	-0.11	-0.25	0.34					1.33	0.01	-9.90	0.97	9.12	1.03
5	610433	0	156302	0.78	0.10	0.78	0.08	0.04	0.00	0.00	0.46	-0.28	0.46	-0.26	-0.17					-0.60	0.01	-9.90	0.92	-9.90	0.80
6	610401	0	156302	0.41	0.03	0.41	0.39	0.16	0.00	0.00	0.19	-0.17	0.19	-0.12	0.00					0.42	0.01	9.90	1.30	9.90	1.32
7	610428	0	156302	0.57	0.07	0.57	0.29	0.06	0.00	0.00	0.33	-0.18	0.33	-0.15	-0.19					-0.04	0.01	9.90	1.24	9.90	1.24
8	610402	0	156302	0.68	0.68	0.10	0.12	0.10	0.00	0.00	0.28	0.28	-0.20	-0.14	-0.08					-0.31	0.01	9.90	1.20	9.90	1.19
9	610434	0	156302	0.60	0.13	0.23	0.60	0.04	0.00	0.00	0.46	-0.17	-0.27	0.46	-0.25					0.20	0.01	-9.90	0.97	-9.90	0.93
10	610417	0	156302	0.83	0.83	0.09	0.06	0.02	0.00	0.00	0.41	0.41	-0.25	-0.21	-0.20					-1.61	0.01	9.90	1.53	9.90	1.34
11	610419	0	156302	0.65	0.65	0.22	0.08	0.04	0.00	0.00	0.30	0.30	-0.06	-0.28	-0.18					-0.15	0.01	9.90	1.15	9.90	1.13
12	610451	0	156302	0.39	0.50	0.39	0.04	0.07	0.00	0.00	0.27	-0.02	0.27	-0.26	-0.25					1.18	0.01	-6.59	0.99	9.90	1.04
13	610416	0	156302	0.85	0.03	0.05	0.85	0.07	0.00	0.00	0.50	-0.25	-0.28	0.50	-0.28					-1.70	0.01	9.90	1.36	-3.73	0.96
14	610424	0	156302	0.60	0.19	0.16	0.60	0.05	0.00	0.00	0.40	-0.11	-0.27	0.40	-0.22					0.30	0.01	-9.09	0.98	-9.90	0.96
15	610422	0	156302	0.50	0.50	0.30	0.07	0.13	0.00	0.00	0.28	0.28	-0.11	-0.20	-0.10					0.68	0.01	9.90	1.05	9.90	1.05
16	610421	0	156302	0.57	0.13	0.10	0.19	0.57	0.00	0.00	0.40	-0.08	-0.18	-0.28	0.40					0.39	0.01	-9.90	0.97	-9.90	0.96
17	610425	0	156302	0.66	0.16	0.06	0.11	0.66	0.00	0.00	0.40	-0.17	-0.25	-0.21	0.40					-0.24	0.01	9.90	1.10	9.90	1.06
18	612468	0	156302	0.86	0.86	0.04	0.04	0.05	0.00	0.00	0.43	0.43	-0.26	-0.28	-0.18					-1.19	0.01	-9.90	0.87	-9.90	0.69
19	612471	0	156302	0.81	0.04	0.81	0.05	0.09	0.00	0.00	0.50	-0.28	0.50	-0.25	-0.28					-0.86	0.01	-9.90	0.88	-9.90	0.72
20	612474	0	156302	0.72	0.13	0.08	0.08	0.72	0.00	0.00	0.50	-0.29	-0.28	-0.20	0.50					-0.39	0.01	-9.90	0.95	-9.90	0.85
21	616849	0	156302	0.73	0.73	0.15	0.07	0.05	0.00	0.00	0.45	0.45	-0.20	-0.29	-0.26					-0.21	0.01	-9.90	0.87	-9.90	0.80
22	612476	0	156302	0.72	0.06	0.19	0.72	0.03	0.00	0.00	0.36	-0.21	-0.18	0.36	-0.23					-0.03	0.01	-9.90	0.92	-9.90	0.89
23	612479	0	156302	0.56	0.07	0.14	0.56	0.22	0.00	0.00	0.40	-0.23	-0.18	0.40	-0.18					0.64	0.01	-9.90	0.93	-9.90	0.93
24	612467	0	156302	0.48	0.48	0.13	0.33	0.06	0.00	0.00	0.23	0.23	-0.11	-0.08	-0.17					0.70	0.01	9.90	1.08	9.90	1.10
25	612469	0	156302	0.80	0.09	0.05	0.06	0.80	0.00	0.00	0.43	-0.19	-0.25	-0.27	0.43					-0.55	0.01	-9.90	0.82	-9.90	0.74
26	612435	0	156302	0.61	0.14	0.13	0.11	0.61	0.00	0.00	0.42	-0.25	-0.16	-0.17	0.42					0.45	0.01	-9.90	0.91	-9.90	0.89
27	612437	0	156302	0.79	0.79	0.09	0.07	0.05	0.00	0.00	0.50	0.50	-0.27	-0.25	-0.26					-0.55	0.01	-9.90	0.82	-9.90	0.72
28	612442	0	156302	0.79	0.04	0.10	0.79	0.06	0.00	0.00	0.34	-0.26	-0.19	0.34	-0.10					-0.74	0.01	2.64	1.01	3.23	1.02
29	612444	0	156302	0.69	0.13	0.07	0.10	0.69	0.00	0.00	0.48	-0.24	-0.28	-0.21	0.48					0.06	0.01	-9.90	0.84	-9.90	0.79
30	612434	0	156302	0.68	0.68	0.12	0.10	0.09	0.00	0.00	0.51	0.51	-0.31	-0.26	-0.19					-0.37	0.01	9.90	1.04	-9.90	0.94
31	612433	0	156302	0.67	0.05	0.08	0.20	0.67	0.00	0.00	0.46	-0.26	-0.25	-0.22	0.46					0.37	0.01	-9.90	0.84	-9.90	0.81

Item Information			Classical													DIF				Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(A)	P(B)	P(C)	P(D)	P(-)	P(*)	ITCorr	Corr(A)	Corr(B)	Corr(C)	Corr(D)	M/F	W/B	W/H	O/P	Meas	SEM	*z*	MS	*z*	MS
32	612443	0	156302	0.62	0.12	0.62	0.15	0.11	0.01	0.00	0.42	-0.16	0.42	-0.22	-0.21					0.15	0.01	-5.91	0.99	-9.90	0.95
33	612440	0	156302	0.55	0.21	0.55	0.15	0.09	0.01	0.00	0.29	-0.10	0.29	-0.21	-0.09					0.60	0.01	9.90	1.02	9.90	1.03
34	640206	0	156302	0.39	0.39	0.09	0.39	0.13	0.01	0.00	0.10	0.10	-0.23	0.15	-0.14					0.91	0.01	9.90	1.15	9.90	1.18
35	642676	1	7124	0.63	0.21	0.13	0.63	0.04	0.00	0.00	0.28	-0.20	-0.12	0.28	-0.07	A+	A-	A-	A+	0.49	0.05	0.06	1.00	0.27	1.01
36	642717	1	7124	0.62	0.62	0.02	0.07	0.29	0.00	0.00	0.14	0.14	-0.19	-0.21	0.04	A+	A-	A-	A-	0.52	0.05	8.13	1.16	7.94	1.20
37	642675	1	7124	0.72	0.13	0.03	0.11	0.72	0.00	0.00	0.41	-0.28	-0.18	-0.17	0.41	A+	A-	A-	A-	-0.01	0.05	-2.96	0.92	-3.55	0.88
38	642661	1	7124	0.61	0.61	0.14	0.18	0.06	0.00	0.00	0.42	0.42	-0.29	-0.12	-0.22	A+	A-	A-	A+	0.57	0.05	-3.62	0.94	-3.29	0.93
39	642718	1	7124	0.60	0.10	0.60	0.24	0.05	0.00	0.00	0.27	-0.22	0.27	-0.05	-0.19	A+	A-	A-	A+	0.60	0.05	1.74	1.03	2.31	1.05
40	642716	1	7124	0.13	0.09	0.13	0.15	0.63	0.00	0.00	-0.01	-0.23	-0.01	-0.12	0.23	A-	A+	A-	A+	3.15	0.07	0.88	1.04	7.38	1.66
41	640871	1	7124	0.67	0.10	0.07	0.67	0.15	0.00	0.00	0.40	-0.28	-0.18	0.40	-0.16	A-	A-	A-	A+	0.26	0.05	-4.99	0.89	-5.46	0.85
42	640874	1	7124	0.40	0.40	0.46	0.10	0.04	0.00	0.00	0.07	0.07	0.17	-0.25	-0.22	A+	A+	A+	A-	1.54	0.05	9.27	1.15	9.90	1.29
43	640870	1	7124	0.77	0.17	0.04	0.03	0.77	0.00	0.00	0.38	-0.21	-0.21	-0.26	0.38	A-	A-	A-	A+	-0.27	0.06	-2.93	0.91	-3.01	0.88
44	640872	1	7124	0.57	0.28	0.10	0.04	0.57	0.00	0.00	0.45	-0.27	-0.14	-0.27	0.45	A+	A-	B-	A-	0.74	0.05	-4.09	0.93	-3.21	0.93
45	640846	1	7124	0.66	0.19	0.66	0.06	0.09	0.00	0.00	0.20	0.01	0.20	-0.17	-0.19	A+	A+	A+	A-	0.32	0.05	3.64	1.08	3.79	1.10
46	640873	1	7124	0.82	0.05	0.10	0.82	0.04	0.00	0.00	0.44	-0.28	-0.22	0.44	-0.24	A+	A-	A-	A+	-0.60	0.06	-3.30	0.88	-4.60	0.78
47	642652	2	7067	0.18	0.50	0.16	0.16	0.18	0.00	0.00	0.04	0.10	-0.12	-0.06	0.04	A+	A+	A+	A+	2.77	0.06	3.69	1.14	7.40	1.49
48	642714	2	7067	0.45	0.45	0.14	0.38	0.02	0.00	0.00	0.31	0.31	-0.18	-0.14	-0.14	A+	A-	A+	A+	1.28	0.05	-0.27	1.00	1.53	1.03
49	642674	2	7067	0.92	0.04	0.02	0.92	0.02	0.00	0.00	0.41	-0.27	-0.21	0.41	-0.20	A-	C-	C-	A+	-1.68	0.09	-2.74	0.82	-5.76	0.53
50	642666	2	7067	0.41	0.21	0.05	0.32	0.41	0.00	0.00	0.35	-0.16	-0.21	-0.12	0.35	A+	A-	A-	A+	1.47	0.05	-4.81	0.93	-1.39	0.97
51	642715	2	7067	0.44	0.03	0.06	0.44	0.47	0.00	0.00	0.17	-0.18	-0.25	0.17	0.01	A+	A+	A+	A+	1.34	0.05	6.74	1.10	7.06	1.16
52	642665	2	7067	0.61	0.61	0.06	0.15	0.17	0.00	0.00	0.35	0.35	-0.22	-0.09	-0.21	A-	A-	A-	A+	0.57	0.05	-0.95	0.98	-0.84	0.98
53	640844	2	7067	0.43	0.43	0.21	0.13	0.23	0.00	0.00	0.25	0.25	-0.06	-0.20	-0.07	A-	A-	A+	A-	1.40	0.05	0.41	1.01	0.81	1.02
54	640847	2	7067	0.47	0.12	0.19	0.22	0.47	0.00	0.00	0.31	-0.09	-0.16	-0.15	0.31	A-	A-	A-	A+	1.19	0.05	-1.77	0.97	-0.87	0.98
55	640875	2	7067	0.72	0.72	0.16	0.04	0.09	0.00	0.00	0.28	0.28	-0.09	-0.22	-0.18	A-	A-	A+	A-	0.01	0.05	-1.13	0.97	-0.85	0.97
56	640845	2	7067	0.77	0.09	0.08	0.77	0.05	0.00	0.00	0.51	-0.31	-0.25	0.51	-0.23	A-	A-	A-	A-	-0.29	0.06	-4.29	0.87	-6.10	0.76
57	640867	2	7067	0.72	0.06	0.72	0.15	0.07	0.00	0.00	0.43	-0.25	0.43	-0.23	-0.20	A-	A-	A-	A-	0.04	0.05	-2.10	0.95	-2.43	0.92
58	640843	2	7067	0.73	0.05	0.73	0.05	0.18	0.00	0.00	0.38	-0.25	0.38	-0.18	-0.19	A+	A-	A-	A+	-0.04	0.06	-2.58	0.93	-2.29	0.92
59	663752	3	7089	0.70	0.19	0.70	0.09	0.03	0.00	0.00	0.39	-0.21	0.39	-0.25	-0.15	A-	A-	A-	A+	0.11	0.05	-3.40	0.92	-3.69	0.89
60	663753	3	7089	0.58	0.58	0.10	0.03	0.29	0.00	0.00	0.20	0.20	-0.14	-0.24	-0.03	A-	A-	A-	A+	0.69	0.05	5.05	1.08	4.85	1.10
61	663754	3	7089	0.73	0.09	0.05	0.13	0.73	0.00	0.00	0.44	-0.22	-0.26	-0.21	0.44	A+	A-	A+	A-	-0.07	0.05	-4.85	0.88	-5.38	0.83
62	663755	3	7089	0.58	0.20	0.08	0.14	0.58	0.00	0.00	0.43	-0.22	-0.23	-0.16	0.43	A-	A-	A-	A+	0.70	0.05	-5.07	0.92	-4.43	0.91
63	663756	3	7089	0.41	0.27	0.12	0.41	0.19	0.00	0.00	0.30	-0.08	-0.17	0.30	-0.14	A-	A-	A-	A-	1.43	0.05	-0.53	0.99	1.44	1.03

Item Information			Classical													DIF				Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(A)	P(B)	P(C)	P(D)	P(-)	P(*)	ITCorr	Corr(A)	Corr(B)	Corr(C)	Corr(D)	M/F	W/B	W/H	O/P	Meas	SEM	*z*	MS	*z*	MS
64	663757	3	7089	0.73	0.07	0.13	0.07	0.73	0.00	0.00	0.46	-0.28	-0.16	-0.29	0.46	A-	A-	A-	A+	-0.07	0.05	-3.72	0.90	-4.86	0.84
65	640848	3	7089	0.60	0.10	0.60	0.19	0.11	0.00	0.00	0.21	-0.13	0.21	-0.04	-0.14	A-	A-	A+	A-	0.60	0.05	6.23	1.11	5.03	1.11
66	640868	3	7089	0.82	0.10	0.06	0.82	0.02	0.00	0.00	0.42	-0.19	-0.31	0.42	-0.21	A+	A-	A-	A-	-0.62	0.06	-2.95	0.89	-4.17	0.80
67	640822	3	7089	0.68	0.11	0.03	0.18	0.68	0.00	0.00	0.43	-0.29	-0.26	-0.17	0.43	A-	A-	A-	A-	0.21	0.05	-3.36	0.93	-3.54	0.90
68	640852	3	7089	0.69	0.05	0.18	0.69	0.08	0.00	0.00	0.19	-0.24	0.03	0.19	-0.15	A+	A+	A-	A-	0.17	0.05	3.57	1.08	4.21	1.13
69	640856	3	7089	0.30	0.19	0.30	0.09	0.42	0.00	0.00	0.10	-0.06	0.10	-0.23	0.10	A+	A-	A-	A+	1.97	0.05	5.88	1.13	9.90	1.41
70	640849	3	7089	0.62	0.62	0.23	0.04	0.12	0.00	0.00	0.17	0.17	0.02	-0.25	-0.13	A+	A-	A-	A-	0.51	0.05	3.87	1.07	3.59	1.08
71	663759	4	7061	0.44	0.38	0.44	0.07	0.11	0.00	0.00	0.20	-0.04	0.20	-0.16	-0.13	A+	A-	A-	A+	1.32	0.05	2.64	1.04	4.16	1.10
72	663760	4	7061	0.61	0.07	0.27	0.61	0.05	0.00	0.00	0.14	-0.14	0.04	0.14	-0.23	A-	A-	A-	A+	0.56	0.05	7.59	1.14	7.41	1.18
73	663761	4	7061	0.54	0.28	0.54	0.06	0.11	0.00	0.00	0.35	-0.07	0.35	-0.28	-0.23	A-	A-	A-	A+	0.87	0.05	-2.78	0.96	-1.58	0.97
74	663762	4	7061	0.75	0.75	0.09	0.05	0.11	0.00	0.00	0.48	0.48	-0.25	-0.25	-0.26	A-	A-	A-	A-	-0.20	0.06	-3.56	0.90	-4.84	0.82
75	663763	4	7061	0.64	0.08	0.19	0.64	0.08	0.00	0.00	0.31	-0.25	-0.13	0.31	-0.09	A-	A-	A-	A-	0.38	0.05	1.00	1.02	0.64	1.02
76	663764	4	7061	0.85	0.85	0.08	0.03	0.04	0.00	0.00	0.43	0.43	-0.20	-0.27	-0.25	A+	A-	A-	A+	-0.86	0.07	-3.26	0.86	-4.16	0.77
77	640821	4	7061	0.45	0.45	0.08	0.29	0.19	0.00	0.00	0.34	0.34	-0.21	-0.16	-0.09	B-	A+	A+	A-	1.30	0.05	-1.50	0.98	0.48	1.01
78	640854	4	7061	0.38	0.38	0.18	0.40	0.03	0.00	0.00	0.30	0.30	-0.20	-0.07	-0.15	A-	A-	A+	A+	1.61	0.05	-2.31	0.96	-0.22	0.99
79	640855	4	7061	0.75	0.13	0.06	0.06	0.75	0.00	0.00	0.45	-0.20	-0.24	-0.28	0.45	A+	A-	A-	A-	-0.21	0.06	-2.73	0.92	-3.30	0.87
80	640853	4	7061	0.80	0.03	0.09	0.08	0.80	0.00	0.00	0.50	-0.25	-0.23	-0.32	0.50	A+	A-	A-	A+	-0.50	0.06	-5.11	0.83	-6.39	0.72
81	640851	4	7061	0.27	0.12	0.41	0.27	0.20	0.00	0.00	0.08	-0.20	0.10	0.08	-0.05	A-	A-	A-	A-	2.18	0.06	3.45	1.09	6.19	1.27
82	640850	4	7061	0.64	0.22	0.64	0.10	0.05	0.00	0.00	0.42	-0.18	0.42	-0.24	-0.26	A-	B-	A-	A+	0.42	0.05	-4.49	0.91	-4.49	0.89
83	643272	5	7019	0.80	0.80	0.06	0.07	0.07	0.00	0.00	0.34	0.34	-0.20	-0.29	-0.05	A-	A-	A-	A+	-0.52	0.06	-1.42	0.95	-1.40	0.93
84	643271	5	7019	0.55	0.08	0.18	0.55	0.18	0.00	0.00	0.32	-0.26	-0.11	0.32	-0.11	A+	A-	A-	A-	0.81	0.05	0.07	1.00	0.62	1.01
85	643276	5	7019	0.88	0.04	0.88	0.03	0.05	0.00	0.00	0.43	-0.26	0.43	-0.25	-0.21	A-	A-	B-	A-	-1.11	0.07	-2.40	0.88	-4.75	0.70
86	643268	5	7019	0.86	0.08	0.02	0.86	0.04	0.00	0.00	0.32	-0.18	-0.19	0.32	-0.19	A+	A-	A+	A-	-0.96	0.07	0.21	1.01	-0.47	0.97
87	643243	5	7019	0.39	0.28	0.09	0.39	0.24	0.00	0.00	0.22	-0.01	-0.07	0.22	-0.19	A-	A-	A-	A-	1.55	0.05	3.38	1.05	4.43	1.11
88	643275	5	7019	0.42	0.42	0.13	0.26	0.19	0.00	0.00	0.24	0.24	-0.11	-0.02	-0.18	A+	A-	A-	A-	1.44	0.05	1.78	1.03	2.67	1.06
89	643265	5	7019	0.58	0.58	0.10	0.10	0.21	0.00	0.00	0.32	0.32	-0.25	-0.21	-0.04	A-	A-	A-	A-	0.68	0.05	-3.50	0.94	-3.10	0.94
90	643296	5	7019	0.46	0.41	0.46	0.09	0.04	0.00	0.00	0.14	0.09	0.14	-0.25	-0.21	A-	A-	A-	A-	1.24	0.05	7.60	1.11	7.05	1.15
91	643266	5	7019	0.46	0.17	0.30	0.07	0.46	0.00	0.00	0.19	-0.16	0.04	-0.19	0.19	A+	A+	A-	A+	1.25	0.05	5.26	1.08	5.80	1.12
92	643290	5	7019	0.31	0.04	0.06	0.58	0.31	0.00	0.00	0.27	-0.26	-0.25	-0.02	0.27	A-	A-	A+	A+	1.92	0.05	-1.58	0.97	0.56	1.02
93	643263	5	7019	0.62	0.62	0.20	0.10	0.08	0.00	0.00	0.39	0.39	-0.13	-0.24	-0.25	A-	A-	A-	A+	0.52	0.05	-3.67	0.93	-3.84	0.91
94	643295	5	7019	0.40	0.21	0.40	0.31	0.08	0.00	0.00	0.16	-0.06	0.16	0.03	-0.25	A-	A-	A+	A-	1.50	0.05	5.70	1.09	7.11	1.17
95	643270	6	6992	0.39	0.33	0.17	0.11	0.39	0.00	0.00	0.32	0.08	-0.25	-0.31	0.32	A+	A-	B-	A+	1.57	0.05	-1.36	0.98	0.05	1.00

Item Information			Classical													DIF				Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(A)	P(B)	P(C)	P(D)	P(-)	P(*)	ITCorr	Corr(A)	Corr(B)	Corr(C)	Corr(D)	M/F	W/B	W/H	O/P	Meas	SEM	*z*	MS	*z*	MS
96	643277	6	6992	0.75	0.02	0.75	0.15	0.08	0.00	0.00	0.31	-0.19	0.31	-0.18	-0.15	A+	A-	A-	A-	-0.18	0.06	-0.20	0.99	-0.52	0.98
97	643274	6	6992	0.42	0.32	0.42	0.10	0.16	0.00	0.00	0.29	-0.18	0.29	-0.14	-0.05	A+	A-	A-	A-	1.39	0.05	-0.28	1.00	0.67	1.02
98	643273	6	6992	0.49	0.08	0.24	0.49	0.19	0.00	0.00	0.10	-0.14	-0.01	0.10	-0.01	A+	A-	A-	A-	1.08	0.05	9.90	1.17	9.90	1.23
99	643269	6	6992	0.62	0.62	0.10	0.04	0.24	0.00	0.00	0.37	0.37	-0.16	-0.26	-0.18	A+	A-	A-	A-	0.51	0.05	-1.04	0.98	-1.96	0.96
100	643242	6	6992	0.57	0.16	0.24	0.03	0.57	0.00	0.00	0.19	-0.18	0.00	-0.17	0.19	A+	A-	A+	A+	0.74	0.05	5.01	1.08	4.76	1.10
101	643298	6	6992	0.36	0.30	0.10	0.36	0.23	0.00	0.00	0.20	-0.13	-0.23	0.20	0.08	A+	A+	A-	A+	1.66	0.05	1.99	1.03	5.58	1.16
102	643262	6	6992	0.84	0.04	0.84	0.06	0.07	0.00	0.00	0.51	-0.27	0.51	-0.28	-0.27	A-	B-	B-	A-	-0.77	0.07	-4.42	0.83	-6.69	0.67
103	643267	6	6992	0.78	0.78	0.07	0.08	0.07	0.00	0.00	0.38	0.38	-0.25	-0.17	-0.17	A+	A-	A-	A-	-0.36	0.06	-0.70	0.98	-1.86	0.92
104	643297	6	6992	0.50	0.10	0.25	0.50	0.15	0.00	0.00	0.19	-0.17	-0.06	0.19	-0.05	A-	A-	A+	A+	1.05	0.05	3.61	1.05	3.78	1.08
105	643261	6	6992	0.48	0.16	0.13	0.48	0.24	0.00	0.00	0.30	-0.04	-0.21	0.30	-0.14	A-	A+	A-	A+	1.15	0.05	-1.80	0.97	-0.29	0.99
106	643264	6	6992	0.58	0.10	0.16	0.16	0.58	0.00	0.00	0.22	-0.11	-0.08	-0.11	0.22	A-	A-	A+	A-	0.70	0.05	3.24	1.06	3.72	1.08
107	641597	7	7017	0.56	0.23	0.05	0.56	0.15	0.00	0.00	0.37	-0.24	-0.19	0.37	-0.12	A-	A-	A-	A+	0.74	0.05	-2.33	0.96	-2.36	0.95
108	641600	7	7017	0.41	0.13	0.22	0.24	0.41	0.00	0.00	0.33	-0.22	-0.05	-0.16	0.33	A-	A-	A-	A+	1.45	0.05	-2.47	0.96	-0.27	0.99
109	641594	7	7017	0.63	0.19	0.63	0.11	0.08	0.00	0.00	0.29	-0.01	0.29	-0.27	-0.19	A+	A+	A+	A-	0.45	0.05	2.55	1.05	2.19	1.06
110	641612	7	7017	0.73	0.73	0.12	0.10	0.04	0.00	0.00	0.40	0.40	-0.22	-0.19	-0.22	A+	A-	A-	A-	-0.11	0.06	-2.83	0.92	-4.12	0.85
111	641599	7	7017	0.61	0.19	0.13	0.61	0.06	0.00	0.00	0.26	0.05	-0.25	0.26	-0.24	A-	A-	A+	A+	0.53	0.05	0.36	1.01	0.26	1.01
112	641593	7	7017	0.34	0.24	0.34	0.27	0.15	0.00	0.00	0.21	0.02	0.21	-0.05	-0.23	A-	A-	A-	A+	1.80	0.05	3.03	1.06	4.98	1.17
113	641570	7	7017	0.61	0.16	0.61	0.18	0.06	0.00	0.00	0.35	-0.23	0.35	-0.11	-0.17	A-	A-	A-	A-	0.53	0.05	-0.12	1.00	-0.01	1.00
114	641587	7	7017	0.38	0.25	0.38	0.06	0.31	0.00	0.00	0.12	-0.03	0.12	-0.19	0.00	A-	A+	A+	A+	1.57	0.05	7.54	1.13	8.51	1.25
115	641590	7	7017	0.83	0.04	0.07	0.83	0.06	0.00	0.00	0.46	-0.27	-0.29	0.46	-0.19	A+	A-	A-	A+	-0.78	0.07	-4.57	0.82	-5.98	0.69
116	641589	7	7017	0.72	0.12	0.12	0.04	0.72	0.00	0.00	0.53	-0.27	-0.28	-0.30	0.53	A-	A-	B-	A+	-0.02	0.06	-7.33	0.82	-7.94	0.75
117	641569	7	7017	0.61	0.28	0.06	0.61	0.06	0.00	0.00	0.30	-0.07	-0.30	0.30	-0.20	A+	A+	A+	A+	0.53	0.05	-0.69	0.99	-0.45	0.99
118	641591	7	7017	0.77	0.77	0.07	0.06	0.09	0.00	0.00	0.47	0.47	-0.25	-0.27	-0.22	A+	A-	A-	A+	-0.36	0.06	-2.97	0.91	-4.58	0.81
119	641596	8	7040	0.32	0.19	0.16	0.33	0.32	0.00	0.00	0.34	-0.24	-0.21	0.03	0.34	A+	A-	A-	A-	1.90	0.05	-3.60	0.93	-2.52	0.92
120	641611	8	7040	0.62	0.62	0.16	0.10	0.12	0.00	0.00	0.38	0.38	-0.17	-0.21	-0.17	A+	A-	A-	A-	0.50	0.05	-2.76	0.95	-2.72	0.94
121	641613	8	7040	0.77	0.17	0.03	0.77	0.03	0.00	0.00	0.32	-0.13	-0.25	0.32	-0.24	A-	A-	A-	A-	-0.31	0.06	-0.67	0.98	-1.30	0.94
122	641598	8	7040	0.51	0.10	0.51	0.34	0.05	0.00	0.00	0.29	-0.21	0.29	-0.09	-0.16	A+	A-	A-	A-	0.99	0.05	1.66	1.03	2.89	1.06
123	641595	8	7040	0.59	0.59	0.10	0.08	0.22	0.00	0.00	0.21	0.21	-0.21	-0.21	0.05	A+	A+	A+	A-	0.64	0.05	5.50	1.10	5.93	1.14
124	641592	8	7040	0.42	0.07	0.32	0.19	0.42	0.00	0.00	0.21	-0.16	-0.08	-0.06	0.21	A-	A-	A+	A-	1.42	0.05	3.18	1.05	4.39	1.11
125	641571	8	7040	0.87	0.05	0.03	0.05	0.87	0.00	0.00	0.46	-0.26	-0.29	-0.23	0.46	A-	A-	A-	A-	-1.11	0.07	-2.87	0.87	-5.22	0.67
126	641585	8	7040	0.61	0.10	0.61	0.24	0.04	0.00	0.00	0.30	-0.21	0.30	-0.09	-0.20	A-	A-	A+	A-	0.54	0.05	1.02	1.02	1.27	1.03
127	641586	8	7040	0.60	0.17	0.06	0.60	0.17	0.00	0.00	0.39	-0.21	-0.30	0.39	-0.11	A+	A-	A+	A-	0.58	0.05	-2.97	0.95	-3.30	0.93

Item Information			Classical													DIF				Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(A)	P(B)	P(C)	P(D)	P(-)	P(*)	ITCorr	Corr(A)	Corr(B)	Corr(C)	Corr(D)	M/F	W/B	W/H	O/P	Meas	SEM	*z*	MS	*z*	MS
128	641588	8	7040	0.57	0.57	0.14	0.17	0.12	0.00	0.00	0.41	0.41	-0.19	-0.21	-0.17	A-	A-	A+	A-	0.75	0.05	-5.01	0.92	-4.60	0.90
129	641568	8	7040	0.83	0.06	0.05	0.07	0.83	0.00	0.00	0.49	-0.23	-0.28	-0.28	0.49	A+	A+	A+	A-	-0.70	0.06	-3.72	0.86	-5.45	0.73
130	641567	8	7040	0.47	0.47	0.14	0.06	0.32	0.00	0.00	0.23	0.23	-0.11	-0.32	0.01	A-	A+	A+	B-	1.19	0.05	3.48	1.05	3.62	1.08
131	640879	9	7026	0.78	0.78	0.11	0.07	0.04	0.00	0.00	0.38	0.38	-0.29	-0.19	-0.10	A+	A-	A-	A-	-0.40	0.06	-1.15	0.96	-1.42	0.94
132	640877	9	7026	0.78	0.78	0.07	0.09	0.05	0.00	0.00	0.45	0.45	-0.24	-0.26	-0.22	B-	B-	B-	B+	-0.34	0.06	-4.61	0.86	-5.65	0.77
133	640863	9	7026	0.89	0.03	0.04	0.04	0.89	0.00	0.00	0.45	-0.26	-0.22	-0.26	0.45	A+	A-	B-	A+	-1.34	0.08	-2.24	0.88	-4.77	0.66
134	640878	9	7026	0.64	0.07	0.13	0.16	0.64	0.00	0.00	0.50	-0.27	-0.28	-0.21	0.50	A-	B-	A-	A+	0.41	0.05	-6.95	0.86	-7.24	0.83
135	640864	9	7026	0.79	0.06	0.09	0.06	0.79	0.00	0.00	0.51	-0.28	-0.28	-0.25	0.51	A+	A-	A-	A+	-0.44	0.06	-5.05	0.83	-6.78	0.72
136	640880	9	7026	0.81	0.09	0.81	0.04	0.06	0.00	0.00	0.47	-0.31	0.47	-0.26	-0.19	B-	C-	C-	B+	-0.60	0.06	-5.74	0.80	-6.38	0.70
137	641583	9	7026	0.53	0.15	0.53	0.19	0.13	0.00	0.00	0.27	-0.21	0.27	-0.10	-0.05	A-	A-	A-	A+	0.95	0.05	2.45	1.04	4.74	1.10
138	641579	9	7026	0.23	0.12	0.23	0.35	0.31	0.00	0.00	0.06	-0.17	0.06	0.00	0.07	A-	A-	A-	A-	2.44	0.06	1.27	1.04	9.50	1.54
139	641578	9	7026	0.77	0.77	0.04	0.11	0.08	0.00	0.00	0.36	0.36	-0.24	-0.12	-0.23	A-	A-	A-	A+	-0.29	0.06	-2.35	0.93	-1.72	0.93
140	641581	9	7026	0.66	0.09	0.16	0.66	0.09	0.00	0.00	0.38	-0.32	-0.16	0.38	-0.10	A-	A-	A-	A+	0.32	0.05	-1.19	0.97	-1.10	0.97
141	641582	9	7026	0.75	0.08	0.04	0.13	0.75	0.00	0.00	0.35	-0.20	-0.20	-0.17	0.35	A+	A-	A-	A+	-0.17	0.06	-0.45	0.99	-1.29	0.95
142	641548	9	7026	0.66	0.06	0.12	0.15	0.66	0.00	0.00	0.51	-0.24	-0.28	-0.24	0.51	A-	A-	A-	A-	0.31	0.05	-5.48	0.88	-6.13	0.84
143	640862	10	6972	0.73	0.06	0.73	0.16	0.05	0.00	0.00	0.50	-0.21	0.50	-0.36	-0.17	A-	A-	A-	A+	-0.04	0.06	-4.57	0.88	-6.09	0.80
144	640876	10	6972	0.70	0.12	0.08	0.10	0.70	0.00	0.00	0.48	-0.29	-0.19	-0.24	0.48	A-	A-	A-	A+	0.09	0.06	-6.36	0.85	-7.18	0.78
145	640881	10	6972	0.57	0.34	0.03	0.57	0.05	0.00	0.00	0.20	-0.04	-0.24	0.20	-0.15	A+	A-	A-	A+	0.72	0.05	3.46	1.06	3.79	1.08
146	640865	10	6972	0.54	0.23	0.05	0.54	0.18	0.00	0.00	0.30	-0.06	-0.23	0.30	-0.18	A+	A-	A-	A+	0.87	0.05	0.97	1.02	1.22	1.03
147	640860	10	6972	0.58	0.05	0.58	0.05	0.32	0.00	0.00	0.25	-0.18	0.25	-0.24	-0.07	A-	A+	A-	A+	0.70	0.05	1.55	1.03	2.43	1.05
148	640861	10	6972	0.90	0.05	0.03	0.90	0.02	0.00	0.00	0.46	-0.31	-0.24	0.46	-0.21	A+	A-	B-	B+	-1.40	0.08	-4.80	0.74	-7.81	0.47
149	641549	10	6972	0.85	0.85	0.05	0.06	0.03	0.00	0.00	0.42	0.42	-0.19	-0.28	-0.21	A-	A-	A-	A+	-0.94	0.07	-1.41	0.94	-3.57	0.78
150	641607	10	6972	0.55	0.08	0.24	0.55	0.13	0.00	0.00	0.15	-0.21	0.06	0.15	-0.12	A+	A-	A-	A-	0.84	0.05	7.68	1.13	7.59	1.17
151	641560	10	6972	0.62	0.23	0.06	0.08	0.62	0.00	0.00	0.28	-0.03	-0.26	-0.21	0.28	A+	A-	A+	A+	0.49	0.05	2.13	1.04	1.86	1.05
152	641584	10	6972	0.62	0.09	0.18	0.62	0.11	0.00	0.00	0.37	-0.09	-0.27	0.37	-0.15	A-	A-	A-	A-	0.52	0.05	-1.63	0.97	-2.09	0.95
153	641608	10	6972	0.65	0.18	0.65	0.09	0.08	0.00	0.00	0.38	-0.08	0.38	-0.28	-0.24	A-	A-	A-	A-	0.37	0.05	-1.85	0.96	-2.12	0.94
154	641580	10	6972	0.73	0.73	0.07	0.08	0.11	0.00	0.00	0.37	0.37	-0.22	-0.13	-0.21	A-	B-	A-	A+	-0.08	0.06	-2.06	0.94	-1.87	0.93
155	641566	11	4744	0.58	0.05	0.14	0.22	0.58	0.00	0.00	0.35	-0.26	-0.24	-0.07	0.35	A-	A+	A-	A+	0.64	0.05	-1.77	0.97	-1.96	0.96
156	641563	11	4744	0.91	0.05	0.03	0.91	0.02	0.00	0.00	0.40	-0.23	-0.25	0.40	-0.20	A-	C-	B-	B+	-1.55	0.08	-3.39	0.80	-5.64	0.57
157	641564	11	4744	0.77	0.77	0.06	0.06	0.11	0.00	0.00	0.46	0.46	-0.19	-0.28	-0.25	A-	A-	A-	A+	-0.33	0.06	-4.12	0.87	-5.50	0.78
158	641562	11	4744	0.53	0.53	0.04	0.02	0.41	0.00	0.00	0.32	0.32	-0.28	-0.24	-0.15	A-	B-	A-	A-	0.87	0.05	-0.61	0.99	-0.09	1.00
159	641546	11	4744	0.58	0.08	0.58	0.28	0.05	0.00	0.00	0.26	-0.16	0.26	-0.09	-0.19	A-	A-	A-	A+	0.64	0.05	1.65	1.03	1.43	1.03

Item Information			Classical													DIF				Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(A)	P(B)	P(C)	P(D)	P(-)	P(*)	ITCorr	Corr(A)	Corr(B)	Corr(C)	Corr(D)	M/F	W/B	W/H	O/P	Meas	SEM	*z*	MS	*z*	MS
160	641543	11	4744	0.73	0.15	0.04	0.73	0.08	0.00	0.00	0.38	-0.18	-0.24	0.38	-0.21	A+	A-	A-	A-	-0.09	0.06	-1.94	0.95	-2.48	0.91
161	643248	11	4744	0.91	0.05	0.03	0.91	0.01	0.00	0.00	0.40	-0.25	-0.25	0.40	-0.16	A+	A-	B-	B+	-1.52	0.08	-5.24	0.71	-5.80	0.56
162	643246	11	4744	0.34	0.34	0.31	0.07	0.28	0.00	0.00	0.12	0.12	-0.04	-0.19	0.03	A-	A-	A-	A+	1.78	0.05	3.10	1.06	5.17	1.17
163	643249	11	4744	0.77	0.09	0.77	0.08	0.05	0.00	0.00	0.42	-0.19	0.42	-0.29	-0.18	A-	A-	A-	A-	-0.34	0.06	-2.13	0.93	-2.83	0.88
164	643247	11	4744	0.54	0.54	0.14	0.05	0.26	0.00	0.00	0.35	0.35	-0.23	-0.18	-0.12	A-	A-	A-	A-	0.83	0.05	-0.41	0.99	0.01	1.00
165	643255	11	4744	0.67	0.13	0.06	0.67	0.14	0.00	0.00	0.34	-0.07	-0.24	0.34	-0.21	A-	A+	A-	A-	0.25	0.05	1.36	1.03	1.89	1.06
166	643250	11	4744	0.53	0.10	0.23	0.13	0.53	0.00	0.00	0.31	-0.21	-0.04	-0.21	0.31	A-	A-	A-	A+	0.87	0.05	0.91	1.01	0.69	1.01
167	641544	12	4714	0.54	0.54	0.34	0.05	0.06	0.00	0.00	0.25	0.25	-0.09	-0.19	-0.16	A-	A-	A+	A-	0.81	0.05	4.41	1.07	4.03	1.09
168	641545	12	4714	0.74	0.09	0.11	0.74	0.05	0.00	0.00	0.41	-0.24	-0.27	0.41	-0.11	A+	A-	A-	A-	-0.20	0.06	0.24	1.01	-1.03	0.96
169	641561	12	4714	0.53	0.08	0.53	0.29	0.10	0.00	0.00	0.28	-0.17	0.28	-0.06	-0.20	A+	A+	A-	A+	0.88	0.05	3.19	1.05	3.92	1.09
170	641547	12	4714	0.79	0.08	0.07	0.06	0.79	0.00	0.00	0.40	-0.20	-0.25	-0.18	0.40	A+	A-	A-	A+	-0.51	0.06	-2.28	0.92	-2.70	0.87
171	641542	12	4714	0.75	0.09	0.75	0.05	0.11	0.00	0.00	0.51	-0.30	0.51	-0.26	-0.24	A-	B-	B-	A-	-0.24	0.06	-4.34	0.88	-5.22	0.80
172	641565	12	4714	0.57	0.57	0.16	0.15	0.12	0.00	0.00	0.36	0.36	-0.11	-0.18	-0.21	A-	A-	A-	A-	0.69	0.05	0.12	1.00	0.12	1.00
173	643245	12	4714	0.49	0.30	0.13	0.08	0.49	0.00	0.00	0.30	0.07	-0.30	-0.29	0.30	C-	B-	B-	A+	1.07	0.05	1.79	1.03	2.62	1.06
174	643253	12	4714	0.72	0.05	0.14	0.08	0.72	0.00	0.00	0.44	-0.25	-0.23	-0.22	0.44	A+	A-	A+	B-	-0.08	0.06	-2.37	0.94	-2.88	0.90
175	643251	12	4714	0.53	0.14	0.11	0.53	0.22	0.00	0.00	0.42	-0.26	-0.21	0.42	-0.12	A-	B-	B-	A-	0.86	0.05	-5.70	0.91	-3.92	0.92
176	643252	12	4714	0.53	0.09	0.53	0.23	0.15	0.00	0.00	0.32	-0.23	0.32	-0.16	-0.06	A-	A-	A-	A-	0.85	0.05	1.37	1.02	2.39	1.05
177	643254	12	4714	0.37	0.37	0.37	0.09	0.16	0.00	0.00	0.22	-0.13	0.22	-0.16	0.02	A-	A-	A+	A+	1.59	0.05	2.35	1.04	5.09	1.15
178	643250	12	4714	0.52	0.11	0.23	0.15	0.52	0.00	0.00	0.33	-0.20	-0.04	-0.23	0.33	A-	A-	A-	A+	0.94	0.05	-0.71	0.99	-0.70	0.98
179	640841	13	4742	0.78	0.10	0.08	0.78	0.04	0.00	0.00	0.42	-0.23	-0.29	0.42	-0.13	A-	A-	B-	A+	-0.45	0.06	-4.25	0.86	-4.74	0.79
180	640857	13	4742	0.83	0.08	0.04	0.05	0.83	0.00	0.00	0.35	-0.17	-0.16	-0.23	0.35	A+	A-	A-	A+	-0.78	0.07	-1.04	0.96	-0.83	0.95
181	640858	13	4742	0.63	0.18	0.63	0.10	0.10	0.00	0.00	0.34	-0.20	0.34	-0.17	-0.12	A+	A-	A-	A-	0.43	0.05	-0.49	0.99	-0.81	0.98
182	640842	13	4742	0.73	0.08	0.10	0.09	0.73	0.00	0.00	0.52	-0.25	-0.24	-0.31	0.52	A+	A-	A-	A+	-0.11	0.06	-7.70	0.79	-8.49	0.71
183	640836	13	4742	0.63	0.10	0.06	0.63	0.21	0.00	0.00	0.26	-0.18	-0.22	0.26	-0.04	A+	A-	A-	A-	0.42	0.05	2.44	1.05	2.32	1.06
184	640835	13	4742	0.49	0.14	0.49	0.11	0.27	0.00	0.00	0.34	-0.23	0.34	-0.16	-0.09	A+	A-	A-	A-	1.09	0.05	0.13	1.00	1.10	1.02
185	642722	13	4742	0.80	0.07	0.80	0.03	0.09	0.00	0.00	0.36	-0.23	0.36	-0.26	-0.11	A+	A-	A-	A+	-0.58	0.06	-1.52	0.94	-1.26	0.93
186	642704	13	4742	0.67	0.06	0.67	0.11	0.15	0.00	0.00	0.44	-0.27	0.44	-0.26	-0.17	A+	A-	A-	A-	0.20	0.05	-3.15	0.93	-4.14	0.88
187	642707	13	4742	0.64	0.06	0.18	0.64	0.11	0.00	0.00	0.45	-0.25	-0.16	0.45	-0.30	A-	A-	A-	A-	0.36	0.05	-3.89	0.92	-4.68	0.87
188	642706	13	4742	0.40	0.15	0.23	0.22	0.40	0.00	0.00	0.20	-0.10	-0.11	-0.03	0.20	A-	A-	A-	A+	1.48	0.05	6.30	1.11	6.54	1.19
189	642723	13	4742	0.70	0.15	0.06	0.09	0.70	0.00	0.00	0.48	-0.23	-0.27	-0.25	0.48	A-	A-	B-	A-	0.07	0.06	-3.60	0.91	-4.03	0.87
190	642721	13	4742	0.72	0.72	0.03	0.13	0.11	0.00	0.00	0.50	0.50	-0.28	-0.27	-0.25	A-	A-	A-	A-	-0.08	0.06	-4.20	0.88	-5.49	0.81
191	640838	14	4690	0.19	0.22	0.53	0.06	0.19	0.00	0.00	0.06	-0.21	0.18	-0.10	0.06	B-	A-	A-	A-	2.62	0.06	2.71	1.10	5.67	1.35

Item Information			Classical													DIF				Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(A)	P(B)	P(C)	P(D)	P(-)	P(*)	ITCorr	Corr(A)	Corr(B)	Corr(C)	Corr(D)	M/F	W/B	W/H	O/P	Meas	SEM	*z*	MS	*z*	MS
192	640840	14	4690	0.64	0.64	0.06	0.14	0.16	0.00	0.00	0.34	0.34	-0.19	-0.12	-0.20	A+	A-	A-	A+	0.39	0.05	-0.15	1.00	-0.42	0.99
193	640839	14	4690	0.85	0.85	0.06	0.07	0.03	0.00	0.00	0.38	0.38	-0.20	-0.23	-0.19	A+	A+	A+	A+	-0.89	0.07	-3.74	0.84	-4.96	0.72
194	640859	14	4690	0.71	0.07	0.12	0.71	0.09	0.00	0.00	0.38	-0.17	-0.25	0.38	-0.15	A-	A-	A-	A-	0.00	0.06	-2.88	0.93	-3.59	0.88
195	640869	14	4690	0.30	0.21	0.42	0.30	0.08	0.00	0.00	0.16	-0.09	0.09	0.16	-0.29	A-	A-	A+	A+	1.99	0.05	1.98	1.04	8.11	1.32
196	640837	14	4690	0.47	0.07	0.04	0.41	0.47	0.00	0.00	0.19	-0.14	-0.25	-0.01	0.19	A-	A+	A+	A+	1.16	0.05	4.99	1.08	5.37	1.12
197	642702	14	4690	0.57	0.11	0.57	0.26	0.05	0.00	0.00	0.36	-0.14	0.36	-0.22	-0.17	B-	A-	A-	A+	0.69	0.05	-2.68	0.95	-2.49	0.95
198	642703	14	4690	0.61	0.07	0.11	0.61	0.20	0.00	0.00	0.25	-0.11	-0.12	0.25	-0.14	A+	A-	A-	A+	0.50	0.05	1.76	1.03	1.38	1.03
199	642720	14	4690	0.84	0.84	0.07	0.06	0.02	0.00	0.00	0.49	0.49	-0.32	-0.27	-0.19	A-	A-	A-	A+	-0.87	0.07	-5.25	0.78	-6.94	0.62
200	642724	14	4690	0.52	0.13	0.52	0.17	0.18	0.00	0.00	0.36	-0.26	0.36	-0.12	-0.11	A-	A+	A-	A-	0.93	0.05	-3.56	0.95	-2.20	0.95
201	642705	14	4690	0.68	0.06	0.16	0.09	0.68	0.00	0.00	0.44	-0.15	-0.27	-0.23	0.44	A-	A-	A-	A-	0.16	0.05	-3.61	0.92	-4.45	0.87
202	642721	14	4690	0.71	0.71	0.03	0.15	0.10	0.00	0.00	0.48	0.48	-0.25	-0.26	-0.25	A+	A-	B-	A+	0.01	0.06	-5.40	0.86	-6.66	0.79
203	643299	15	4730	0.75	0.10	0.75	0.10	0.05	0.00	0.00	0.38	-0.15	0.38	-0.23	-0.22	A-	A-	A-	A+	-0.19	0.06	-2.57	0.93	-3.77	0.86
204	643288	15	4730	0.66	0.66	0.09	0.12	0.12	0.00	0.00	0.39	0.39	-0.18	-0.21	-0.18	A-	A+	A+	A-	0.27	0.05	-3.51	0.92	-4.51	0.88
205	643300	15	4730	0.46	0.09	0.16	0.29	0.46	0.00	0.00	0.14	-0.09	-0.11	-0.01	0.14	A+	A+	A+	A-	1.21	0.05	8.16	1.12	8.12	1.18
206	643304	15	4730	0.61	0.61	0.21	0.11	0.07	0.00	0.00	0.26	0.26	-0.10	-0.16	-0.13	A+	A+	A-	A-	0.51	0.05	1.88	1.04	1.68	1.04
207	643305	15	4730	0.72	0.06	0.72	0.19	0.03	0.00	0.00	0.41	-0.22	0.41	-0.26	-0.18	A+	A-	A-	A-	-0.03	0.05	-2.09	0.95	-3.21	0.89
208	643287	15	4730	0.29	0.29	0.17	0.44	0.11	0.00	0.00	0.01	0.01	0.03	0.06	-0.14	A-	A+	A+	A+	2.04	0.05	6.99	1.17	9.86	1.40
209	641557	15	4730	0.61	0.24	0.61	0.13	0.03	0.00	0.00	0.44	-0.33	0.44	-0.13	-0.17	A+	A-	A-	A-	0.53	0.05	-3.86	0.93	-4.23	0.91
210	641550	15	4730	0.70	0.03	0.10	0.17	0.70	0.00	0.00	0.27	-0.17	-0.13	-0.14	0.27	A-	A+	A-	A+	0.06	0.05	0.99	1.02	1.42	1.05
211	641551	15	4730	0.50	0.20	0.50	0.24	0.06	0.00	0.00	0.15	-0.06	0.15	-0.01	-0.20	A+	A-	A-	A-	1.05	0.05	7.71	1.12	7.57	1.16
212	641553	15	4730	0.43	0.14	0.32	0.11	0.43	0.00	0.00	0.12	-0.17	0.15	-0.20	0.12	A+	A-	A-	A+	1.36	0.05	7.99	1.12	7.62	1.18
213	641554	15	4730	0.75	0.11	0.08	0.75	0.06	0.00	0.00	0.52	-0.28	-0.32	0.52	-0.21	A-	A-	A-	A+	-0.19	0.06	-6.30	0.83	-7.87	0.72
214	641556	15	4730	0.72	0.72	0.10	0.11	0.07	0.00	0.00	0.50	0.50	-0.24	-0.26	-0.28	A-	A-	A-	A+	-0.02	0.05	-4.79	0.88	-6.50	0.79
215	643301	16	4768	0.69	0.18	0.69	0.04	0.08	0.00	0.00	0.28	-0.18	0.28	-0.15	-0.10	A+	A-	B-	A+	0.11	0.05	2.15	1.05	1.85	1.06
216	643302	16	4768	0.42	0.20	0.16	0.22	0.42	0.00	0.00	0.40	-0.18	-0.13	-0.18	0.40	A+	A-	A-	A-	1.39	0.05	-6.49	0.90	-3.31	0.92
217	643286	16	4768	0.80	0.07	0.10	0.80	0.03	0.00	0.00	0.37	-0.24	-0.18	0.37	-0.16	A-	A-	A-	A+	-0.50	0.06	-2.14	0.92	-2.52	0.88
218	643303	16	4768	0.80	0.07	0.10	0.80	0.03	0.00	0.00	0.32	-0.12	-0.19	0.32	-0.21	A+	A+	A-	A+	-0.53	0.06	-2.07	0.93	-2.32	0.89
219	643306	16	4768	0.65	0.07	0.21	0.07	0.65	0.00	0.00	0.43	-0.18	-0.25	-0.22	0.43	A-	A-	B-	A-	0.35	0.05	-3.73	0.92	-4.45	0.88
220	643307	16	4768	0.33	0.03	0.57	0.33	0.07	0.00	0.00	0.16	-0.25	0.08	0.16	-0.29	A-	A-	A-	A-	1.82	0.05	3.20	1.06	6.88	1.24
221	641558	16	4768	0.66	0.18	0.07	0.66	0.09	0.00	0.00	0.40	-0.18	-0.25	0.40	-0.20	A-	B-	B-	A-	0.31	0.05	-2.76	0.94	-3.48	0.91
222	641605	16	4768	0.65	0.65	0.12	0.14	0.10	0.00	0.00	0.37	0.37	-0.23	-0.19	-0.13	A-	A-	A-	A+	0.34	0.05	-1.76	0.96	-2.71	0.93
223	641555	16	4768	0.36	0.36	0.07	0.24	0.33	0.00	0.00	0.08	0.08	-0.11	-0.04	0.02	A+	A-	A+	A-	1.69	0.05	6.86	1.13	8.31	1.26

Item Information			Classical													DIF				Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(A)	P(B)	P(C)	P(D)	P(-)	P(*)	ITCorr	Corr(A)	Corr(B)	Corr(C)	Corr(D)	M/F	W/B	W/H	O/P	Meas	SEM	*z*	MS	*z*	MS
224	641559	16	4768	0.55	0.04	0.15	0.55	0.26	0.00	0.00	0.27	-0.26	-0.16	0.27	-0.05	A+	A-	A-	A-	0.84	0.05	2.50	1.04	2.05	1.04
225	641552	16	4768	0.64	0.11	0.64	0.14	0.10	0.00	0.00	0.28	-0.18	0.28	-0.11	-0.12	A-	A-	A-	A+	0.39	0.05	1.24	1.03	1.51	1.04
226	641556	16	4768	0.69	0.69	0.11	0.13	0.07	0.00	0.00	0.49	0.49	-0.24	-0.24	-0.27	A+	A-	B-	A+	0.15	0.05	-6.60	0.85	-7.33	0.79
227	640826	17	4723	0.46	0.46	0.15	0.23	0.15	0.00	0.00	0.21	0.21	-0.29	-0.07	0.08	A+	A-	A+	A-	1.19	0.05	5.51	1.09	6.05	1.14
228	640866	17	4723	0.55	0.27	0.55	0.07	0.12	0.00	0.00	0.38	-0.16	0.38	-0.24	-0.17	A-	A-	A-	A+	0.81	0.05	-2.53	0.96	-2.30	0.95
229	640828	17	4723	0.67	0.16	0.11	0.67	0.06	0.00	0.00	0.34	-0.18	-0.16	0.34	-0.18	A-	A-	A-	A-	0.19	0.05	1.45	1.03	0.90	1.03
230	640827	17	4723	0.79	0.06	0.06	0.10	0.79	0.00	0.00	0.47	-0.24	-0.24	-0.27	0.47	A+	A-	A+	A+	-0.48	0.06	-2.75	0.91	-4.84	0.78
231	640832	17	4723	0.11	0.08	0.15	0.11	0.66	0.00	0.00	-0.02	-0.21	-0.18	-0.02	0.27	A+	A+	A+	B-	3.32	0.08	-0.35	0.98	7.10	1.74
232	640820	17	4723	0.40	0.40	0.12	0.26	0.22	0.00	0.00	0.28	0.28	-0.26	-0.06	-0.05	A-	A-	A-	A-	1.51	0.05	1.20	1.02	3.49	1.10
233	642669	17	4723	0.69	0.08	0.11	0.12	0.69	0.00	0.00	0.58	-0.25	-0.39	-0.23	0.58	A-	C-	B-	A+	0.10	0.05	-8.52	0.80	-9.08	0.73
234	642664	17	4723	0.62	0.20	0.07	0.62	0.11	0.00	0.00	0.39	-0.10	-0.28	0.39	-0.23	A+	A-	A-	A-	0.47	0.05	-2.53	0.95	-2.47	0.94
235	642688	17	4723	0.63	0.63	0.07	0.14	0.15	0.00	0.00	0.48	0.48	-0.24	-0.19	-0.27	B-	A-	A-	A-	0.42	0.05	-5.47	0.89	-5.55	0.86
236	642689	17	4723	0.72	0.72	0.10	0.11	0.07	0.00	0.00	0.33	0.33	-0.14	-0.19	-0.16	A+	A-	A-	A+	-0.03	0.06	0.05	1.00	0.91	1.03
237	642668	17	4723	0.75	0.75	0.08	0.05	0.11	0.00	0.00	0.54	0.54	-0.28	-0.33	-0.24	A+	A-	A+	A+	-0.23	0.06	-5.75	0.84	-7.50	0.72
238	642663	17	4723	0.61	0.12	0.61	0.10	0.16	0.00	0.00	0.37	-0.17	0.37	-0.26	-0.10	A-	A-	A-	A+	0.53	0.05	-1.29	0.97	-0.88	0.98
239	640831	18	4789	0.50	0.21	0.12	0.18	0.50	0.00	0.00	0.29	-0.08	-0.20	-0.11	0.29	A-	A-	A-	A-	1.06	0.05	0.98	1.01	1.45	1.03
240	640824	18	4789	0.82	0.82	0.10	0.05	0.03	0.00	0.00	0.22	0.22	-0.09	-0.16	-0.14	A+	A+	A-	A+	-0.69	0.06	-0.51	0.98	1.04	1.06
241	640829	18	4789	0.71	0.15	0.71	0.06	0.08	0.00	0.00	0.29	-0.06	0.29	-0.28	-0.16	A+	A-	A-	A-	0.04	0.05	1.58	1.04	2.33	1.08
242	640823	18	4789	0.45	0.13	0.45	0.15	0.26	0.00	0.00	0.32	-0.08	0.32	-0.25	-0.10	A-	A-	A-	A-	1.24	0.05	-1.91	0.97	0.35	1.01
243	640830	18	4789	0.52	0.05	0.23	0.20	0.52	0.00	0.00	0.37	-0.27	-0.12	-0.19	0.37	A+	A-	A+	A+	0.94	0.05	-4.74	0.93	-3.67	0.93
244	640825	18	4789	0.59	0.59	0.04	0.18	0.19	0.00	0.00	0.38	0.38	-0.29	-0.17	-0.16	A+	A-	A+	A+	0.63	0.05	-2.93	0.95	-2.69	0.94
245	642662	18	4789	0.67	0.17	0.06	0.67	0.10	0.00	0.00	0.39	-0.19	-0.21	0.39	-0.20	A-	A-	B-	A+	0.25	0.05	-2.91	0.94	-3.78	0.90
246	642695	18	4789	0.75	0.11	0.04	0.75	0.10	0.00	0.00	0.46	-0.29	-0.27	0.46	-0.18	A-	A+	A+	A-	-0.19	0.06	-3.99	0.89	-5.03	0.82
247	642667	18	4789	0.31	0.17	0.41	0.11	0.31	0.00	0.00	0.20	-0.17	0.12	-0.27	0.20	A+	A+	A+	A-	1.93	0.05	0.59	1.01	2.67	1.09
248	642697	18	4789	0.30	0.24	0.34	0.12	0.30	0.00	0.00	0.01	0.01	0.12	-0.20	0.01	A-	A-	A-	A+	1.98	0.05	8.43	1.20	9.86	1.39
249	642696	18	4789	0.52	0.23	0.52	0.21	0.04	0.00	0.00	0.34	-0.09	0.34	-0.19	-0.27	A-	A-	A-	A+	0.95	0.05	-1.13	0.98	-0.55	0.99
250	642663	18	4789	0.55	0.17	0.55	0.11	0.17	0.00	0.00	0.33	-0.18	0.33	-0.21	-0.08	A-	A-	A-	A+	0.79	0.05	-0.62	0.99	-0.43	0.99
251	641603	19	4752	0.31	0.47	0.31	0.15	0.07	0.00	0.00	0.16	0.07	0.16	-0.20	-0.15	A-	A-	A+	A-	1.92	0.05	2.47	1.06	7.15	1.28
252	641572	19	4752	0.55	0.25	0.10	0.09	0.55	0.00	0.00	0.49	-0.14	-0.28	-0.32	0.49	A-	A-	B-	A+	0.78	0.05	-8.23	0.87	-7.85	0.84
253	641602	19	4752	0.71	0.10	0.71	0.10	0.08	0.00	0.00	0.46	-0.20	0.46	-0.24	-0.26	A-	A-	A-	A-	-0.02	0.06	-4.08	0.90	-4.78	0.84
254	641609	19	4752	0.76	0.03	0.10	0.76	0.10	0.00	0.00	0.46	-0.27	-0.25	0.46	-0.23	A-	A-	A-	A-	-0.32	0.06	-2.53	0.92	-4.06	0.84
255	641601	19	4752	0.48	0.10	0.32	0.48	0.11	0.00	0.00	0.24	-0.29	0.08	0.24	-0.21	A+	A-	A-	A+	1.12	0.05	3.35	1.05	4.03	1.09

Item Information			Classical													DIF				Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(A)	P(B)	P(C)	P(D)	P(-)	P(*)	ITCorr	Corr(A)	Corr(B)	Corr(C)	Corr(D)	M/F	W/B	W/H	O/P	Meas	SEM	*z*	MS	*z*	MS
256	641604	19	4752	0.47	0.47	0.15	0.20	0.17	0.00	0.00	0.25	0.25	-0.13	-0.03	-0.18	A+	A-	A+	A-	1.14	0.05	3.96	1.06	5.55	1.13
257	642709	19	4752	0.55	0.07	0.55	0.19	0.19	0.00	0.00	0.43	-0.19	0.43	-0.24	-0.18	B-	A-	B-	A-	0.78	0.05	-4.14	0.93	-3.17	0.93
258	642710	19	4752	0.71	0.23	0.71	0.03	0.02	0.00	0.00	0.43	-0.24	0.43	-0.29	-0.25	A+	C-	A-	A+	0.00	0.06	-3.41	0.91	-3.68	0.88
259	642711	19	4752	0.47	0.40	0.04	0.47	0.09	0.00	0.00	0.20	0.06	-0.24	0.20	-0.27	A+	A+	A-	A+	1.16	0.05	5.27	1.08	5.74	1.13
260	642684	19	4752	0.41	0.26	0.14	0.41	0.18	0.00	0.00	0.15	-0.03	-0.15	0.15	-0.03	A-	A-	A-	A+	1.40	0.05	6.00	1.10	5.93	1.16
261	642682	19	4752	0.56	0.11	0.56	0.10	0.22	0.00	0.00	0.34	-0.19	0.34	-0.25	-0.08	A+	A-	A-	A+	0.73	0.05	-1.38	0.98	-0.66	0.99
262	642686	19	4752	0.58	0.08	0.08	0.58	0.26	0.00	0.00	0.28	-0.18	-0.25	0.28	-0.04	A-	A-	A-	A-	0.64	0.05	2.32	1.04	2.16	1.05
263	641577	20	4771	0.62	0.62	0.11	0.10	0.17	0.00	0.00	0.42	0.42	-0.36	-0.25	-0.04	A-	A-	A-	A+	0.44	0.05	-4.34	0.91	-4.20	0.89
264	641573	20	4771	0.73	0.03	0.05	0.73	0.18	0.00	0.00	0.50	-0.23	-0.29	0.50	-0.30	A-	A-	A-	A+	-0.16	0.06	-4.94	0.86	-6.50	0.76
265	641576	20	4771	0.86	0.03	0.05	0.05	0.86	0.00	0.00	0.47	-0.26	-0.26	-0.25	0.47	A+	A+	B-	A-	-1.11	0.07	-3.76	0.83	-5.43	0.66
266	641610	20	4771	0.78	0.08	0.78	0.06	0.08	0.00	0.00	0.48	-0.29	0.48	-0.26	-0.21	A-	A+	A-	A-	-0.45	0.06	-3.38	0.89	-4.46	0.80
267	641575	20	4771	0.61	0.61	0.18	0.11	0.11	0.00	0.00	0.40	0.40	-0.20	-0.25	-0.12	A-	A-	A-	A-	0.51	0.05	-2.61	0.95	-2.67	0.93
268	641574	20	4771	0.77	0.06	0.09	0.08	0.77	0.00	0.00	0.49	-0.26	-0.31	-0.19	0.49	A+	A-	A-	A+	-0.35	0.06	-4.03	0.87	-4.89	0.79
269	642685	20	4771	0.64	0.64	0.17	0.12	0.07	0.00	0.00	0.37	0.37	-0.21	-0.14	-0.20	A-	A-	A-	A-	0.32	0.05	-1.88	0.96	-2.49	0.93
270	642681	20	4771	0.85	0.85	0.04	0.06	0.04	0.00	0.00	0.48	0.48	-0.26	-0.27	-0.24	A+	A-	A-	A-	-1.01	0.07	-3.31	0.86	-4.60	0.72
271	642713	20	4771	0.85	0.05	0.06	0.04	0.85	0.00	0.00	0.41	-0.25	-0.14	-0.31	0.41	B+	B-	A-	A+	-0.97	0.07	-4.26	0.82	-4.25	0.74
272	642687	20	4771	0.42	0.03	0.10	0.44	0.42	0.00	0.00	0.22	-0.22	-0.17	-0.02	0.22	A-	A-	A-	A+	1.37	0.05	5.75	1.09	6.93	1.19
273	642683	20	4771	0.62	0.20	0.05	0.62	0.13	0.00	0.00	0.32	-0.04	-0.31	0.32	-0.22	A+	A-	A-	A-	0.43	0.05	1.44	1.03	1.96	1.05
274	642686	20	4771	0.60	0.08	0.10	0.60	0.22	0.00	0.00	0.29	-0.18	-0.27	0.29	-0.02	A-	A-	A-	A+	0.56	0.05	4.27	1.08	4.57	1.12

Table J–8. Algebra I Multiple-Choice Item Statistics: Summer

Item Information			Classical													Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(A)	P(B)	P(C)	P(D)	P(-)	P(*)	ITCorr	Corr(A)	Corr(B)	Corr(C)	Corr(D)	Meas	SEM	*z*	MS	*z*	MS
1	605056	0	2144	0.57	0.37	0.03	0.04	0.57	0.00	0.00	0.28	-0.23	-0.07	-0.09	0.28	-0.42	0.05	1.50	1.02	0.83	1.02
2	631615	0	2144	0.68	0.05	0.68	0.18	0.08	0.00	0.00	0.39	-0.14	0.39	-0.26	-0.18	-0.63	0.05	-7.84	0.86	-7.30	0.82
3	605075	0	2144	0.42	0.42	0.14	0.23	0.21	0.01	0.00	0.31	0.31	-0.12	-0.18	-0.08	0.54	0.05	-1.34	0.98	-1.11	0.98
4	605134	0	2144	0.24	0.48	0.19	0.24	0.09	0.00	0.00	0.20	-0.10	-0.11	0.20	0.03	1.36	0.05	0.15	1.00	1.03	1.04
5	632347	0	2144	0.52	0.25	0.10	0.52	0.13	0.00	0.00	0.22	-0.05	-0.08	0.22	-0.18	-0.11	0.05	3.03	1.04	2.16	1.04
6	605213	0	2144	0.31	0.27	0.31	0.38	0.05	0.00	0.00	0.10	-0.06	0.10	-0.03	-0.02	0.98	0.05	4.40	1.09	5.72	1.17
7	633256	0	2144	0.50	0.15	0.50	0.13	0.21	0.00	0.00	0.20	-0.10	0.20	-0.18	-0.01	0.66	0.05	9.90	1.18	9.45	1.22
8	632144	0	2144	0.29	0.28	0.21	0.22	0.29	0.00	0.00	0.20	-0.11	-0.13	0.02	0.20	0.90	0.05	-1.04	0.98	-0.78	0.98
9	605263	0	2144	0.37	0.37	0.40	0.12	0.11	0.00	0.00	0.14	0.14	-0.04	-0.14	-0.01	1.02	0.05	9.03	1.20	8.84	1.27
10	605088	0	2144	0.53	0.13	0.53	0.24	0.09	0.00	0.00	0.25	-0.05	0.25	-0.18	-0.10	-0.21	0.05	2.03	1.03	1.47	1.03
11	633246	0	2144	0.43	0.12	0.43	0.34	0.11	0.00	0.00	0.29	-0.13	0.29	-0.10	-0.17	0.12	0.05	-1.06	0.99	-1.11	0.98
12	605139	0	2144	0.33	0.33	0.21	0.32	0.14	0.00	0.00	0.16	0.16	-0.11	0.01	-0.10	1.10	0.05	6.64	1.16	6.45	1.21
13	605299	0	2144	0.50	0.07	0.08	0.50	0.35	0.00	0.00	0.15	-0.14	-0.20	0.15	0.04	0.22	0.05	6.02	1.08	5.24	1.10
14	605051	0	2144	0.39	0.39	0.11	0.39	0.11	0.00	0.00	0.21	0.21	-0.12	-0.06	-0.10	0.73	0.05	4.09	1.07	4.28	1.10
15	631599	0	2144	0.71	0.10	0.71	0.11	0.07	0.00	0.00	0.36	-0.18	0.36	-0.21	-0.14	-0.72	0.05	-7.70	0.86	-6.72	0.82
16	633258	0	2144	0.43	0.32	0.14	0.43	0.10	0.00	0.00	0.23	0.04	-0.23	0.23	-0.14	0.60	0.05	3.84	1.06	4.06	1.09
17	605215	0	2144	0.18	0.22	0.32	0.28	0.18	0.00	0.00	0.17	0.04	-0.27	0.11	0.17	1.56	0.06	-2.50	0.92	-0.70	0.97
18	640657	0	2144	0.35	0.06	0.29	0.30	0.35	0.00	0.00	0.21	-0.19	-0.07	-0.04	0.21	0.96	0.05	4.05	1.08	4.43	1.13
19	605101	0	2144	0.74	0.74	0.17	0.05	0.04	0.00	0.00	0.31	0.31	-0.20	-0.15	-0.14	-1.06	0.05	-2.42	0.94	-2.56	0.91
20	605160	0	2144	0.70	0.07	0.70	0.19	0.04	0.00	0.00	0.28	-0.15	0.28	-0.16	-0.13	-0.58	0.05	-5.53	0.91	-4.69	0.88
21	605174	0	2144	0.63	0.63	0.15	0.14	0.08	0.00	0.00	0.37	0.37	-0.17	-0.21	-0.15	-0.39	0.05	-6.62	0.90	-5.98	0.87
22	605158	0	2144	0.28	0.22	0.28	0.32	0.17	0.00	0.00	0.18	-0.09	0.18	-0.06	-0.04	1.29	0.05	4.30	1.11	6.39	1.24
23	633251	0	2144	0.64	0.09	0.13	0.64	0.13	0.00	0.00	0.22	-0.14	-0.05	0.22	-0.15	-0.51	0.05	0.12	1.00	0.16	1.00
24	631612	0	2144	0.21	0.15	0.46	0.17	0.21	0.00	0.00	0.17	-0.12	0.02	-0.09	0.17	1.42	0.05	-0.47	0.99	1.28	1.05
25	633401	0	2144	0.63	0.63	0.24	0.09	0.05	0.00	0.00	0.33	0.33	-0.18	-0.17	-0.18	-0.29	0.05	-6.60	0.91	-5.50	0.89
26	605288	0	2144	0.22	0.13	0.29	0.35	0.22	0.00	0.00	0.30	-0.12	-0.12	-0.07	0.30	1.10	0.05	-7.72	0.84	-5.94	0.83
27	605178	0	2144	0.38	0.22	0.27	0.38	0.13	0.00	0.00	0.20	-0.06	-0.09	0.20	-0.11	0.71	0.05	3.53	1.06	4.15	1.10
28	632163	0	2144	0.48	0.12	0.22	0.48	0.19	0.00	0.00	0.18	-0.05	-0.09	0.18	-0.09	0.35	0.05	5.22	1.07	5.00	1.09
29	605067	0	2144	0.40	0.20	0.23	0.40	0.17	0.00	0.00	0.15	-0.01	-0.13	0.15	-0.04	0.55	0.05	4.62	1.07	4.38	1.09
30	605149	0	2144	0.61	0.13	0.17	0.10	0.61	0.00	0.00	0.35	-0.12	-0.21	-0.19	0.35	-0.36	0.05	-5.55	0.92	-4.52	0.90
31	605130	0	2144	0.56	0.22	0.56	0.09	0.13	0.00	0.00	0.35	-0.10	0.35	-0.18	-0.23	-0.66	0.05	5.08	1.10	3.39	1.10

Item Information			Classical													Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(A)	P(B)	P(C)	P(D)	P(-)	P(*)	ITCorr	Corr(A)	Corr(B)	Corr(C)	Corr(D)	Meas	SEM	*z*	MS	*z*	MS
32	605165	0	2144	0.36	0.20	0.36	0.21	0.22	0.00	0.00	0.11	-0.02	0.11	-0.16	0.05	0.96	0.05	8.48	1.18	8.48	1.25
33	605309	0	2144	0.43	0.43	0.27	0.21	0.09	0.00	0.00	0.19	0.19	-0.03	-0.14	-0.08	0.46	0.05	3.84	1.06	3.24	1.06
34	632355	0	2144	0.38	0.17	0.18	0.28	0.38	0.00	0.00	0.24	-0.13	-0.16	-0.02	0.24	0.12	0.05	1.48	1.02	0.93	1.02
35	632156	0	2144	0.39	0.08	0.28	0.24	0.39	0.00	0.00	0.31	-0.07	-0.13	-0.17	0.31	0.58	0.05	-1.95	0.97	-1.23	0.97
36	632361	0	2144	0.42	0.15	0.21	0.42	0.22	0.00	0.00	0.28	-0.15	-0.15	0.28	-0.06	0.89	0.05	6.24	1.13	5.80	1.16

Table J–9. Biology Multiple-Choice Item Statistics: Summer

Item Information			Classical													Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(A)	P(B)	P(C)	P(D)	P(-)	P(*)	ITCorr	Corr(A)	Corr(B)	Corr(C)	Corr(D)	Meas	SEM	*z*	MS	*z*	MS
1	635793	0	1073	0.92	0.02	0.92	0.06	0.01	0.00	0.00	0.14	-0.05	0.14	-0.12	-0.06	-2.14	0.09	-5.05	0.71	-0.67	0.93
2	608377	0	1073	0.49	0.22	0.49	0.19	0.10	0.00	0.00	0.28	-0.16	0.28	-0.09	-0.13	-0.14	0.06	-0.11	1.00	2.57	1.07
3	635766	0	1073	0.41	0.21	0.20	0.18	0.41	0.00	0.00	0.21	-0.17	-0.10	0.01	0.21	0.43	0.07	3.29	1.08	3.35	1.11
4	635750	0	1073	0.46	0.05	0.15	0.46	0.33	0.00	0.00	0.21	-0.20	-0.01	0.21	-0.12	0.16	0.07	2.86	1.06	2.69	1.08
5	610877	0	1073	0.67	0.67	0.14	0.08	0.12	0.00	0.00	0.25	0.25	-0.26	-0.05	-0.05	0.33	0.07	9.90	1.24	8.25	1.26
6	635762	0	1073	0.39	0.18	0.39	0.06	0.36	0.00	0.00	0.30	-0.09	0.30	-0.11	-0.18	0.45	0.07	-0.14	1.00	-0.49	0.98
7	612386	0	1073	0.57	0.57	0.12	0.16	0.14	0.00	0.00	0.42	0.42	-0.19	-0.25	-0.15	-0.38	0.07	-5.78	0.89	-4.78	0.86
8	610524	0	1073	0.58	0.04	0.11	0.58	0.27	0.00	0.00	0.22	-0.12	-0.16	0.22	-0.08	-0.73	0.07	4.55	1.11	2.86	1.12
9	611392	0	1073	0.42	0.17	0.42	0.23	0.18	0.00	0.00	0.26	-0.02	0.26	-0.20	-0.10	0.42	0.07	2.00	1.05	1.92	1.06
10	611384	0	1073	0.50	0.10	0.50	0.22	0.17	0.00	0.00	0.38	-0.20	0.38	-0.22	-0.10	-0.12	0.06	-3.80	0.93	-3.25	0.91
11	607712	0	1073	0.44	0.30	0.17	0.44	0.09	0.00	0.00	0.32	-0.23	-0.05	0.32	-0.13	0.37	0.07	0.20	1.00	0.44	1.01
12	618060	0	1073	0.60	0.08	0.06	0.26	0.60	0.00	0.00	0.12	-0.15	0.02	-0.04	0.12	-0.74	0.07	6.59	1.17	5.69	1.25
13	611031	0	1073	0.34	0.18	0.31	0.34	0.17	0.00	0.00	0.20	-0.04	-0.04	0.20	-0.15	0.49	0.07	0.93	1.02	1.09	1.04
14	609390	0	1073	0.75	0.05	0.75	0.09	0.11	0.00	0.00	0.27	-0.12	0.27	-0.18	-0.12	-1.16	0.07	-2.50	0.92	-2.13	0.89
15	607118	0	1073	0.29	0.16	0.29	0.37	0.18	0.00	0.00	0.22	-0.08	0.22	-0.07	-0.09	0.75	0.07	-0.41	0.99	0.25	1.01
16	611477	0	1073	0.70	0.08	0.09	0.70	0.13	0.00	0.00	0.39	-0.21	-0.16	0.39	-0.23	-1.04	0.07	-3.27	0.90	-3.46	0.84
17	608083	0	1073	0.48	0.21	0.14	0.17	0.48	0.00	0.00	0.26	-0.05	-0.11	-0.19	0.26	0.31	0.07	2.75	1.06	1.89	1.06
18	635753	0	1073	0.35	0.25	0.08	0.32	0.35	0.00	0.00	0.22	-0.13	-0.12	-0.03	0.22	0.25	0.07	0.29	1.01	0.91	1.03
19	635597	0	1073	0.58	0.58	0.16	0.16	0.10	0.00	0.00	0.30	0.30	-0.13	-0.14	-0.16	-0.57	0.07	0.46	1.01	-0.24	0.99
20	607702	0	1073	0.54	0.54	0.12	0.18	0.16	0.00	0.00	0.35	0.35	-0.12	-0.15	-0.22	-0.45	0.07	-1.37	0.97	-1.33	0.96
21	611008	0	1073	0.44	0.06	0.28	0.22	0.44	0.00	0.00	0.31	-0.19	-0.17	-0.07	0.31	0.25	0.07	-0.59	0.99	-0.79	0.98
22	611037	0	1073	0.63	0.09	0.08	0.21	0.63	0.00	0.00	0.35	-0.23	-0.22	-0.11	0.35	-0.48	0.07	-4.59	0.91	-2.04	0.93
23	611156	0	1073	0.55	0.09	0.20	0.16	0.55	0.00	0.00	0.36	-0.14	-0.18	-0.18	0.36	-0.69	0.07	1.77	1.04	0.45	1.02
24	635760	0	1073	0.54	0.27	0.08	0.54	0.11	0.00	0.00	0.33	-0.21	-0.12	0.33	-0.12	-0.63	0.07	2.17	1.05	1.20	1.05
25	611053	0	1073	0.61	0.14	0.61	0.15	0.10	0.00	0.00	0.30	-0.17	0.30	-0.10	-0.17	-0.45	0.07	-1.73	0.97	-2.03	0.93
26	607085	0	1073	0.45	0.45	0.09	0.25	0.21	0.00	0.00	0.18	0.18	-0.13	-0.12	0.00	0.08	0.06	3.59	1.07	3.17	1.09
27	607590	0	1073	0.44	0.19	0.44	0.23	0.14	0.00	0.00	0.21	-0.13	0.21	-0.11	-0.01	0.22	0.07	2.63	1.05	2.92	1.09
28	612594	0	1073	0.39	0.12	0.37	0.39	0.12	0.00	0.00	0.27	-0.18	-0.14	0.27	-0.01	0.48	0.07	1.07	1.03	1.34	1.04
29	607668	0	1073	0.38	0.21	0.38	0.30	0.11	0.00	0.00	0.12	0.01	0.12	-0.02	-0.17	0.54	0.07	5.03	1.13	5.84	1.21
30	610479	0	1073	0.32	0.21	0.13	0.32	0.33	0.00	0.00	0.14	-0.04	-0.22	0.14	0.05	0.88	0.07	3.68	1.12	4.85	1.22
31	611507	0	1073	0.49	0.12	0.13	0.49	0.25	0.00	0.00	0.25	-0.21	-0.08	0.25	-0.06	0.23	0.07	2.89	1.06	2.78	1.08

Item Information			Classical													Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(A)	P(B)	P(C)	P(D)	P(-)	P(*)	ITCorr	Corr(A)	Corr(B)	Corr(C)	Corr(D)	Meas	SEM	*z*	MS	*z*	MS
32	612675	0	1073	0.57	0.20	0.57	0.13	0.10	0.00	0.00	0.32	-0.07	0.32	-0.23	-0.18	-0.22	0.06	-2.65	0.95	-0.21	0.99
33	611074	0	1073	0.50	0.19	0.50	0.18	0.13	0.00	0.00	0.28	-0.10	0.28	-0.15	-0.13	-0.13	0.06	0.31	1.01	0.02	1.00
34	610909	0	1073	0.44	0.44	0.17	0.27	0.12	0.00	0.00	0.25	0.25	-0.03	-0.10	-0.20	0.05	0.06	1.07	1.02	0.46	1.01
35	611923	0	1073	0.35	0.06	0.14	0.44	0.35	0.00	0.00	0.28	-0.23	-0.16	-0.04	0.28	0.63	0.07	0.17	1.00	0.18	1.01
36	607754	0	1073	0.39	0.39	0.25	0.14	0.22	0.00	0.00	0.36	0.36	-0.22	-0.20	-0.03	0.67	0.07	-0.02	1.00	-0.12	1.00
37	607586	0	1073	0.51	0.13	0.51	0.17	0.20	0.00	0.00	0.31	-0.20	0.31	-0.19	-0.04	-0.16	0.06	-1.01	0.98	-1.21	0.97
38	607092	0	1073	0.38	0.13	0.38	0.26	0.22	0.00	0.00	0.23	-0.10	0.23	-0.11	-0.07	0.60	0.07	2.66	1.07	2.43	1.09
39	608382	0	1073	0.67	0.09	0.09	0.14	0.67	0.00	0.00	0.37	-0.19	-0.22	-0.15	0.37	-1.00	0.07	-1.50	0.96	-1.54	0.93
40	607589	0	1073	0.49	0.49	0.21	0.24	0.06	0.00	0.00	0.37	0.37	-0.17	-0.16	-0.19	-0.06	0.06	-3.35	0.94	-3.09	0.92
41	608345	0	1073	0.46	0.10	0.10	0.34	0.46	0.00	0.00	0.22	-0.13	-0.14	-0.06	0.22	0.00	0.06	2.54	1.05	1.69	1.05
42	612667	0	1073	0.29	0.29	0.36	0.26	0.09	0.00	0.00	0.20	0.20	-0.05	-0.06	-0.15	0.66	0.07	-0.35	0.99	0.45	1.02
43	607748	0	1073	0.29	0.19	0.34	0.29	0.17	0.00	0.00	0.21	-0.04	-0.14	0.21	-0.03	0.98	0.07	1.41	1.05	2.60	1.12
44	612664	0	1073	0.28	0.36	0.10	0.28	0.25	0.00	0.00	0.24	-0.02	-0.11	0.24	-0.15	0.73	0.07	-1.61	0.95	-0.51	0.98
45	608271	0	1073	0.35	0.35	0.25	0.17	0.23	0.00	0.00	0.18	0.18	-0.08	-0.13	0.00	0.75	0.07	3.32	1.10	4.23	1.17
46	611509	0	1073	0.60	0.10	0.60	0.14	0.15	0.00	0.00	0.36	-0.19	0.36	-0.27	-0.07	-0.63	0.07	-2.49	0.94	-0.27	0.99
47	611046	0	1073	0.44	0.14	0.15	0.26	0.44	0.00	0.00	0.37	-0.13	-0.19	-0.15	0.37	0.15	0.07	-3.31	0.94	-3.02	0.92
48	611925	0	1073	0.53	0.24	0.11	0.11	0.53	0.00	0.00	0.32	-0.15	-0.06	-0.24	0.32	-0.31	0.07	-1.45	0.97	-0.48	0.99

Table J–10. Literature Multiple-Choice Item Statistics: Summer

Item Information			Classical													Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(A)	P(B)	P(C)	P(D)	P(-)	P(*)	ITCorr	Corr(A)	Corr(B)	Corr(C)	Corr(D)	Meas	SEM	*z*	MS	*z*	MS
1	614801	0	741	0.82	0.08	0.82	0.04	0.06	0.00	0.00	0.32	-0.15	0.32	-0.17	-0.21	-0.54	0.09	-5.37	0.79	-4.31	0.72
2	614799	0	741	0.56	0.56	0.14	0.06	0.25	0.00	0.00	0.24	0.24	-0.02	-0.21	-0.15	-0.10	0.08	5.77	1.20	4.39	1.26
3	614800	0	741	0.50	0.13	0.06	0.32	0.50	0.00	0.00	0.20	0.02	-0.17	-0.15	0.20	0.62	0.08	4.59	1.14	4.26	1.19
4	614796	0	741	0.62	0.09	0.11	0.18	0.62	0.00	0.00	0.29	-0.19	-0.10	-0.14	0.29	0.21	0.08	1.01	1.03	1.31	1.06
5	614794	0	741	0.69	0.10	0.14	0.69	0.08	0.00	0.00	0.39	-0.20	-0.23	0.39	-0.17	-0.28	0.09	-1.97	0.93	-2.34	0.86
6	614791	0	741	0.41	0.21	0.41	0.18	0.20	0.00	0.00	0.15	-0.13	0.15	-0.01	-0.05	0.74	0.08	5.35	1.16	5.78	1.26
7	614792	0	741	0.57	0.17	0.19	0.57	0.06	0.00	0.00	0.23	-0.03	-0.14	0.23	-0.20	0.16	0.08	4.03	1.13	2.95	1.15
8	614798	0	741	0.72	0.08	0.06	0.72	0.15	0.00	0.00	0.42	-0.17	-0.17	0.42	-0.30	-0.36	0.09	-3.61	0.87	-3.55	0.79
9	614793	0	741	0.64	0.01	0.13	0.22	0.64	0.00	0.00	0.32	-0.14	-0.13	-0.23	0.32	0.34	0.08	0.09	1.00	-0.29	0.99
10	608191	0	741	0.51	0.51	0.21	0.16	0.12	0.00	0.00	0.41	0.41	-0.22	-0.21	-0.13	0.25	0.08	-0.64	0.98	-1.14	0.95
11	612420	0	741	0.69	0.11	0.08	0.12	0.69	0.00	0.00	0.42	-0.26	-0.18	-0.19	0.42	-0.77	0.09	1.88	1.09	1.10	1.09
12	612418	0	741	0.49	0.12	0.49	0.26	0.12	0.00	0.00	0.23	-0.16	0.23	-0.10	-0.07	0.50	0.08	4.03	1.12	6.24	1.29
13	608193	0	741	0.52	0.52	0.13	0.28	0.06	0.00	0.00	0.36	0.36	-0.30	-0.05	-0.23	-0.06	0.08	3.32	1.11	3.43	1.19
14	612413	0	741	0.47	0.24	0.14	0.47	0.15	0.00	0.00	0.30	-0.18	-0.14	0.30	-0.06	0.47	0.08	2.09	1.06	2.02	1.09
15	612417	0	741	0.62	0.62	0.17	0.10	0.11	0.00	0.00	0.29	0.29	-0.03	-0.28	-0.14	-0.15	0.08	2.23	1.08	2.94	1.18
16	612414	0	741	0.75	0.75	0.12	0.08	0.05	0.00	0.00	0.44	0.44	-0.29	-0.15	-0.25	-1.14	0.10	1.95	1.12	0.14	1.01
17	612415	0	741	0.63	0.18	0.13	0.63	0.06	0.00	0.00	0.26	-0.18	-0.10	0.26	-0.08	-0.11	0.08	2.39	1.08	2.45	1.14
18	608943	0	741	0.53	0.19	0.16	0.12	0.53	0.00	0.00	0.41	-0.24	-0.15	-0.17	0.41	0.41	0.08	-1.63	0.95	-1.78	0.92
19	608939	0	741	0.60	0.16	0.08	0.60	0.16	0.00	0.00	0.34	-0.15	-0.23	0.34	-0.13	0.25	0.08	0.05	1.00	-0.17	0.99
20	616846	0	741	0.43	0.13	0.32	0.43	0.12	0.00	0.00	0.36	-0.22	-0.15	0.36	-0.11	0.68	0.08	-0.86	0.98	-0.43	0.98
21	608941	0	741	0.55	0.55	0.22	0.06	0.17	0.00	0.00	0.37	0.37	-0.22	-0.25	-0.08	0.62	0.08	-0.38	0.99	-0.15	0.99
22	640221	0	741	0.42	0.24	0.42	0.19	0.15	0.01	0.00	0.28	-0.11	0.28	-0.14	-0.09	0.82	0.08	2.02	1.06	1.84	1.08
23	640205	0	741	0.44	0.24	0.44	0.21	0.11	0.00	0.00	0.20	-0.05	0.20	-0.06	-0.16	0.76	0.08	4.57	1.14	4.21	1.19
24	608948	0	741	0.54	0.54	0.09	0.28	0.09	0.00	0.00	0.28	0.28	-0.26	-0.01	-0.20	0.46	0.08	2.26	1.07	1.90	1.08
25	608942	0	741	0.25	0.32	0.25	0.27	0.16	0.01	0.00	0.18	0.04	0.18	-0.15	-0.07	1.29	0.08	-0.16	0.99	1.58	1.08
26	614687	0	741	0.57	0.16	0.57	0.17	0.09	0.00	0.00	0.23	-0.09	0.23	-0.09	-0.15	0.42	0.08	3.64	1.11	3.26	1.15
27	614693	0	741	0.70	0.70	0.12	0.07	0.11	0.00	0.00	0.37	0.37	-0.13	-0.18	-0.24	-0.80	0.09	2.56	1.13	1.45	1.13
28	614690	0	741	0.54	0.23	0.54	0.18	0.06	0.00	0.00	0.36	-0.08	0.36	-0.22	-0.26	0.06	0.08	1.92	1.06	1.11	1.06
29	614697	0	741	0.64	0.09	0.18	0.64	0.09	0.00	0.00	0.23	-0.22	-0.05	0.23	-0.10	0.00	0.08	2.56	1.08	2.77	1.15
30	614696	0	741	0.84	0.84	0.04	0.06	0.05	0.00	0.00	0.44	0.44	-0.23	-0.26	-0.23	-1.50	0.11	-1.21	0.91	-2.63	0.70
31	614698	0	741	0.84	0.84	0.03	0.07	0.07	0.00	0.00	0.42	0.42	-0.20	-0.29	-0.19	-1.46	0.11	-0.69	0.95	-1.59	0.81

Item Information			Classical													Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(A)	P(B)	P(C)	P(D)	P(-)	P(*)	ITCorr	Corr(A)	Corr(B)	Corr(C)	Corr(D)	Meas	SEM	*z*	MS	*z*	MS
32	614694	0	741	0.59	0.04	0.09	0.59	0.28	0.00	0.00	0.25	-0.21	-0.16	0.25	-0.07	-0.03	0.08	3.95	1.13	2.65	1.15
33	614691	0	741	0.50	0.32	0.11	0.06	0.50	0.01	0.00	0.26	-0.09	-0.15	-0.18	0.26	0.60	0.08	3.05	1.09	2.43	1.10
34	614689	0	741	0.52	0.07	0.11	0.30	0.52	0.00	0.00	0.31	-0.19	-0.10	-0.16	0.31	0.45	0.08	1.64	1.05	1.54	1.07

Table J–11. Algebra I Constructed-Response Item Statistics: Winter

Item Information			Classical														Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(0)	P(1)	P(2)	P(3)	P(4)	P(B)	ITCorr	Corr(0)	Corr(1)	Corr(2)	Corr(3)	Corr(4)	Meas	SEM	*z*	MS	*z*	MS
1	612749	0	215160	0.44	0.28	0.22	0.08	0.30	0.12	0.03	0.75	-0.63	-0.10	0.02	0.38	0.45	1.42	0.00	-9.90	0.93	-9.90	0.93
2	608732	0	215160	0.29	0.37	0.32	0.15	0.09	0.06	0.05	0.70	-0.63	0.05	0.30	0.33	0.32	1.69	0.00	-9.90	0.77	-9.90	0.72
3	632502	0	215160	0.43	0.16	0.27	0.28	0.25	0.03	0.06	0.62	-0.49	-0.21	0.15	0.42	0.13	0.72	0.00	9.90	1.12	9.90	1.16
4	622485	0	215160	0.55	0.18	0.14	0.18	0.32	0.18	0.02	0.58	-0.46	-0.08	-0.05	0.07	0.49	0.97	0.00	9.90	1.38	9.90	1.53
5	608729	0	215160	0.44	0.38	0.12	0.10	0.16	0.24	0.05	0.76	-0.67	-0.08	0.06	0.25	0.56	1.08	0.00	-9.90	0.82	-9.90	0.73
6	622399	0	215160	0.55	0.16	0.20	0.19	0.16	0.29	0.05	0.68	-0.43	-0.30	-0.09	0.20	0.53	0.39	0.00	9.90	1.08	9.90	1.09

Table J–12. Biology Constructed-Response Item Statistics: Winter

Item Information			Classical												Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(0)	P(1)	P(2)	P(3)	P(B)	ITCorr	Corr(0)	Corr(1)	Corr(2)	Corr(3)	Meas	SEM	*z*	MS	*z*	MS
1	629467	0	148667	0.33	0.34	0.39	0.23	0.05	0.07	0.65	-0.52	-0.02	0.45	0.30	0.95	0.00	-9.90	0.65	-9.90	0.67
2	629469	0	148667	0.39	0.26	0.36	0.34	0.04	0.07	0.48	-0.42	0.02	0.26	0.28	0.99	0.00	-5.56	0.98	-1.83	0.99
3	629406	0	148667	0.19	0.62	0.24	0.11	0.03	0.17	0.52	-0.47	0.19	0.32	0.26	1.37	0.00	-9.90	0.86	-9.90	0.77
4	610912	0	148667	0.46	0.18	0.38	0.31	0.13	0.03	0.61	-0.46	-0.18	0.30	0.37	0.48	0.00	-9.90	0.85	-9.90	0.85
5	611059	0	148667	0.40	0.25	0.40	0.24	0.11	0.05	0.60	-0.43	-0.13	0.31	0.39	0.35	0.00	-9.90	0.89	-9.90	0.88
6	608342	0	148667	0.38	0.32	0.31	0.30	0.07	0.07	0.61	-0.54	0.00	0.38	0.29	0.88	0.00	-9.90	0.90	-9.90	0.88

Table J–13. Literature Constructed-Response Item Statistics: Winter

Item Information			Classical												Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(0)	P(1)	P(2)	P(3)	P(B)	ITCorr	Corr(0)	Corr(1)	Corr(2)	Corr(3)	Meas	SEM	*z*	MS	*z*	MS
1	614631	0	140478	0.65	0.06	0.20	0.48	0.26	0.01	0.64	-0.39	-0.42	0.14	0.42	0.59	0.00	-9.90	0.73	-9.90	0.73
2	614675	0	140478	0.57	0.07	0.23	0.61	0.09	0.02	0.59	-0.45	-0.34	0.42	0.19	0.88	0.00	-9.90	0.81	-9.90	0.79
3	614674	0	140478	0.49	0.17	0.31	0.36	0.15	0.10	0.64	-0.49	-0.21	0.31	0.38	0.87	0.00	-9.90	0.92	-9.90	0.91
4	614016	0	140478	0.48	0.18	0.29	0.44	0.09	0.04	0.67	-0.57	-0.15	0.41	0.30	1.69	0.00	-9.90	0.84	-9.90	0.84
5	613847	0	140478	0.63	0.05	0.18	0.59	0.17	0.03	0.61	-0.40	-0.36	0.18	0.37	0.40	0.00	-9.90	0.69	-9.90	0.69
6	613848	0	140478	0.51	0.18	0.24	0.45	0.13	0.08	0.67	-0.52	-0.25	0.38	0.35	0.86	0.00	-9.90	0.90	-9.90	0.89

Table J–14. Algebra I Constructed-Response Item Statistics: Spring

Item Information			Classical														DIF				Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(0)	P(1)	P(2)	P(3)	P(4)	P(B)	ITCorr	Corr(0)	Corr(1)	Corr(2)	Corr(3)	Corr(4)	M/F	W/B	W/H	O/P	Meas	SEM	*z*	MS	*z*	MS
1	640372	0	247978	0.19	0.60	0.22	0.08	0.05	0.05	0.05	0.67	-0.59	0.15	0.26	0.30	0.40					1.73	0.00	-9.90	0.80	-9.90	0.77
2	628222	0	247978	0.39	0.26	0.31	0.17	0.12	0.15	0.05	0.73	-0.48	-0.22	0.09	0.26	0.55					0.69	0.00	-9.90	0.54	-9.90	0.67
3	640376	0	247978	0.34	0.34	0.27	0.17	0.12	0.10	0.08	0.68	-0.53	-0.09	0.16	0.33	0.43					0.81	0.00	-9.90	0.59	-9.90	0.82
4	632505	0	247978	0.41	0.29	0.21	0.20	0.16	0.13	0.04	0.65	-0.45	-0.15	0.03	0.23	0.50					1.13	0.00	9.90	1.18	9.90	1.73
5	628225	0	247978	0.40	0.19	0.27	0.35	0.16	0.04	0.03	0.64	-0.41	-0.22	0.09	0.41	0.32					0.97	0.00	-9.90	0.82	9.90	3.39
6	628226	0	247978	0.50	0.12	0.32	0.15	0.25	0.15	0.05	0.65	-0.36	-0.39	0.04	0.32	0.40					0.42	0.00	-9.90	0.63	9.90	1.84
7	640890	1	1967	0.50	0.19	0.11	0.33	0.23	0.14	0.02	0.76	-0.55	-0.21	-0.06	0.33	0.50	A+	A-	A-	A-	0.65	0.02	-9.90	0.66	-9.90	0.66
8	628224	1	1967	0.29	0.42	0.25	0.15	0.12	0.06	0.03	0.63	-0.49	-0.04	0.16	0.36	0.36	A-	A-	A-	A-	1.46	0.02	-2.35	0.93	-3.13	0.88
9	644556	2	2003	0.26	0.52	0.17	0.12	0.10	0.08	0.04	0.69	-0.65	0.10	0.24	0.35	0.38	A+	A-	A-	A-	1.47	0.02	-8.06	0.75	-8.02	0.65
10	644984	2	2003	0.31	0.20	0.47	0.25	0.08	0.00	0.02	0.61	-0.45	-0.12	0.32	0.34	0.11	A+	B-	A-	A+	2.06	0.03	-6.27	0.82	-6.61	0.81
11	641529	3	1944	0.22	0.42	0.34	0.18	0.05	0.01	0.02	0.63	-0.57	0.13	0.35	0.30	0.17	A+	A-	B-	A-	2.23	0.03	-5.98	0.82	-6.69	0.78
12	640132	3	1944	0.13	0.78	0.07	0.06	0.07	0.03	0.02	0.57	-0.56	0.17	0.23	0.35	0.28	A-	A-	A-	A-	2.20	0.03	-3.56	0.83	-4.89	0.56
13	641541	4	2020	0.27	0.37	0.37	0.12	0.10	0.04	0.03	0.72	-0.61	0.04	0.31	0.39	0.30	A-	A-	A-	A+	1.62	0.03	-9.27	0.72	-9.90	0.66
14	644798	4	2020	0.32	0.33	0.27	0.23	0.11	0.05	0.02	0.63	-0.51	-0.03	0.18	0.34	0.32	C-	B-	A-	A-	1.44	0.02	-3.25	0.90	-4.27	0.87
15	644791	5	1989	0.20	0.52	0.24	0.15	0.08	0.01	0.02	0.61	-0.54	0.11	0.32	0.37	0.13	A-	A-	A-	A-	2.39	0.03	-5.14	0.84	-5.04	0.80
16	640887	5	1989	0.15	0.60	0.26	0.08	0.04	0.01	0.03	0.60	-0.55	0.23	0.34	0.29	0.18	A-	A-	A-	A-	2.45	0.03	-4.90	0.81	-6.94	0.70
17	640891	6	2029	0.24	0.51	0.20	0.13	0.10	0.05	0.06	0.70	-0.62	0.07	0.28	0.37	0.35	A+	A-	A-	A-	1.69	0.02	-9.78	0.70	-9.54	0.62
18	640886	6	2029	0.31	0.29	0.35	0.24	0.10	0.03	0.04	0.71	-0.60	-0.02	0.31	0.36	0.26	A+	A-	A-	A-	1.61	0.03	-9.90	0.72	-9.90	0.71
19	640123	7	1972	0.34	0.27	0.35	0.22	0.12	0.05	0.02	0.71	-0.52	-0.13	0.22	0.38	0.37	A-	A-	A+	A-	1.36	0.03	-9.90	0.72	-9.80	0.71
20	640896	7	1972	0.35	0.29	0.26	0.25	0.16	0.03	0.04	0.72	-0.59	-0.12	0.28	0.41	0.26	A+	A-	A+	A+	1.47	0.02	-9.58	0.74	-9.41	0.73
21	644790	8	2023	0.25	0.51	0.19	0.16	0.08	0.07	0.01	0.70	-0.61	0.02	0.33	0.29	0.40	A-	A-	A-	A+	1.58	0.02	-9.05	0.72	-9.07	0.63
22	644797	8	2023	0.36	0.24	0.35	0.23	0.12	0.06	0.02	0.72	-0.51	-0.19	0.21	0.38	0.38	A-	A-	A-	A-	1.25	0.02	-9.90	0.72	-9.90	0.71
23	640127	9	1977	0.33	0.36	0.23	0.21	0.11	0.09	0.03	0.75	-0.62	-0.06	0.23	0.34	0.44	A-	A-	A-	A-	1.24	0.02	-9.90	0.67	-9.90	0.64
24	640136	9	1977	0.32	0.35	0.25	0.22	0.14	0.04	0.02	0.72	-0.61	-0.06	0.29	0.40	0.29	A-	A-	A-	A+	1.48	0.02	-9.76	0.73	-9.90	0.69
25	640134	10	1971	0.08	0.80	0.12	0.05	0.02	0.01	0.03	0.55	-0.55	0.32	0.30	0.24	0.18	A-	A-	A-	A-	2.73	0.04	-4.95	0.74	-7.11	0.51
26	640643	10	1971	0.20	0.59	0.19	0.10	0.08	0.03	0.03	0.70	-0.65	0.16	0.31	0.38	0.31	A-	A-	A+	A-	1.90	0.03	-9.15	0.69	-9.58	0.57
27	641527	11	1963	0.26	0.44	0.25	0.16	0.12	0.03	0.03	0.66	-0.58	0.05	0.27	0.37	0.26	A+	A+	A+	A-	1.77	0.03	-6.06	0.82	-5.85	0.78
28	640130	11	1963	0.38	0.32	0.22	0.18	0.20	0.08	0.03	0.64	-0.54	-0.03	0.10	0.29	0.40	B+	A-	A-	A-	1.19	0.02	-2.51	0.93	-2.07	0.93
29	640892	12	1995	0.23	0.42	0.35	0.13	0.06	0.03	0.04	0.62	-0.53	0.10	0.30	0.32	0.24	A-	A-	A-	A-	1.90	0.03	-4.84	0.84	-6.27	0.78
30	640131	12	1995	0.16	0.52	0.36	0.09	0.03	0.00	0.03	0.51	-0.40	0.11	0.34	0.27	0.07	A-	A-	A-	A+	2.90	0.03	-3.52	0.88	-3.72	0.86
31	644788	13	1984	0.17	0.56	0.27	0.13	0.04	0.01	0.04	0.60	-0.58	0.24	0.34	0.27	0.14	A+	A-	A-	A-	2.41	0.03	-3.72	0.87	-5.40	0.78

Item Information			Classical														DIF				Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(0)	P(1)	P(2)	P(3)	P(4)	P(B)	ITCorr	Corr(0)	Corr(1)	Corr(2)	Corr(3)	Corr(4)	M/F	W/B	W/H	O/P	Meas	SEM	*z*	MS	*z*	MS
32	641526	13	1984	0.36	0.29	0.27	0.19	0.24	0.02	0.04	0.75	-0.56	-0.20	0.20	0.56	0.20	A+	A+	A+	B-	1.70	0.02	-9.90	0.71	-9.90	0.68
33	640128	14	1979	0.51	0.14	0.24	0.22	0.25	0.14	0.02	0.75	-0.49	-0.34	0.01	0.36	0.44	A+	A-	A-	A-	0.63	0.02	-9.90	0.70	-9.90	0.70
34	644795	14	1979	0.15	0.70	0.12	0.12	0.02	0.05	0.06	0.56	-0.52	0.11	0.36	0.15	0.32	A-	A-	A-	A+	1.98	0.03	-3.16	0.87	-2.34	0.84
35	644452	15	2005	0.37	0.21	0.35	0.23	0.16	0.05	0.01	0.65	-0.46	-0.19	0.17	0.38	0.32	A+	A-	A-	A-	1.23	0.02	-5.84	0.84	-5.69	0.84
36	631622	15	2005	0.42	0.25	0.24	0.22	0.15	0.13	0.03	0.73	-0.55	-0.17	0.08	0.31	0.49	A+	A-	A+	A-	0.93	0.02	-9.90	0.73	-9.90	0.71
37	640889	16	1994	0.19	0.69	0.06	0.15	0.02	0.08	0.06	0.58	-0.54	0.04	0.33	0.11	0.40	A+	A-	A+	A-	1.73	0.02	-0.88	0.96	-1.87	0.85
38	640899	16	1994	0.23	0.45	0.31	0.15	0.07	0.02	0.03	0.60	-0.54	0.11	0.30	0.31	0.21	A+	A-	A-	A-	1.90	0.03	-2.05	0.93	-4.02	0.85
39	644449	17	1993	0.25	0.48	0.21	0.17	0.07	0.06	0.03	0.63	-0.57	0.08	0.27	0.26	0.34	A+	A-	A-	A-	1.56	0.02	-2.48	0.92	-4.09	0.83
40	640633	17	1993	0.35	0.29	0.20	0.40	0.01	0.10	0.02	0.72	-0.61	-0.12	0.39	0.08	0.42	A-	A-	A-	A-	1.16	0.02	-8.82	0.75	-9.07	0.73
41	640126	18	2002	0.21	0.49	0.28	0.14	0.07	0.02	0.05	0.63	-0.56	0.12	0.33	0.31	0.24	A+	A-	A-	B-	2.08	0.03	-5.02	0.84	-6.55	0.75
42	640637	18	2002	0.24	0.39	0.43	0.07	0.07	0.04	0.03	0.61	-0.47	0.05	0.23	0.32	0.32	A-	A-	A-	A-	1.73	0.03	-4.12	0.85	-4.93	0.81
43	640888	19	1995	0.25	0.41	0.34	0.12	0.11	0.02	0.04	0.63	-0.53	0.07	0.22	0.38	0.24	A+	A-	A-	A-	1.91	0.03	-4.95	0.84	-5.01	0.82
44	640634	19	1995	0.10	0.74	0.18	0.06	0.02	0.01	0.03	0.57	-0.58	0.37	0.32	0.20	0.14	A-	A-	A-	A-	2.77	0.04	-3.72	0.82	-6.99	0.60
45	644774	20	1995	0.19	0.49	0.30	0.17	0.03	0.01	0.04	0.61	-0.54	0.13	0.40	0.26	0.14	A+	A-	A+	A-	2.45	0.03	-5.27	0.84	-6.06	0.79
46	640898	20	1995	0.23	0.53	0.18	0.17	0.07	0.05	0.04	0.65	-0.56	0.03	0.31	0.30	0.34	A-	A-	A-	A+	1.67	0.02	-4.75	0.84	-5.26	0.77

Table J–15. Biology Constructed-Response Item Statistics: Spring

Item Information			Classical												DIF				Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(0)	P(1)	P(2)	P(3)	P(B)	ITCorr	Corr(0)	Corr(1)	Corr(2)	Corr(3)	M/F	W/B	W/H	O/P	Meas	SEM	*z*	MS	*z*	MS
1	629477	0	180917	0.33	0.40	0.29	0.22	0.09	0.06	0.58	-0.48	0.01	0.28	0.39					0.93	0.00	-9.90	0.82	9.90	1.08
2	609478	0	180917	0.22	0.59	0.20	0.13	0.07	0.05	0.59	-0.55	0.19	0.30	0.37					1.46	0.00	8.44	1.04	-1.84	0.99
3	607796	0	180917	0.20	0.67	0.08	0.21	0.03	0.08	0.42	-0.37	0.02	0.29	0.27					1.46	0.00	9.90	1.34	9.90	1.49
4	610866	0	180917	0.31	0.38	0.37	0.20	0.05	0.03	0.45	-0.39	0.07	0.26	0.24					0.88	0.00	-9.90	0.92	9.90	1.56
5	608339	0	180917	0.59	0.08	0.17	0.66	0.09	0.04	0.40	-0.32	-0.15	0.18	0.21					-0.38	0.00	-9.90	0.80	9.90	3.27
6	608341	0	180917	0.37	0.29	0.37	0.27	0.07	0.07	0.54	-0.45	-0.03	0.32	0.28					0.77	0.00	-9.90	0.86	9.90	1.58
7	641206	1	2029	0.22	0.58	0.24	0.11	0.06	0.07	0.64	-0.60	0.22	0.36	0.36	A+	A-	A-	A-	1.57	0.03	-6.94	0.77	-7.93	0.67
8	608322	1	2029	0.18	0.61	0.26	0.09	0.03	0.08	0.55	-0.49	0.19	0.36	0.27	B+	A-	A-	A-	1.88	0.03	-4.03	0.86	-4.27	0.81
9	644134	2	1870	0.23	0.53	0.28	0.14	0.05	0.02	0.54	-0.50	0.19	0.32	0.26	A-	A-	B-	A+	1.66	0.03	-1.83	0.94	-2.50	0.90
10	608333	2	1870	0.18	0.62	0.24	0.12	0.03	0.04	0.56	-0.56	0.31	0.33	0.23	A+	A-	A-	A-	1.97	0.03	-3.97	0.86	-5.57	0.75
11	641289	3	1970	0.22	0.56	0.26	0.16	0.02	0.05	0.60	-0.56	0.23	0.41	0.21	A-	A-	A+	A-	1.93	0.03	-5.86	0.82	-6.50	0.76
12	607815	3	1970	0.47	0.21	0.34	0.27	0.18	0.03	0.54	-0.41	-0.15	0.22	0.36	A+	A-	A-	A+	0.52	0.03	-0.18	0.99	0.28	1.01
13	611446	4	1890	0.17	0.73	0.09	0.10	0.08	0.14	0.54	-0.50	0.11	0.29	0.39	A+	A-	A+	A-	1.65	0.03	-3.16	0.87	-3.34	0.74
14	608328	4	1890	0.09	0.80	0.15	0.05	0.01	0.06	0.48	-0.48	0.34	0.28	0.13	A+	A-	A-	A-	2.74	0.05	-3.23	0.84	-5.60	0.64
15	641208	5	1969	0.14	0.70	0.20	0.07	0.02	0.09	0.59	-0.59	0.36	0.36	0.21	A+	A+	A-	A-	2.23	0.04	-6.56	0.75	-8.53	0.58
16	608331	5	1969	0.18	0.63	0.23	0.11	0.03	0.05	0.48	-0.44	0.18	0.30	0.24	A-	A-	A-	A+	1.93	0.03	-0.36	0.99	-0.93	0.95
17	641218	6	1899	0.18	0.65	0.22	0.09	0.04	0.07	0.55	-0.49	0.19	0.31	0.33	A-	A-	A-	A-	1.82	0.03	-4.41	0.83	-4.57	0.77
18	611079	6	1899	0.42	0.28	0.31	0.28	0.13	0.05	0.56	-0.48	-0.05	0.28	0.34	A+	B-	B-	A+	0.77	0.03	-0.60	0.98	-1.26	0.96
19	641219	7	1946	0.28	0.51	0.22	0.19	0.09	0.05	0.58	-0.50	0.04	0.35	0.35	A-	A-	A-	A-	1.34	0.03	-3.07	0.91	-2.60	0.89
20	611407	7	1946	0.10	0.77	0.17	0.05	0.01	0.07	0.47	-0.46	0.31	0.29	0.15	A+	A-	A-	A-	2.53	0.04	-2.67	0.87	-4.60	0.72
21	641294	8	1898	0.08	0.86	0.08	0.05	0.02	0.03	0.46	-0.47	0.26	0.29	0.24	A-	A+	A-	A-	2.48	0.04	-2.70	0.84	-4.77	0.54
22	611433	8	1898	0.14	0.75	0.13	0.09	0.04	0.08	0.56	-0.55	0.25	0.36	0.29	A+	A-	A-	A-	2.08	0.04	-4.87	0.79	-6.66	0.57
23	641307	9	1938	0.19	0.62	0.23	0.11	0.04	0.04	0.56	-0.52	0.21	0.37	0.25	A+	A+	A+	A-	1.84	0.03	-4.39	0.85	-5.91	0.73
24	612592	9	1938	0.11	0.78	0.14	0.04	0.03	0.04	0.45	-0.41	0.20	0.27	0.27	A-	A-	A+	A+	2.10	0.04	-2.60	0.87	-4.32	0.69
25	608086	10	1948	0.23	0.59	0.20	0.14	0.07	0.06	0.54	-0.45	0.04	0.29	0.38	A-	A-	A-	A-	1.54	0.03	-1.87	0.94	-2.43	0.88
26	641226	10	1948	0.33	0.49	0.18	0.16	0.17	0.04	0.67	-0.61	0.04	0.31	0.48	A+	A-	A-	A-	1.04	0.03	-6.88	0.80	-7.52	0.69
27	637064	11	1948	0.23	0.58	0.20	0.16	0.05	0.04	0.62	-0.59	0.20	0.37	0.32	A-	A-	A+	A+	1.63	0.03	-6.49	0.80	-6.06	0.74
28	641230	11	1948	0.13	0.71	0.20	0.07	0.02	0.04	0.49	-0.48	0.30	0.30	0.16	A+	A-	A+	A+	2.31	0.04	-2.21	0.91	-3.88	0.79
29	641221	12	1976	0.27	0.46	0.31	0.17	0.06	0.05	0.55	-0.41	-0.02	0.37	0.35	A-	A-	A-	A-	1.44	0.03	-4.26	0.87	-3.65	0.87
30	641232	12	1976	0.23	0.55	0.26	0.15	0.05	0.06	0.52	-0.49	0.17	0.32	0.25	A+	A-	A+	A-	1.62	0.03	-1.08	0.96	-2.54	0.90
31	641295	13	1944	0.47	0.24	0.28	0.30	0.17	0.05	0.62	-0.54	-0.08	0.28	0.37	A+	A-	A+	A-	0.56	0.03	-3.81	0.90	-3.90	0.89

Item Information			Classical												DIF				Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(0)	P(1)	P(2)	P(3)	P(B)	ITCorr	Corr(0)	Corr(1)	Corr(2)	Corr(3)	M/F	W/B	W/H	O/P	Meas	SEM	*z*	MS	*z*	MS
32	641298	13	1944	0.21	0.61	0.20	0.13	0.05	0.12	0.62	-0.60	0.25	0.35	0.32	A+	A-	A-	A-	1.67	0.03	-6.30	0.79	-6.35	0.71
33	641309	14	1926	0.26	0.48	0.31	0.17	0.04	0.07	0.63	-0.57	0.17	0.39	0.30	A+	A-	A-	A-	1.57	0.03	-7.16	0.79	-7.52	0.75
34	641299	14	1926	0.28	0.45	0.31	0.18	0.06	0.03	0.60	-0.54	0.13	0.34	0.32	A+	A-	A-	A-	1.38	0.03	-4.26	0.87	-4.82	0.83
35	611454	15	1965	0.17	0.65	0.24	0.08	0.04	0.10	0.58	-0.57	0.32	0.32	0.27	A+	A-	A+	A-	1.92	0.03	-5.09	0.81	-6.46	0.70
36	641300	15	1965	0.15	0.72	0.15	0.09	0.05	0.07	0.52	-0.48	0.18	0.32	0.30	A+	A-	A-	A-	1.88	0.03	-2.67	0.89	-4.03	0.75
37	612582	16	1908	0.09	0.81	0.14	0.05	0.01	0.07	0.52	-0.52	0.35	0.34	0.11	A+	A-	A-	A-	2.82	0.05	-5.01	0.76	-7.33	0.52
38	641301	16	1908	0.10	0.80	0.12	0.05	0.03	0.06	0.50	-0.51	0.31	0.29	0.24	A+	A+	A+	A-	2.25	0.04	-2.99	0.85	-5.70	0.57
39	641223	17	1963	0.21	0.63	0.20	0.10	0.07	0.04	0.49	-0.46	0.17	0.25	0.30	A-	A-	A-	A+	1.49	0.03	0.19	1.01	-1.52	0.92
40	641311	17	1963	0.21	0.57	0.26	0.14	0.03	0.06	0.63	-0.60	0.26	0.40	0.27	A+	A-	A-	A-	1.75	0.03	-7.87	0.76	-8.91	0.67
41	641296	18	1999	0.10	0.81	0.11	0.04	0.04	0.04	0.52	-0.52	0.30	0.26	0.30	A+	A-	A-	A-	2.17	0.04	-4.18	0.78	-6.59	0.51
42	644201	18	1999	0.24	0.55	0.22	0.18	0.05	0.03	0.63	-0.58	0.15	0.43	0.29	A+	A-	A-	A+	1.62	0.03	-5.99	0.82	-6.49	0.74
43	607790	19	1964	0.14	0.76	0.10	0.10	0.04	0.06	0.54	-0.54	0.23	0.35	0.27	A+	A-	A+	A+	2.01	0.03	-4.14	0.83	-4.50	0.67
44	641303	19	1964	0.24	0.52	0.28	0.13	0.06	0.04	0.57	-0.50	0.12	0.35	0.33	A-	B-	A-	A+	1.55	0.03	-4.58	0.85	-4.67	0.82
45	641308	20	1874	0.26	0.51	0.27	0.16	0.06	0.05	0.59	-0.54	0.16	0.34	0.32	A-	A-	A-	A+	1.49	0.03	-3.57	0.89	-4.40	0.83
46	644202	20	1874	0.49	0.19	0.33	0.30	0.18	0.04	0.63	-0.45	-0.20	0.22	0.45	A+	A-	A-	A-	0.42	0.03	-5.21	0.86	-5.51	0.84

Table J–16. Literature Constructed-Response Item Statistics: Spring

Item Information			Classical												DIF				Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(0)	P(1)	P(2)	P(3)	P(B)	ITCorr	Corr(0)	Corr(1)	Corr(2)	Corr(3)	M/F	W/B	W/H	O/P	Meas	SEM	*z*	MS	*z*	MS
1	613655	0	156302	0.54	0.10	0.36	0.37	0.17	0.03	0.61	-0.41	-0.29	0.22	0.41					1.08	0.00	-9.90	0.51	9.90	1.55
2	613263	0	156302	0.46	0.14	0.38	0.42	0.06	0.04	0.62	-0.46	-0.22	0.42	0.27					1.16	0.00	-9.90	0.43	9.90	1.38
3	613264	0	156302	0.39	0.24	0.41	0.30	0.05	0.07	0.62	-0.53	-0.04	0.40	0.27					1.48	0.00	-9.90	0.51	9.90	1.50
4	613849	0	156302	0.53	0.10	0.33	0.45	0.12	0.03	0.61	-0.42	-0.29	0.32	0.33					1.10	0.00	-9.90	0.50	9.90	1.45
5	614013	0	156302	0.51	0.16	0.31	0.38	0.15	0.05	0.67	-0.54	-0.20	0.30	0.40					0.91	0.00	-9.90	0.41	-9.90	0.64
6	614014	0	156302	0.43	0.29	0.26	0.32	0.13	0.10	0.67	-0.58	-0.07	0.36	0.39					1.25	0.00	-9.90	0.45	-9.90	0.60
7	644128	1	1884	0.48	0.18	0.31	0.38	0.12	0.02	0.69	-0.55	-0.19	0.38	0.36	B+	A-	A-	A-	1.18	0.03	-9.90	0.70	-9.90	0.70
8	643189	1	1884	0.57	0.13	0.26	0.39	0.22	0.04	0.71	-0.55	-0.25	0.20	0.48	B+	A-	A+	A-	0.77	0.03	-9.90	0.69	-9.90	0.69
9	644127	2	1867	0.52	0.19	0.25	0.39	0.17	0.03	0.68	-0.53	-0.22	0.30	0.42	B+	A-	A+	B-	1.08	0.03	-9.90	0.72	-9.90	0.71
10	643188	2	1867	0.56	0.12	0.29	0.38	0.21	0.02	0.71	-0.57	-0.26	0.27	0.43	B+	A-	A-	B-	0.82	0.03	-9.90	0.68	-9.90	0.67
11	663758	3	1934	0.56	0.17	0.21	0.40	0.22	0.03	0.69	-0.54	-0.24	0.24	0.44	A+	A-	A-	B-	0.85	0.03	-9.90	0.72	-9.90	0.70
12	643190	3	1934	0.54	0.10	0.36	0.38	0.17	0.03	0.68	-0.53	-0.27	0.28	0.41	C+	A-	A+	A-	0.76	0.03	-9.90	0.72	-9.90	0.72
13	663765	4	1853	0.56	0.10	0.28	0.46	0.15	0.03	0.66	-0.52	-0.25	0.25	0.40	A+	A+	A-	A-	0.81	0.03	-9.90	0.72	-9.79	0.73
14	643191	4	1853	0.55	0.12	0.30	0.39	0.19	0.05	0.63	-0.47	-0.27	0.26	0.38	B+	A-	A+	A-	0.81	0.03	-7.56	0.80	-7.94	0.78
15	644720	5	1843	0.52	0.15	0.31	0.39	0.15	0.02	0.62	-0.45	-0.23	0.25	0.40	A+	A+	A+	C-	1.03	0.03	-8.32	0.78	-8.24	0.78
16	644186	5	1843	0.54	0.14	0.31	0.37	0.19	0.03	0.67	-0.48	-0.27	0.24	0.45	A+	A+	A+	C-	0.92	0.03	-9.90	0.72	-9.90	0.71
17	644721	6	1821	0.58	0.10	0.26	0.46	0.18	0.03	0.68	-0.49	-0.33	0.26	0.41	B+	A+	A+	A-	0.70	0.03	-9.90	0.72	-9.90	0.72
18	644185	6	1821	0.43	0.23	0.36	0.27	0.13	0.05	0.64	-0.52	-0.12	0.34	0.37	A+	A+	A+	B-	1.30	0.03	-9.90	0.74	-9.90	0.73
19	643728	7	1821	0.50	0.16	0.31	0.41	0.13	0.03	0.70	-0.54	-0.24	0.36	0.38	B+	A+	A-	C-	1.07	0.03	-9.90	0.71	-9.90	0.70
20	644039	7	1821	0.40	0.19	0.48	0.26	0.07	0.05	0.64	-0.54	-0.05	0.37	0.30	A+	A-	A+	A-	1.48	0.03	-9.05	0.74	-9.28	0.74
21	643730	8	1872	0.47	0.18	0.33	0.37	0.12	0.03	0.67	-0.52	-0.19	0.37	0.36	B+	A+	A+	A-	1.20	0.03	-9.90	0.73	-9.90	0.72
22	644041	8	1872	0.61	0.14	0.18	0.37	0.30	0.04	0.75	-0.58	-0.29	0.16	0.52	A+	A-	A-	B-	0.63	0.03	-9.90	0.64	-9.90	0.62
23	643178	9	1836	0.58	0.10	0.22	0.52	0.16	0.03	0.68	-0.54	-0.29	0.29	0.37	C+	B-	A-	A-	0.73	0.03	-9.56	0.72	-9.63	0.71
24	643725	9	1836	0.39	0.24	0.41	0.28	0.06	0.03	0.63	-0.55	-0.02	0.41	0.25	A+	A-	A+	A-	1.61	0.03	-9.16	0.75	-8.99	0.75
25	643179	10	1794	0.55	0.13	0.28	0.41	0.18	0.03	0.68	-0.52	-0.27	0.29	0.40	B+	A-	A+	B-	0.88	0.03	-9.90	0.72	-9.90	0.72
26	643727	10	1794	0.55	0.11	0.32	0.39	0.18	0.03	0.70	-0.47	-0.36	0.29	0.45	A+	A+	A+	A-	0.80	0.03	-9.90	0.68	-9.90	0.68
27	643960	11	1855	0.56	0.09	0.32	0.43	0.16	0.02	0.69	-0.45	-0.38	0.31	0.42	A+	A+	A+	A-	0.71	0.03	-9.90	0.71	-9.90	0.71
28	644056	11	1855	0.56	0.13	0.24	0.43	0.20	0.03	0.69	-0.53	-0.27	0.24	0.44	B+	A+	A+	B-	0.80	0.03	-9.90	0.72	-9.90	0.72
29	643946	12	1842	0.55	0.11	0.27	0.46	0.16	0.02	0.69	-0.50	-0.31	0.30	0.40	B+	A+	A+	C-	0.78	0.03	-9.73	0.73	-9.76	0.73
30	644058	12	1842	0.52	0.15	0.30	0.40	0.15	0.03	0.69	-0.53	-0.25	0.32	0.41	A+	A+	A+	A-	0.96	0.03	-9.90	0.71	-9.90	0.71
31	643182	13	1808	0.58	0.13	0.25	0.37	0.24	0.04	0.68	-0.57	-0.23	0.24	0.42	B+	A+	A+	B-	0.72	0.03	-9.90	0.73	-9.90	0.72

Item Information			Classical												DIF				Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(0)	P(1)	P(2)	P(3)	P(B)	ITCorr	Corr(0)	Corr(1)	Corr(2)	Corr(3)	M/F	W/B	W/H	O/P	Meas	SEM	*z*	MS	*z*	MS
32	644767	13	1808	0.55	0.11	0.29	0.43	0.17	0.03	0.68	-0.47	-0.34	0.29	0.41	A+	A-	A-	A-	0.78	0.03	-9.70	0.73	-9.74	0.73
33	643181	14	1794	0.57	0.13	0.22	0.45	0.20	0.03	0.72	-0.56	-0.27	0.24	0.46	B+	A+	A-	B-	0.80	0.03	-9.90	0.68	-9.90	0.68
34	644768	14	1794	0.63	0.05	0.22	0.55	0.19	0.02	0.62	-0.41	-0.34	0.13	0.41	B+	A+	A-	A-	0.34	0.04	-7.55	0.77	-7.59	0.77
35	643685	15	1861	0.58	0.10	0.30	0.36	0.23	0.02	0.68	-0.47	-0.34	0.20	0.47	A+	A-	A-	A-	0.63	0.03	-9.90	0.72	-9.90	0.71
36	643688	15	1861	0.45	0.20	0.34	0.35	0.10	0.05	0.69	-0.58	-0.13	0.39	0.35	A+	A+	A+	C-	1.31	0.03	-9.90	0.70	-9.90	0.70
37	643686	16	1821	0.55	0.13	0.28	0.42	0.18	0.02	0.68	-0.54	-0.25	0.28	0.40	A+	A-	A-	A-	0.85	0.03	-9.90	0.73	-9.90	0.72
38	643690	16	1821	0.48	0.17	0.33	0.41	0.10	0.06	0.66	-0.55	-0.18	0.40	0.31	B+	A-	A+	B-	1.21	0.03	-9.15	0.75	-9.30	0.74
39	643176	17	1796	0.50	0.14	0.36	0.38	0.12	0.03	0.70	-0.50	-0.29	0.38	0.39	B+	A+	A+	C-	1.05	0.03	-9.90	0.70	-9.90	0.70
40	644430	17	1796	0.57	0.10	0.28	0.41	0.21	0.03	0.70	-0.51	-0.32	0.22	0.46	A+	A+	A+	B-	0.66	0.03	-9.90	0.70	-9.90	0.70
41	643174	18	1846	0.35	0.34	0.35	0.23	0.07	0.02	0.64	-0.55	0.03	0.38	0.33	A+	A+	A-	A-	1.71	0.03	-9.90	0.72	-9.90	0.70
42	644431	18	1846	0.49	0.21	0.26	0.37	0.16	0.04	0.72	-0.62	-0.12	0.31	0.43	A+	A-	A+	A-	1.12	0.03	-9.90	0.67	-9.90	0.67
43	643185	19	1760	0.54	0.15	0.28	0.36	0.21	0.05	0.72	-0.54	-0.28	0.25	0.48	A+	A-	A-	A-	0.81	0.03	-9.90	0.66	-9.90	0.67
44	644708	19	1760	0.49	0.21	0.25	0.38	0.15	0.07	0.69	-0.58	-0.15	0.33	0.40	A+	A-	A-	B-	1.11	0.03	-9.90	0.72	-9.90	0.70
45	643186	20	1808	0.52	0.16	0.32	0.34	0.19	0.03	0.71	-0.54	-0.24	0.28	0.46	A+	A-	A+	B-	0.92	0.03	-9.90	0.69	-9.90	0.69
46	644707	20	1808	0.56	0.12	0.25	0.44	0.19	0.03	0.73	-0.56	-0.29	0.27	0.44	A+	B-	A-	A-	0.75	0.03	-9.90	0.68	-9.90	0.68

Table J–17. Algebra I Constructed-Response Item Statistics: Summer

Item Information			Classical														Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(0)	P(1)	P(2)	P(3)	P(4)	P(B)	ITCorr	Corr(0)	Corr(1)	Corr(2)	Corr(3)	Corr(4)	Meas	SEM	*z*	MS	*z*	MS
1	631618	0	2144	0.20	0.46	0.32	0.17	0.05	0.00	0.01	0.39	-0.27	-0.02	0.21	0.24	0.19	2.03	0.03	6.79	1.23	5.87	1.22
2	613666	0	2144	0.21	0.39	0.44	0.15	0.01	0.01	0.03	0.53	-0.39	0.06	0.30	0.22	0.26	1.61	0.03	-6.52	0.8	-7.2	0.79
3	632542	0	2144	0.19	0.42	0.48	0.05	0.03	0.02	0.02	0.58	-0.44	0.16	0.25	0.29	0.26	1.37	0.03	-5.57	0.78	-7.07	0.74
4	632546	0	2144	0.18	0.56	0.25	0.11	0.06	0.02	0.02	0.52	-0.43	0.09	0.23	0.30	0.24	1.35	0.02	-6.73	0.78	-6.47	0.73
5	616433	0	2144	0.62	0.07	0.16	0.25	0.29	0.23	0.01	0.43	-0.24	-0.17	-0.16	0.11	0.34	-0.43	0.02	-1.38	0.96	1.74	1.05
6	628223	0	2144	0.24	0.45	0.30	0.13	0.08	0.05	0.03	0.55	-0.44	0.05	0.15	0.27	0.34	0.93	0.02	-5.84	0.82	-5.96	0.78

Table J–18. Biology Constructed-Response Item Statistics: Summer

Item Information			Classical												Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(0)	P(1)	P(2)	P(3)	P(B)	ITCorr	Corr(0)	Corr(1)	Corr(2)	Corr(3)	Meas	SEM	*z*	MS	*z*	MS
1	607764	0	1073	0.18	0.60	0.28	0.10	0.02	0.12	0.47	-0.39	0.14	0.27	0.30	1.75	0.05	2.07	1.11	1.91	1.12
2	607591	0	1073	0.13	0.66	0.28	0.04	0.01	0.06	0.54	-0.43	0.23	0.30	0.34	1.61	0.05	-7.28	0.66	-7.53	0.63
3	607772	0	1073	0.15	0.66	0.23	0.09	0.02	0.08	0.49	-0.39	0.14	0.30	0.33	1.85	0.05	1.42	1.08	0.66	1.05
4	608356	0	1073	0.39	0.30	0.34	0.25	0.11	0.02	0.48	-0.38	-0.03	0.18	0.36	0.62	0.04	0.36	1.01	0.05	1.00
5	608340	0	1073	0.35	0.39	0.30	0.19	0.12	0.07	0.48	-0.40	0.04	0.14	0.37	0.42	0.03	-3.41	0.87	-1.59	0.92
6	608350	0	1073	0.22	0.48	0.38	0.13	0.01	0.04	0.39	-0.36	0.17	0.25	0.12	1.82	0.05	1.17	1.05	0.79	1.03

Table J–19. Literature Constructed-Response Item Statistics: Summer

Item Information			Classical												Rasch		Infit		Outfit	
Ref	ID	Form	*N*	PVal	P(0)	P(1)	P(2)	P(3)	P(B)	ITCorr	Corr(0)	Corr(1)	Corr(2)	Corr(3)	Meas	SEM	*z*	MS	*z*	MS
1	614804	0	741	0.48	0.16	0.35	0.37	0.12	0.04	0.63	-0.45	-0.25	0.35	0.36	1.36	0.05	1.60	1.08	1.31	1.06
2	608194	0	741	0.47	0.14	0.42	0.34	0.10	0.04	0.66	-0.48	-0.27	0.41	0.34	0.71	0.05	-7.51	0.68	-7.35	0.69
3	613272	0	741	0.39	0.23	0.41	0.33	0.03	0.08	0.63	-0.47	-0.14	0.47	0.27	1.26	0.05	-6.10	0.73	-6.07	0.73
4	613250	0	741	0.42	0.18	0.44	0.33	0.06	0.05	0.60	-0.44	-0.17	0.39	0.29	1.66	0.06	1.56	1.08	1.16	1.06
5	614700	0	741	0.54	0.12	0.30	0.40	0.18	0.04	0.63	-0.45	-0.26	0.21	0.42	0.41	0.05	-5.23	0.77	-5.35	0.76
6	614699	0	741	0.42	0.18	0.45	0.30	0.07	0.07	0.54	-0.41	-0.10	0.29	0.31	0.90	0.05	-0.82	0.96	-0.99	0.95

APPENDIX K: RAW-TO-SCALED SCORE CONVERSION TABLES

Table K–1. Raw-to-Scaled Score Conversion Tables

Column Heading	Definition
Raw	Raw score
SS	Scaled score
CSEM	Conditional standard error of measurement
LCI	Lower confidence interval
UCI	Upper confidence interval

WINTER

Table K–2. Algebra I Raw-to-Scaled Score Conversion Table

Raw	SS	CSEM	LCI	UCI
0	1201	92	1200	1293
1	1263	51	1212	1314
2	1299	37	1262	1336
3	1322	30	1292	1352
4	1338	27	1311	1365
5	1351	24	1327	1375
6	1362	23	1339	1385
7	1372	21	1351	1393
8	1380	20	1360	1400
9	1388	19	1369	1407
10	1395	19	1376	1414
11	1402	18	1384	1420
12	1408	18	1390	1426
13	1414	17	1397	1431
14	1420	17	1403	1437
15	1426	16	1410	1442
16	1431	16	1415	1447
17	1436	16	1420	1452
18	1440	15	1425	1455
19	1445	15	1430	1460
20	1449	15	1434	1464
21	1454	15	1439	1469
22	1458	14	1444	1472
23	1462	14	1448	1476
24	1466	14	1452	1480
25	1470	14	1456	1484
26	1474	14	1460	1488
27	1477	14	1463	1491

Raw	SS	CSEM	LCI	UCI
28	1481	13	1468	1494
29	1484	13	1471	1497
30	1488	13	1475	1501
31	1491	13	1478	1504
32	1495	13	1482	1508
33	1498	13	1485	1511
34	1502	13	1489	1515
35	1505	13	1492	1518
36	1508	13	1495	1521
37	1512	13	1499	1525
38	1515	13	1502	1528
39	1519	13	1506	1532
40	1523	14	1509	1537
41	1526	14	1512	1540
42	1530	14	1516	1544
43	1534	14	1520	1548
44	1538	15	1523	1553
45	1543	15	1528	1558
46	1547	15	1532	1562
47	1552	16	1536	1568
48	1557	16	1541	1573
49	1563	17	1546	1580
50	1569	18	1551	1587
51	1575	19	1556	1594
52	1583	19	1564	1602
53	1591	21	1570	1612
54	1600	22	1578	1622
55	1610	24	1586	1634
56	1623	26	1597	1649
57	1639	30	1609	1669
58	1661	37	1624	1698
59	1698	51	1647	1749
60	1759	92	1667	1800

Table K–3. Biology Raw-to-Scaled Score Conversion Table

Raw	SS	CSEM	LCI	UCI
0	1209	92	1200	1301
1	1270	51	1219	1321
2	1306	36	1270	1342
3	1328	30	1298	1358
4	1344	26	1318	1370
5	1357	24	1333	1381
6	1367	22	1345	1389
7	1376	21	1355	1397
8	1384	20	1364	1404
9	1392	19	1373	1411
10	1398	18	1380	1416
11	1404	17	1387	1421
12	1410	17	1393	1427
13	1416	16	1400	1432
14	1421	16	1405	1437
15	1426	15	1411	1441
16	1430	15	1415	1445
17	1435	15	1420	1450
18	1439	15	1424	1454
19	1443	14	1429	1457
20	1447	14	1433	1461
21	1451	14	1437	1465
22	1455	14	1441	1469
23	1459	14	1445	1473
24	1462	14	1448	1476
25	1466	13	1453	1479
26	1470	13	1457	1483
27	1473	13	1460	1486
28	1477	13	1464	1490
29	1480	13	1467	1493
30	1483	13	1470	1496
31	1487	13	1474	1500
32	1490	13	1477	1503
33	1493	13	1480	1506
34	1497	13	1484	1510
35	1500	13	1487	1513
36	1504	13	1491	1517
37	1507	13	1494	1520
38	1510	13	1497	1523
39	1514	13	1501	1527
40	1517	13	1504	1530
41	1521	13	1508	1534
42	1524	13	1511	1537

Raw	SS	CSEM	LCI	UCI
43	1528	13	1515	1541
44	1531	14	1517	1545
45	1535	14	1521	1549
46	1539	14	1525	1553
47	1543	14	1529	1557
48	1547	14	1533	1561
49	1551	15	1536	1566
50	1555	15	1540	1570
51	1560	15	1545	1575
52	1565	16	1549	1581
53	1570	16	1554	1586
54	1575	16	1559	1591
55	1581	17	1564	1598
56	1587	18	1569	1605
57	1593	18	1575	1611
58	1600	19	1581	1619
59	1608	21	1587	1629
60	1617	22	1595	1639
61	1628	24	1604	1652
62	1640	26	1614	1666
63	1656	30	1626	1686
64	1678	36	1642	1714
62	1714	51	1663	1765
66	1776	92	1684	1800

Table K–4. Literature Raw-to-Scaled Score Conversion Table

Raw	SS	CSEM	LCI	UCI
0	1201	92	1200	1293
1	1262	51	1211	1313
2	1298	36	1262	1334
3	1320	30	1290	1350
4	1336	27	1309	1363
5	1349	24	1325	1373
6	1359	22	1337	1381
7	1369	21	1348	1390
8	1377	20	1357	1397
9	1385	19	1366	1404
10	1392	18	1374	1410
11	1398	18	1380	1416
12	1404	17	1387	1421
13	1410	17	1393	1427
14	1416	16	1400	1432
15	1421	16	1405	1437
16	1426	16	1410	1442
17	1431	16	1415	1447
18	1436	16	1420	1452
19	1441	15	1426	1456
20	1445	15	1430	1460
21	1450	15	1435	1465
22	1455	15	1440	1470
23	1459	15	1444	1474
24	1464	15	1449	1479
25	1468	15	1453	1483
26	1473	15	1458	1488
27	1477	15	1462	1492
28	1482	15	1467	1497
29	1487	15	1472	1502
30	1491	15	1476	1506
31	1496	16	1480	1512
32	1501	16	1485	1517
33	1506	16	1490	1522
34	1511	16	1495	1527
35	1516	16	1500	1532
36	1522	17	1505	1539
37	1528	17	1511	1545
38	1533	17	1516	1550
39	1540	18	1522	1558
40	1546	18	1528	1564
41	1553	19	1534	1572
42	1561	20	1541	1581

Raw	SS	CSEM	LCI	UCI
43	1569	20	1549	1589
44	1577	21	1556	1598
45	1587	23	1564	1610
46	1598	24	1574	1622
47	1610	26	1584	1636
48	1625	28	1597	1653
49	1643	32	1611	1675
50	1667	38	1629	1705
51	1706	52	1654	1758
52	1770	93	1677	1800

SPRING

Table K–5. Algebra I Raw-to-Scaled Score Conversion Table

Raw	SS	CSEM	LCI	UCI
0	1213	92	1200	1305
1	1275	51	1224	1326
2	1311	37	1274	1348
3	1334	30	1304	1364
4	1350	27	1323	1377
5	1363	24	1339	1387
6	1373	22	1351	1395
7	1383	21	1362	1404
8	1391	20	1371	1411
9	1399	19	1380	1418
10	1406	18	1388	1424
11	1412	18	1394	1430
12	1418	17	1401	1435
13	1424	17	1407	1441
14	1429	16	1413	1445
15	1435	16	1419	1451
16	1439	16	1423	1455
17	1444	15	1429	1459
18	1449	15	1434	1464
19	1453	15	1438	1468
20	1458	15	1443	1473
21	1462	14	1448	1476
22	1466	14	1452	1480
23	1470	14	1456	1484
24	1474	14	1460	1488
25	1478	14	1464	1492
26	1481	14	1467	1495
27	1485	14	1471	1499
28	1489	13	1476	1502
29	1492	13	1479	1505
30	1496	13	1483	1509
31	1500	13	1487	1513
32	1503	13	1490	1516
33	1507	13	1494	1520
34	1510	13	1497	1523
35	1514	13	1501	1527
36	1517	13	1504	1530
37	1521	13	1508	1534
38	1524	13	1511	1537
39	1528	13	1515	1541
40	1531	14	1517	1545

Raw	SS	CSEM	LCI	UCI
41	1535	14	1521	1549
42	1539	14	1525	1553
43	1543	14	1529	1557
44	1547	14	1533	1561
45	1551	15	1536	1566
46	1555	15	1540	1570
47	1560	15	1545	1575
48	1565	16	1549	1581
49	1570	16	1554	1586
50	1575	17	1558	1592
51	1581	18	1563	1599
52	1588	18	1570	1606
53	1595	20	1575	1615
54	1603	21	1582	1624
55	1613	23	1590	1636
56	1625	26	1599	1651
57	1640	29	1611	1669
58	1660	36	1624	1696
59	1696	50	1646	1746
60	1756	91	1665	1800

Table K–6. Biology Raw-to-Scaled Score Conversion Table

Raw	SS	CSEM	LCI	UCI
0	1211	92	1200	1303
1	1272	50	1222	1322
2	1307	36	1271	1343
3	1328	30	1298	1358
4	1344	26	1318	1370
5	1356	23	1333	1379
6	1366	22	1344	1388
7	1375	20	1355	1395
8	1383	19	1364	1402
9	1390	18	1372	1408
10	1396	18	1378	1414
11	1402	17	1385	1419
12	1407	16	1391	1423
13	1413	16	1397	1429
14	1418	16	1402	1434
15	1422	15	1407	1437
16	1427	15	1412	1442
17	1431	15	1416	1446
18	1436	14	1422	1450
19	1440	14	1426	1454
20	1444	14	1430	1458
21	1448	14	1434	1462
22	1452	14	1438	1466
23	1455	14	1441	1469
24	1459	14	1445	1473
25	1463	13	1450	1476
26	1466	13	1453	1479
27	1470	13	1457	1483
28	1473	13	1460	1486
29	1477	13	1464	1490
30	1480	13	1467	1493
31	1484	13	1471	1497
32	1487	13	1474	1500
33	1490	13	1477	1503
34	1494	13	1481	1507
35	1497	13	1484	1510
36	1500	13	1487	1513
37	1504	13	1491	1517
38	1507	13	1494	1520
39	1510	13	1497	1523
40	1514	13	1501	1527
41	1517	13	1504	1530
42	1521	13	1508	1534

Raw	SS	CSEM	LCI	UCI
43	1524	13	1511	1537
44	1528	13	1515	1541
45	1531	13	1518	1544
46	1535	14	1521	1549
47	1539	14	1525	1553
48	1543	14	1529	1557
49	1547	14	1533	1561
50	1551	15	1536	1566
51	1555	15	1540	1570
52	1560	15	1545	1575
53	1564	16	1548	1580
54	1569	16	1553	1585
55	1575	17	1558	1592
56	1581	17	1564	1598
57	1587	18	1569	1605
58	1594	19	1575	1613
59	1602	20	1582	1622
60	1611	22	1589	1633
61	1621	24	1597	1645
62	1634	26	1608	1660
63	1649	30	1619	1679
64	1671	36	1635	1707
62	1707	51	1656	1758
66	1769	92	1677	1800

Table K–7. Literature Raw-to-Scaled Score Conversion Table

Raw	SS	CSEM	LCI	UCI
0	1200	92	1200	1292
1	1261	51	1210	1312
2	1298	37	1261	1335
3	1320	30	1290	1350
4	1336	27	1309	1363
5	1349	24	1325	1373
6	1360	23	1337	1383
7	1370	21	1349	1391
8	1379	20	1359	1399
9	1386	19	1367	1405
10	1394	19	1375	1413
11	1400	18	1382	1418
12	1407	18	1389	1425
13	1413	17	1396	1430
14	1418	17	1401	1435
15	1424	16	1408	1440
16	1429	16	1413	1445
17	1434	16	1418	1450
18	1439	16	1423	1455
19	1444	16	1428	1460
20	1449	16	1433	1465
21	1454	15	1439	1469
22	1459	15	1444	1474
23	1463	15	1448	1478
24	1468	15	1453	1483
25	1473	15	1458	1488
26	1477	15	1462	1492
27	1482	15	1467	1497
28	1487	15	1472	1502
29	1492	15	1477	1507
30	1496	16	1480	1512
31	1501	16	1485	1517
32	1506	16	1490	1522
33	1511	16	1495	1527
34	1516	16	1500	1532
35	1522	17	1505	1539
36	1527	17	1510	1544
37	1533	17	1516	1550
38	1539	18	1521	1557
39	1545	18	1527	1563
40	1552	18	1534	1570
41	1559	19	1540	1578
42	1567	20	1547	1587

Raw	SS	CSEM	LCI	UCI
43	1575	21	1554	1596
44	1584	22	1562	1606
45	1593	23	1570	1616
46	1605	24	1581	1629
47	1617	26	1591	1643
48	1632	29	1603	1661
49	1651	32	1619	1683
50	1675	38	1637	1713
51	1715	52	1663	1767
52	1779	93	1686	1800

SUMMER

Table K–8. Algebra I Raw-to-Scaled Score Conversion Table

Raw	SS	CSEM	LCI	UCI
0	1220	92	1200	1312
1	1281	51	1230	1332
2	1318	36	1282	1354
3	1339	30	1309	1369
4	1355	26	1329	1381
5	1368	24	1344	1392
6	1378	22	1356	1400
7	1387	21	1366	1408
8	1395	20	1375	1415
9	1403	19	1384	1422
10	1410	18	1392	1428
11	1416	17	1399	1433
12	1422	17	1405	1439
13	1427	16	1411	1443
14	1433	16	1417	1449
15	1438	16	1422	1454
16	1443	16	1427	1459
17	1447	15	1432	1462
18	1452	15	1437	1467
19	1456	15	1441	1471
20	1461	15	1446	1476
21	1465	15	1450	1480
22	1469	14	1455	1483
23	1473	14	1459	1487
24	1477	14	1463	1491
25	1481	14	1467	1495
26	1485	14	1471	1499
27	1489	14	1475	1503
28	1493	14	1479	1507
29	1496	14	1482	1510
30	1500	14	1486	1514
31	1504	14	1490	1518
32	1507	13	1494	1520
33	1511	13	1498	1524
34	1515	13	1502	1528
35	1518	14	1504	1532
36	1522	14	1508	1536
37	1526	14	1512	1540
38	1529	14	1515	1543
39	1533	14	1519	1547
40	1537	14	1523	1551

Raw	SS	CSEM	LCI	UCI
41	1541	14	1527	1555
42	1545	14	1531	1559
43	1549	15	1534	1564
44	1554	15	1539	1569
45	1558	15	1543	1573
46	1563	16	1547	1579
47	1568	16	1552	1584
48	1573	16	1557	1589
49	1579	17	1562	1596
50	1585	18	1567	1603
51	1591	18	1573	1609
52	1598	19	1579	1617
53	1606	21	1585	1627
54	1615	22	1593	1637
55	1626	24	1602	1650
56	1639	27	1612	1666
57	1655	30	1625	1685
58	1677	37	1640	1714
59	1714	51	1663	1765
60	1776	92	1684	1800

Table K–9. Biology Raw-to-Scaled Score Conversion Table

Raw	SS	CSEM	LCI	UCI
0	1211	92	1200	1303
1	1272	51	1221	1323
2	1308	37	1271	1345
3	1330	30	1300	1360
4	1346	27	1319	1373
5	1359	24	1335	1383
6	1370	22	1348	1392
7	1379	21	1358	1400
8	1387	20	1367	1407
9	1394	19	1375	1413
10	1401	18	1383	1419
11	1407	17	1390	1424
12	1413	17	1396	1430
13	1419	16	1403	1435
14	1424	16	1408	1440
15	1429	16	1413	1445
16	1433	15	1418	1448
17	1438	15	1423	1453
18	1442	15	1427	1457
19	1447	14	1433	1461
20	1451	14	1437	1465
21	1455	14	1441	1469
22	1458	14	1444	1472
23	1462	14	1448	1476
24	1466	14	1452	1480
25	1470	13	1457	1483
26	1473	13	1460	1486
27	1477	13	1464	1490
28	1480	13	1467	1493
29	1484	13	1471	1497
30	1487	13	1474	1500
31	1490	13	1477	1503
32	1494	13	1481	1507
33	1497	13	1484	1510
34	1500	13	1487	1513
35	1504	13	1491	1517
36	1507	13	1494	1520
37	1511	13	1498	1524
38	1514	13	1501	1527
39	1518	13	1505	1531
40	1521	13	1508	1534
41	1525	13	1512	1538
42	1528	14	1514	1542

Raw	SS	CSEM	LCI	UCI
43	1532	14	1518	1546
44	1536	14	1522	1550
45	1540	14	1526	1554
46	1544	14	1530	1558
47	1548	14	1534	1562
48	1552	15	1537	1567
49	1556	15	1541	1571
50	1561	15	1546	1576
51	1565	16	1549	1581
52	1570	16	1554	1586
53	1576	16	1560	1592
54	1581	17	1564	1598
55	1587	17	1570	1604
56	1593	18	1575	1611
57	1600	19	1581	1619
58	1607	20	1587	1627
59	1616	21	1595	1637
60	1625	23	1602	1648
61	1636	24	1612	1660
62	1649	27	1622	1676
63	1666	31	1635	1697
64	1689	38	1651	1727
62	1728	52	1676	1780
66	1792	93	1699	1800

Table K–10. Literature Raw-to-Scaled Score Conversion Table

Raw	SS	CSEM	LCI	UCI
0	1204	92	1200	1296
1	1266	51	1215	1317
2	1302	37	1265	1339
3	1324	30	1294	1354
4	1340	27	1313	1367
5	1353	24	1329	1377
6	1364	23	1341	1387
7	1374	21	1353	1395
8	1382	20	1362	1402
9	1390	19	1371	1409
10	1397	19	1378	1416
11	1404	18	1386	1422
12	1410	17	1393	1427
13	1416	17	1399	1433
14	1422	17	1405	1439
15	1427	16	1411	1443
16	1432	16	1416	1448
17	1438	16	1422	1454
18	1442	16	1426	1458
19	1447	15	1432	1462
20	1452	15	1437	1467
21	1457	15	1442	1472
22	1461	15	1446	1476
23	1466	15	1451	1481
24	1471	15	1456	1486
25	1475	15	1460	1490
26	1480	15	1465	1495
27	1484	15	1469	1499
28	1489	15	1474	1504
29	1494	15	1479	1509
30	1498	15	1483	1513
31	1503	16	1487	1519
32	1508	16	1492	1524
33	1513	16	1497	1529
34	1518	16	1502	1534
35	1523	16	1507	1539
36	1529	17	1512	1546
37	1534	17	1517	1551
38	1540	17	1523	1557
39	1546	18	1528	1564
40	1553	18	1535	1571
41	1559	19	1540	1578
42	1567	19	1548	1586

Raw	SS	CSEM	LCI	UCI
43	1575	20	1555	1595
44	1583	21	1562	1604
45	1593	22	1571	1615
46	1603	24	1579	1627
47	1615	26	1589	1641
48	1630	28	1602	1658
49	1647	32	1615	1679
50	1671	38	1633	1709
51	1709	52	1657	1761
52	1772	92	1680	1800

APPENDIX L: POST-EQUATING CHECK ANALYSES RESULTS

ITEM LEVEL

Table L–1. Evaluation of Algebra I Item Difficulty Stability: Winter

Item ID	Item Type	Sequence Change	Old *N*	New *N*	Old Logit	Old SEM	New Logit	New SEM	Equated Logit	Displacement
605197	MC	-13	4176	187186	-1.20	0.06	-1.30	0.01	-1.36	-0.17
605171	MC	-10	4176	187186	-0.05	0.05	-0.19	0.01	-0.24	-0.18
605261	MC	-11	4179	187186	0.08	0.05	-0.37	0.01	-0.43	-0.50
605184	MC	-9	4207	187186	1.12	0.05	1.65	0.01	1.60	0.49
605090	MC	-6	4349	187186	0.47	0.05	0.53	0.01	0.48	0.02
605255	MC	-4	4349	187186	-0.87	0.05	-1.09	0.01	-1.14	-0.28
605211	MC	-3	4195	187186	0.87	0.05	0.70	0.01	0.65	-0.20
605132	MC	-3	4176	187186	0.85	0.05	1.32	0.01	1.27	0.44
605076	MC	-2	4187	187186	-0.39	0.05	-0.57	0.01	-0.62	-0.22
605249	MC	4	4187	187186	-1.01	0.06	-0.99	0.01	-1.04	-0.03
605116	MC	4	4349	187186	-0.03	0.05	0.24	0.01	0.18	0.23
605188	MC	5	4187	187186	0.74	0.05	0.88	0.01	0.83	0.11
605094	MC	10	4176	187186	-0.67	0.05	-0.32	0.01	-0.37	0.32
605218	MC	8	4176	187186	0.64	0.05	0.52	0.01	0.47	-0.15
605169	MC	9	4349	187186	-0.40	0.05	-0.42	0.01	-0.48	-0.07
605133	MC	13	4187	187186	-0.22	0.05	0.18	0.01	0.13	0.38
605307	MC	14	4179	187186	-1.18	0.06	-0.86	0.01	-0.91	0.27
605265	MC	13	4187	187186	1.03	0.05	-0.06	0.01	-0.11	-1.12
605123	MC	-10	4187	187186	-1.42	0.06	-1.76	0.01	-1.81	-0.42
605066	MC	-10	4187	187186	0.28	0.05	0.27	0.01	0.21	-0.05
605115	MC	-11	4187	187186	-0.60	0.05	-0.35	0.01	-0.40	0.22
605260	MC	-10	4176	187186	-0.51	0.05	-0.33	0.01	-0.38	0.15
605127	MC	-5	4349	187186	-0.36	0.05	-0.17	0.01	-0.22	0.15
605194	MC	-6	4349	187186	-0.91	0.05	-1.02	0.01	-1.07	-0.16
605266	MC	-4	4349	187186	-0.83	0.05	-0.43	0.01	-0.48	0.36
605192	MC	-6	4349	187186	0.91	0.05	1.13	0.01	1.07	0.19
605241	MC	-1	4176	187186	0.47	0.05	0.69	0.01	0.64	0.19
605071	MC	4	4349	187186	0.54	0.05	0.44	0.01	0.39	-0.13
605096	MC	5	4176	187186	0.43	0.05	0.39	0.01	0.34	-0.07
605250	MC	5	4179	187186	1.04	0.05	0.77	0.01	0.72	-0.30
605080	MC	8	4179	187186	0.39	0.05	0.68	0.01	0.62	0.26
605095	MC	9	4176	187186	0.91	0.05	1.07	0.01	1.02	0.13
605081	MC	9	4187	187186	0.79	0.05	0.69	0.01	0.64	-0.12
605259	MC	13	4187	187186	0.36	0.05	0.42	0.01	0.37	0.03
605061	MC	13	4176	187186	-1.15	0.06	-0.85	0.01	-0.90	0.25
605104	MC	15	4179	187186	-1.64	0.07	-1.49	0.01	-1.54	0.09
612749	CR	-1	1945	187186	1.42	0.06	1.15	0.01	1.10	-0.26
608732	CR	10	1899	187186	1.69	0.07	1.86	0.01	1.81	0.12

Item ID	Item Type	Sequence Change	Old *N*	New *N*	Old Logit	Old SEM	New Logit	New SEM	Equated Logit	Displacement
632502	CR	11	1944	187186	0.72	0.06	1.46	0.01	1.41	0.47
622485	CR	-1	2008	187186	0.97	0.07	0.66	0.01	0.61	-0.27
608729	CR	10	1945	187186	1.08	0.10	1.03	0.01	0.98	-0.06
622399	CR	11	1899	187186	0.39	0.09	0.51	0.01	0.46	0.10

Table L–2. Evaluation of Biology Item Difficulty Stability: Winter

Item ID	Item Type	Sequence Change	Old *N*	New *N*	Old Logit	Old SEM	New Logit	New SEM	Equated Logit	Displacement
610879	MC	-18	1735	127029	-0.88	0.06	-1.02	0.01	-1.02	-0.12
618060	MC	-17	1821	127029	-0.74	0.05	-0.76	0.01	-0.75	0.01
607721	MC	-10	1737	127029	0.48	0.05	0.28	0.01	0.28	-0.17
611163	MC	-12	1821	127029	-0.51	0.05	-0.60	0.01	-0.60	-0.07
607797	MC	-15	1735	127029	-0.64	0.05	-0.70	0.01	-0.70	-0.04
611452	MC	-10	1726	127029	0.93	0.06	0.62	0.01	0.62	-0.26
610456	MC	-7	1821	127029	-0.98	0.05	-0.92	0.01	-0.91	0.09
611158	MC	-7	1726	127029	0.23	0.05	-0.11	0.01	-0.11	-0.31
610485	MC	-10	1726	127029	-0.09	0.05	-0.23	0.01	-0.23	-0.11
611023	MC	-3	1735	127029	0.75	0.05	0.59	0.01	0.59	-0.12
607723	MC	-10	1726	127029	-0.51	0.05	-0.69	0.01	-0.69	-0.16
611443	MC	-10	1726	127029	0.46	0.05	0.05	0.01	0.05	-0.37
610878	MC	8	1821	127029	-2.10	0.07	-2.35	0.01	-2.35	-0.26
611155	MC	2	1735	127029	-0.32	0.05	-0.38	0.01	-0.38	-0.03
610897	MC	4	1735	127029	0.82	0.05	0.94	0.01	0.94	0.15
611391	MC	4	1821	127029	0.96	0.05	1.13	0.01	1.13	0.20
635795	MC	11	1598	127029	0.27	0.05	0.32	0.01	0.32	0.08
609428	MC	7	1821	127029	0.41	0.05	0.54	0.01	0.54	0.17
607719	MC	9	1821	127029	-0.18	0.05	-0.22	0.01	-0.22	0.00
607693	MC	10	1726	127029	-0.33	0.05	-0.37	0.01	-0.37	-0.01
611030	MC	18	1821	127029	0.94	0.05	0.94	0.01	0.94	0.03
611016	MC	18	1726	127029	0.81	0.05	0.63	0.01	0.63	-0.14
613876	MC	18	1735	127029	0.76	0.05	0.97	0.01	0.97	0.24
611445	MC	18	1735	127029	-0.20	0.05	-0.12	0.01	-0.11	0.11
608099	MC	-14	1726	127029	-1.07	0.06	-1.16	0.01	-1.16	-0.07
607754	MC	-11	1735	127029	0.67	0.05	0.64	0.01	0.64	0.01
608020	MC	-10	1726	127029	-0.14	0.05	-0.12	0.01	-0.12	0.05
608247	MC	-10	1735	127029	-0.26	0.05	-0.49	0.01	-0.49	-0.20
608295	MC	-10	1821	127029	-0.56	0.05	-0.69	0.01	-0.68	-0.10
611411	MC	-10	1821	127029	0.30	0.05	0.29	0.01	0.29	0.03
611412	MC	-14	1726	127029	0.77	0.05	0.87	0.01	0.87	0.14
611609	MC	-13	1735	127029	0.41	0.05	0.00	0.01	0.00	-0.38
608278	MC	-6	1735	127029	0.85	0.05	1.01	0.01	1.01	0.20
611474	MC	-6	1735	127029	0.12	0.05	-0.03	0.01	-0.03	-0.11
610876	MC	-8	1821	127029	-0.53	0.05	-0.54	0.01	-0.54	0.02
607753	MC	-9	1821	127029	1.21	0.06	1.44	0.01	1.44	0.25
611420	MC	3	1735	127029	-0.21	0.05	-0.34	0.01	-0.34	-0.10
611421	MC	5	1735	127029	0.70	0.05	0.17	0.01	0.17	-0.49
610915	MC	9	1726	127029	-0.85	0.06	-0.94	0.01	-0.94	-0.07
607827	MC	6	1726	127029	-0.47	0.05	-0.40	0.01	-0.40	0.10
611620	MC	5	1735	127029	0.27	0.05	-0.03	0.01	-0.03	-0.27

Item ID	Item Type	Sequence Change	Old *N*	New *N*	Old Logit	Old SEM	New Logit	New SEM	Equated Logit	Displacement
609822	MC	6	1757	127029	-0.30	0.05	-0.29	0.01	-0.29	0.05
611060	MC	15	1821	127029	0.34	0.05	0.14	0.01	0.14	-0.17
607762	MC	17	1737	127029	1.09	0.06	1.64	0.01	1.64	0.57
610864	MC	12	1757	127029	-0.03	0.05	-0.15	0.01	-0.15	-0.09
608252	MC	19	1821	127029	-0.07	0.05	-0.25	0.01	-0.25	-0.15
609823	MC	11	1726	127029	0.38	0.05	0.91	0.01	0.91	0.57
611067	MC	14	1821	127029	-0.18	0.05	-0.24	0.01	-0.24	-0.03
629467	CR	-1	1821	127029	0.95	0.06	1.18	0.01	1.18	0.01
629469	CR	17	1726	127029	0.99	0.06	1.03	0.01	1.03	-0.03
629406	CR	18	1734	127029	1.37	0.06	1.79	0.01	1.79	0.36
610912	CR	-1	1725	127029	0.48	0.06	0.38	0.01	0.38	-0.10
611059	CR	17	1820	127029	0.35	0.12	0.64	0.01	0.64	0.30
608342	CR	18	1592	127029	0.88	0.09	0.90	0.01	0.90	-0.06

Table L–3. Evaluation of Literature Item Difficulty Stability: Winter

Item ID	Item Type	Sequence Change	Old *N*	New *N*	Old Logit	Old SEM	New Logit	New SEM	Equated Logit	Displacement
614624	MC	-10	1884	121181	-1.07	0.06	-1.28	0.01	-1.29	-0.25
614623	MC	-8	1881	121181	-0.30	0.06	-0.19	0.01	-0.21	0.11
614625	MC	-8	1881	121181	0.47	0.05	0.41	0.01	0.39	-0.06
614618	MC	-10	1884	121181	-0.24	0.06	-0.29	0.01	-0.30	-0.05
614621	MC	-8	1881	121181	0.04	0.05	-0.01	0.01	-0.02	-0.05
614619	MC	-8	1881	121181	1.68	0.06	1.63	0.01	1.62	-0.03
614622	MC	-6	1884	121181	-0.33	0.06	-0.49	0.01	-0.50	-0.17
614627	MC	-7	1881	121181	0.86	0.05	1.06	0.01	1.04	0.20
614671	MC	7	1859	121181	-0.84	0.06	-0.35	0.01	-0.36	0.48
614662	MC	6	1860	121181	0.09	0.05	0.23	0.01	0.21	0.14
614663	MC	6	1859	121181	-0.30	0.06	-0.26	0.01	-0.27	0.04
614667	MC	8	1859	121181	0.61	0.05	0.82	0.01	0.81	0.22
614668	MC	11	1860	121181	-0.57	0.06	-0.42	0.01	-0.44	0.14
614664	MC	8	1860	121181	-0.37	0.06	-0.13	0.01	-0.14	0.24
614665	MC	12	1859	121181	-1.29	0.07	-1.01	0.01	-1.02	0.26
614661	MC	10	1859	121181	0.75	0.05	0.99	0.01	0.98	0.25
614669	MC	10	1859	121181	-1.07	0.07	-0.81	0.01	-0.82	0.24
612408	MC	-11	1859	121181	-1.06	0.07	-1.27	0.01	-1.29	-0.26
612400	MC	-11	1859	121181	0.20	0.05	-0.09	0.01	-0.11	-0.30
612403	MC	-12	1859	121181	-0.01	0.05	-0.13	0.01	-0.15	-0.13
616847	MC	-10	1859	121181	0.18	0.05	-0.45	0.01	-0.47	-0.66
612402	MC	-8	1860	121181	1.17	0.05	1.09	0.01	1.07	-0.07
612406	MC	-9	1860	121181	-0.08	0.05	-0.55	0.01	-0.57	-0.49
612405	MC	-9	1860	121181	0.05	0.05	-0.09	0.01	-0.10	-0.14
612446	MC	-9	1859	121181	1.15	0.05	1.10	0.01	1.08	-0.04
612457	MC	0	1884	121181	-0.38	0.06	-0.52	0.01	-0.54	-0.16
612463	MC	5	1881	121181	0.00	0.05	0.14	0.01	0.12	0.14
612461	MC	7	1884	121181	0.31	0.05	0.34	0.01	0.33	0.03
612459	MC	4	1881	121181	-0.09	0.05	0.39	0.01	0.38	0.49
612464	MC	6	1884	121181	0.34	0.05	0.38	0.01	0.36	0.04
616845	MC	8	1881	121181	-0.51	0.06	-0.67	0.01	-0.69	-0.19
612466	MC	8	1881	121181	-0.11	0.05	0.04	0.01	0.03	0.16
612456	MC	7	1881	121181	0.51	0.05	0.55	0.01	0.54	0.05
612462	MC	9	1884	121181	-0.05	0.05	-0.18	0.01	-0.20	-0.14
614631	CR	-7	1880	121181	0.59	0.07	0.18	0.01	0.17	-0.29
614675	CR	10	1860	121181	0.88	0.07	0.85	0.01	0.83	-0.13
614674	CR	11	1859	121181	0.87	0.06	1.26	0.01	1.24	0.36
614016	CR	-9	1858	121181	1.69	0.06	1.49	0.01	1.47	-0.35
613847	CR	8	1880	121181	0.40	0.08	0.39	0.01	0.38	0.01
613848	CR	9	1878	121181	0.86	0.09	1.31	0.01	1.29	0.26

Table L–4. Evaluation of Algebra I Item Difficulty Stability: Spring

Item ID	Item Type	Sequence Change	Old *N*	New *N*	Old Logit	Old SEM	New Logit	New SEM	Equated Logit	Displacement
605231	MC	-13	3698	247822	-0.54	0.05	-0.89	0.00	-0.60	-0.10
605216	MC	-9	3671	247822	-0.23	0.05	-0.46	0.00	-0.17	0.05
631616	MC	-7	3664	247822	0.49	0.05	0.20	0.00	0.49	0.02
605214	MC	-8	3680	247822	0.73	0.05	0.22	0.00	0.51	-0.20
633399	MC	-8	3687	247822	0.51	0.05	0.37	0.00	0.67	0.18
631602	MC	-5	3703	247822	0.75	0.05	0.50	0.00	0.80	0.07
632146	MC	-7	4195	247822	-0.31	0.05	-0.69	0.00	-0.39	-0.12
605205	MC	-5	4195	247822	1.33	0.05	1.02	0.00	1.31	0.02
605085	MC	-4	3703	247822	0.52	0.05	0.05	0.00	0.35	-0.17
632149	MC	6	4195	247822	-0.80	0.06	-0.72	0.00	-0.43	0.34
605292	MC	7	3664	247822	0.79	0.05	0.48	0.00	0.78	0.01
632366	MC	6	3672	247822	0.22	0.05	0.15	0.00	0.45	0.23
605237	MC	8	3703	247822	-0.39	0.05	-0.72	0.00	-0.43	-0.06
605244	MC	10	3652	247822	0.93	0.05	0.65	0.00	0.95	0.04
633257	MC	9	3703	247822	0.12	0.05	-0.19	0.00	0.10	-0.02
633532	MC	9	3709	247822	0.50	0.05	0.25	0.00	0.54	0.06
605108	MC	12	4193	247822	-0.15	0.05	-0.39	0.00	-0.09	0.04
633250	MC	14	3682	247822	-0.48	0.05	-0.35	0.00	-0.06	0.42
605179	MC	-9	3703	247822	-0.54	0.05	-0.33	0.00	-0.04	0.49
605277	MC	-11	3652	247822	-0.30	0.05	-0.48	0.00	-0.18	0.10
605268	MC	-8	3652	247822	0.79	0.05	0.31	0.00	0.60	-0.17
632160	MC	-10	3652	247822	1.36	0.05	0.80	0.00	1.10	-0.22
605147	MC	-9	3664	247822	0.71	0.05	-0.20	0.00	0.10	-0.61
632360	MC	-8	3709	247822	-0.15	0.05	-0.37	0.00	-0.07	0.07
605110	MC	-4	3698	247822	-0.62	0.05	-1.02	0.00	-0.73	-0.16
605150	MC	-3	4213	247822	0.96	0.05	0.69	0.00	0.98	0.05
605157	MC	-4	4207	247822	1.02	0.05	0.82	0.00	1.12	0.14
605163	MC	5	3682	247822	0.07	0.05	-0.22	0.00	0.08	-0.01
605233	MC	7	4207	247822	1.21	0.05	0.81	0.00	1.10	-0.08
632153	MC	5	4207	247822	-0.65	0.05	-0.67	0.00	-0.38	0.25
605167	MC	6	3703	247822	0.88	0.05	0.55	0.00	0.85	0.00
605099	MC	9	4195	247822	1.03	0.05	0.37	0.00	0.66	-0.34
633533	MC	9	4207	247822	0.30	0.05	-0.02	0.00	0.28	-0.02
640270	MC	13	3652	247822	0.58	0.05	0.29	0.00	0.59	0.02
605276	MC	12	4193	247822	-0.56	0.05	-0.52	0.00	-0.22	0.32
605275	MC	15	3680	247822	0.02	0.05	-0.30	0.00	0.00	-0.04
640372	CR	-1	1947	247822	1.73	0.03	1.45	0.00	1.74	0.04
628222	CR	10	2002	247822	0.69	0.02	0.45	0.00	0.74	0.06
640376	CR	11	1929	247822	0.81	0.02	0.76	0.00	1.05	0.25
632505	CR	-1	2027	247822	1.13	0.02	0.46	0.00	0.75	-0.37
628225	CR	10	1909	247822	0.97	0.03	0.72	0.00	1.02	0.07
628226	CR	11	1966	247822	0.42	0.03	0.03	0.00	0.32	-0.16

Table L–5. Evaluation of Biology Item Difficulty Stability: Spring

Item ID	Item Type	Sequence Change	Old *N*	New *N*	Old Logit	Old SEM	New Logit	New SEM	Equated Logit	Displacement
635782	MC	-15	1614	180312	-0.03	0.05	-0.02	0.01	-0.13	-0.08
635763	MC	-20	1595	180312	0.46	0.05	0.38	0.01	0.27	-0.17
607738	MC	-11	1753	180312	0.22	0.05	0.27	0.01	0.16	-0.04
607724	MC	-9	1624	180312	0.07	0.05	0.14	0.01	0.04	-0.01
610880	MC	-17	1632	180312	-0.16	0.05	-0.18	0.01	-0.29	-0.10
610887	MC	-8	1748	180312	0.28	0.05	0.29	0.01	0.18	-0.07
610459	MC	-13	1734	180312	0.03	0.05	-0.09	0.01	-0.20	-0.21
634307	MC	-6	1614	180312	0.08	0.05	0.19	0.01	0.08	0.03
611387	MC	-6	1753	180312	0.28	0.05	-0.11	0.01	-0.22	-0.47
635602	MC	-5	1717	180312	-0.06	0.05	0.13	0.01	0.02	0.11
607082	MC	-8	1620	180312	-0.52	0.06	-0.62	0.01	-0.73	-0.19
607081	MC	-8	1620	180312	-1.08	0.06	-1.12	0.01	-1.23	-0.13
607103	MC	10	1592	180312	-0.87	0.06	-0.95	0.01	-1.06	-0.17
635783	MC	3	1744	180312	-0.29	0.05	-0.25	0.01	-0.36	-0.04
609427	MC	3	1620	180312	-0.36	0.05	-0.53	0.01	-0.64	-0.25
607789	MC	11	1614	180312	0.54	0.05	0.57	0.01	0.46	-0.06
635799	MC	5	1734	180312	-0.58	0.05	-0.43	0.01	-0.54	0.07
610483	MC	6	1602	180312	0.93	0.06	1.15	0.01	1.04	0.11
607706	MC	14	1737	180312	0.38	0.05	0.22	0.01	0.11	-0.25
635786	MC	8	1748	180312	0.40	0.05	0.36	0.01	0.25	-0.12
610882	MC	10	1613	180312	-0.12	0.05	0.10	0.01	-0.01	0.15
612579	MC	11	1620	180312	-0.13	0.05	0.04	0.01	-0.07	0.08
607720	MC	20	1609	180312	0.00	0.05	0.09	0.01	-0.02	0.01
610907	MC	18	1747	180312	-0.01	0.05	0.22	0.01	0.11	0.15
608019	MC	-12	1748	180312	0.16	0.05	0.16	0.01	0.05	-0.08
608274	MC	-14	1748	180312	-0.23	0.05	-0.18	0.01	-0.29	-0.04
607578	MC	-11	1620	180312	0.67	0.06	1.06	0.01	0.95	0.29
608286	MC	-11	1619	180312	0.36	0.05	0.57	0.01	0.46	0.11
611436	MC	-11	1609	180312	0.33	0.05	0.55	0.01	0.44	0.13
610913	MC	-15	1744	180312	-0.76	0.05	-0.81	0.01	-0.92	-0.13
612588	MC	-15	1737	180312	0.37	0.05	0.60	0.01	0.49	0.14
609389	MC	-8	1632	180312	-0.37	0.05	-0.65	0.01	-0.76	-0.37
607752	MC	-6	1595	180312	-0.43	0.05	-0.42	0.01	-0.53	-0.08
610895	MC	-11	1757	180312	-0.28	0.05	-0.32	0.01	-0.43	-0.12
610453	MC	-8	1595	180312	-1.45	0.07	-1.54	0.01	-1.65	-0.18
610452	MC	-8	1595	180312	-0.57	0.06	-0.64	0.01	-0.75	-0.16
611921	MC	4	1602	180312	-1.02	0.06	-0.95	0.01	-1.06	-0.02
612587	MC	2	1761	180312	-0.09	0.05	-0.13	0.01	-0.24	-0.13
610904	MC	11	1624	180312	0.27	0.05	0.39	0.01	0.28	0.04
611072	MC	10	1744	180312	-0.37	0.05	-0.38	0.01	-0.49	-0.09
611150	MC	12	1744	180312	0.13	0.05	0.30	0.01	0.19	0.09
608383	MC	6	1614	180312	0.76	0.06	0.77	0.01	0.66	-0.09

Item ID	Item Type	Sequence Change	Old *N*	New *N*	Old Logit	Old SEM	New Logit	New SEM	Equated Logit	Displacement
611398	MC	16	1619	180312	0.59	0.05	1.03	0.01	0.92	0.34
611611	MC	16	1602	180312	1.01	0.06	1.03	0.01	0.92	-0.09
611926	MC	16	1613	180312	0.07	0.05	0.45	0.01	0.34	0.28
635601	MC	19	1761	180312	-0.35	0.05	-0.25	0.01	-0.36	0.01
608283	MC	12	1609	180312	-0.77	0.06	-0.75	0.01	-0.86	-0.06
610527	MC	21	1609	180312	0.17	0.05	0.27	0.01	0.16	0.01
629477	CR	-1	1748	180312	0.93	0.03	1.05	0.00	0.94	-0.09
609478	CR	17	1737	180312	1.46	0.03	1.51	0.00	1.40	-0.11
607796	CR	18	1619	180312	1.46	0.03	1.84	0.00	1.73	0.11
610866	CR	-1	1614	180312	0.88	0.03	1.34	0.00	1.23	0.27
608339	CR	17	1747	180312	-0.38	0.03	0.06	0.00	-0.05	0.28
608341	CR	18	1716	180312	0.77	0.03	0.96	0.00	0.85	0.13

Table L–6. Evaluation of Literature Item Difficulty Stability: Spring

ItemID	Item Type	Sequence Change	Old *N*	New *N*	Old Logit	Old SEM	New Logit	New SEM	Equated Logit	Displacement
610429	MC	-10	1671	156153	-0.45	0.06	-0.36	0.01	-0.32	0.12
610427	MC	-11	1671	156153	0.58	0.05	0.80	0.01	0.84	0.28
610415	MC	-7	1699	156153	0.11	0.06	0.14	0.01	0.18	0.08
610414	MC	-7	1699	156153	1.33	0.06	1.15	0.01	1.20	-0.10
610433	MC	-9	1671	156153	-0.60	0.06	-0.74	0.01	-0.69	-0.12
610401	MC	-8	1699	156153	0.42	0.05	1.20	0.01	1.25	0.86
610428	MC	-6	1699	156153	-0.04	0.06	0.42	0.01	0.46	0.52
610402	MC	-2	1671	156153	-0.31	0.06	-0.15	0.01	-0.10	0.21
610434	MC	-6	1699	156153	0.20	0.06	0.28	0.01	0.32	0.13
610417	MC	8	1879	156153	-1.61	0.07	-1.12	0.01	-1.08	0.50
610419	MC	6	1846	156153	-0.15	0.05	-0.02	0.01	0.03	0.18
610451	MC	9	1879	156153	1.18	0.05	1.32	0.01	1.37	0.23
610416	MC	8	1879	156153	-1.70	0.08	-1.30	0.01	-1.25	0.41
610424	MC	10	1846	156153	0.30	0.05	0.28	0.01	0.32	0.03
610422	MC	13	1846	156153	0.68	0.05	0.74	0.01	0.79	0.13
610421	MC	10	1846	156153	0.39	0.05	0.43	0.01	0.47	0.10
610425	MC	10	1879	156153	-0.24	0.06	-0.05	0.01	0.00	0.24
612468	MC	-11	1694	156153	-1.19	0.07	-1.39	0.01	-1.34	-0.22
612471	MC	-11	1694	156153	-0.86	0.06	-0.99	0.01	-0.95	-0.13
612474	MC	-9	1704	156153	-0.39	0.06	-0.38	0.01	-0.33	0.03
616849	MC	-10	1694	156153	-0.21	0.06	-0.46	0.01	-0.42	-0.23
612476	MC	-12	1694	156153	-0.03	0.06	-0.36	0.01	-0.31	-0.30
612479	MC	-10	1694	156153	0.64	0.05	0.48	0.01	0.52	-0.10
612467	MC	-10	1704	156153	0.70	0.05	0.87	0.01	0.92	0.24
612469	MC	-8	1704	156153	-0.55	0.06	-0.90	0.01	-0.85	-0.34
612435	MC	5	1712	156153	0.45	0.05	0.22	0.01	0.26	-0.19
612437	MC	6	1689	156153	-0.55	0.06	-0.80	0.01	-0.75	-0.24
612442	MC	6	1712	156153	-0.74	0.06	-0.82	0.01	-0.77	-0.06
612444	MC	7	1689	156153	0.06	0.06	-0.23	0.01	-0.18	-0.26
612434	MC	7	1712	156153	-0.37	0.06	-0.16	0.01	-0.12	0.25
612433	MC	7	1689	156153	0.37	0.05	-0.08	0.01	-0.04	-0.41
612443	MC	7	1689	156153	0.15	0.06	0.18	0.01	0.23	0.08
612440	MC	8	1712	156153	0.60	0.05	0.53	0.01	0.57	-0.01
640206	MC	8	1689	156153	0.91	0.05	1.29	0.01	1.34	0.47
613655	CR	-6	1671	156153	1.08	0.04	0.50	0.00	0.55	-0.55
613263	CR	10	1845	156153	1.16	0.04	1.19	0.00	1.24	0.05
613264	CR	11	1879	156153	1.48	0.03	1.53	0.00	1.58	0.17
613849	CR	-9	1702	156153	1.10	0.03	0.67	0.00	0.71	-0.35
614013	CR	8	1711	156153	0.91	0.03	0.78	0.00	0.82	-0.12
614014	CR	9	1689	156153	1.25	0.03	1.19	0.00	1.24	-0.09

Table L–7. Evaluation of Algebra I Item Difficulty Stability: Summer

ItemID	Item Type	Sequence Change	Old *N*	New *N*	Old Logit	Old SEM	New Logit	New SEM	Equated Logit	Displacement
605056	MC	-10	3709	2143	-0.42	0.05	-0.53	0.05	-0.18	0.21
631615	MC	-12	3703	2143	-0.63	0.05	-1.07	0.05	-0.72	-0.12
605075	MC	-9	4179	2143	0.54	0.05	0.13	0.05	0.48	-0.07
605134	MC	-9	3680	2143	1.36	0.05	1.03	0.05	1.38	0.05
632347	MC	-7	3672	2143	-0.11	0.05	-0.31	0.05	0.04	0.14
605213	MC	-6	4349	2143	0.98	0.05	0.65	0.05	1.00	0.03
633256	MC	-7	3682	2143	0.66	0.05	-0.24	0.05	0.11	-0.56
632144	MC	-2	4213	2143	0.90	0.05	0.73	0.05	1.08	0.20
605263	MC	-1	3697	2143	1.02	0.05	0.33	0.05	0.68	-0.32
605088	MC	5	3687	2143	-0.21	0.05	-0.37	0.05	-0.02	0.17
633246	MC	6	4195	2143	0.12	0.05	0.05	0.05	0.40	0.28
605139	MC	9	3703	2143	1.10	0.05	0.52	0.05	0.87	-0.22
605299	MC	10	3687	2143	0.22	0.05	-0.22	0.05	0.13	-0.10
605051	MC	9	4213	2143	0.73	0.05	0.23	0.05	0.58	-0.14
631599	MC	10	3664	2143	-0.72	0.06	-1.22	0.05	-0.87	-0.19
633258	MC	10	3709	2143	0.60	0.05	0.07	0.05	0.42	-0.19
605215	MC	12	3703	2143	1.56	0.05	1.41	0.06	1.76	0.23
640657	MC	11	4207	2143	0.96	0.05	0.46	0.05	0.80	-0.15
605101	MC	-9	4207	2143	-1.06	0.06	-1.35	0.05	-1.00	0.02
605160	MC	-8	4213	2143	-0.58	0.05	-1.15	0.05	-0.80	-0.26
605174	MC	-7	3709	2143	-0.39	0.05	-0.80	0.05	-0.45	-0.09
605158	MC	-10	4165	2143	1.29	0.05	0.76	0.05	1.11	-0.17
633251	MC	-6	4195	2143	-0.51	0.05	-0.87	0.05	-0.52	-0.04
631612	MC	-5	4193	2143	1.42	0.05	1.16	0.05	1.51	0.12
633401	MC	-5	3671	2143	-0.29	0.05	-0.81	0.05	-0.46	-0.20
605288	MC	-4	3698	2143	1.10	0.05	1.11	0.05	1.46	0.39
605178	MC	-2	3703	2143	0.71	0.05	0.27	0.05	0.62	-0.08
632163	MC	5	3703	2143	0.35	0.05	-0.13	0.05	0.22	-0.14
605067	MC	7	3672	2143	0.55	0.05	0.22	0.05	0.57	0.02
605149	MC	9	4195	2143	-0.36	0.05	-0.70	0.05	-0.35	-0.02
605130	MC	10	4165	2143	-0.66	0.05	-0.48	0.05	-0.13	0.52
605165	MC	10	3687	2143	0.96	0.05	0.38	0.05	0.73	-0.23
605309	MC	8	3697	2143	0.46	0.05	0.08	0.05	0.43	-0.03
632355	MC	13	3664	2143	0.12	0.05	0.29	0.05	0.64	0.52
632156	MC	12	3697	2143	0.58	0.05	0.23	0.05	0.58	0.00
632361	MC	11	3687	2143	0.89	0.05	0.11	0.05	0.46	-0.43
631618	CR	-1	1949	2143	2.03	0.03	1.49	0.03	1.84	-0.21
613666	CR	10	2008	2143	1.61	0.03	1.21	0.03	1.56	0.04
632542	CR	11	2016	2143	1.37	0.03	1.12	0.03	1.47	0.12
632546	CR	-1	1900	2143	1.35	0.02	1.14	0.03	1.48	0.08
616433	CR	10	2016	2143	-0.43	0.02	-0.73	0.02	-0.38	0.10
628223	CR	11	2002	2143	0.93	0.02	0.69	0.02	1.04	0.07

Table L–8. Evaluation of Biology Item Difficulty Stability: Summer

ItemID	Item Type	Sequence Change	Old *N*	New *N*	Old Logit	Old SEM	New Logit	New SEM	Equated Logit	Displacement
635793	MC	-12	1744	1071	-2.14	0.08	-2.60	0.11	-2.60	-0.53
608377	MC	-14	1611	1071	-0.14	0.05	0.00	0.06	0.00	0.14
635766	MC	-18	1592	1071	0.43	0.05	0.33	0.07	0.33	-0.10
635750	MC	-11	1620	1071	0.16	0.05	0.10	0.07	0.10	-0.05
610877	MC	-10	1744	1071	0.33	0.05	-0.81	0.07	-0.80	-1.16
635762	MC	-8	1620	1071	0.45	0.05	0.42	0.07	0.42	-0.02
612386	MC	-8	1619	1071	-0.38	0.05	-0.37	0.07	-0.37	0.00
610524	MC	-7	1744	1071	-0.73	0.05	-0.42	0.07	-0.42	0.30
611392	MC	-6	1761	1071	0.42	0.05	0.30	0.07	0.30	-0.12
611384	MC	-4	1734	1071	-0.12	0.05	-0.07	0.06	-0.06	0.05
607712	MC	-3	1735	1071	0.37	0.05	0.19	0.07	0.19	-0.17
618060	MC	-7	1821	1071	-0.74	0.05	-0.49	0.07	-0.49	0.24
611031	MC	4	1744	1071	0.49	0.05	0.68	0.07	0.68	0.21
609390	MC	4	1744	1071	-1.16	0.06	-1.25	0.07	-1.25	-0.12
607118	MC	9	1609	1071	0.75	0.06	0.93	0.07	0.93	0.20
611477	MC	7	1734	1071	-1.04	0.06	-0.99	0.07	-0.99	0.03
608083	MC	5	1744	1071	0.31	0.05	0.03	0.06	0.03	-0.28
635753	MC	6	1761	1071	0.25	0.05	0.61	0.07	0.62	0.38
635597	MC	10	1761	1071	-0.57	0.05	-0.43	0.07	-0.43	0.13
607702	MC	8	1613	1071	-0.45	0.05	-0.25	0.06	-0.25	0.20
611008	MC	18	1598	1071	0.25	0.05	0.22	0.07	0.22	-0.03
611037	MC	10	1597	1071	-0.48	0.06	-0.63	0.07	-0.63	-0.17
611156	MC	20	1595	1071	-0.69	0.06	-0.27	0.06	-0.27	0.41
635760	MC	19	1713	1071	-0.63	0.05	-0.23	0.06	-0.23	0.40
611053	MC	-20	1598	1071	-0.45	0.06	-0.56	0.07	-0.55	-0.11
607085	MC	-20	1744	1071	0.08	0.05	0.15	0.07	0.15	0.08
607590	MC	-12	1602	1071	0.22	0.05	0.22	0.07	0.22	0.00
612594	MC	-12	1613	1071	0.48	0.05	0.44	0.07	0.44	-0.04
607668	MC	-8	1613	1071	0.54	0.05	0.50	0.07	0.50	-0.03
610479	MC	-16	1616	1071	0.88	0.06	0.79	0.07	0.79	-0.08
611507	MC	-15	1598	1071	0.23	0.05	-0.04	0.06	-0.04	-0.27
612675	MC	-6	1609	1071	-0.22	0.05	-0.38	0.07	-0.38	-0.16
611074	MC	-10	1734	1071	-0.13	0.05	-0.04	0.06	-0.04	0.09
610909	MC	-3	1592	1071	0.05	0.05	0.22	0.07	0.23	0.18
611923	MC	-8	1624	1071	0.63	0.05	0.61	0.07	0.61	-0.01
607754	MC	-1	1735	1071	0.67	0.05	0.46	0.07	0.46	-0.20
607586	MC	4	1632	1071	-0.16	0.05	-0.09	0.06	-0.09	0.07
607092	MC	4	1632	1071	0.60	0.06	0.48	0.07	0.48	-0.12
608382	MC	10	1598	1071	-1.00	0.06	-0.83	0.07	-0.83	0.15
607589	MC	10	1744	1071	-0.06	0.05	0.00	0.06	0.00	0.06
608345	MC	14	1620	1071	0.00	0.05	0.14	0.07	0.14	0.14

ItemID	Item Type	Sequence Change	Old *N*	New *N*	Old Logit	Old SEM	New Logit	New SEM	Equated Logit	Displacement
612667	MC	13	1614	1071	0.66	0.06	0.92	0.07	0.92	0.28
607748	MC	13	1737	1071	0.98	0.06	0.94	0.07	0.94	-0.02
612664	MC	14	1761	1071	0.73	0.05	0.97	0.07	0.97	0.26
608271	MC	11	1734	1071	0.75	0.05	0.65	0.07	0.65	-0.09
611509	MC	12	1616	1071	-0.63	0.06	-0.51	0.07	-0.51	0.11
611046	MC	18	1713	1071	0.15	0.05	0.18	0.07	0.18	0.04
611925	MC	21	1744	1071	-0.31	0.05	-0.20	0.06	-0.20	0.11
607764	CR	-1	1613	1071	1.75	0.04	1.54	0.05	1.54	-0.19
607591	CR	0	1595	1071	1.61	0.04	1.98	0.06	1.98	0.29
607772	CR	17	1632	1071	1.85	0.04	1.76	0.05	1.77	-0.19
608356	CR	-1	1757	1071	0.62	0.03	0.42	0.04	0.43	-0.21
608340	CR	0	1620	1071	0.42	0.03	0.49	0.04	0.49	0.02
608350	CR	17	1752	1071	1.82	0.04	1.70	0.05	1.71	0.02

Table L–9. Evaluation of Literature Item Difficulty Stability: Summer

ItemID	Item Type	Sequence Change	Old *N*	New *N*	Old Logit	Old SEM	New Logit	New SEM	Equated Logit	Displacement
614801	MC	-13	1693	737	-0.54	0.06	-1.31	0.10	-1.14	-0.68
614799	MC	-8	1695	737	-0.10	0.06	0.11	0.08	0.27	0.39
614800	MC	-10	1693	737	0.62	0.05	0.43	0.08	0.59	-0.02
614796	MC	-9	1695	737	0.21	0.06	-0.16	0.08	0.01	-0.21
614794	MC	-7	1695	737	-0.28	0.06	-0.51	0.09	-0.35	-0.09
614791	MC	-4	1693	737	0.74	0.05	0.85	0.08	1.01	0.31
614792	MC	-4	1695	737	0.16	0.06	0.06	0.08	0.22	0.07
614798	MC	-3	1693	737	-0.36	0.06	-0.69	0.09	-0.53	-0.20
614793	MC	-6	1695	737	0.34	0.05	-0.28	0.08	-0.12	-0.47
608191	MC	7	1848	737	0.25	0.05	0.34	0.08	0.51	0.27
612420	MC	9	1848	737	-0.77	0.06	-0.52	0.09	-0.36	0.39
612418	MC	9	1868	737	0.50	0.05	0.42	0.08	0.58	0.10
608193	MC	8	1868	737	-0.06	0.05	0.28	0.08	0.44	0.52
612413	MC	8	1848	737	0.47	0.05	0.52	0.08	0.68	0.23
612417	MC	10	1848	737	-0.15	0.05	-0.15	0.08	0.01	0.16
612414	MC	9	1868	737	-1.14	0.07	-0.85	0.09	-0.69	0.42
612415	MC	11	1868	737	-0.11	0.05	-0.22	0.08	-0.06	0.04
608943	MC	-11	1696	737	0.41	0.05	0.26	0.08	0.42	0.02
608939	MC	-12	1696	737	0.25	0.06	-0.04	0.08	0.12	-0.13
616846	MC	-10	1696	737	0.68	0.05	0.74	0.08	0.90	0.26
608941	MC	-11	1696	737	0.62	0.05	0.18	0.08	0.34	-0.27
640221	MC	-12	1696	737	0.82	0.05	0.77	0.08	0.93	0.15
640205	MC	-8	1721	737	0.76	0.05	0.66	0.08	0.82	0.10
608948	MC	-9	1696	737	0.46	0.05	0.23	0.08	0.39	-0.06
608942	MC	-9	1721	737	1.29	0.06	1.67	0.09	1.83	0.60
614687	MC	5	1708	737	0.42	0.05	0.08	0.08	0.24	-0.17
614693	MC	5	1722	737	-0.80	0.06	-0.58	0.09	-0.42	0.36
614690	MC	2	1708	737	0.06	0.06	0.23	0.08	0.39	0.34
614697	MC	8	1722	737	0.00	0.06	-0.27	0.08	-0.11	-0.11
614696	MC	5	1708	737	-1.50	0.08	-1.49	0.11	-1.33	0.10
614698	MC	8	1722	737	-1.46	0.07	-1.42	0.10	-1.26	0.14
614694	MC	8	1708	737	-0.03	0.06	-0.03	0.08	0.13	0.17
614691	MC	7	1722	737	0.60	0.05	0.38	0.08	0.54	-0.05
614689	MC	9	1722	737	0.45	0.05	0.31	0.08	0.47	0.05
614804	CR	-6	1694	737	1.36	0.03	0.54	0.05	0.70	-0.62
608194	CR	10	1868	737	0.71	0.03	0.59	0.05	0.75	0.11
613272	CR	11	1848	737	1.26	0.03	1.32	0.05	1.48	-0.01
613250	CR	-9	1696	737	1.66	0.04	0.91	0.05	1.07	-0.56
614700	CR	8	1708	737	0.41	0.03	0.20	0.05	0.36	-0.06
614699	CR	9	1722	737	0.90	0.04	0.90	0.05	1.06	0.14

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Table L–10. Raw-to-Scaled Score Comparison for Algebra I: Winter

			Post-equating			
	Preequating		All Items		Outliers Removed	
RS	SS	SEM	SS	SEM	SS	SEM
0	1201	92	1201	92	1200	92
1	1263	51	1262	51	1261	51
2	1299	37	1299	37	1298	37
3	1322	30	1321	31	1320	31
4	1338	27	1337	27	1337	27
5	1351	24	1351	24	1350	24
6	1362	23	1362	23	1361	23
7	1372	21	1371	21	1370	21
8	1380	20	1380	20	1379	20
9	1388	19	1388	19	1387	19
10	1395	19	1395	19	1394	19
11	1402	18	1402	18	1401	18
12	1408	18	1408	17	1407	17
13	1414	17	1414	17	1413	17
14	1420	17	1419	16	1418	16
15	1426	16	1425	16	1424	16
16	1431	16	1430	16	1429	16
17	1436	16	1434	15	1433	15
18	1440	15	1439	15	1438	15
19	1445	15	1444	15	1443	15
20	1449	15	1448	15	1447	15
21	1454	15	1452	14	1451	14
22	1458	14	1456	14	1455	14
23	1462	14	1460	14	1459	14
24	1466	14	1464	14	1463	14
25	1470	14	1468	14	1467	14
26	1474	14	1472	14	1471	14
27	1477	14	1475	13	1474	13
28	1481	13	1479	13	1478	13
29	1484	13	1482	13	1481	13
30	1488	13	1486	13	1485	13
31	1491	13	1489	13	1488	13
32	1495	13	1493	13	1492	13
33	1498	13	1496	13	1495	13
34	1502	13	1500	13	1499	13
35	1505	13	1503	13	1502	13
36	1508	13	1507	13	1506	13
37	1512	13	1510	13	1509	13
38	1515	13	1514	13	1513	13
39	1519	13	1517	14	1516	14
40	1523	14	1521	14	1520	14
41	1526	14	1525	14	1524	14

	Preequating		Post-equating			
			All Items		Outliers Removed	
RS	SS	SEM	SS	SEM	SS	SEM
42	1530	14	1529	14	1528	14
43	1534	14	1533	15	1532	15
44	1538	15	1537	15	1536	15
45	1543	15	1542	15	1541	15
46	1547	15	1547	16	1546	16
47	1552	16	1552	16	1551	16
48	1557	16	1557	17	1556	17
49	1563	17	1563	18	1562	18
50	1569	18	1570	18	1569	18
51	1575	19	1577	19	1576	19
52	1583	19	1584	20	1583	20
53	1591	21	1593	21	1592	21
54	1600	22	1603	23	1602	23
55	1610	24	1614	25	1613	25
56	1623	26	1628	28	1627	28
57	1639	30	1646	32	1645	32
58	1661	37	1670	39	1669	39
59	1698	51	1711	53	1710	53
60	1759	92	1776	94	1776	94

Table L–11. Raw-to-Scaled Score Comparison for Biology: Winter

	Preequating		Post-equating			
			All Items		Outliers Removed	
RS	SS	SEM	SS	SEM	SS	SEM
0	1209	92	1204	92	1205	92
1	1270	51	1265	51	1266	51
2	1306	36	1301	36	1302	36
3	1328	30	1323	30	1324	30
4	1344	26	1339	26	1340	26
5	1357	24	1352	24	1353	24
6	1367	22	1363	22	1363	22
7	1376	21	1372	21	1373	21
8	1384	20	1380	20	1381	20
9	1392	19	1387	19	1388	19
10	1398	18	1394	18	1395	18
11	1404	17	1400	17	1401	17
12	1410	17	1406	17	1407	17
13	1416	16	1411	16	1412	16
14	1421	16	1417	16	1417	16
15	1426	15	1422	16	1422	16
16	1430	15	1426	15	1427	15
17	1435	15	1431	15	1432	15
18	1439	15	1435	15	1436	15
19	1443	14	1439	14	1440	14
20	1447	14	1444	14	1444	14
21	1451	14	1448	14	1448	14
22	1455	14	1452	14	1452	14
23	1459	14	1455	14	1456	14
24	1462	14	1459	14	1460	14
25	1466	13	1463	14	1464	14
26	1470	13	1467	14	1467	14
27	1473	13	1470	13	1471	13
28	1477	13	1474	13	1475	13
29	1480	13	1477	13	1478	13
30	1483	13	1481	13	1482	13
31	1487	13	1485	13	1485	13
32	1490	13	1488	13	1489	13
33	1493	13	1492	13	1492	13
34	1497	13	1495	13	1496	13
35	1500	13	1499	13	1500	13
36	1504	13	1502	13	1503	13
37	1507	13	1506	13	1507	13
38	1510	13	1510	14	1510	14
39	1514	13	1513	14	1514	14

			Post-equating			
	Preequating		All Items		Outliers Removed	
RS	SS	SEM	SS	SEM	SS	SEM
40	1517	13	1517	14	1518	14
41	1521	13	1521	14	1522	14
42	1524	13	1525	14	1525	14
43	1528	13	1529	14	1529	14
44	1531	14	1533	14	1533	14
45	1535	14	1537	14	1537	14
46	1539	14	1541	15	1542	15
47	1543	14	1545	15	1546	15
48	1547	14	1549	15	1550	15
49	1551	15	1554	15	1555	15
50	1555	15	1559	16	1560	16
51	1560	15	1564	16	1565	16
52	1565	16	1569	16	1570	16
53	1570	16	1574	17	1575	17
54	1575	16	1580	17	1581	17
55	1581	17	1586	18	1587	18
56	1587	18	1593	18	1593	18
57	1593	18	1600	19	1600	19
58	1600	19	1607	20	1608	20
59	1608	21	1616	21	1617	21
60	1617	22	1625	23	1626	23
61	1628	24	1637	25	1637	25
62	1640	26	1650	27	1651	27
63	1656	30	1666	31	1667	31
64	1678	36	1689	37	1690	37
65	1714	51	1726	51	1727	51
66	1776	92	1788	92	1789	92

Table L–12. Raw-to-Scaled Score Comparison for Literature: Winter

	Preequating		Post-equating			
			All Items		Outliers Removed	
RS	SS	SEM	SS	SEM	SS	SEM
0	1201	92	1199	92	1200	92
1	1262	51	1260	51	1259	51
2	1298	36	1296	36	1295	36
3	1320	30	1318	30	1317	30
4	1336	27	1333	26	1333	26
5	1349	24	1346	24	1345	24
6	1359	22	1357	22	1356	22
7	1369	21	1366	21	1365	21
8	1377	20	1374	20	1374	20
9	1385	19	1382	19	1381	19
10	1392	18	1389	18	1388	18
11	1398	18	1395	18	1395	18
12	1404	17	1401	17	1401	17
13	1410	17	1407	17	1407	17
14	1416	16	1413	16	1412	16
15	1421	16	1418	16	1417	16
16	1426	16	1423	16	1423	16
17	1431	16	1428	16	1428	16
18	1436	16	1433	16	1433	16
19	1441	15	1438	15	1437	15
20	1445	15	1443	15	1442	15
21	1450	15	1447	15	1447	15
22	1455	15	1452	15	1451	15
23	1459	15	1457	15	1456	15
24	1464	15	1461	15	1461	15
25	1468	15	1466	15	1465	15
26	1473	15	1470	15	1470	15
27	1477	15	1475	15	1474	15
28	1482	15	1480	15	1479	15
29	1487	15	1484	15	1484	15
30	1491	15	1489	16	1489	16
31	1496	16	1494	16	1493	16
32	1501	16	1499	16	1498	16
33	1506	16	1504	16	1504	16
34	1511	16	1510	16	1509	16
35	1516	16	1515	17	1515	17
36	1522	17	1521	17	1520	17
37	1528	17	1527	18	1526	18
38	1533	17	1533	18	1533	18
39	1540	18	1540	19	1539	19

	Preequating		Post-equating			
			All Items		Outliers Removed	
RS	SS	SEM	SS	SEM	SS	SEM
40	1546	18	1547	19	1546	19
41	1553	19	1555	20	1554	20
42	1561	20	1563	21	1562	21
43	1569	20	1572	22	1571	22
44	1577	21	1582	23	1581	23
45	1587	23	1592	24	1592	24
46	1598	24	1605	25	1604	25
47	1610	26	1619	27	1618	27
48	1625	28	1635	30	1634	30
49	1643	32	1655	33	1654	33
50	1667	38	1681	39	1680	39
51	1706	52	1721	53	1720	53
52	1770	93	1785	93	1785	93

Table L–13. Raw-to-Scaled Score Comparison for Algebra I: Spring

	Preequating		Post-equating			
			All Items		Outliers Removed	
RS	SS	SEM	SS	SEM	SS	SEM
0	1213	92	1220	92	1219	92
1	1275	51	1281	51	1281	51
2	1311	37	1317	36	1317	36
3	1334	30	1339	30	1338	30
4	1350	27	1355	26	1354	26
5	1363	24	1367	24	1367	24
6	1373	22	1378	22	1377	22
7	1383	21	1387	21	1386	21
8	1391	20	1395	20	1394	20
9	1399	19	1402	19	1402	19
10	1406	18	1409	18	1408	18
11	1412	18	1415	17	1415	17
12	1418	17	1421	17	1420	17
13	1424	17	1426	16	1426	16
14	1429	16	1431	16	1431	16
15	1435	16	1436	15	1436	15
16	1439	16	1441	15	1440	15
17	1444	15	1445	15	1445	15
18	1449	15	1450	15	1449	15
19	1453	15	1454	14	1453	14
20	1458	15	1458	14	1458	14
21	1462	14	1462	14	1461	14
22	1466	14	1466	14	1465	14
23	1470	14	1470	14	1469	14
24	1474	14	1473	14	1473	14
25	1478	14	1477	13	1476	13
26	1481	14	1480	13	1480	13
27	1485	14	1484	13	1483	13
28	1489	13	1487	13	1487	13
29	1492	13	1491	13	1490	13
30	1496	13	1494	13	1494	13
31	1500	13	1498	13	1497	13
32	1503	13	1501	13	1501	13
33	1507	13	1505	13	1504	13
34	1510	13	1508	13	1508	13
35	1514	13	1512	13	1511	13
36	1517	13	1515	13	1514	13
37	1521	13	1518	13	1518	13
38	1524	13	1522	13	1522	13
39	1528	13	1526	13	1525	13

	Preequating		Post-equating			
			All Items		Outliers Removed	
RS	SS	SEM	SS	SEM	SS	SEM
40	1531	14	1529	14	1529	14
41	1535	14	1533	14	1532	14
42	1539	14	1537	14	1536	14
43	1543	14	1541	14	1540	14
44	1547	14	1545	14	1544	14
45	1551	15	1549	15	1548	15
46	1555	15	1553	15	1553	15
47	1560	15	1558	15	1557	15
48	1565	16	1563	16	1562	16
49	1570	16	1568	16	1567	16
50	1575	17	1573	17	1573	17
51	1581	18	1579	18	1579	18
52	1588	18	1586	19	1585	19
53	1595	20	1593	20	1592	20
54	1603	21	1601	21	1601	21
55	1613	23	1611	23	1610	23
56	1625	26	1623	26	1622	26
57	1640	29	1638	29	1637	29
58	1660	36	1659	36	1658	36
59	1696	50	1694	50	1694	50
60	1756	91	1755	92	1755	92

Table L–14. Raw-to-Scaled Score Comparison for Biology: Spring

	Preequating		Post-equating All Items	
RS	SS	SEM	SS	SEM
0	1211	92	1205	92
1	1272	50	1266	51
2	1307	36	1302	36
3	1328	30	1323	30
4	1344	26	1339	26
5	1356	23	1351	24
6	1366	22	1361	22
7	1375	20	1370	20
8	1383	19	1378	19
9	1390	18	1385	18
10	1396	18	1392	18
11	1402	17	1398	17
12	1407	16	1404	17
13	1413	16	1409	16
14	1418	16	1414	16
15	1422	15	1419	15
16	1427	15	1424	15
17	1431	15	1428	15
18	1436	14	1432	15
19	1440	14	1437	14
20	1444	14	1441	14
21	1448	14	1445	14
22	1452	14	1449	14
23	1455	14	1453	14
24	1459	14	1456	14
25	1463	13	1460	14
26	1466	13	1464	14
27	1470	13	1468	13
28	1473	13	1471	13
29	1477	13	1475	13
30	1480	13	1478	13
31	1484	13	1482	13
32	1487	13	1485	13
33	1490	13	1489	13
34	1494	13	1492	13
35	1497	13	1496	13
36	1500	13	1499	13
37	1504	13	1503	13
38	1507	13	1506	13
39	1510	13	1510	13

RS	Preequating		Post-equating All Items	
	SS	SEM	SS	SEM
40	1514	13	1514	13
41	1517	13	1517	13
42	1521	13	1521	14
43	1524	13	1524	14
44	1528	13	1528	14
45	1531	13	1532	14
46	1535	14	1536	14
47	1539	14	1540	14
48	1543	14	1544	15
49	1547	14	1549	15
50	1551	15	1553	15
51	1555	15	1558	15
52	1560	15	1563	16
53	1564	16	1568	16
54	1569	16	1573	17
55	1575	17	1579	17
56	1581	17	1586	18
57	1587	18	1593	19
58	1594	19	1600	20
59	1602	20	1609	21
60	1611	22	1618	23
61	1621	24	1630	25
62	1634	26	1643	27
63	1649	30	1660	31
64	1671	36	1683	37
65	1707	51	1720	51
66	1769	92	1783	92

Table L–15. Raw-to-Scaled Score Comparison for Literature: Spring

	Preequating		Post-equating			
			All Items		Outliers Removed	
RS	SS	SEM	SS	SEM	SS	SEM
0	1200	92	1200	92	1201	92
1	1261	51	1262	51	1263	51
2	1298	37	1298	37	1299	37
3	1320	30	1320	30	1321	30
4	1336	27	1336	27	1337	27
5	1349	24	1349	24	1350	24
6	1360	23	1360	23	1361	23
7	1370	21	1370	21	1371	21
8	1379	20	1378	20	1379	20
9	1386	19	1386	19	1387	19
10	1394	19	1393	19	1394	19
11	1400	18	1400	18	1401	18
12	1407	18	1406	18	1407	18
13	1413	17	1412	17	1413	17
14	1418	17	1418	17	1419	17
15	1424	16	1424	16	1424	16
16	1429	16	1429	16	1430	16
17	1434	16	1434	16	1435	16
18	1439	16	1439	16	1440	16
19	1444	16	1444	16	1445	16
20	1449	16	1449	16	1450	16
21	1454	15	1454	15	1455	15
22	1459	15	1458	15	1459	15
23	1463	15	1463	15	1464	15
24	1468	15	1468	15	1469	15
25	1473	15	1473	15	1473	15
26	1477	15	1477	15	1478	15
27	1482	15	1482	15	1483	15
28	1487	15	1487	15	1487	15
29	1492	15	1491	15	1492	15
30	1496	16	1496	16	1497	16
31	1501	16	1501	16	1502	16
32	1506	16	1506	16	1507	16
33	1511	16	1511	16	1512	16
34	1516	16	1516	16	1517	16
35	1522	17	1522	17	1522	17
36	1527	17	1527	17	1528	17
37	1533	17	1533	17	1534	17
38	1539	18	1539	18	1540	18
39	1545	18	1545	18	1546	18

			Post-equating			
	Preequating		All Items		Outliers Removed	
RS	SS	SEM	SS	SEM	SS	SEM
40	1552	18	1552	19	1553	19
41	1559	19	1559	19	1560	19
42	1567	20	1567	20	1568	20
43	1575	21	1575	21	1576	21
44	1584	22	1584	22	1585	22
45	1593	23	1594	23	1595	23
46	1605	24	1605	24	1606	24
47	1617	26	1618	26	1619	26
48	1632	29	1633	29	1634	29
49	1651	32	1652	32	1652	32
50	1675	38	1676	39	1677	39
51	1715	52	1716	52	1717	52
52	1779	93	1780	93	1781	93

Table L–16. Raw-to-Scaled Score Comparison for Algebra I: Summer

	Preequating		Post-equating			
			All Items		Outliers Removed	
RS	SS	SEM	SS	SEM	SS	SEM
0	1220	92	1219	92	1219	92
1	1281	51	1281	51	1281	51
2	1318	36	1317	36	1317	36
3	1339	30	1338	30	1338	30
4	1355	26	1354	26	1354	26
5	1368	24	1367	24	1367	24
6	1378	22	1377	22	1377	22
7	1387	21	1387	21	1387	21
8	1395	20	1395	20	1395	20
9	1403	19	1402	19	1402	19
10	1410	18	1409	18	1409	18
11	1416	17	1415	18	1415	18
12	1422	17	1421	17	1421	17
13	1427	16	1427	17	1427	17
14	1433	16	1432	16	1432	16
15	1438	16	1438	16	1438	16
16	1443	16	1442	16	1442	16
17	1447	15	1447	15	1447	15
18	1452	15	1452	15	1452	15
19	1456	15	1456	15	1456	15
20	1461	15	1461	15	1461	15
21	1465	15	1465	15	1465	15
22	1469	14	1469	14	1469	14
23	1473	14	1473	14	1473	14
24	1477	14	1477	14	1477	14
25	1481	14	1481	14	1481	14
26	1485	14	1485	14	1485	14
27	1489	14	1489	14	1489	14
28	1493	14	1493	14	1493	14
29	1496	14	1497	14	1497	14
30	1500	14	1501	14	1501	14
31	1504	14	1504	14	1504	14
32	1507	13	1508	14	1508	14
33	1511	13	1512	14	1512	14
34	1515	13	1515	14	1515	14
35	1518	14	1519	14	1519	14
36	1522	14	1523	14	1523	14
37	1526	14	1527	14	1527	14
38	1529	14	1531	14	1530	14
39	1533	14	1534	14	1534	14

			Post-equating			
	Preequating		All Items		Outliers Removed	
RS	SS	SEM	SS	SEM	SS	SEM
40	1537	14	1538	14	1538	14
41	1541	14	1542	14	1542	14
42	1545	14	1546	14	1546	14
43	1549	15	1550	15	1550	15
44	1554	15	1555	15	1555	15
45	1558	15	1559	15	1559	15
46	1563	16	1564	15	1564	15
47	1568	16	1569	16	1569	16
48	1573	16	1574	16	1574	16
49	1579	17	1579	17	1579	17
50	1585	18	1585	17	1585	17
51	1591	18	1591	18	1591	18
52	1598	19	1598	19	1598	19
53	1606	21	1606	20	1606	20
54	1615	22	1614	22	1614	22
55	1626	24	1624	24	1624	24
56	1639	27	1637	26	1637	26
57	1655	30	1653	30	1653	30
58	1677	37	1675	37	1675	37
59	1714	51	1713	52	1713	52
60	1776	92	1776	92	1776	92

Table L–17. Raw-to-Scaled Score Comparison for Biology: Summer

	Preequating		Post-equating			
			All Items		Outliers Removed	
RS	SS	SEM	SS	SEM	SS	SEM
0	1211	92	1208	92	1207	92
1	1272	51	1270	51	1269	51
2	1308	37	1307	37	1306	37
3	1330	30	1329	31	1328	31
4	1346	27	1345	27	1344	27
5	1359	24	1358	24	1357	24
6	1370	22	1369	22	1368	22
7	1379	21	1378	21	1377	21
8	1387	20	1386	20	1386	20
9	1394	19	1394	19	1393	19
10	1401	18	1401	18	1400	18
11	1407	17	1407	17	1406	17
12	1413	17	1413	17	1412	17
13	1419	16	1418	16	1417	16
14	1424	16	1423	16	1423	16
15	1429	16	1428	16	1427	16
16	1433	15	1433	15	1432	15
17	1438	15	1438	15	1437	15
18	1442	15	1442	15	1441	15
19	1447	14	1446	14	1445	14
20	1451	14	1450	14	1449	14
21	1455	14	1454	14	1453	14
22	1458	14	1458	14	1457	14
23	1462	14	1462	14	1461	14
24	1466	14	1466	14	1465	14
25	1470	13	1469	13	1468	13
26	1473	13	1473	13	1472	13
27	1477	13	1476	13	1475	13
28	1480	13	1480	13	1479	13
29	1484	13	1483	13	1482	13
30	1487	13	1487	13	1486	13
31	1490	13	1490	13	1489	13
32	1494	13	1494	13	1493	13
33	1497	13	1497	13	1496	13
34	1500	13	1500	13	1500	13
35	1504	13	1504	13	1503	13
36	1507	13	1507	13	1506	13
37	1511	13	1511	13	1510	13
38	1514	13	1514	13	1513	13
39	1518	13	1518	13	1517	13

			Post-equating			
	Preequating		All Items		Outliers Removed	
RS	SS	SEM	SS	SEM	SS	SEM
40	1521	13	1521	13	1520	13
41	1525	13	1525	13	1524	13
42	1528	14	1529	14	1528	14
43	1532	14	1532	14	1531	14
44	1536	14	1536	14	1535	14
45	1540	14	1540	14	1539	14
46	1544	14	1544	14	1543	14
47	1548	14	1548	14	1547	14
48	1552	15	1552	15	1552	15
49	1556	15	1557	15	1556	15
50	1561	15	1561	15	1561	15
51	1565	16	1566	16	1565	16
52	1570	16	1571	16	1570	16
53	1576	16	1577	16	1576	16
54	1581	17	1582	17	1581	17
55	1587	17	1588	18	1587	18
56	1593	18	1594	18	1594	18
57	1600	19	1601	19	1600	19
58	1607	20	1609	20	1608	20
59	1616	21	1617	21	1616	21
60	1625	23	1627	22	1626	22
61	1636	24	1638	24	1637	24
62	1649	27	1651	27	1650	27
63	1666	31	1667	31	1666	31
64	1689	38	1690	37	1689	37
65	1728	52	1727	51	1726	51
66	1792	93	1789	92	1788	92

Table L–18. Raw-to-Scaled Score Comparison for Literature: Summer

	Preequating		Post-equating			
			All Items		Outliers Removed	
RS	SS	SEM	SS	SEM	SS	SEM
0	1204	92	1205	92	1200	92
1	1266	51	1266	51	1262	51
2	1302	37	1303	37	1298	37
3	1324	30	1325	30	1320	30
4	1340	27	1341	27	1336	27
5	1353	24	1354	24	1349	24
6	1364	23	1364	22	1360	22
7	1374	21	1374	21	1369	21
8	1382	20	1382	20	1377	20
9	1390	19	1390	19	1385	19
10	1397	19	1397	18	1392	18
11	1404	18	1404	18	1399	18
12	1410	17	1410	17	1405	17
13	1416	17	1416	17	1411	17
14	1422	17	1421	17	1416	17
15	1427	16	1427	16	1422	16
16	1432	16	1432	16	1427	16
17	1438	16	1437	16	1432	16
18	1442	16	1442	16	1437	16
19	1447	15	1447	15	1442	15
20	1452	15	1452	15	1447	15
21	1457	15	1456	15	1451	15
22	1461	15	1461	15	1456	15
23	1466	15	1465	15	1461	15
24	1471	15	1470	15	1465	15
25	1475	15	1475	15	1470	15
26	1480	15	1479	15	1474	15
27	1484	15	1484	15	1479	15
28	1489	15	1488	15	1483	15
29	1494	15	1493	15	1488	15
30	1498	15	1498	15	1493	15
31	1503	16	1502	16	1498	16
32	1508	16	1507	16	1503	16
33	1513	16	1512	16	1507	16
34	1518	16	1517	16	1513	16
35	1523	16	1523	16	1518	16
36	1529	17	1528	17	1523	17
37	1534	17	1534	17	1529	17
38	1540	17	1540	17	1535	17
39	1546	18	1546	18	1541	18

			Post-equating			
	Preequating		All Items		Outliers Removed	
RS	SS	SEM	SS	SEM	SS	SEM
40	1553	18	1552	18	1548	18
41	1559	19	1559	19	1554	19
42	1567	19	1567	20	1562	20
43	1575	20	1575	20	1570	20
44	1583	21	1583	21	1578	21
45	1593	22	1593	23	1588	23
46	1603	24	1604	24	1599	24
47	1615	26	1616	26	1611	26
48	1630	28	1631	28	1626	28
49	1647	32	1649	32	1644	32
50	1671	38	1673	38	1669	38
51	1709	52	1713	52	1708	52
52	1772	92	1776	93	1772	93

APPENDIX M: RELIABILITIES

Table M–1. Reliabilities

Column Heading	Definition
Level	Total test or module level
Group	Student group: all students or subgroup
Pts.	Max points possible
Len.	Test length
N	Number of students
Mean	Mean of raw score
SD	Standard deviation of raw score
r	Reliability coefficient: Cronbach's alpha
SEM	Standard error of measurement

Note: "DNR" in the tables below represents "Do Not Report". This happened only when the *N* count was small.

Table M–2. Winter: Algebra I Reliabilities

	Level	Group	Pts.	Len.	*N*	Mean	SD	r	*SEM*
Overall	Total	All	60	42	215160	34.06	13.23	0.91	3.89
	Module 1	All	30	21	215160	16.33	6.64	0.85	2.58
	Module 2	All	30	21	215160	17.73	7.10	0.83	2.91
Gender	**Level**	**Group**	**Pts.**	**Len.**	***N***	**Mean**	**SD**	**r**	***SEM***
	Total	Female	60	42	106173	34.35	12.86	0.91	3.90
		Male	60	42	107935	33.84	13.56	0.92	3.88
	Module 1	Female	30	21	106173	16.49	6.48	0.84	2.59
		Male	30	21	107935	16.21	6.78	0.86	2.57
	Module 2	Female	30	21	106173	17.86	6.91	0.82	2.92
		Male	30	21	107935	17.63	7.28	0.84	2.91
Ethnicity	**Level**	**Group**	**Pts.**	**Len.**	***N***	**Mean**	**SD**	**r**	***SEM***
	Total	African American	60	42	29103	24.75	12.02	0.90	3.77
		American Indian	60	42	279	31.74	13.71	0.92	3.90
		Asian	60	42	7740	40.81	13.68	0.93	3.73
		Hispanic	60	42	15499	25.79	12.45	0.91	3.80
		Multi-racial	60	42	2673	31.22	13.17	0.91	3.91
		Native Hawaiian/ Pacific Islander	60	42	124	35.62	13.90	0.92	3.92
		White	60	42	156498	36.45	12.27	0.90	3.84
	Module 1	African American	30	21	29103	11.73	6.05	0.83	2.49
		American Indian	30	21	279	15.38	6.76	0.85	2.61
		Asian	30	21	7740	19.73	6.89	0.87	2.50
		Hispanic	30	21	15499	12.21	6.23	0.84	2.51
		Multi-racial	30	21	2673	14.93	6.59	0.85	2.58
		Native Hawaiian/ Pacific Islander	30	21	124	16.86	7.06	0.86	2.60
		White	30	21	156498	17.51	6.17	0.83	2.56
	Module 2	African American	30	21	29103	13.02	6.54	0.81	2.83
		American Indian	30	21	279	16.36	7.40	0.85	2.90
		Asian	30	21	7740	21.09	7.23	0.85	2.78
		Hispanic	30	21	15499	13.58	6.77	0.82	2.86
		Multi-racial	30	21	2673	16.29	7.10	0.83	2.94
		Native Hawaiian/ Pacific Islander	30	21	124	18.76	7.28	0.84	2.95
		White	30	21	156498	18.93	6.65	0.81	2.87
ELL	**Level**	**Group**	**Pts.**	**Len.**	***N***	**Mean**	**SD**	**r**	***SEM***
	Total	All	60	42	3992	17.72	10.30	0.89	3.48
	Module 1	All	30	21	3992	8.67	5.54	0.82	2.36
	Module 2	All	30	21	3992	9.06	5.36	0.77	2.56
IEP	**Level**	**Group**	**Pts.**	**Len.**	***N***	**Mean**	**SD**	**r**	***SEM***
	Total	All	60	42	23769	20.79	10.93	0.89	3.58
	Module 1	All	30	21	23769	9.99	5.55	0.82	2.39
	Module 2	All	30	21	23769	10.80	5.95	0.80	2.66
ED	**Level**	**Group**	**Pts.**	**Len.**	***N***	**Mean**	**SD**	**r**	***SEM***
	Total	All	60	42	71802	27.62	12.53	0.91	3.84
	Module 1	All	30	21	71802	13.15	6.27	0.84	2.54
	Module 2	All	30	21	71802	14.48	6.82	0.82	2.88

Table M–3. Winter: Biology Reliabilities

	Level	Group	Pts.	Len.	*N*	Mean	SD	r	*SEM*
Overall	Total	All	66	54	148667	31.90	12.29	0.91	3.63
	Module 1	All	33	27	148667	15.67	6.28	0.84	2.52
	Module 2	All	33	27	148667	16.23	6.59	0.84	2.61
Gender	**Level**	**Group**	**Pts.**	**Len.**	***N***	**Mean**	**SD**	**r**	***SEM***
	Total	Female	66	54	73310	31.76	11.87	0.91	3.64
		Male	66	54	74582	32.11	12.68	0.92	3.61
	Module 1	Female	33	27	73310	15.50	6.01	0.82	2.53
		Male	33	27	74582	15.87	6.52	0.85	2.51
	Module 2	Female	33	27	73310	16.26	6.46	0.84	2.62
		Male	33	27	74582	16.24	6.71	0.85	2.59
Ethnicity	**Level**	**Group**	**Pts.**	**Len.**	***N***	**Mean**	**SD**	**r**	***SEM***
	Total	African American	66	54	19790	23.34	9.74	0.86	3.58
		American Indian	66	54	199	30.66	12.63	0.92	3.60
		Asian	66	54	5400	37.29	13.93	0.93	3.57
		Hispanic	66	54	10185	24.39	10.48	0.88	3.59
		Multi-racial	66	54	1852	29.40	11.99	0.91	3.63
		Native Hawaiian/ Pacific Islander	66	54	90	33.63	12.87	0.92	3.65
		White	66	54	109331	34.00	11.75	0.91	3.62
	Module 1	African American	33	27	19790	11.64	4.95	0.75	2.48
		American Indian	33	27	199	15.05	6.40	0.85	2.47
		Asian	33	27	5400	18.39	7.12	0.88	2.48
		Hispanic	33	27	10185	11.99	5.27	0.78	2.48
		Multi-racial	33	27	1852	14.40	5.99	0.82	2.52
		Native Hawaiian/ Pacific Islander	33	27	90	16.58	6.41	0.84	2.55
		White	33	27	109331	16.67	6.08	0.83	2.52
	Module 2	African American	33	27	19790	11.70	5.50	0.78	2.57
		American Indian	33	27	199	15.62	6.87	0.86	2.60
		Asian	33	27	5400	18.90	7.30	0.88	2.57
		Hispanic	33	27	10185	12.39	5.87	0.81	2.58
		Multi-racial	33	27	1852	15.00	6.58	0.84	2.61
		Native Hawaiian/ Pacific Islander	33	27	90	17.06	7.05	0.86	2.59
		White	33	27	109331	17.34	6.26	0.83	2.59
ELL	**Level**	**Group**	**Pts.**	**Len.**	***N***	**Mean**	**SD**	**r**	***SEM***
	Total	All	66	54	2628	17.72	6.90	0.76	3.40
	Module 1	All	33	27	2628	9.13	3.77	0.60	2.39
	Module 2	All	33	27	2628	8.60	3.97	0.63	2.42
IEP	**Level**	**Group**	**Pts.**	**Len.**	***N***	**Mean**	**SD**	**r**	***SEM***
	Total	All	66	54	18453	21.67	9.28	0.86	3.52
	Module 1	All	33	27	18453	10.89	4.82	0.74	2.45
	Module 2	All	33	27	18453	10.77	5.16	0.76	2.52
ED	**Level**	**Group**	**Pts.**	**Len.**	***N***	**Mean**	**SD**	**r**	***SEM***
	Total	All	66	54	49124	25.82	10.58	0.88	3.62
	Module 1	All	33	27	49124	12.75	5.37	0.78	2.50
	Module 2	All	33	27	49124	13.06	5.87	0.80	2.60

Table M–4. Winter: Literature Reliabilities

	Level	Group	Pts.	Len.	*N*	Mean	SD	r	*SEM*
Overall	Total	All	52	40	140478	34.07	9.84	0.91	2.95
	Module 1	All	26	20	140478	17.16	4.93	0.82	2.09
	Module 2	All	26	20	140478	16.91	5.39	0.85	2.08
Gender	**Level**	**Group**	**Pts.**	**Len.**	***N***	**Mean**	**SD**	**r**	***SEM***
	Total	Female	52	40	68371	35.68	9.21	0.90	2.88
		Male	52	40	71304	32.57	10.16	0.91	2.98
	Module 1	Female	26	20	68371	17.97	4.59	0.80	2.03
		Male	26	20	71304	16.41	5.11	0.83	2.12
	Module 2	Female	26	20	68371	17.71	5.10	0.84	2.04
		Male	26	20	71304	16.16	5.53	0.86	2.10
Ethnicity	**Level**	**Group**	**Pts.**	**Len.**	***N***	**Mean**	**SD**	**r**	***SEM***
	Total	African American	52	40	19549	27.82	10.13	0.90	3.16
		American Indian	52	40	190	34.05	9.63	0.90	3.01
		Asian	52	40	4733	36.15	10.45	0.92	2.86
		Hispanic	52	40	9845	28.26	10.44	0.91	3.13
		Multi-racial	52	40	1709	32.04	10.08	0.91	3.04
		Native Hawaiian/ Pacific Islander	52	40	85	33.45	9.95	0.91	2.94
		White	52	40	102658	35.82	8.90	0.90	2.87
	Module 1	African American	26	20	19549	14.49	5.13	0.81	2.22
		American Indian	26	20	190	17.25	4.97	0.82	2.13
		Asian	26	20	4733	18.25	5.11	0.85	1.99
		Hispanic	26	20	9845	14.57	5.25	0.82	2.22
		Multi-racial	26	20	1709	16.38	5.04	0.82	2.14
		Native Hawaiian/ Pacific Islander	26	20	85	16.92	4.78	0.81	2.06
		White	26	20	102658	17.91	4.55	0.80	2.04
	Module 2	African American	26	20	19549	13.33	5.57	0.84	2.24
		American Indian	26	20	190	16.80	5.18	0.83	2.12
		Asian	26	20	4733	17.91	5.73	0.87	2.05
		Hispanic	26	20	9845	13.70	5.72	0.85	2.20
		Multi-racial	26	20	1709	15.65	5.53	0.85	2.15
		Native Hawaiian/ Pacific Islander	26	20	85	16.53	5.67	0.87	2.08
		White	26	20	102658	17.91	4.83	0.83	2.01
ELL	**Level**	**Group**	**Pts.**	**Len.**	***N***	**Mean**	**SD**	**r**	***SEM***
	Total	All	52	40	2435	17.91	7.29	0.81	3.14
	Module 1	All	26	20	2435	9.82	3.96	0.68	2.25
	Module 2	All	26	20	2435	8.09	4.07	0.71	2.18
IEP	**Level**	**Group**	**Pts.**	**Len.**	***N***	**Mean**	**SD**	**r**	***SEM***
	Total	All	52	40	18275	23.14	9.42	0.89	3.16
	Module 1	All	26	20	18275	12.00	4.86	0.79	2.25
	Module 2	All	26	20	18275	11.14	5.16	0.82	2.21
ED	**Level**	**Group**	**Pts.**	**Len.**	***N***	**Mean**	**SD**	**r**	***SEM***
	Total	All	52	40	47276	29.44	10.14	0.91	3.11
	Module 1	All	26	20	47276	15.08	5.08	0.81	2.19
	Module 2	All	26	20	47276	14.37	5.60	0.85	2.19

Table M–5. Spring: Algebra I Reliabilities

	Level	Group	Pts.	Len.	*N*	Mean	SD	r	*SEM*
Overall	Total	All	60	42	247978	27.45	12.54	0.91	3.85
	Module 1	All	30	21	247978	13.06	6.55	0.83	2.74
	Module 2	All	30	21	247978	14.40	6.59	0.83	2.71
Gender	**Level**	**Group**	**Pts.**	**Len.**	***N***	**Mean**	**SD**	**r**	***SEM***
	Total	Female	60	42	121927	27.87	12.30	0.90	3.85
		Male	60	42	125655	27.07	12.77	0.91	3.85
	Module 1	Female	30	21	121927	13.24	6.46	0.82	2.74
		Male	30	21	125655	12.89	6.64	0.83	2.73
	Module 2	Female	30	21	121927	14.63	6.46	0.82	2.70
		Male	30	21	125655	14.18	6.72	0.84	2.71
Ethnicity	**Level**	**Group**	**Pts.**	**Len.**	***N***	**Mean**	**SD**	**r**	***SEM***
	Total	African American	60	42	40718	20.13	10.02	0.87	3.60
		American Indian	60	42	336	25.61	12.34	0.90	3.84
		Asian	60	42	7724	34.75	14.97	0.93	3.99
		Hispanic	60	42	21657	21.22	10.56	0.88	3.65
		Multi-racial	60	42	3872	25.54	12.14	0.90	3.83
		Native Hawaiian/ Pacific Islander	60	42	165	30.58	13.83	0.92	3.98
		White	60	42	173003	29.69	12.20	0.90	3.86
	Module 1	African American	30	21	40718	9.35	5.03	0.76	2.46
		American Indian	30	21	336	11.98	6.51	0.83	2.70
		Asian	30	21	7724	16.68	7.96	0.87	2.91
		Hispanic	30	21	21657	9.89	5.31	0.78	2.50
		Multi-racial	30	21	3872	12.09	6.30	0.82	2.69
		Native Hawaiian/ Pacific Islander	30	21	165	14.56	7.22	0.84	2.87
		White	30	21	173003	14.19	6.46	0.82	2.77
	Module 2	African American	30	21	40718	10.78	5.70	0.79	2.63
		American Indian	30	21	336	13.64	6.50	0.82	2.72
		Asian	30	21	7724	18.07	7.53	0.87	2.72
		Hispanic	30	21	21657	11.33	5.92	0.80	2.65
		Multi-racial	30	21	3872	13.45	6.48	0.82	2.72
		Native Hawaiian/ Pacific Islander	30	21	165	16.02	7.14	0.85	2.76
		White	30	21	173003	15.50	6.36	0.82	2.69
ELL	**Level**	**Group**	**Pts.**	**Len.**	***N***	**Mean**	**SD**	**r**	***SEM***
	Total	All	60	42	6799	15.98	9.07	0.86	3.34
	Module 1	All	30	21	6799	7.52	4.57	0.75	2.28
	Module 2	All	30	21	6799	8.46	5.20	0.78	2.42
IEP	**Level**	**Group**	**Pts.**	**Len.**	***N***	**Mean**	**SD**	**r**	***SEM***
	Total	All	60	42	37094	17.59	9.07	0.86	3.43
	Module 1	All	30	21	37094	8.31	4.64	0.74	2.36
	Module 2	All	30	21	37094	9.27	5.12	0.76	2.49
ED	**Level**	**Group**	**Pts.**	**Len.**	***N***	**Mean**	**SD**	**r**	***SEM***
	Total	All	60	42	102426	22.46	10.81	0.88	3.69
	Module 1	All	30	21	102426	10.54	5.53	0.79	2.55
	Module 2	All	30	21	102426	11.92	5.95	0.80	2.66

Table M–6. Spring: Biology Reliabilities

	Level	Group	Pts.	Len.	*N*	Mean	SD	r	*SEM*
Overall	Total	All	66	54	180917	32.32	12.68	0.92	3.66
	Module 1	All	33	27	180917	15.45	6.95	0.86	2.64
	Module 2	All	33	27	180917	16.88	6.33	0.84	2.53
Gender	**Level**	**Group**	**Pts.**	**Len.**	***N***	**Mean**	**SD**	**r**	***SEM***
	Total	Female	66	54	89881	32.59	12.20	0.91	3.67
		Male	66	54	90720	32.09	13.14	0.92	3.64
	Module 1	Female	33	27	89881	15.47	6.72	0.84	2.66
		Male	33	27	90720	15.43	7.17	0.87	2.61
	Module 2	Female	33	27	89881	17.11	6.09	0.83	2.52
		Male	33	27	90720	16.65	6.55	0.85	2.53
Ethnicity	**Level**	**Group**	**Pts.**	**Len.**	***N***	**Mean**	**SD**	**r**	***SEM***
	Total	African American	66	54	25684	24.29	10.40	0.88	3.60
		American Indian	66	54	263	31.75	12.92	0.92	3.61
		Asian	66	54	5791	37.43	14.70	0.94	3.61
		Hispanic	66	54	13069	25.79	11.13	0.89	3.62
		Multi-racial	66	54	2705	29.95	12.46	0.91	3.65
		Native Hawaiian/ Pacific Islander	66	54	136	34.21	12.73	0.92	3.66
		White	66	54	132875	34.37	12.26	0.91	3.66
	Module 1	African American	33	27	25684	11.52	5.56	0.79	2.54
		American Indian	33	27	263	15.25	7.18	0.87	2.62
		Asian	33	27	5791	18.55	8.08	0.89	2.62
		Hispanic	33	27	13069	12.16	5.98	0.82	2.56
		Multi-racial	33	27	2705	14.35	6.83	0.85	2.60
		Native Hawaiian/ Pacific Islander	33	27	136	16.74	7.17	0.87	2.63
		White	33	27	132875	16.43	6.83	0.85	2.66
	Module 2	African American	33	27	25684	12.78	5.54	0.79	2.55
		American Indian	33	27	263	16.50	6.28	0.84	2.49
		Asian	33	27	5791	18.88	7.08	0.88	2.47
		Hispanic	33	27	13069	13.63	5.81	0.81	2.56
		Multi-racial	33	27	2705	15.60	6.22	0.83	2.54
		Native Hawaiian/ Pacific Islander	33	27	136	17.46	6.07	0.83	2.54
		White	33	27	132875	17.94	6.03	0.83	2.52
ELL	**Level**	**Group**	**Pts.**	**Len.**	***N***	**Mean**	**SD**	**r**	***SEM***
	Total	All	66	54	3784	19.03	7.83	0.80	3.46
	Module 1	All	33	27	3784	8.97	4.30	0.69	2.40
	Module 2	All	33	27	3784	10.06	4.34	0.67	2.49
IEP	**Level**	**Group**	**Pts.**	**Len.**	***N***	**Mean**	**SD**	**r**	***SEM***
	Total	All	66	54	26055	22.53	9.74	0.87	3.56
	Module 1	All	33	27	26055	10.51	5.24	0.77	2.49
	Module 2	All	33	27	26055	12.02	5.22	0.76	2.54
ED	**Level**	**Group**	**Pts.**	**Len.**	***N***	**Mean**	**SD**	**r**	***SEM***
	Total	All	66	54	68780	26.97	11.19	0.89	3.64
	Module 1	All	33	27	68780	12.70	6.03	0.82	2.58
	Module 2	All	33	27	68780	14.26	5.83	0.81	2.56

Table M–7. Spring: Literature Reliabilities

	Level	Group	Pts.	Len.	*N*	Mean	SD	r	*SEM*
Overall	Total	All	52	40	156302	30.35	10.04	0.90	3.11
	Module 1	All	26	20	156302	14.50	5.03	0.81	2.20
	Module 2	All	26	20	156302	15.85	5.55	0.84	2.19
Gender	**Level**	**Group**	**Pts.**	**Len.**	***N***	**Mean**	**SD**	**r**	***SEM***
	Total	Female	52	40	73724	32.10	9.70	0.90	3.08
		Male	52	40	82222	28.81	10.08	0.91	3.11
	Module 1	Female	26	20	73724	15.35	4.93	0.80	2.19
		Male	26	20	82222	13.76	5.01	0.81	2.20
	Module 2	Female	26	20	73724	16.76	5.32	0.84	2.15
		Male	26	20	82222	15.05	5.62	0.85	2.18
Ethnicity	**Level**	**Group**	**Pts.**	**Len.**	***N***	**Mean**	**SD**	**r**	***SEM***
	Total	African American	52	40	25744	25.04	9.52	0.89	3.22
		American Indian	52	40	234	29.03	10.26	0.91	3.15
		Asian	52	40	4828	33.22	10.87	0.92	3.06
		Hispanic	52	40	13477	25.30	9.73	0.89	3.22
		Multi-racial	52	40	2290	29.29	9.66	0.89	3.14
		Native Hawaiian/ Pacific Islander	52	40	100	30.77	10.43	0.91	3.14
		White	52	40	109196	32.15	9.48	0.90	3.05
	Module 1	African American	26	20	25744	11.86	4.63	0.76	2.27
		American Indian	26	20	234	14.00	5.19	0.82	2.23
		Asian	26	20	4828	15.88	5.57	0.85	2.19
		Hispanic	26	20	13477	11.88	4.70	0.76	2.28
		Multi-racial	26	20	2290	14.01	4.87	0.80	2.20
		Native Hawaiian/ Pacific Islander	26	20	100	14.49	5.19	0.81	2.25
		White	26	20	109196	15.41	4.79	0.80	2.17
	Module 2	African American	26	20	25744	13.18	5.53	0.83	2.27
		American Indian	26	20	234	15.03	5.68	0.85	2.21
		Asian	26	20	4828	17.35	5.74	0.86	2.13
		Hispanic	26	20	13477	13.42	5.64	0.84	2.25
		Multi-racial	26	20	2290	15.28	5.41	0.83	2.22
		Native Hawaiian/ Pacific Islander	26	20	100	16.28	5.63	0.85	2.21
		White	26	20	109196	16.74	5.22	0.83	2.14
ELL	**Level**	**Group**	**Pts.**	**Len.**	***N***	**Mean**	**SD**	**r**	***SEM***
	Total	All	52	40	4121	18.44	7.19	0.80	3.22
	Module 1	All	26	20	4121	8.76	3.50	0.58	2.27
	Module 2	All	26	20	4121	9.68	4.45	0.74	2.27
IEP	**Level**	**Group**	**Pts.**	**Len.**	***N***	**Mean**	**SD**	**r**	***SEM***
	Total	All	52	40	27740	21.44	8.60	0.86	3.17
	Module 1	All	26	20	27740	10.49	4.20	0.72	2.24
	Module 2	All	26	20	27740	10.95	5.06	0.80	2.24
ED	**Level**	**Group**	**Pts.**	**Len.**	***N***	**Mean**	**SD**	**r**	***SEM***
	Total	All	52	40	64894	26.28	9.59	0.89	3.19
	Module 1	All	26	20	64894	12.51	4.69	0.77	2.25
	Module 2	All	26	20	64894	13.78	5.51	0.83	2.24

Table M–8. Summer: Algebra I Reliabilities

	Level	Group	Pts.	Len.	*N*	Mean	SD	r	*SEM*
Overall	Total	All	60	42	2144	22.74	8.40	0.82	3.55
	Module 1	All	30	21	2144	10.12	4.23	0.68	2.38
	Module 2	All	30	21	2144	12.62	4.92	0.71	2.64
Gender	**Level**	**Group**	**Pts.**	**Len.**	***N***	**Mean**	**SD**	**r**	***SEM***
	Total	Female	60	42	1038	22.91	8.31	0.82	3.54
		Male	60	42	1001	22.71	8.64	0.83	3.56
	Module 1	Female	30	21	1038	10.22	4.19	0.67	2.39
		Male	30	21	1001	10.09	4.32	0.70	2.36
	Module 2	Female	30	21	1038	12.69	4.82	0.71	2.62
		Male	30	21	1001	12.62	5.11	0.73	2.66
Ethnicity	**Level**	**Group**	**Pts.**	**Len.**	***N***	**Mean**	**SD**	**r**	***SEM***
	Total	African American	60	42	352	21.38	9.12	0.84	3.64
		American Indian	60	42	3	22.00	10.58	DNR	DNR
		Asian	60	42	32	23.50	8.17	0.80	3.63
		Hispanic	60	42	97	20.40	7.35	0.78	3.41
		Multi-racial	60	42	32	24.28	10.90	0.88	3.75
		Native Hawaiian/ Pacific Islander	60	42	0	DNR	DNR	DNR	DNR
		White	60	42	1448	23.29	8.30	0.82	3.52
	Module 1	African American	30	21	352	9.26	4.40	0.71	2.36
		American Indian	30	21	3	9.33	5.13	DNR	DNR
		Asian	30	21	32	10.72	4.05	0.63	2.45
		Hispanic	30	21	97	9.09	3.66	0.62	2.26
		Multi-racial	30	21	32	10.97	5.11	0.75	2.54
		Native Hawaiian/ Pacific Islander	30	21	2	14.50	0.71	DNR	DNR
		White	30	21	1448	10.43	4.20	0.68	2.38
	Module 2	African American	30	21	352	12.12	5.43	0.74	2.76
		American Indian	30	21	3	12.67	5.51	DNR	DNR
		Asian	30	21	32	12.78	4.70	0.67	2.69
		Hispanic	30	21	97	11.31	4.57	0.69	2.54
		Multi-racial	30	21	32	13.31	6.62	0.83	2.73
		Native Hawaiian/ Pacific Islander	30	21	2	21.50	2.12	DNR	DNR
		White	30	21	1448	12.85	4.84	0.71	2.59
ELL	**Level**	**Group**	**Pts.**	**Len.**	***N***	**Mean**	**SD**	**r**	***SEM***
	Total	All	60	42	17	15.12	5.19	0.63	3.18
	Module 1	All	30	21	17	6.76	2.93	0.51	2.05
	Module 2	All	30	21	17	8.35	3.22	0.43	2.42
IEP	**Level**	**Group**	**Pts.**	**Len.**	***N***	**Mean**	**SD**	**r**	***SEM***
	Total	All	60	42	312	18.01	7.66	0.80	3.39
	Module 1	All	30	21	312	8.09	3.92	0.66	2.28
	Module 2	All	30	21	312	9.93	4.50	0.69	2.50
ED	**Level**	**Group**	**Pts.**	**Len.**	***N***	**Mean**	**SD**	**r**	***SEM***
	Total	All	60	42	592	21.16	8.56	0.83	3.56
	Module 1	All	30	21	592	9.36	4.16	0.68	2.35
	Module 2	All	30	21	592	11.80	5.16	0.73	2.66

Table M–9. Summer: Biology Reliabilities

	Level	Group	Pts.	Len.	*N*	Mean	SD	r	*SEM*
Overall	Total	All	66	54	1073	27.55	9.97	0.86	3.70
	Module 1	All	33	27	1073	14.06	5.24	0.77	2.50
	Module 2	All	33	27	1073	13.49	5.40	0.75	2.72
Gender	Level	Group	Pts.	Len.	*N*	Mean	SD	r	*SEM*
	Total	Female	66	54	558	28.05	9.15	0.84	3.70
		Male	66	54	504	26.99	10.78	0.88	3.69
	Module 1	Female	33	27	558	14.28	4.83	0.73	2.50
		Male	33	27	504	13.80	5.64	0.80	2.50
	Module 2	Female	33	27	558	13.78	5.08	0.71	2.72
		Male	33	27	504	13.19	5.72	0.77	2.72
Ethnicity	Level	Group	Pts.	Len.	*N*	Mean	SD	r	*SEM*
	Total	African American	66	54	210	23.64	8.67	0.83	3.61
		American Indian	66	54	1	38.00	DNR	DNR	DNR
		Asian	66	54	44	37.73	13.93	0.93	3.64
		Hispanic	66	54	48	24.77	8.80	0.83	3.66
		Multi-racial	66	54	21	28.29	12.00	0.91	3.68
		Native Hawaiian/ Pacific Islander	66	54	0	DNR	DNR	DNR	DNR
		White	66	54	737	28.22	9.47	0.85	3.71
	Module 1	African American	33	27	210	12.26	4.80	0.74	2.47
		American Indian	33	27	1	20.00	DNR	DNR	DNR
		Asian	33	27	44	18.86	7.31	0.88	2.54
		Hispanic	33	27	48	12.42	4.73	0.73	2.46
		Multi-racial	33	27	21	14.33	5.78	0.81	2.54
		Native Hawaiian/ Pacific Islander	33	27	0	DNR	DNR	DNR	DNR
		White	33	27	737	14.38	4.98	0.75	2.50
	Module 2	African American	33	27	210	11.38	4.62	0.67	2.64
		American Indian	33	27	1	18.00	DNR	DNR	DNR
		Asian	33	27	44	18.86	6.96	0.86	2.62
		Hispanic	33	27	48	12.35	4.83	0.69	2.71
		Multi-racial	33	27	21	13.95	6.71	0.84	2.66
		Native Hawaiian/ Pacific Islander	33	27	0	DNR	DNR	DNR	DNR
		White	33	27	737	13.84	5.21	0.73	2.73
ELL	Level	Group	Pts.	Len.	*N*	Mean	SD	r	*SEM*
	Total	All	66	54	12	23.75	7.91	0.80	3.56
	Module 1	All	33	27	12	11.08	4.64	0.74	2.35
	Module 2	All	33	27	12	12.67	3.65	0.46	2.69
IEP	Level	Group	Pts.	Len.	*N*	Mean	SD	r	*SEM*
	Total	All	66	54	173	22.64	9.35	0.85	3.57
	Module 1	All	33	27	173	11.61	4.95	0.76	2.43
	Module 2	All	33	27	173	11.03	5.07	0.73	2.61
ED	Level	Group	Pts.	Len.	*N*	Mean	SD	r	*SEM*
	Total	All	66	54	366	24.61	9.05	0.84	3.67
	Module 1	All	33	27	366	12.55	4.74	0.72	2.48
	Module 2	All	33	27	366	12.06	4.99	0.71	2.70

Table M–10. Summer: Literature Reliabilities

	Level	Group	Pts.	Len.	*N*	Mean	SD	r	*SEM*
Overall	Total	All	52	40	741	27.88	9.16	0.88	3.20
	Module 1	All	26	20	741	14.24	4.95	0.79	2.25
	Module 2	All	26	20	741	13.64	4.82	0.78	2.27
Gender	**Level**	**Group**	**Pts.**	**Len.**	***N***	**Mean**	**SD**	**r**	***SEM***
	Total	Female	52	40	339	30.03	8.64	0.87	3.17
		Male	52	40	380	25.74	9.24	0.88	3.18
	Module 1	Female	26	20	339	15.49	4.77	0.78	2.21
		Male	26	20	380	13.02	4.89	0.79	2.25
	Module 2	Female	26	20	339	14.55	4.46	0.74	2.27
		Male	26	20	380	12.71	5.00	0.80	2.23
Ethnicity	**Level**	**Group**	**Pts.**	**Len.**	***N***	**Mean**	**SD**	**r**	***SEM***
	Total	African American	52	40	167	27.49	9.19	0.87	3.36
		American Indian	52	40	0	DNR	DNR	DNR	DNR
		Asian	52	40	8	30.50	8.14	0.86	3.05
		Hispanic	52	40	26	27.31	11.15	0.91	3.35
		Multi-racial	52	40	16	30.50	10.09	0.90	3.24
		Native Hawaiian/ Pacific Islander	52	40	0	DNR	DNR	DNR	DNR
		White	52	40	480	27.75	9.24	0.88	3.14
	Module 1	African American	26	20	167	14.23	5.18	0.79	2.35
		American Indian	26	20	0	DNR	DNR	DNR	DNR
		Asian	26	20	8	15.38	5.42	0.86	2.00
		Hispanic	26	20	26	13.73	6.06	0.85	2.34
		Multi-racial	26	20	16	15.38	4.69	0.75	2.34
		Native Hawaiian/ Pacific Islander	26	20	0	DNR	DNR	DNR	DNR
		White	26	20	480	14.13	4.93	0.80	2.22
	Module 2	African American	26	20	167	13.25	4.76	0.75	2.38
		American Indian	26	20	0	DNR	DNR	DNR	DNR
		Asian	26	20	8	15.13	3.23	0.50	2.28
		Hispanic	26	20	26	13.58	5.49	0.81	2.41
		Multi-racial	26	20	16	15.13	5.73	0.84	2.26
		Native Hawaiian/ Pacific Islander	26	20	0	DNR	DNR	DNR	DNR
		White	26	20	480	13.62	4.89	0.80	2.21
ELL	**Level**	**Group**	**Pts.**	**Len.**	***N***	**Mean**	**SD**	**r**	***SEM***
	Total	All	52	40	1	36.00	DNR	DNR	DNR
	Module 1	All	26	20	1	21.00	DNR	DNR	DNR
	Module 2	All	26	20	1	15.00	DNR	DNR	DNR
IEP	**Level**	**Group**	**Pts.**	**Len.**	***N***	**Mean**	**SD**	**r**	***SEM***
	Total	All	52	40	154	21.01	7.29	0.81	3.17
	Module 1	All	26	20	154	10.60	4.26	0.73	2.22
	Module 2	All	26	20	154	10.41	4.02	0.69	2.23
ED	**Level**	**Group**	**Pts.**	**Len.**	***N***	**Mean**	**SD**	**r**	***SEM***
	Total	All	52	40	302	26.36	9.15	0.87	3.29
	Module 1	All	26	20	302	13.65	5.03	0.79	2.30
	Module 2	All	26	20	302	12.71	4.77	0.76	2.35

APPENDIX N: ITEM SCRAMBLING ANALYSES RESULTS

ITEM LEVEL

Table N–1. Algebra I: Winter

Item ID	Seq1-2	Seq3-2	P1-P2	P3-P2	L1-L2	L3-L2
605197	5	8	0.00	0.00	-0.04	-0.02
605171	6	4	0.02	0.04	-0.12	-0.23
605261	6	2	0.00	0.00	-0.03	0.02
605184	3	3	-0.05	-0.03	0.29	0.18
605090	0	-2	0.01	0.01	-0.05	-0.05
605255	-5	-4	0.00	-0.01	-0.01	0.07
605211	-3	-3	-0.02	-0.01	0.08	0.07
605132	-6	0	-0.02	0.01	0.10	-0.02
605076	-6	-8	0.02	0.02	-0.13	-0.16
605249	6	3	-0.02	-0.01	0.11	0.06
605116	1	4	-0.02	-0.02	0.10	0.08
605188	-1	6	0.00	0.02	0.01	-0.08
605094	4	-3	-0.02	0.01	0.13	-0.04
605218	4	0	0.00	0.01	-0.02	-0.02
605169	0	-4	-0.02	0.02	0.10	-0.10
605133	-6	1	0.01	0.00	-0.06	0.01
605307	-4	-1	0.02	0.00	-0.15	-0.01
605265	-4	-6	0.00	0.01	-0.03	-0.05
605123	5	6	-0.01	-0.01	0.12	0.13
605066	6	3	0.00	-0.01	-0.01	0.07
605115	4	0	0.03	0.02	-0.21	-0.15
605260	0	5	0.02	-0.01	-0.11	0.03
605127	0	-3	-0.01	-0.02	0.05	0.13
605194	-5	0	-0.02	-0.01	0.13	0.06
605266	-4	-6	-0.02	-0.03	0.14	0.16
605192	-6	0	0.01	0.04	-0.07	-0.23
605241	0	-5	0.00	0.03	-0.01	-0.15
605071	2	5	-0.01	-0.01	0.03	0.04
605096	0	3	-0.01	-0.01	0.05	0.07
605250	-2	4	0.01	0.01	-0.06	-0.06
605080	3	0	0.00	0.00	0.00	0.03
605095	0	-3	0.00	-0.01	0.00	0.08
605081	0	-5	0.00	0.02	0.00	-0.08
605259	-3	-4	0.00	0.00	-0.02	0.03
605061	1	0	-0.01	0.01	0.04	-0.07
605104	-1	0	0.01	0.00	-0.12	-0.01
Mean	0	0	0.00	0.00	0.01	-0.01
Max	6	8	0.03	0.04	0.29	0.18
Min	-6	-8	-0.05	-0.03	-0.21	-0.23

Table N–2. Biology: Winter

Item ID	Seq1-2	Seq3-2	P1-P2	P3-P2	L1-L2	L3-L2
610879	4	1	0.00	0.00	-0.02	-0.01
618060	2	-1	0.03	0.01	-0.17	-0.06
607721	3	0	0.01	0.01	-0.08	-0.05
611163	-2	1	-0.01	-0.01	0.01	0.01
607797	-4	-1	-0.03	0.00	0.15	0.00
611452	-3	0	0.00	0.00	0.00	0.00
610456	4	2	-0.04	-0.01	0.20	0.06
611158	4	2	-0.02	0.00	0.06	-0.03
610485	1	-2	0.04	-0.03	-0.19	0.13
611023	-1	-2	0.01	-0.01	-0.09	0.05
607723	-4	1	-0.03	0.01	0.15	-0.07
611443	-4	-1	-0.05	-0.04	0.22	0.16
610878	0	0	0.00	0.00	0.04	0.01
611155	3	4	0.02	0.01	-0.12	-0.07
610897	3	1	-0.03	-0.02	0.14	0.08
611391	0	-1	-0.03	-0.02	0.14	0.11
635795	-3	0	0.00	-0.01	0.00	0.01
609428	-3	-4	-0.01	0.03	0.01	-0.14
607719	4	3	-0.02	-0.01	0.07	0.04
607693	4	4	-0.03	-0.03	0.11	0.14
611030	1	2	-0.04	-0.02	0.19	0.10
611016	-1	-3	-0.03	-0.02	0.14	0.09
613876	-4	-2	0.00	0.01	-0.02	-0.05
611445	-4	-4	0.00	0.00	-0.02	-0.03
608099	3	4	0.02	0.02	-0.14	-0.15
607754	0	4	0.01	0.00	-0.06	-0.03
608020	3	1	0.02	0.00	-0.11	-0.03
608247	-3	-1	-0.01	-0.01	0.05	0.05
608295	0	-4	0.01	0.02	-0.08	-0.12
611411	-3	-4	-0.02	-0.01	0.05	0.05
611412	5	3	0.00	-0.01	0.00	0.04
611609	3	3	-0.01	0.00	0.03	0.00
608278	1	3	-0.02	-0.01	0.07	0.06
611474	-1	-3	-0.01	0.02	0.01	-0.10
610876	-3	-3	0.02	0.02	-0.14	-0.09
607753	-5	-3	0.06	0.01	-0.40	-0.09
611420	1	0	0.00	-0.01	-0.01	0.02
611421	-1	0	-0.04	0.01	0.19	-0.07
610915	3	1	-0.01	-0.02	0.05	0.08
607827	0	-1	-0.04	-0.02	0.17	0.08
611620	-2	1	0.00	0.01	0.00	-0.08
609822	-1	-1	0.00	-0.02	-0.04	0.08
611060	4	1	-0.02	-0.03	0.07	0.12
607762	0	-1	0.00	-0.01	-0.06	0.08
610864	1	3	0.00	-0.02	0.00	0.09
608252	-1	1	-0.01	0.01	0.00	-0.04
609823	-4	-1	0.02	0.03	-0.12	-0.16
611067	0	-3	0.00	0.02	-0.02	-0.11
Mean	0	0	-0.01	0.00	0.01	0.00
Max	5	4	0.06	0.03	0.22	0.16
Min	-5	-4	-0.05	-0.04	-0.40	-0.16

Table N–3. Literature: Winter

Item ID	Seq1-2	Seq3-2	P1-P2	P3-P2	L1-L2	L3-L2
614624	1	3	-0.0081	-0.0316	0.0755	0.3412
614623	-1	1	-0.0215	-0.0595	0.1249	0.3812
614625	1	-1	-0.0055	0.0070	0.0119	-0.0391
614618	-1	-3	0.0074	-0.0033	-0.0685	0.0221
614621	0	2	-0.0039	0.0084	0.0049	-0.0519
614619	2	0	0.0393	0.0356	-0.2188	-0.1873
614622	0	-2	0.0180	0.0398	-0.1450	-0.2886
614627	-2	0	0.0100	0.0001	-0.0668	-0.0021
614671	1	2	-0.0099	-0.0151	0.0496	0.1035
614662	-1	2	-0.0093	0.0066	0.0342	-0.0386
614663	1	-2	0.0007	0.0048	-0.0238	-0.0324
614667	-1	-2	-0.0023	0.0052	-0.0054	-0.0281
614668	1	0	-0.0209	0.0057	0.1258	-0.0410
614664	-1	2	0.0017	0.0349	-0.0296	-0.2226
614665	0	0	0.0049	0.0068	-0.0654	-0.0623
614661	0	-2	-0.0031	0.0167	-0.0005	-0.0860
614669	0	0	-0.0024	-0.0062	0.0010	0.0527
612408	2	0	-0.0111	-0.0016	0.0990	0.0179
612400	2	1	0.0036	0.0075	-0.0412	-0.0469
612403	-2	-1	0.0014	-0.0144	-0.0278	0.0906
616847	-2	3	0.0125	-0.0132	-0.1100	0.0918
612402	0	0	-0.0247	-0.0163	0.1078	0.0800
612406	1	0	-0.0109	0.0006	0.0613	-0.0052
612405	-1	-3	-0.0051	0.0103	0.0134	-0.0642
612446	0	0	0.0122	0.0169	-0.0777	-0.0866
612457	1	2	-0.0227	-0.0328	0.1508	0.2435
612463	-1	2	-0.0043	-0.0009	0.0062	0.0043
612461	1	-2	-0.0653	0.0091	0.3378	-0.0528
612459	-1	-2	0.0217	0.0174	-0.1357	-0.0953
612464	1	2	-0.0142	-0.0292	0.0605	0.1590
616845	-1	0	0.0116	0.0058	-0.1112	-0.0459
612466	0	-2	-0.0073	0.0087	0.0242	-0.0528
612456	1	0	0.0069	0.0087	-0.0543	-0.0473
612462	-1	0	-0.0057	-0.0031	0.0182	0.0198
Mean	0	0	0.00	0.00	0.00	0.00
Max	2	3	0.04	0.04	0.34	0.38
Min	-2	-3	-0.07	-0.06	-0.22	-0.29

Table N–4. Algebra I: Spring

Item ID	Seq1-2	Seq3-2	Seq4-2	Seq5-2	Seq6-2	Seq7-2	Seq8-2	P1-P2	P3-P2	P4-P2	P5-P2	P6-P2	P7-P2	P8-P2	L1-L2	L3-L2	L4-L2	L5-L2	L6-L2	L7-L2	L8-L2
605085	-3	-1	-6	-5	-5	-1	-6	0.05	0.00	0.06	0.05	0.05	-0.01	0.06	-0.25	0.02	-0.27	-0.23	-0.24	0.00	-0.28
605099	3	4	-3	-2	3	-3	4	0.00	-0.01	-0.02	0.05	0.00	-0.03	-0.01	-0.05	0.03	0.09	-0.24	-0.02	0.14	0.04
605108	-2	-5	-6	-3	-6	-2	-3	0.02	0.02	0.03	0.04	0.03	0.02	0.04	-0.15	-0.11	-0.12	-0.19	-0.17	-0.13	-0.19
605110	-5	-2	-4	-6	-2	-6	-5	0.00	0.01	0.00	0.01	0.01	0.02	0.01	-0.07	-0.04	0.03	-0.09	-0.05	-0.11	-0.05
605147	4	-4	3	-3	-4	-3	4	0.00	0.00	0.01	-0.01	0.00	-0.01	-0.01	-0.01	-0.01	-0.03	0.02	0.00	0.01	0.03
605150	-5	1	-6	-4	1	-4	-5	0.01	0.04	0.06	0.02	0.03	0.03	0.01	-0.07	-0.19	-0.28	-0.11	-0.13	-0.20	-0.07
605157	-5	-1	-4	-2	-1	-2	-5	0.00	-0.01	0.00	0.01	-0.01	0.01	0.00	-0.04	0.03	0.03	-0.05	0.03	-0.07	-0.01
605163	6	4	8	1	6	8	4	-0.01	-0.05	-0.02	-0.03	-0.01	-0.04	-0.04	0.03	0.23	0.10	0.15	0.05	0.17	0.20
605167	-3	4	1	2	-3	1	4	-0.03	-0.02	-0.03	-0.05	-0.04	-0.04	-0.01	0.12	0.10	0.16	0.26	0.18	0.17	0.03
605179	4	1	5	2	1	2	4	-0.02	-0.01	0.01	-0.05	0.00	-0.05	-0.01	0.05	0.05	-0.06	0.21	0.02	0.22	0.03
605205	-4	1	-2	-5	-5	1	-2	-0.05	-0.02	0.00	-0.02	-0.02	-0.02	-0.01	0.24	0.11	0.02	0.12	0.13	0.08	0.03
605214	4	-1	-3	3	3	-1	-3	0.00	0.01	0.00	0.00	0.00	0.00	0.00	-0.02	-0.05	-0.01	0.01	0.01	-0.05	-0.03
605216	-1	3	6	4	4	3	6	-0.01	0.01	0.00	0.01	0.01	0.02	0.01	0.02	-0.06	-0.02	-0.06	-0.06	-0.11	-0.05
605231	2	6	1	4	4	6	1	0.00	0.01	0.01	0.02	0.02	0.01	0.01	-0.04	-0.04	-0.05	-0.12	-0.13	-0.09	-0.04
605233	1	4	6	-1	1	6	4	-0.02	-0.03	0.00	0.01	-0.01	-0.02	-0.02	0.10	0.17	0.01	-0.06	0.06	0.09	0.11
605237	-1	4	-3	2	-3	-1	2	0.01	-0.02	0.02	-0.02	0.02	0.01	-0.01	-0.09	0.09	-0.08	0.09	-0.12	-0.06	0.05
605244	-1	-4	-1	3	-1	-1	3	0.00	0.03	-0.01	-0.01	0.01	0.00	-0.01	-0.03	-0.14	0.03	0.02	-0.04	-0.01	0.05
605268	4	1	-2	3	1	3	4	-0.02	0.02	-0.03	-0.04	0.02	-0.03	-0.01	0.04	-0.08	0.15	0.17	-0.07	0.09	0.06
605275	-4	-6	-3	0	-4	-3	-6	0.00	0.00	0.02	-0.01	0.02	-0.01	0.01	-0.05	0.00	-0.11	0.04	-0.08	0.00	-0.05
605276	-2	-6	-4	0	-2	-4	-6	0.00	0.02	0.00	0.01	0.02	0.00	0.03	-0.02	-0.12	-0.02	-0.04	-0.08	-0.02	-0.14
605277	4	5	7	6	5	6	4	-0.01	-0.01	-0.02	0.00	-0.01	0.00	0.00	0.02	0.04	0.10	-0.03	0.03	-0.05	-0.03
605292	-1	5	6	1	6	-1	1	-0.01	-0.02	-0.03	-0.02	-0.03	0.00	-0.02	0.01	0.11	0.14	0.08	0.14	-0.04	0.09
631602	3	-4	-1	2	2	-4	-1	0.00	0.00	0.02	0.01	0.01	0.00	0.02	-0.04	-0.01	-0.08	-0.04	-0.07	-0.01	-0.09
631616	-1	1	6	-2	-2	1	6	-0.01	0.01	0.01	-0.03	-0.03	0.01	0.01	0.00	-0.05	-0.05	0.14	0.16	-0.08	-0.04
632146	-2	-6	-3	-5	-5	-6	-3	-0.01	-0.05	-0.01	-0.05	-0.04	-0.05	-0.01	0.00	0.23	0.05	0.22	0.20	0.20	0.06
632149	1	5	8	3	8	1	3	-0.03	-0.05	-0.09	-0.05	-0.08	-0.03	-0.04	0.11	0.27	0.45	0.23	0.42	0.14	0.22
632153	6	-2	4	2	6	4	-2	-0.03	0.03	0.00	0.00	-0.01	-0.01	0.01	0.11	-0.15	-0.01	-0.01	0.07	0.03	-0.04
632160	4	-1	3	5	-1	5	4	-0.01	0.04	0.02	0.00	0.04	0.00	-0.01	0.00	-0.19	-0.12	-0.02	-0.18	-0.01	0.05
632360	-5	0	-2	-1	0	-1	-5	-0.03	-0.02	-0.04	-0.03	-0.02	-0.03	-0.04	0.11	0.10	0.22	0.12	0.08	0.14	0.17
632366	2	6	4	-2	4	2	-2	0.00	-0.03	-0.03	0.01	-0.03	-0.03	0.03	-0.02	0.13	0.13	-0.07	0.16	0.09	-0.14
633250	-1	-4	-3	-2	-3	-1	-2	0.01	0.03	0.03	0.02	0.03	0.01	0.03	-0.11	-0.14	-0.16	-0.10	-0.16	-0.06	-0.13
633257	1	-4	-1	3	-1	1	3	-0.01	0.00	-0.02	-0.01	0.00	-0.01	-0.01	0.02	0.02	0.09	0.01	0.01	0.04	0.05
633399	2	1	2	4	4	1	2	-0.01	-0.02	-0.01	-0.02	-0.02	-0.01	-0.01	0.02	0.08	0.06	0.09	0.11	0.04	0.05
633532	2	-3	-4	-5	-4	2	-5	-0.01	0.03	0.04	0.03	0.04	-0.02	0.02	0.00	-0.15	-0.16	-0.15	-0.20	0.05	-0.09
633533	-2	1	-5	-2	-2	-5	1	-0.01	0.00	0.03	0.01	0.00	0.01	0.00	0.02	0.01	-0.15	-0.04	0.02	-0.08	-0.01
640270	-5	-3	-4	0	-5	-4	-3	-0.01	0.02	-0.01	0.01	0.00	-0.01	0.02	0.03	-0.08	0.05	-0.04	0.00	0.01	-0.09
Mean	0	0	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.01	0.00	0.01	0.00	0.01	-0.01
Max	6	6	8.00	6.00	8.00	8.00	6.00	0.05	0.04	0.06	0.05	0.05	0.03	0.06	0.24	0.27	0.45	0.26	0.42	0.22	0.22
Min	-5	-6	-6.00	-6.00	-6.00	-6.00	-6.00	-0.05	-0.05	-0.09	-0.05	-0.08	-0.05	-0.04	-0.25	-0.19	-0.28	-0.24	-0.24	-0.20	-0.28

Table N–5. Biology: Spring

Item ID	Seq1-2	Seq3-2	Seq4-2	Seq5-2	Seq6-2	Seq7-2	Seq8-2	P1-P2	P3-P2	P4-P2	P5-P2	P6-P2	P7-P2	P8-P2	L1-L2	L3-L2	L4-L2	L5-L2	L6-L2	L7-L2	L8-L2
607081	0	0	0	0	0	0	0	-0.01	0.00	0.00	0.00	-0.01	0.00	0.00	0.05	0.02	-0.02	0.00	0.04	0.01	0.02
607082	0	0	0	0	0	0	0	-0.02	-0.01	-0.02	-0.01	-0.01	-0.01	0.00	0.07	0.04	0.10	0.04	0.05	0.06	0.04
610452	0	0	0	0	0	0	0	-0.02	0.01	0.00	-0.01	-0.01	-0.01	0.00	0.02	0.01	0.03	0.02	0.00	0.00	0.00
610453	0	0	0	0	0	0	0	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.03	-0.03	-0.02	-0.02	-0.05	-0.03
607103	3	5	0	3	0	3	3	-0.01	0.00	-0.02	0.00	-0.01	0.01	0.01	0.07	-0.04	0.02	0.02	0.04	0.04	0.04
607578	0	0	0	0	0	0	0	0.03	0.00	0.02	0.00	-0.02	0.00	0.01	-0.01	0.02	0.00	-0.01	-0.01	0.01	0.02
607706	1	5	2	4	4	1	5	0.01	0.00	0.02	0.01	0.03	0.00	0.02	0.02	0.01	0.11	0.01	0.03	-0.03	-0.01
607720	1	-2	-3	-4	-4	1	-2	-0.01	0.01	0.01	0.00	0.01	0.02	0.01	-0.18	0.00	-0.11	0.00	0.08	-0.01	0.00
607724	-3	0	-3	0	-3	0	-3	0.00	0.00	0.01	-0.02	0.00	0.02	0.00	-0.10	0.00	-0.09	-0.04	-0.14	0.00	-0.09
607738	-1	0	2	-2	-1	0	2	0.02	0.00	0.01	0.02	0.02	0.02	0.02	-0.01	-0.07	-0.05	-0.02	-0.05	-0.07	-0.02
607752	0	0	0	0	0	0	0	-0.06	-0.01	-0.03	-0.06	-0.05	0.00	-0.04	-0.02	0.00	-0.04	0.07	-0.02	-0.08	0.01
607789	1	-3	-1	1	-1	1	1	0.01	-0.01	-0.01	0.06	0.00	0.00	-0.01	-0.13	0.01	-0.06	-0.13	-0.12	-0.11	-0.07
608019	3	0	3	3	3	0	3	0.00	-0.01	0.00	-0.01	0.00	0.00	0.00	0.24	0.04	0.17	0.27	0.24	0.02	0.20
608274	0	2	3	-1	0	2	3	0.00	0.00	0.02	0.01	0.01	0.00	0.02	-0.08	0.03	0.07	-0.29	-0.01	0.00	0.07
608283	-4	1	0	1	1	-4	1	0.02	0.03	0.03	0.03	0.05	0.04	0.02	-0.05	0.06	0.02	0.05	0.01	-0.01	0.02
608286	1	1	-3	1	1	1	-3	-0.01	0.00	0.01	0.00	0.00	0.01	0.00	-0.04	-0.02	-0.07	-0.04	-0.04	-0.01	-0.06
608383	-5	-2	-1	-4	-1	-4	-5	-0.02	-0.02	0.00	0.00	0.00	-0.01	0.00	-0.14	-0.16	-0.17	-0.16	-0.26	-0.22	-0.10
609389	-2	0	-1	2	0	-1	2	-0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.02	-0.03	-0.02	0.02	-0.03	0.02
609427	-1	2	1	3	1	3	-1	0.00	0.00	0.01	0.00	0.00	0.01	0.01	0.07	0.11	-0.01	0.01	0.02	0.05	0.02
610459	1	1	3	-1	1	3	-1	-0.01	0.01	-0.01	0.03	0.00	-0.01	0.02	0.00	-0.04	0.07	-0.14	0.00	0.06	-0.09
610483	-3	-4	0	-3	0	-3	-3	-0.01	-0.01	0.00	-0.01	0.00	-0.01	-0.01	0.03	0.05	-0.01	0.05	0.00	0.05	0.10
610527	-3	-2	-4	-5	-5	-3	-2	0.00	-0.01	0.00	0.00	0.00	0.00	-0.01	-0.05	0.07	0.00	0.01	0.01	0.00	0.07
610880	0	-4	-3	-2	0	-4	-3	-0.01	0.01	0.02	-0.01	0.00	0.00	0.02	0.00	-0.05	-0.07	0.02	0.00	-0.01	-0.05
610882	1	-2	3	-1	-1	1	-2	0.00	0.00	-0.02	0.01	0.01	0.00	0.01	-0.01	0.01	0.12	-0.08	-0.06	0.00	-0.05
610887	4	1	2	2	1	2	2	0.00	0.01	0.01	0.00	0.00	0.01	0.01	-0.05	-0.06	-0.02	-0.02	-0.02	-0.05	-0.01
610895	-2	-3	-2	-3	-3	-2	-3	-0.01	0.02	-0.01	0.01	0.01	-0.01	0.01	0.01	-0.10	0.04	-0.06	-0.04	0.04	-0.03
610904	2	2	1	0	1	0	2	-0.01	0.01	0.03	0.01	0.02	0.01	-0.02	0.02	-0.07	-0.12	-0.04	-0.07	-0.04	0.14
610907	-3	-1	-5	-2	-2	-3	-1	-0.01	0.01	0.03	0.01	0.04	0.00	0.02	0.01	-0.07	-0.11	-0.03	-0.18	-0.01	-0.07
610913	4	4	0	0	4	0	0	-0.01	0.01	0.00	-0.01	-0.01	-0.01	0.00	-0.01	-0.04	0.01	0.03	0.04	0.06	0.05
611072	-2	2	-1	2	-1	2	-2	-0.01	-0.01	0.00	-0.01	0.00	-0.01	0.00	-0.01	0.05	-0.01	0.02	0.01	0.05	0.00
611150	-1	-4	-3	0	-3	0	-1	-0.01	-0.02	0.03	-0.02	0.00	-0.01	-0.02	0.01	0.08	-0.13	0.08	0.00	0.05	0.10
611387	0	-3	0	0	-3	0	0	-0.02	-0.01	-0.01	-0.01	-0.02	0.00	0.00	0.05	0.05	0.08	0.07	0.08	0.01	0.04
611398	3	1	0	4	4	3	1	-0.03	-0.03	-0.02	-0.03	-0.02	-0.02	-0.01	0.11	0.15	0.09	0.14	0.09	0.13	0.06
611436	-4	-3	-3	-3	-4	-3	-3	0.05	0.03	0.03	0.01	0.05	0.02	0.04	-0.29	-0.16	-0.16	-0.05	-0.25	-0.11	-0.15
611611	3	3	4	1	1	3	3	-0.02	-0.01	0.01	-0.01	-0.01	-0.01	-0.02	0.06	0.07	-0.07	0.04	0.03	0.06	0.12
611921	5	2	0	3	0	3	5	-0.01	0.01	0.01	-0.01	0.01	0.00	0.00	0.04	-0.05	-0.02	0.03	-0.04	-0.01	0.03
611926	-1	0	1	-1	-1	-1	0	-0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.03	0.00	0.01	-0.06	0.00	-0.02	0.00
612579	-3	-2	1	2	2	-3	-2	0.01	0.02	0.00	0.01	0.01	0.02	0.01	-0.09	-0.11	0.02	-0.08	-0.04	-0.09	-0.02
612587	1	0	4	-1	4	-1	1	-0.02	-0.01	0.00	0.01	-0.01	-0.03	0.01	0.07	0.04	0.03	-0.04	0.06	0.13	-0.01
612588	0	-1	3	1	-1	3	1	-0.01	0.02	0.02	-0.02	0.02	0.01	-0.01	0.01	-0.10	-0.09	0.07	-0.09	-0.05	0.06
634307	-1	2	-2	2	2	-2	2	-0.02	0.00	-0.01	0.00	0.00	-0.01	0.00	0.04	-0.02	0.06	0.00	0.00	0.04	0.03
635601	2	-3	-1	0	0	2	-3	-0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.01	-0.01	-0.02	0.02	0.01	-0.02
635602	-4	-1	-3	-3	-1	-3	-3	-0.02	-0.01	0.02	0.00	-0.02	0.01	0.01	0.05	0.05	-0.07	0.01	0.09	-0.03	-0.03

Item ID	Seq1-2	Seq3-2	Seq4-2	Seq5-2	Seq6-2	Seq7-2	Seq8-2	P1-P2	P3-P2	P4-P2	P5-P2	P6-P2	P7-P2	P8-P2	L1-L2	L3-L2	L4-L2	L5-L2	L6-L2	L7-L2	L8-L2
635763	1	3	2	3	1	3	2	0.03	0.03	0.02	0.03	0.04	0.04	0.02	-0.19	-0.17	-0.08	-0.16	-0.18	-0.17	-0.09
635782	3	1	2	1	3	1	2	-0.03	0.01	0.01	0.00	-0.02	0.02	0.01	0.10	-0.07	-0.04	-0.01	0.12	-0.09	-0.02
635783	4	1	3	-1	3	-1	4	-0.03	-0.01	-0.04	-0.02	-0.04	-0.01	-0.03	0.11	0.06	0.20	0.09	0.19	0.08	0.20
635786	3	2	2	1	1	3	2	0.02	0.01	0.03	0.03	0.02	0.03	0.01	-0.12	-0.03	-0.13	-0.14	-0.10	-0.16	-0.03
635799	-4	-1	-3	-3	-3	-3	-4	0.01	0.00	0.01	0.00	0.01	0.00	0.02	-0.07	0.00	-0.05	-0.03	-0.07	-0.01	-0.06
Mean	0	0	0	0	0	0	0	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	0.01
Max	5	5	4	4	4	3	5	0.05	0.03	0.03	0.06	0.05	0.04	0.04	0.24	0.15	0.20	0.27	0.24	0.13	0.20
Min	-5	-4	-5	-5	-5	-4	-5	-0.06	-0.03	-0.04	-0.06	-0.05	-0.03	-0.04	-0.29	-0.17	-0.17	-0.29	-0.26	-0.22	-0.15

Table N–6. Literature: Spring

Item ID	Seq1-2	Seq3-2	Seq4-2	Seq5-2	Seq6-2	Seq7-2	Seq8-2	P1-P2	P3-P2	P4-P2	P5-P2	P6-P2	P7-P2	P8-P2	L1-L2	L3-L2	L4-L2	L5-L2	L6-L2	L7-L2	L8-L2
610401	-2	0	1	-2	0	0	1	0.06	0.05	0.09	0.05	0.00	0.05	0.09	-0.29	-0.29	-0.46	-0.30	0.00	-0.28	-0.46
610402	-1	-3	1	-1	0	-3	1	0.02	0.00	0.00	0.01	0.00	0.00	0.01	-0.09	-0.02	-0.02	-0.10	0.00	-0.02	-0.05
610414	2	-2	0	2	0	-2	0	0.01	0.02	0.00	0.00	0.00	0.02	-0.01	-0.05	-0.12	-0.04	-0.05	0.00	-0.14	0.02
610415	2	-2	-1	2	0	-2	-1	-0.04	0.04	-0.01	-0.05	0.00	0.04	-0.01	0.23	-0.25	0.00	0.24	0.00	-0.26	0.02
610416	4	0	-3	0	0	-3	4	-0.02	-0.01	0.00	-0.01	0.00	-0.01	-0.02	0.14	0.05	-0.02	0.05	0.03	0.01	0.15
610417	1	7	3	0	7	3	1	-0.01	-0.03	-0.01	0.00	-0.03	-0.02	-0.01	0.07	0.17	0.03	0.01	0.24	0.09	0.05
610419	-1	3	4	0	3	4	-1	-0.01	-0.03	-0.02	-0.01	-0.02	-0.03	-0.02	0.05	0.11	0.07	0.05	0.12	0.12	0.07
610421	-1	0	-2	0	0	-2	-1	-0.03	-0.01	0.02	-0.01	-0.01	0.01	-0.04	0.16	0.04	-0.13	0.03	0.03	-0.09	0.19
610422	1	-3	-4	0	-3	-4	1	0.02	-0.06	-0.05	0.00	-0.07	-0.06	0.01	-0.09	0.26	0.19	-0.04	0.31	0.23	-0.05
610424	-2	-3	2	0	-3	2	-2	0.08	0.06	0.01	0.00	0.06	0.00	0.08	-0.39	-0.34	-0.10	-0.02	-0.33	-0.06	-0.40
610425	-4	-7	0	0	-7	0	-4	0.03	0.02	0.00	-0.01	0.02	0.00	0.03	-0.17	-0.15	-0.03	0.02	-0.10	-0.05	-0.17
610427	-1	2	1	-1	0	2	1	-0.03	-0.01	-0.03	-0.04	0.00	0.00	-0.03	0.16	0.02	0.10	0.15	0.01	-0.02	0.14
610428	1	2	-1	1	0	2	-1	0.01	-0.04	0.02	0.01	-0.01	-0.05	0.02	-0.06	0.18	-0.12	-0.07	0.05	0.20	-0.10
610429	1	2	4	1	0	2	4	-0.05	-0.05	-0.10	-0.05	-0.01	-0.07	-0.10	0.33	0.29	0.53	0.30	0.03	0.36	0.59
610433	-2	3	-4	-2	0	3	-4	0.01	-0.01	0.01	0.01	0.00	-0.01	0.01	-0.06	0.02	-0.07	-0.12	-0.03	0.02	-0.06
610434	0	-2	-1	0	0	-2	-1	0.01	-0.06	-0.01	0.01	0.00	-0.06	-0.01	-0.06	0.29	0.03	-0.05	0.01	0.25	0.04
610451	2	3	0	0	3	0	2	-0.01	-0.02	-0.02	-0.01	-0.02	-0.01	-0.01	0.04	0.06	0.05	0.00	0.10	0.03	0.03
612433	0	-2	-1	-1	0	0	-2	0.01	0.03	-0.01	0.00	0.01	0.00	0.02	-0.04	-0.18	0.04	-0.01	-0.07	-0.01	-0.13
612434	-1	0	1	1	-1	0	0	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	-0.06	-0.06	-0.08	-0.01	-0.02	-0.03
612435	1	0	1	1	1	0	0	0.03	-0.01	0.03	0.02	0.04	-0.01	0.00	-0.13	0.03	-0.17	-0.14	-0.22	0.01	0.01
612437	-1	1	-1	-1	-1	0	1	0.02	-0.01	0.02	0.02	0.02	0.00	-0.01	-0.16	0.03	-0.14	-0.16	-0.18	-0.03	0.03
612440	-1	0	1	1	-1	0	0	0.00	-0.01	0.00	-0.01	-0.01	0.00	0.00	0.00	0.00	-0.01	0.03	0.04	-0.05	-0.01
612442	0	-1	0	0	0	0	-1	0.00	-0.01	-0.01	0.00	0.00	-0.01	-0.01	0.01	-0.01	0.01	-0.01	-0.01	0.03	0.03
612443	1	2	0	0	1	0	2	0.00	0.00	-0.01	-0.01	-0.01	0.00	0.00	0.03	-0.04	0.03	0.01	0.04	-0.05	0.00
612444	1	2	0	0	1	0	2	-0.01	-0.03	-0.01	-0.01	-0.02	-0.01	-0.02	0.05	0.10	0.01	0.03	0.08	0.00	0.08
612467	-1	-3	-4	-3	-4	-1	0	-0.02	-0.02	0.00	-0.01	0.02	-0.03	0.00	0.11	0.04	-0.03	0.02	-0.09	0.10	0.00
612468	1	2	4	2	4	1	0	-0.01	-0.02	-0.01	-0.02	-0.01	-0.01	0.00	0.10	0.11	0.10	0.17	0.11	0.05	0.00
612469	-3	-6	0	-6	0	-3	0	0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.06	-0.04	-0.02	-0.04	-0.02	-0.08	-0.02
612471	-1	6	0	6	0	-1	0	-0.01	-0.03	-0.01	-0.02	0.00	-0.01	0.00	0.06	0.15	0.03	0.15	0.01	0.02	0.01
612474	1	-2	4	-2	4	1	0	0.01	0.00	-0.01	0.00	0.00	0.01	0.01	-0.05	-0.03	0.01	-0.04	0.01	-0.09	-0.08
612476	3	1	-4	1	-4	3	0	-0.04	-0.04	-0.02	-0.04	-0.02	-0.05	0.00	0.24	0.19	0.09	0.22	0.11	0.23	-0.04
612479	1	-1	-2	-1	-2	1	0	0.03	0.04	0.01	0.04	0.01	0.03	0.00	-0.16	-0.21	-0.07	-0.20	-0.04	-0.20	-0.04
616849	-1	3	2	3	2	-1	0	0.00	-0.02	-0.02	-0.02	-0.02	-0.01	0.01	0.01	0.08	0.12	0.12	0.10	0.02	-0.05
640206	0	-2	-1	-1	0	0	-2	0.00	0.00	0.00	-0.01	-0.01	0.02	0.01	0.03	-0.05	-0.04	0.00	0.06	-0.12	-0.06
Mean	0	0	0	0	0	0	0	0.00	-0.01	0.00	0.00	0.00	-0.01	0.00	0.00	0.01	0.00	0.01	0.01	0.01	-0.01
Max	4	7	4	6	7	4	4	0.08	0.06	0.09	0.05	0.06	0.05	0.09	0.33	0.29	0.53	0.30	0.31	0.36	0.59
Min	-4	-7	-4	-6	-7	-4	-4	-0.05	-0.06	-0.10	-0.05	-0.07	-0.07	-0.10	-0.39	-0.34	-0.46	-0.30	-0.33	-0.28	-0.46

Table N–7. Algebra I: Summer

Item ID	Seq1-2	Seq3-2	P1-P2	P3-P2	L1-L2	L3-L2
605056	4	8	0.02	0.09	-0.08	-0.35
631615	6	5	0.00	0.03	0.02	-0.10
605075	4	5	0.05	0.06	-0.21	-0.22
605134	5	2	0.04	0.00	-0.22	0.05
632347	-1	0	-0.01	-0.03	0.04	0.18
605213	-5	-2	-0.02	0.01	0.10	-0.01
633256	-5	-4	0.03	0.03	-0.12	-0.09
632144	-2	-6	0.00	0.03	0.03	-0.13
605263	-6	-8	0.05	0.06	-0.23	-0.26
605088	8	7	-0.01	-0.02	0.07	0.12
633246	4	7	-0.06	-0.07	0.27	0.35
605139	0	3	-0.02	-0.02	0.08	0.14
605299	-3	3	0.02	0.02	-0.09	-0.04
605051	0	-3	-0.01	0.03	0.04	-0.12
631599	-4	-3	0.00	0.00	0.03	0.06
633258	1	-2	-0.03	-0.03	0.14	0.16
605215	-4	-7	0.00	0.01	0.03	-0.03
640657	-2	-5	0.01	0.03	-0.03	-0.13
605101	5	6	0.01	0.00	-0.06	0.06
605160	3	6	-0.01	0.04	0.05	-0.15
605174	4	6	-0.03	-0.01	0.15	0.10
605158	5	2	-0.03	-0.03	0.16	0.19
633251	-3	0	0.02	-0.04	-0.09	0.21
631612	-5	-2	-0.06	-0.05	0.37	0.30
633401	-4	-6	0.03	0.03	-0.11	-0.12
605288	0	-6	0.01	0.02	-0.08	-0.12
605178	-5	-6	0.00	0.05	0.02	-0.19
632163	3	6	-0.04	0.00	0.18	0.04
605067	4	3	0.01	0.04	-0.04	-0.14
605149	6	1	-0.04	0.00	0.17	0.05
605130	3	2	-0.04	-0.01	0.19	0.09
605165	-3	4	0.00	0.02	0.01	-0.08
605309	-3	2	-0.01	0.02	0.04	-0.08
632355	-2	-6	-0.07	-0.07	0.33	0.33
632156	0	-5	-0.01	-0.02	0.07	0.13
632361	-8	-7	-0.01	0.01	0.07	0.00
Mean	0	0	-0.01	0.01	0.04	0.01
Max	8	8	0.05	0.09	0.37	0.35
Min	-8	-8	-0.07	-0.07	-0.23	-0.35

Table N–8. Biology: Summer

Item ID	Seq1-2	Seq3-2	P1-P2	P3-P2	L1-L2	L3-L2
635793	4	2	-0.01	0.02	0.18	-0.17
608377	4	0	0.03	0.04	-0.03	-0.08
635766	0	-2	0.00	0.03	0.11	-0.08
635750	-2	2	-0.02	0.01	0.18	0.03
610877	-4	0	-0.04	-0.01	0.27	0.14
635762	-2	-2	0.03	-0.03	-0.06	0.24
612386	3	4	0.06	0.00	-0.18	0.06
610524	1	4	0.01	0.08	0.05	-0.29
611392	2	-2	0.06	0.05	-0.16	-0.15
611384	2	-2	0.02	0.04	0.00	-0.10
607712	-3	-2	0.04	0.04	-0.09	-0.11
618060	-5	-2	0.06	0.05	-0.17	-0.15
611031	0	0	0.06	0.04	-0.19	-0.15
609390	0	0	-0.01	0.00	0.15	0.08
607118	2	4	0.07	0.07	-0.27	-0.33
611477	3	2	-0.07	-0.01	0.43	0.13
608083	1	-1	0.03	0.06	-0.02	-0.17
635753	-2	-1	0.05	-0.05	-0.15	0.30
635597	-4	-4	0.03	0.03	-0.03	-0.04
607702	4	4	-0.02	-0.02	0.19	0.17
611008	2	-1	0.01	0.04	0.05	-0.11
611037	-2	-1	0.02	0.05	0.02	-0.13
611156	-2	-1	0.06	0.03	-0.18	-0.06
635760	-2	-1	-0.09	-0.12	0.50	0.61
611053	4	3	0.04	0.05	-0.07	-0.13
607085	2	4	-0.02	-0.01	0.18	0.13
607590	-2	2	0.00	-0.07	0.10	0.39
612594	2	-2	0.00	0.04	0.08	-0.13
607668	-2	-4	0.02	0.02	-0.01	-0.03
610479	-4	-3	0.05	0.03	-0.17	-0.09
611507	1	4	-0.02	-0.03	0.20	0.19
612675	2	1	0.02	-0.02	0.02	0.15
611074	2	3	-0.03	-0.03	0.25	0.21
610909	-3	-2	-0.02	0.01	0.20	0.02
611923	1	-4	0.01	-0.01	0.07	0.14
607754	-3	-2	0.02	-0.03	0.02	0.23
607586	0	0	-0.03	0.02	0.21	-0.02
607092	0	0	-0.01	0.00	0.16	0.07
608382	1	4	-0.02	0.01	0.18	0.03
607589	3	1	-0.04	-0.02	0.26	0.16
608345	1	-1	0.04	-0.04	-0.06	0.24
612667	-3	-3	0.05	0.03	-0.16	-0.08
607748	-2	-1	-0.03	-0.05	0.25	0.34
612664	2	1	0.00	-0.01	0.12	0.12

Item ID	Seq1-2	Seq3-2	P1-P2	P3-P2	L1-L2	L3-L2
608271	3	2	0.04	0.05	-0.10	-0.16
611509	-1	2	0.00	0.00	0.07	0.06
611046	-3	-1	-0.01	0.04	0.12	-0.10
611925	-1	-4	0.07	0.01	-0.24	0.02
Mean	0	0	0.01	0.01	0.05	0.03
Max	4	4	0.07	0.08	0.50	0.61
Min	-5	-4	-0.09	-0.12	-0.27	-0.33

Table N–9. Literature: Summer

Item ID	Seq1-2	Seq3-2	P1-P2	P3-P2	L1-L2	L3-L2
614801	1	3	0.01	0.03	-0.03	-0.25
614799	-1	1	0.08	0.04	-0.31	-0.18
614800	1	-1	-0.01	-0.01	0.11	0.06
614796	-1	-3	0.04	0.04	-0.15	-0.19
614794	1	2	0.01	-0.01	-0.03	0.06
614791	-1	0	0.04	0.11	-0.10	-0.51
614792	1	-2	-0.01	-0.01	0.12	0.06
614798	-1	1	-0.03	0.03	0.24	-0.17
614793	0	-1	0.04	0.10	-0.13	-0.48
608191	1	2	-0.01	-0.06	0.13	0.31
612420	-1	2	0.09	0.01	-0.42	-0.04
612418	1	-2	-0.03	0.01	0.22	-0.01
608193	-1	-2	-0.02	-0.02	0.15	0.10
612413	1	3	0.00	-0.01	0.07	0.05
612417	-1	1	0.13	0.05	-0.55	-0.24
612414	1	-1	0.04	0.03	-0.18	-0.17
612415	-1	-3	-0.04	-0.01	0.24	0.04
608943	1	3	0.00	-0.02	0.05	0.12
608939	-1	1	0.04	-0.02	-0.11	0.12
616846	1	-1	0.03	0.13	-0.08	-0.56
608941	-1	-3	0.01	0.05	0.01	-0.20
640221	3	2	-0.03	-0.01	0.23	0.09
640205	1	2	-0.04	-0.01	0.29	0.05
608948	-1	-2	0.05	0.01	-0.17	-0.03
608942	-3	-2	0.03	0.07	-0.06	-0.35
614687	8	7	0.04	0.00	-0.14	0.00
614693	3	4	-0.02	0.01	0.15	-0.07
614690	1	4	0.05	0.07	-0.17	-0.31
614697	-1	5	-0.04	-0.03	0.24	0.14
614696	-3	0	0.03	-0.02	-0.26	0.12
614698	0	-4	0.01	0.01	-0.01	-0.07
614694	1	-4	0.03	0.03	-0.07	-0.13
614691	-1	-7	0.02	-0.12	-0.01	0.59
614689	-8	-5	0.05	0.02	-0.15	-0.07
Mean	0	0	0.02	0.01	-0.03	-0.06
Max	8	7	0.13	0.13	0.29	0.59
Min	-8	-7	-0.04	-0.12	-0.55	-0.56

FORM LEVEL

Table N–10. Algebra I: Winter

RS	SS-All	SEM-SS	SS-F1	SS-F2	SS-F3
0	1201	92	1200	1200	1201
1	1262	51	1262	1262	1262
2	1299	37	1299	1299	1299
3	1321	31	1321	1321	1321
4	1337	27	1337	1337	1338
5	1351	24	1350	1351	1351
6	1362	23	1362	1362	1362
7	1371	21	1371	1371	1371
8	1380	20	1380	1380	1380
9	1388	19	1388	1388	1388
10	1395	19	1395	1395	1395
11	1402	18	1401	1402	1401
12	1408	17	1408	1408	1408
13	1414	17	1414	1414	1414
14	1419	16	1419	1419	1419
15	1425	16	1424	1425	1424
16	1430	16	1429	1430	1429
17	1434	15	1434	1435	1434
18	1439	15	1439	1439	1439
19	1444	15	1443	1444	1443
20	1448	15	1448	1448	1448
21	1452	14	1452	1452	1452
22	1456	14	1456	1456	1456
23	1460	14	1460	1460	1460
24	1464	14	1464	1464	1464
25	1468	14	1468	1468	1468
26	1472	14	1472	1472	1472
27	1475	13	1475	1475	1475
28	1479	13	1479	1479	1479
29	1482	13	1482	1483	1482
30	1486	13	1486	1486	1486
31	1489	13	1489	1490	1489
32	1493	13	1493	1493	1493
33	1496	13	1496	1496	1496
34	1500	13	1500	1500	1500
35	1503	13	1503	1503	1503
36	1507	13	1507	1507	1507
37	1510	13	1510	1510	1510
38	1514	13	1514	1514	1514
39	1517	14	1517	1517	1517

RS	SS-All	SEM-SS	SS-F1	SS-F2	SS-F3
40	1521	14	1521	1521	1521
41	1525	14	1525	1525	1525
42	1529	14	1529	1529	1529
43	1533	15	1533	1533	1533
44	1537	15	1537	1537	1537
45	1542	15	1542	1542	1542
46	1547	16	1547	1547	1547
47	1552	16	1552	1552	1552
48	1557	17	1558	1557	1557
49	1563	18	1563	1563	1563
50	1570	18	1570	1570	1570
51	1577	19	1577	1577	1577
52	1584	20	1585	1584	1584
53	1593	21	1593	1593	1593
54	1603	23	1603	1603	1603
55	1614	25	1615	1614	1614
56	1628	28	1629	1628	1628
57	1646	32	1646	1645	1646
58	1670	39	1671	1670	1671
59	1711	53	1711	1710	1711
60	1776	94	1777	1776	1777

Table N–11. Biology: Winter

RS	SS-All	SEM-SS	SS-F1	SS-F2	SS-F3
0	1204	92	1204	1203	1203
1	1265	51	1265	1265	1265
2	1301	36	1302	1301	1301
3	1323	30	1324	1323	1323
4	1339	26	1340	1339	1339
5	1352	24	1352	1352	1352
6	1363	22	1363	1362	1362
7	1372	21	1372	1372	1371
8	1380	20	1380	1380	1380
9	1387	19	1388	1387	1387
10	1394	18	1394	1394	1394
11	1400	17	1400	1400	1400
12	1406	17	1406	1406	1406
13	1411	16	1412	1411	1411
14	1417	16	1417	1416	1416
15	1422	16	1422	1421	1421
16	1426	15	1427	1426	1426
17	1431	15	1431	1431	1431
18	1435	15	1435	1435	1435
19	1439	14	1440	1439	1439
20	1444	14	1444	1443	1443
21	1448	14	1448	1447	1447
22	1452	14	1452	1451	1451
23	1455	14	1456	1455	1455
24	1459	14	1459	1459	1459
25	1463	14	1463	1463	1463
26	1467	14	1467	1466	1466
27	1470	13	1470	1470	1470
28	1474	13	1474	1474	1474
29	1477	13	1478	1477	1477
30	1481	13	1481	1481	1481
31	1485	13	1485	1484	1484
32	1488	13	1488	1488	1488
33	1492	13	1492	1492	1492
34	1495	13	1495	1495	1495
35	1499	13	1499	1499	1499
36	1502	13	1502	1502	1502
37	1506	13	1506	1506	1506
38	1510	14	1510	1510	1510
39	1513	14	1513	1513	1513
40	1517	14	1517	1517	1517
41	1521	14	1521	1521	1521
42	1525	14	1525	1525	1525
43	1529	14	1529	1529	1529

RS	SS-All	SEM-SS	SS-F1	SS-F2	SS-F3
44	1533	14	1532	1533	1533
45	1537	14	1537	1537	1537
46	1541	15	1541	1541	1541
47	1545	15	1545	1545	1545
48	1549	15	1549	1550	1550
49	1554	15	1554	1554	1554
50	1559	16	1559	1559	1559
51	1564	16	1563	1564	1564
52	1569	16	1569	1569	1569
53	1574	17	1574	1574	1575
54	1580	17	1580	1580	1580
55	1586	18	1586	1586	1586
56	1593	18	1592	1593	1593
57	1600	19	1599	1600	1600
58	1607	20	1607	1608	1608
59	1616	21	1615	1616	1616
60	1625	23	1625	1626	1626
61	1637	25	1636	1637	1637
62	1650	27	1649	1650	1650
63	1666	31	1666	1667	1667
64	1689	37	1688	1689	1690
65	1726	51	1725	1727	1727
66	1788	92	1787	1789	1789

Table N–12. Literature: Winter

RS	SS-All	SEM-SS	SS-F1	SS-F2	SS-F3
0	1199	92	1200	1200	1200
1	1260	51	1260	1259	1260
2	1296	36	1296	1295	1296
3	1318	30	1317	1317	1318
4	1333	26	1333	1333	1334
5	1346	24	1346	1346	1346
6	1357	22	1357	1356	1357
7	1366	21	1366	1366	1366
8	1374	20	1374	1374	1374
9	1382	19	1382	1382	1382
10	1389	18	1389	1389	1389
11	1395	18	1395	1395	1395
12	1401	17	1401	1401	1401
13	1407	17	1407	1407	1407
14	1413	16	1413	1413	1413
15	1418	16	1418	1418	1418
16	1423	16	1423	1423	1423
17	1428	16	1428	1428	1428
18	1433	16	1433	1433	1433
19	1438	15	1438	1438	1438
20	1443	15	1443	1443	1443
21	1447	15	1447	1447	1447
22	1452	15	1452	1452	1452
23	1457	15	1457	1457	1457
24	1461	15	1461	1461	1461
25	1466	15	1466	1466	1466
26	1470	15	1470	1470	1470
27	1475	15	1475	1475	1475
28	1480	15	1480	1480	1480
29	1484	15	1484	1484	1484
30	1489	16	1489	1489	1489
31	1494	16	1494	1494	1494
32	1499	16	1499	1499	1499
33	1504	16	1504	1504	1504
34	1510	16	1510	1510	1509
35	1515	17	1515	1515	1515
36	1521	17	1521	1521	1521
37	1527	18	1527	1527	1527
38	1533	18	1533	1533	1533
39	1540	19	1540	1540	1540
40	1547	19	1547	1547	1547
41	1555	20	1555	1555	1554
42	1563	21	1563	1563	1563
43	1572	22	1572	1572	1572

RS	SS-All	SEM-SS	SS-F1	SS-F2	SS-F3
44	1582	23	1582	1582	1581
45	1592	24	1592	1593	1592
46	1605	25	1605	1605	1604
47	1619	27	1618	1619	1618
48	1635	30	1635	1635	1635
49	1655	33	1655	1655	1655
50	1681	39	1681	1681	1681
51	1721	53	1721	1721	1721
52	1785	93	1785	1785	1786

Table N–13. Algebra I: Spring

RS	SS-All	SEM-SS	SS-F1	SS-F2	SS-F3	SS-F4	SS-F5	SS-F6	SS-F7	SS-F8
0	1220	92	1219	1220	1220	1220	1220	1220	1220	1220
1	1281	51	1281	1281	1282	1281	1281	1281	1281	1281
2	1317	36	1317	1317	1318	1317	1317	1317	1317	1317
3	1339	30	1338	1339	1339	1339	1339	1339	1339	1339
4	1355	26	1354	1355	1355	1355	1354	1355	1355	1355
5	1367	24	1367	1367	1368	1367	1367	1367	1367	1367
6	1378	22	1377	1378	1378	1378	1377	1378	1378	1378
7	1387	21	1387	1387	1387	1387	1387	1387	1387	1387
8	1395	20	1395	1395	1395	1395	1395	1395	1395	1395
9	1402	19	1402	1402	1403	1402	1402	1402	1402	1402
10	1409	18	1409	1409	1409	1409	1409	1409	1409	1409
11	1415	17	1415	1415	1415	1415	1415	1415	1415	1415
12	1421	17	1421	1421	1421	1421	1421	1421	1421	1421
13	1426	16	1426	1426	1427	1426	1426	1426	1426	1426
14	1431	16	1431	1431	1432	1431	1431	1432	1431	1431
15	1436	15	1436	1436	1437	1436	1436	1436	1436	1436
16	1441	15	1441	1441	1441	1441	1441	1441	1441	1441
17	1445	15	1445	1445	1446	1445	1445	1446	1446	1445
18	1450	15	1450	1450	1450	1450	1450	1450	1450	1450
19	1454	14	1454	1454	1454	1454	1454	1454	1454	1454
20	1458	14	1458	1458	1458	1458	1458	1458	1458	1458
21	1462	14	1462	1462	1462	1462	1462	1462	1462	1462
22	1466	14	1466	1466	1466	1466	1466	1466	1466	1466
23	1470	14	1470	1470	1470	1470	1469	1470	1470	1470
24	1473	14	1473	1473	1473	1473	1473	1473	1473	1473
25	1477	13	1477	1477	1477	1477	1477	1477	1477	1477
26	1480	13	1480	1480	1480	1480	1480	1481	1480	1481
27	1484	13	1484	1484	1484	1484	1484	1484	1484	1484
28	1487	13	1487	1487	1487	1487	1487	1488	1487	1488
29	1491	13	1491	1491	1491	1491	1491	1491	1491	1491
30	1494	13	1494	1494	1494	1494	1494	1495	1494	1494
31	1498	13	1498	1498	1498	1498	1498	1498	1498	1498
32	1501	13	1501	1501	1501	1501	1501	1501	1501	1501
33	1505	13	1505	1505	1504	1505	1505	1505	1505	1505
34	1508	13	1508	1508	1508	1508	1508	1508	1508	1508
35	1512	13	1512	1512	1511	1512	1512	1512	1511	1512
36	1515	13	1515	1515	1515	1515	1515	1515	1515	1515
37	1518	13	1519	1519	1518	1518	1519	1519	1518	1519
38	1522	13	1522	1522	1522	1522	1522	1522	1522	1522
39	1526	13	1526	1526	1525	1526	1526	1526	1525	1526
40	1529	14	1529	1529	1529	1529	1529	1529	1529	1529
41	1533	14	1533	1533	1533	1533	1533	1533	1533	1533
42	1537	14	1537	1537	1537	1537	1537	1537	1537	1537
43	1541	14	1541	1541	1540	1541	1541	1541	1541	1541
44	1545	14	1545	1545	1545	1545	1545	1545	1545	1545
45	1549	15	1549	1549	1549	1549	1549	1549	1549	1549
46	1553	15	1554	1553	1553	1553	1554	1553	1553	1553
47	1558	15	1558	1558	1558	1558	1558	1558	1558	1558
48	1563	16	1563	1563	1562	1563	1563	1563	1563	1563
49	1568	16	1568	1568	1568	1568	1568	1568	1568	1568
50	1573	17	1573	1573	1573	1573	1574	1573	1573	1573
51	1579	18	1579	1579	1579	1579	1580	1579	1579	1579
52	1586	19	1586	1586	1585	1586	1586	1586	1586	1586
53	1593	20	1593	1593	1593	1593	1593	1593	1593	1593
54	1601	21	1602	1601	1601	1601	1602	1601	1601	1601
55	1611	23	1611	1611	1611	1611	1611	1611	1611	1611
56	1623	26	1623	1623	1623	1623	1623	1622	1623	1623
57	1638	29	1638	1638	1638	1638	1638	1637	1638	1638
58	1659	36	1659	1659	1659	1659	1659	1658	1659	1659
59	1694	50	1695	1694	1694	1695	1695	1693	1695	1694
60	1755	92	1756	1755	1755	1756	1756	1754	1756	1755

Table N–14. Biology: Spring

RS	SS-All	SEM-SS	SS-F1	SS-F2	SS-F3	SS-F4	SS-F5	SS-F6	SS-F7	SS-F8
0	1205	92	1205	1205	1205	1205	1205	1205	1205	1206
1	1266	51	1266	1266	1266	1266	1266	1266	1266	1266
2	1302	36	1302	1302	1302	1302	1302	1302	1302	1302
3	1323	30	1323	1323	1323	1323	1323	1323	1323	1324
4	1339	26	1339	1339	1338	1339	1338	1339	1339	1339
5	1351	24	1351	1351	1351	1351	1351	1351	1351	1351
6	1361	22	1361	1361	1361	1361	1361	1361	1361	1362
7	1370	20	1370	1370	1370	1370	1370	1370	1370	1370
8	1378	19	1378	1378	1378	1378	1378	1378	1378	1378
9	1385	18	1385	1385	1385	1385	1385	1385	1385	1386
10	1392	18	1392	1392	1391	1392	1391	1392	1392	1392
11	1398	17	1398	1398	1398	1398	1398	1398	1398	1398
12	1404	17	1404	1403	1403	1403	1403	1403	1403	1404
13	1409	16	1409	1409	1409	1409	1409	1409	1409	1409
14	1414	16	1414	1414	1414	1414	1414	1414	1414	1414
15	1419	15	1419	1419	1419	1419	1419	1419	1419	1419
16	1424	15	1424	1424	1423	1423	1423	1424	1423	1424
17	1428	15	1428	1428	1428	1428	1428	1428	1428	1428
18	1432	15	1433	1432	1432	1432	1432	1432	1432	1433
19	1437	14	1437	1437	1437	1437	1436	1437	1437	1437
20	1441	14	1441	1441	1441	1441	1441	1441	1441	1441
21	1445	14	1445	1445	1445	1445	1445	1445	1445	1445
22	1449	14	1449	1449	1449	1449	1449	1449	1449	1449
23	1453	14	1453	1453	1453	1453	1452	1453	1452	1453
24	1456	14	1457	1457	1456	1456	1456	1456	1456	1457
25	1460	14	1460	1460	1460	1460	1460	1460	1460	1460
26	1464	14	1464	1464	1464	1464	1464	1464	1464	1464
27	1468	13	1468	1468	1467	1467	1467	1468	1467	1468
28	1471	13	1471	1471	1471	1471	1471	1471	1471	1471
29	1475	13	1475	1475	1475	1475	1475	1475	1475	1475
30	1478	13	1478	1478	1478	1478	1478	1478	1478	1478
31	1482	13	1482	1482	1482	1482	1482	1482	1482	1482
32	1485	13	1485	1485	1485	1485	1485	1485	1485	1485
33	1489	13	1489	1489	1489	1489	1489	1489	1489	1489
34	1492	13	1492	1492	1492	1492	1492	1492	1492	1492
35	1496	13	1496	1496	1496	1496	1496	1496	1496	1496
36	1499	13	1499	1499	1499	1499	1499	1499	1499	1499
37	1503	13	1503	1503	1503	1503	1503	1503	1503	1503
38	1506	13	1506	1507	1506	1506	1506	1506	1506	1506
39	1510	13	1510	1510	1510	1510	1510	1510	1510	1510
40	1514	13	1514	1514	1514	1513	1514	1513	1513	1513
41	1517	13	1517	1517	1517	1517	1517	1517	1517	1517
42	1521	14	1521	1521	1521	1521	1521	1521	1521	1520
43	1524	14	1525	1525	1525	1524	1525	1524	1524	1524
44	1528	14	1528	1528	1528	1528	1528	1528	1528	1528
45	1532	14	1532	1532	1532	1532	1532	1532	1532	1532
46	1536	14	1536	1536	1536	1536	1536	1536	1536	1536
47	1540	14	1540	1540	1540	1540	1540	1540	1540	1540
48	1544	15	1544	1544	1545	1544	1544	1544	1544	1544
49	1549	15	1549	1549	1549	1549	1549	1549	1549	1548
50	1553	15	1553	1553	1553	1553	1553	1553	1553	1553
51	1558	15	1558	1558	1558	1558	1558	1558	1558	1558
52	1563	16	1563	1563	1563	1563	1563	1563	1563	1562
53	1568	16	1568	1568	1568	1568	1568	1568	1568	1568
54	1573	17	1573	1573	1574	1574	1574	1573	1574	1573
55	1579	17	1579	1579	1579	1579	1579	1579	1580	1579
56	1586	18	1585	1586	1586	1586	1586	1586	1586	1586
57	1593	19	1592	1593	1593	1593	1593	1593	1593	1593
58	1600	20	1600	1600	1600	1601	1600	1600	1601	1600
59	1609	21	1608	1609	1609	1609	1609	1609	1609	1609

RS	SS-All	SEM-SS	SS-F1	SS-F2	SS-F3	SS-F4	SS-F5	SS-F6	SS-F7	SS-F8
60	1618	23	1618	1618	1619	1619	1619	1619	1619	1618
61	1630	25	1629	1629	1630	1630	1630	1630	1630	1630
62	1643	27	1643	1643	1643	1644	1643	1643	1644	1643
63	1660	31	1659	1659	1660	1660	1660	1660	1660	1660
64	1683	37	1682	1682	1683	1683	1684	1683	1683	1682
65	1720	51	1720	1720	1721	1721	1721	1721	1721	1720
66	1783	92	1782	1782	1783	1784	1784	1783	1783	1782

Table N–15. Literature: Spring

RS	SS-All	SEM-SS	SS-F1	SS-F2	SS-F3	SS-F4	SS-F5	SS-F6	SS-F7	SS-F8
0	1200	92	1201	1200	1201	1200	1201	1200	1200	1200
1	1262	51	1262	1261	1262	1262	1262	1261	1262	1262
2	1298	37	1298	1297	1298	1298	1298	1298	1298	1298
3	1320	30	1320	1320	1320	1320	1320	1320	1320	1320
4	1336	27	1337	1336	1337	1336	1336	1336	1336	1336
5	1349	24	1349	1349	1350	1349	1349	1349	1349	1349
6	1360	23	1360	1360	1360	1360	1360	1360	1360	1360
7	1370	21	1370	1369	1370	1370	1370	1369	1370	1370
8	1378	20	1378	1378	1378	1378	1378	1378	1378	1378
9	1386	19	1386	1386	1386	1386	1386	1386	1386	1386
10	1393	19	1393	1393	1393	1393	1393	1393	1393	1393
11	1400	18	1400	1400	1400	1400	1400	1400	1400	1400
12	1406	18	1406	1406	1406	1406	1406	1406	1406	1406
13	1412	17	1412	1412	1412	1412	1412	1412	1412	1412
14	1418	17	1418	1418	1418	1418	1418	1418	1418	1418
15	1424	16	1424	1423	1424	1424	1424	1423	1424	1424
16	1429	16	1429	1429	1429	1429	1429	1429	1429	1429
17	1434	16	1434	1434	1434	1434	1434	1434	1434	1434
18	1439	16	1439	1439	1439	1439	1439	1439	1439	1439
19	1444	16	1444	1444	1444	1444	1444	1444	1444	1444
20	1449	16	1449	1449	1449	1449	1449	1449	1449	1449
21	1454	15	1454	1454	1454	1454	1454	1454	1454	1454
22	1458	15	1459	1458	1458	1459	1458	1458	1458	1458
23	1463	15	1463	1463	1463	1463	1463	1463	1463	1463
24	1468	15	1468	1468	1468	1468	1468	1468	1468	1468
25	1473	15	1473	1473	1472	1473	1472	1472	1472	1472
26	1477	15	1477	1477	1477	1477	1477	1477	1477	1477
27	1482	15	1482	1482	1482	1482	1482	1482	1482	1482
28	1487	15	1487	1487	1486	1487	1487	1486	1487	1486
29	1491	15	1491	1491	1491	1491	1491	1491	1491	1491
30	1496	16	1496	1496	1496	1496	1496	1496	1496	1496
31	1501	16	1501	1501	1501	1501	1501	1501	1501	1501
32	1506	16	1506	1506	1506	1506	1506	1506	1506	1506
33	1511	16	1511	1511	1511	1511	1511	1511	1511	1511
34	1516	16	1516	1517	1516	1516	1516	1516	1516	1516
35	1522	17	1522	1522	1522	1522	1522	1522	1522	1522
36	1527	17	1527	1528	1527	1527	1527	1527	1527	1527
37	1533	17	1533	1533	1533	1533	1533	1533	1533	1533
38	1539	18	1539	1539	1539	1539	1539	1539	1539	1539
39	1545	18	1545	1546	1545	1545	1545	1546	1545	1545
40	1552	19	1552	1552	1552	1552	1552	1553	1552	1552
41	1559	19	1559	1560	1559	1559	1559	1560	1559	1559
42	1567	20	1567	1567	1567	1567	1567	1567	1567	1567
43	1575	21	1575	1576	1575	1575	1575	1576	1575	1575
44	1584	22	1584	1585	1584	1584	1584	1585	1584	1584
45	1594	23	1594	1594	1594	1594	1594	1595	1594	1594
46	1605	24	1605	1606	1605	1605	1605	1606	1605	1605
47	1618	26	1618	1618	1618	1618	1618	1619	1618	1618
48	1633	29	1633	1633	1633	1633	1633	1634	1633	1633
49	1652	32	1651	1652	1652	1652	1652	1652	1652	1652
50	1676	39	1676	1677	1676	1676	1677	1677	1677	1677
51	1716	52	1715	1716	1716	1716	1716	1717	1717	1717
52	1780	93	1779	1780	1780	1780	1780	1780	1781	1780

Table N–16. Algebra I: Summer

RS	SS-All	SEM-SS	SS-F1	SS-F2	SS-F3
0	1219	92	1220	1218	1219
1	1281	51	1281	1280	1280
2	1317	36	1317	1316	1316
3	1338	30	1339	1338	1337
4	1354	26	1355	1354	1353
5	1367	24	1367	1366	1366
6	1377	22	1378	1377	1376
7	1387	21	1387	1386	1386
8	1395	20	1395	1394	1394
9	1402	19	1403	1402	1401
10	1409	18	1410	1409	1408
11	1415	18	1416	1415	1415
12	1421	17	1422	1421	1421
13	1427	17	1428	1427	1426
14	1432	16	1433	1432	1432
15	1438	16	1438	1437	1437
16	1442	16	1443	1442	1442
17	1447	15	1448	1447	1447
18	1452	15	1452	1451	1451
19	1456	15	1457	1456	1456
20	1461	15	1461	1460	1460
21	1465	15	1466	1464	1464
22	1469	14	1470	1469	1469
23	1473	14	1474	1473	1473
24	1477	14	1478	1477	1477
25	1481	14	1482	1481	1481
26	1485	14	1486	1485	1485
27	1489	14	1490	1489	1489
28	1493	14	1493	1493	1493
29	1497	14	1497	1497	1496
30	1501	14	1501	1500	1500
31	1504	14	1504	1504	1504
32	1508	14	1508	1508	1508
33	1512	14	1512	1512	1511
34	1515	14	1515	1516	1515
35	1519	14	1519	1519	1519
36	1523	14	1523	1523	1523
37	1527	14	1526	1527	1526
38	1531	14	1530	1531	1530
39	1534	14	1534	1535	1534
40	1538	14	1538	1539	1538
41	1542	14	1541	1543	1542
42	1546	14	1545	1547	1546
43	1550	15	1549	1551	1550

RS	SS-All	SEM-SS	SS-F1	SS-F2	SS-F3
44	1555	15	1554	1556	1554
45	1559	15	1558	1560	1559
46	1564	15	1563	1565	1563
47	1569	16	1567	1570	1568
48	1574	16	1572	1575	1573
49	1579	17	1578	1581	1579
50	1585	17	1583	1586	1585
51	1591	18	1590	1593	1591
52	1598	19	1597	1599	1598
53	1606	20	1604	1607	1606
54	1614	22	1613	1616	1615
55	1624	24	1624	1626	1625
56	1637	26	1636	1638	1638
57	1653	30	1653	1653	1656
58	1675	37	1676	1674	1681
59	1713	52	1714	1710	1723
60	1776	92	1779	1772	1792

Table N–17. Biology: Summer

RS	SS-All	SEM-SS	SS-F1	SS-F2	SS-F3
0	1208	92	1211	1207	1206
1	1270	51	1273	1269	1269
2	1307	37	1310	1305	1306
3	1329	31	1332	1328	1328
4	1345	27	1348	1344	1345
5	1358	24	1361	1357	1358
6	1369	22	1372	1368	1369
7	1378	21	1381	1377	1378
8	1386	20	1389	1385	1386
9	1394	19	1396	1393	1394
10	1401	18	1403	1400	1401
11	1407	17	1409	1406	1407
12	1413	17	1415	1412	1413
13	1418	16	1421	1418	1418
14	1423	16	1426	1423	1424
15	1428	16	1431	1428	1429
16	1433	15	1435	1432	1433
17	1438	15	1440	1437	1438
18	1442	15	1444	1441	1442
19	1446	14	1448	1446	1447
20	1450	14	1452	1450	1451
21	1454	14	1456	1454	1455
22	1458	14	1460	1458	1459
23	1462	14	1464	1461	1462
24	1466	14	1467	1465	1466
25	1469	13	1471	1469	1470
26	1473	13	1475	1472	1473
27	1476	13	1478	1476	1477
28	1480	13	1482	1479	1480
29	1483	13	1485	1483	1484
30	1487	13	1488	1486	1487
31	1490	13	1492	1490	1491
32	1494	13	1495	1493	1494
33	1497	13	1498	1497	1498
34	1500	13	1502	1500	1501
35	1504	13	1505	1503	1505
36	1507	13	1508	1507	1508
37	1511	13	1512	1510	1512
38	1514	13	1515	1514	1515
39	1518	13	1518	1517	1519
40	1521	13	1522	1521	1522
41	1525	13	1525	1525	1526
42	1529	14	1529	1528	1530
43	1532	14	1532	1532	1533

RS	SS-All	SEM-SS	SS-F1	SS-F2	SS-F3
44	1536	14	1536	1536	1537
45	1540	14	1540	1540	1541
46	1544	14	1543	1544	1545
47	1548	14	1547	1548	1549
48	1552	15	1551	1552	1553
49	1557	15	1555	1557	1558
50	1561	15	1560	1562	1562
51	1566	16	1564	1567	1567
52	1571	16	1569	1572	1572
53	1577	16	1574	1577	1577
54	1582	17	1579	1583	1582
55	1588	18	1585	1589	1588
56	1594	18	1591	1595	1594
57	1601	19	1597	1603	1601
58	1609	20	1604	1610	1608
59	1617	21	1612	1619	1616
60	1627	22	1621	1628	1625
61	1638	24	1632	1640	1636
62	1651	27	1644	1653	1648
63	1667	31	1660	1670	1664
64	1690	37	1682	1693	1686
65	1727	51	1718	1731	1722
66	1789	92	1780	1794	1783

Table N–18. Literature: Summer

RS	SS-All	SEM-SS	SS-F1	SS-F2	SS-F3
0	1205	92	1201	1206	1206
1	1266	51	1262	1268	1267
2	1303	37	1299	1304	1303
3	1325	30	1321	1326	1325
4	1341	27	1337	1342	1341
5	1354	24	1350	1355	1354
6	1364	22	1361	1366	1365
7	1374	21	1371	1375	1374
8	1382	20	1379	1384	1383
9	1390	19	1387	1391	1390
10	1397	18	1395	1398	1397
11	1404	18	1401	1405	1404
12	1410	17	1408	1411	1410
13	1416	17	1414	1417	1416
14	1421	17	1420	1423	1421
15	1427	16	1425	1428	1426
16	1432	16	1430	1433	1432
17	1437	16	1436	1438	1437
18	1442	16	1441	1443	1441
19	1447	15	1446	1448	1446
20	1452	15	1451	1453	1451
21	1456	15	1456	1457	1455
22	1461	15	1460	1462	1460
23	1465	15	1465	1467	1464
24	1470	15	1470	1471	1469
25	1475	15	1475	1476	1473
26	1479	15	1479	1480	1478
27	1484	15	1484	1485	1482
28	1488	15	1489	1489	1487
29	1493	15	1494	1494	1492
30	1498	15	1498	1498	1496
31	1502	16	1503	1503	1501
32	1507	16	1508	1508	1506
33	1512	16	1514	1513	1511
34	1517	16	1519	1518	1516
35	1523	16	1524	1523	1521
36	1528	17	1530	1528	1527
37	1534	17	1536	1534	1532
38	1540	17	1542	1539	1538
39	1546	18	1548	1545	1545
40	1552	18	1555	1552	1551
41	1559	19	1562	1558	1558
42	1567	20	1569	1565	1566
43	1575	20	1577	1573	1574

RS	SS-All	SEM-SS	SS-F1	SS-F2	SS-F3
44	1583	21	1586	1581	1583
45	1593	23	1596	1591	1594
46	1604	24	1607	1601	1605
47	1616	26	1619	1613	1618
48	1631	28	1634	1627	1633
49	1649	32	1652	1644	1653
50	1673	38	1677	1668	1678
51	1713	52	1716	1706	1719
52	1776	93	1779	1769	1783