# Colorado Measures of Academic Success

# Technical Report

# Math, English Language Arts (ELA), and Science

# 2023

# Table of Contents

## List of Tables

# List of Figures

# Chapter 1: Introduction

The purpose of this technical report is to inform users and other interested parties about the development, content, administration, and technical characteristics of the Spring 2023 Colorado Measures of Academic Success (CMAS) assessments for mathematics and English language arts (ELA) in Grades 3–8; for science in Grades 5, 8, and 11; and for the Colorado Spanish Language Arts (CSLA) assessment in Grades 3 and 4. The report includes an overview and summary of the components of the program, including information regarding the planning and administration of the assessments and details regarding item development, test construction, administration procedures, scoring, reporting, reliability, and validity, as well as a statistical summary of the Spring 2023 operational and field test items.

## 1.1. Testing Requirements

All public schools in Colorado are required by state law to administer a standards-based summative assessment each year in specified content areas and grade levels. Every student, regardless of ability or language background, must be provided the opportunity to demonstrate their content knowledge through the state assessments. The CMAS assessments in mathematics, ELA, science, and social studies are Colorado's end-of-year standards-based assessments designed to measure students' achievement of the Colorado Academic Standards (CAS).

As a requirement of Colorado School Law C.R.S. §22-7-1006.3 (4) (II)(b), students with Spanish as their home language in Grades 3 and 4 who meet established eligibility criteria may take the CSLA forms of the ELA assessment. The CSLA forms serve as accommodated versions of the CMAS ELA assessments and are parallel and comparable to ELA in test design, scoring, and reporting.

Colorado legislation (C.R.S. §22-7-1006.3 (1) (d)) also requires that a paper-based version be available for all online assessments that may be used by local educational providers for their students. The comparable paper-based forms may also be administered to students with disabilities and multilingual learner (ML) students as appropriate. Multilingual learners for assessment purposes are students with a home language other than English who are designated as not English proficient or limited English proficient (NEP/LEP) by an English language proficiency assessment or screener.

In 2015, Colorado passed legislation (C.R.S. §22-7-1013 (8) (a-c)) that allows for parents/guardians to excuse their child(ren) from testing.

## 1.2. Intended Population

The CMAS assessments are intended to be taken by all students enrolled in public schools, except for some students with the most significant cognitive disabilities who take the Colorado Alternate (CoAlt) assessment as determined by the student's Individualized Education Plan (IEP) team. ML students in their first year in the U.S. are exempt from the ELA assessment. However, ML students in Grades 3 and 4 designated as NEP whose native language is Spanish and who have received language arts instruction in Spanish during the current school year are required to take the CSLA assessment. Students with disabilities and ML students may take the CMAS assessments with or without accommodations that do not change the construct of the assessment. Accommodations are determined based on classroom experience and educational team decisions.

## 1.3. CMAS Background

The CMAS Science assessments were first administered in 2013–2014, the CMAS Mathematics and ELA assessments were first administered in 2014–2015, and the CSLA assessments were first administered in 2015-2016. Colorado developed the CMAS Mathematics and ELA assessments in collaboration with the Partnership for Assessment of Readiness for College and Careers (PARCC) consortium, with Pearson taking over as the testing contractor for mathematics and ELA in 2017–2018.[1] Pearson has been the testing contractor for the CMAS Science and Social Studies assessments and the CSLA assessments since their inception.

In 2017, the Colorado State Board of Education provided direction to the Colorado Department of Education (CDE) to decrease testing time. CDE began exploring the use of abbreviated versions of the prior years' test blueprints with the goal of decreasing testing time while retaining comparability to the CMAS Mathematics and ELA/CSLA assessments previously administered in Colorado to maintain longitudinal trend data. Test forms based on the abbreviated blueprints were developed in Fall 2017 and administered beginning in Spring 2018.

In 2021, Colorado received a partial waiver of the federal assessment requirements from the U.S. Department of Education (USED) due to COVID-19 conditions in Colorado. The number of tests students were required to take was reduced, with alternating grades for mathematics and ELA. Students were required to take one test in either mathematics or ELA, depending on their grade, although parents/guardians could choose to have their children take both tests. With the exception of students with a parent/guardian excusal, students in Grades 4, 6, and 8 were required to take the mathematics assessments; students in Grades 3, 5, and 7 were required to take the ELA assessments; and students in Grade 8 also took the science assessment. The Grade 5 and high school science and Grades 4 and 7 social studies assessments were not administered.

In 2022, newly revised standards were implemented for mathematics, ELA, and science. In 2008, Colorado passed Senate Bill 212 (also known as CAP4K) that required the State Board of Education to adopt content standards that prepare students for the 21st century workforce and for active citizenship upon receiving a high school diploma. It also required a revision to the CAS by July 1, 2018, and every six years thereafter. As such, the 2009/2010 CAS were reviewed and revised, resulting in the 2020 CAS. While minimal changes were made to the mathematics and ELA standards, the science standards underwent a substantial update to keep up with the shift to the Next Generation Science Standards (NGSS; NGSS Lead States, 2013).

Full implementation of the new three-dimensional science standards took place in 2021–2022. The new CMAS Science test was administered to all tested students for the first time in Spring 2022, which made it possible to test enough new content to allow for a robust item bank and to obtain a sufficient sample of students to conduct field test analyses. Standard setting was conducted in Fall 2022 so that full results with scale scores and proficiency levels could be reported for the Spring 2023 administration. While the Spring 2022 CMAS Science assessment reported percentile ranks only, the Spring 2023 science assessment reported scale scores and performance levels.

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[1] For information on the background of the consortium and the development and administration of the assessments, see prior years' technical reports at https://www.cde.state.co.us/assessment/cmas_coalt_techreport.

Regular testing procedures resumed in Spring 2022 for mathematics and ELA/CSLA. Social studies was not administered in Spring 2022 or Spring 2023.

## 1.4. Purpose of CMAS

CMAS assessments were designed to be used for a variety of purposes, including informing parents/guardians and educators about individual student achievement of the grade-level CAS and allowing comparisons to other students across the state. Results are intended to provide one measure of a student's academic progress relative to the CAS. Results should be taken into consideration alongside other achievement information available locally. Results are also used as a piece of information in the evaluation of educator, school, and district performance. State assessment data typically help inform the state's school and district accountability system, including assigning performance ratings to schools and districts. State assessment results are also typically a component of educator evaluation. CMAS is a source of data that

- may be used as a prompt for further investigation at the student, classroom, school, and district levels;
- supports districts/schools in reviewing and developing goals for the performance of their students, including subgroups;
- may indicate that a review of programs, curricula, materials, and/or scope and sequence may be appropriate; and
- may inform the evaluation of district/school approaches.

Assessment results also support a range of data-driven stakeholder conversations, activities, and decisions such as school selection, program evaluation, investigative research, and policy/legislation formation and review. For example, educators can use the test scores to plan for further instruction and curriculum development and to report progress to parents/guardians. The results can also be used as one factor in making administrative decisions about program effectiveness, teacher effectiveness, class grouping, and needs assessment. CMAS results can also be used for research purposes and for informing community and organization efforts.

## 1.5. Assessment Development Partners

Activities specific to the CMAS assessments were conducted collaboratively by CDE, the Colorado educator community, and Pearson, the assessment contractor. Input and advice were provided by the Colorado Technical Advisory Committee (TAC).

### 1.5.1. Colorado Department of Education

As the administrative arm of the State Board of Education, CDE is responsible for implementing state and federal education laws. CDE's Assessment Unit works closely with Colorado school districts, educators, community stakeholders, and test development partners to develop and administer the state assessments. CDE focuses on creating assessments that serve students, schools, districts, and the community while complying with state and federal legal requirements. CDE also works closely with Pearson on each facet of the assessment, with CDE serving as the ultimate approver of services and products provided.

*1.5.2. Colorado Educator Community*

Educator participation in the CMAS development process is critical to ensuring that the assessments are aligned to the CAS, are appropriate for Colorado students at the assessed grade level, and are free from potential bias and sensitivity issues. Throughout the test development process, educators participate in the following development activities, as shown in Table 1.1:

- Item writing: After receiving item writing assignments based on the CAS, educators create assessment items. Items that successfully move through the entire item development process will eventually appear on the operational assessments.
- Content and bias review: Educators review items to ensure content alignment and identify potential bias and sensitivity concerns before items are field tested.
- Rangefinding: Educators review student responses to field tested constructed-response items and define the score point ranges for the scoring rubrics that are used to score student responses.
- Data review: Before field tested items are included on operational assessments, educators review items with statistical parameters outside of normal ranges to determine if the item is acceptable for inclusion in the operational item bank.
- Standard setting: Colorado educators participated in the CMAS Science standard setting in September 2022 to recommend cut scores for the new three-dimensional science assessment aligned to the 2020 CAS.

**Table 1.1. Schedule of Major Events**

| Event | Date(s) |
|---|---|
| ELA Passage Reviews | January 5–11, 2022 |
| | January 14–21, 2022 |
| | February 3–9, 2022 |
| | February 21–25, 2022 |
| | March 8–14, 2022 |
| IWW Training (ELA) | February 16, 2022 |
| IWW Trainings (Math) | February 17–18, 2022 |
| | March 9, 2022 |
| IWW Training (Science) | March 21–24, 2022 |
| Sim Storyboard Review (Science) | March 1, 2022 |
| Content and Bias Review (Science) | Aug 2–5, 2022 |
| Content and Bias Review (Math) | July 19–20, 2022 |
| Content and Bias Review (ELA) | July 25–29, 2022 |
| CMAS Science Standard Setting | September 27–28, 2022 |
| Braille Review (Math & Science) | December 8–9, 2022 |
| DAC Administration Training | November 9–15, 2022 |
| Spring 2023 Administration Window | April 10–28, 2023 |
| Rangefinding | June 5–8, 2023 |
| Data Review (ELA) | August 17–18, 2023 |
| Data Review (Science) | August 4, 2023 |
| Data Review (CSLA) | September 13, 2023 |
| Data Review (Math) | September 22, 2023 |
| CMAS Reports Available | July 10, 2023 |

*Note*. The ELA passage review included five windows where educators reviewed batches of passages independently.

### 1.5.3. Pearson

As the primary contractor responsible for the end-to-end assessment cycle services and products, Pearson works closely with CDE throughout the CMAS and CoAlt Science assessment development and administration processes. This includes item and test development, forms creation, enrollment, packaging and distribution, test delivery, scoring, customer service, standard setting, scoring, score reporting, and psychometric services.

### 1.5.4. Tri-Lin Integrated Services, Inc.

As a subcontractor to Pearson, Tri-Lin is responsible for CSLA content and test development, including passage development, item development, and test form construction.

### 1.5.5. Colorado Technical Advisory Committee

The Colorado TAC is comprised of psychometric, assessment, and special populations experts tasked with providing high-level consulting and expert advice regarding validity and reliability issues. Topics for which the TAC has provided input include the blueprint design, scaling and equating, mode comparability, scoring, reporting, alignment study feedback, peer review, and standard setting. The TAC included the following members during the 2023 assessment cycle:

- Dr. Elliot Asp, Senior Partner, The Colorado Education Initiative
- Dr. Jonathan Dings, Executive Director of Student Assessment and Program Evaluation, Boulder Valley School District
- Dr. Michael Kolen, Psychometric Consultant
- Dr. Suzanne Lane, Professor, University of Pittsburgh
- Dr. Martha Thurlow, Director, National Center on Educational Outcomes

# Chapter 2: Test Design

## 2.1. Colorado Academic Standards

The CMAS assessments are standards-based tests designed to measure what students should know and be able to demonstrate at the end of each grade or grade band based on the 2020 CAS located at the following links for each content area. The CAS for all content areas include the components in Figure 2.1.

- 2020 Mathematics Standards: http://www.cde.state.co.us/comath/statestandards
- 2020 Reading, Writing, and Communicating Standards: http://www.cde.state.co.us/coreadingwriting/statestandards
- 2020 Science Standards: https://www.cde.state.co.us/coscience/statestandards

**Figure 2.1. How to Read the Colorado Academic Standards**

The 2020 CAS for Mathematics and ELA had minimal changes compared to the previous 2009/2010 standards, whereas the 2020 CAS for Science underwent significant changes to be based on the NGSS.[2] The NGSS were guided by *A Framework for K–12 Science Education* (National Research Council, 2012) and designed to reflect more recent research and thinking in science education. The 2020 CAS for Science represent what all Colorado students should know and be able to do in science based on their PreK–Grade 12 science education.

The new science content standards are considered three-dimensional in that they incorporate Disciplinary Core Ideas (DCIs), Science and Engineering Practices (SEPs), and Crosscutting Concepts (CCCs). The DCIs encompass the content that occurs at each grade and provides the background knowledge for students to develop sense-making around phenomena in the three standards of Physical Science, Life Science, and Earth and Space Science. The DCIs are as follows[3]:

- Physical Science: Students know and understand common properties, forms, and changes in matter and energy.
    - PS1: Matter and its interactions
    - PS2: Motion and stability: Forces and interactions
    - PS3: Energy
    - PS4: Waves and their applications in technologies for information transfer

- Life Science: Students know and understand the characteristics and structure of living things, the processes of life, and how living things interact with each other and their environment.
    - LS1: From molecules to organisms: Structures and processes
    - LS2: Ecosystems: Interactions, energy, and dynamics
    - LS3: Heredity: Inheritance and variation of traits
    - LS4: Biological evolution: Unity and diversity

- Earth and Space Science: Students know and understand the processes and interactions of Earth's systems and the structure and dynamics of Earth and other objects in space.
    - ESS1: Earth's place in the universe
    - ESS2: Earth's systems
    - ESS3: Earth and human activity

The SEPs describe how scientists investigate and build models and theories of the natural world or how engineers design and build systems. They reflect science and engineering as they are practiced and experienced. There are eight SEPs:

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations

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[2]A summary of all the changes made to the standards are available on the CDE website for mathematics at https://www.cde.state.co.us/comath/2020cas-ma-changes, for ELA at https://www.cde.state.co.us/coreadingwriting/2020cas-rw-changes, and for science at https://www.cde.state.co.us/coscience/2020cas-sc-changes.

[3]Adaptation of the NGSS occurred by not adopting the fourth standard of Engineering, Technology, and Applications of Science (although engineering is still incorporated within the SEPs).

4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

CCCs cross boundaries between science disciplines and provide an organizational framework to connect knowledge from various disciplines into a coherent and scientifically based view of the world. They build bridges between science and other disciplines and connect the DCIs and SEPs throughout the fields of science and engineering. There are seven CCCs:

1. Patterns
2. Cause and Effect
3. Scale, Proportion, and Quantity
4. Systems and System Models
5. Energy and Matter
6. Structure and Function
7. Stability and Change

The CMAS Science assessment is given in Grades 5, 8, and 11. Consistent with the standards, the Grade 5 assessment assesses the grade-level standards. Because the science standards are articulated by grade band at the middle school and high school levels rather than grade levels, the Grade 8 assessment assesses all middle school science standards, and the Grade 11 assessment assesses all high school science standards.

## 2.2. Test Frameworks and Blueprints

Concepts and skills identified in the CAS are the basis for the CMAS assessments. The CMAS frameworks list the percent representation and number of score points for each subclaim and standard area that appear on the assessments and specify the Evidence Outcomes (EOs) from the CAS that are included on the assessments. The mathematics and ELA frameworks continue to use Evidence Statements (ES) developed in collaboration with PARCC that describe the knowledge and skills an assessment item/task elicits from students. Together, the CMAS frameworks and ES provide the foundation for ensuring that the full range and depth of the standards are assessed. CDE incorporated feedback from content experts and educators throughout the state to create the final versions of the frameworks. The frameworks and ES are both available on the CDE website at https://www.cde.state.co.us/assessment/cmas_testdesign.

The test blueprints take the frameworks a step further by specifying the number of test items by Prepared Graduate (PG) Statement, Grade-Level Expectation (GLE), EO, item type, and cognitive complexity. The specificity of the test blueprints ensures that the assessments cover the breadth of the content indicated by the CAS within the associated grade or grade band. Appendix A presents the high-level test blueprints that summarize the percentage of score points on each test for each claim and subclaim on each assessment as shown in the frameworks. The most recent versions of the mathematics and ELA blueprints were developed in 2017–2018, while new test blueprints were created for CMAS Science in 2021–2022.

### 2.2.1. Mathematics and ELA

In 2017, the State Board of Education provided direction to CDE to decrease testing time. CDE began exploring the use of abbreviated versions of the prior years' test blueprints with the goal of decreasing testing time while retaining comparability to the CMAS Mathematics and ELA assessments previously administered in Colorado to maintain longitudinal trend data. Therefore, with the intent to reduce testing time, the 2018 blueprints were a proportionate abbreviation of the 2017 forms. CDE and Pearson collaborated in designing the CMAS subject- and grade-specific blueprints for mathematics and ELA in 2017–2018. The blueprints were designed to measure the same constructs as, and provide content comparability to, the previous year's assessments. Eligible content continued to reflect the CAS and ES used in prior years.[4]

### 2.2.2. Science

Pearson worked with Achieve, a nonprofit education organization that leads the effort to help states make college and career readiness a priority for all students, during the initial development of the new science assessment. Achieve provided background on how other states were approaching the new three-dimensional science standards and assessments and advice on how to proceed with cognitive complexity, blueprints, and reporting. With guidance from Achieve, Pearson, CDE, and Colorado educators collaborated in designing the science blueprints in a workshop held from November 6–7, 2019, in Denver. An effort was made to involve educators who were from areas representative of the entire state of Colorado (in terms of geographic location, gender, and race) and familiar with the 2020 CAS, related three-dimensional science instruction, and the assessment interaction and demonstration of achievement of the CAS of different groups of students, including students with disabilities and ML students. The blueprints were reviewed on October 14, 2021, by the TAC.

Results from the Spring 2022 test administration showed that items at the end of the test units were often left unanswered on the Grade 11 CMAS Science assessment, indicating that high school students had difficulty finishing the test in the time given. Therefore, after review by CDE and Pearson psychometrics, a proportional reduction was made to the Grade 11 blueprint to prevent speededness. The proposed blueprint reduction and test timing data was reviewed by the TAC on August 30, 2022. Grades 5 and 8 did not show a similar concern with speededness, so the length of these tests was not changed.

## 2.3. Claims and Subclaims

Student performance on the CMAS assessments is reported at the overall content area level as a scale score and performance level. Their performance is broken down even further at the claim and subclaim levels. The mathematics subclaims provide information on a student's achievement on grade-level math skills and concepts, as well as reasoning and modeling based on both grade-level and securely held knowledge of the skills and concepts from the previous grade level. The Reading and Writing claims for ELA provide information on a student's achievement in reading and comprehending a range of sufficiently complex texts independently. The subclaims are intended to provide more granular information about student demonstration of the knowledge and skills within the content area as reflected in the CAS.

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[4] For more information about the transition and abbreviated assessments, see the 2017–2018 CMAS Mathematics and ELA technical report on the CDE website at https://www.cde.state.co.us/assessment/cmas_coalt_techreport.

Table 2.1 presents the content reflected in each subclaim by content area. The mathematics score is a composite of the four subclaims (Major Content, Supporting Content, Mathematical Reasoning, and Modeling and Application). The Reading score is a composite of the three reading subclaims (Reading: Literary Text, Reading: Informational Text, and Reading: Vocabulary, and the Written Expression subclaim that measures reading), and the Writing claim is a composite of the two writing subclaims (Writing: Written Expression and Writing: Knowledge and Use of Language Conventions). The science score is a composite of the three standards (Physical, Life, and Earth and Space Science), as well as an SEP score.

**Table 2.1. Subclaims**

| Content Area | Subclaim | Description |
|---|---|---|
| Mathematics | Subclaim A: Major Content | Students solve problems involving the Major Content of the grade level with connections to the Standards for Mathematical Practice. |
| | Subclaim B: Additional & Supporting Content | Students solve problems involving the Additional and Supporting Content of the grade level with connections to the Standards for Mathematical Practice. |
| | Subclaim C: Expressing Mathematical Reasoning | In connection with content, the student expresses grade/course-level appropriate mathematical reasoning by constructing viable arguments, critiquing the reasoning of others and/or attending to precision when making mathematical statements. |
| | Subclaim D: Modeling & Application | In connection with content, the student solves real-world problems with a degree of difficulty appropriate to the grade/course by applying knowledge and skills articulated in the standards for the current grade/course (or for more complex problems, knowledge and skills articulated in the standards for previous grades/courses), engaging particularly in the Modeling practice, and where helpful making sense of problems and persevering to solve them, reasoning abstractly and quantitatively, using appropriate tools strategically, looking for the making use of structure, and/or looking for and expressing regularity in repeated reasoning. |
| ELA | Reading: Literary Text | Students read and analyze fiction, drama, and poetry. |
| | Reading: Informational Text | Students read and analyze nonfiction, history, science, and the arts. |
| | Reading: Vocabulary | Students use context to determine what words and phrases mean. |
| | Writing: Written Expression | Students compose well-developed writing using details from what they have read. |
| | Writing: Knowledge and Use of Language Conventions | Students demonstrate knowledge of conventions and other important elements of language. |
| Science | Physical Science | Students know and understand common properties, forms, and changes in matter and energy. |
| | Life Science | Students know and understand the characteristics and structure of living things, the processes of life, and how living things interact with each other and their environment. |
| | Earth and Space Science | Students know and understand the processes and interactions of Earth's systems and the structure and dynamics of Earth and other objects in space. |
| | Science and Engineering Practices (SEPs) | The SEPs describe how scientists investigate and build models and theories of the natural world or how engineers design and build systems. They reflect science and engineering as they are practiced and experienced. |

## 2.4. Performance Levels

Student performance on the CMAS Mathematics and ELA assessments is categorized into five performance levels (*Did Not Yet Meet Expectations, Partially Met Expectations, Approached Expectations, Met Expectations*, and *Exceeded Expectations*), whereas student performance on CMAS Science is categorized into four performance levels (*Partially Met Expectations, Approached Expectations, Met Expectations*, and *Exceeded Expectations*). The performance levels are based on the overall scale score, and cut scores divide the score scale for a grade and content area into the performance levels (see Chapter 7 for more information on the cut scores). Students in the *Met Expectations* and *Exceeded Expectations* levels are considered on track to being college and career ready.

The performance levels are accompanied by performance level descriptors (PLDs) that articulate what a student should know and be able to do in a particular performance level (e.g., the set of statements describing what it means for a Grade 8 student to reach *Met Expectations* in mathematics). The CMAS assessments use two types of PLDs: (1) policy PLDs (also known as policy claims) that provide a general idea of what is expected of a student at each level regardless of their grade level, as shown in Table 2.2 and Table 2.3, and (2) grade-level PLDs that provide detailed descriptions of performance levels by grade level and content area, available online at https://www.cde.state.co.us/assessment/cmas_plds and included on the Individual Student Performance Report and in the *CMAS and CoAlt Interpretive Guide to Assessment Reports*.

**Table 2.2. Performance Levels and Policy Claims—Mathematics and ELA**

| Performance Level | *Did Not Yet Meet Expectations* | *Partially Met Expectations* | *Approached Expectations* | *Met Expectations* | *Exceeded Expectations* |
|---|---|---|---|---|---|
| Policy Claim | Students who do not yet meet academic expectations for the concepts, skills, and practices embodied by the Colorado Academic Standards assessed at their grade level. They will *need extensive academic support* to engage successfully in further studies in this content area. | Students who demonstrate a limited command of the concepts, skills, and practices embodied by the Colorado Academic Standards assessed at their grade level. They will *need additional academic support* to engage successfully in further studies in this content area. | Students who demonstrate a moderate command of the concepts, skills, and practices embodied by the Colorado Academic Standards assessed at their grade level. They will *likely need additional academic support* to engage successfully in further studies in this content area. | Students who demonstrate a strong command of the concepts, skills, and practices embodied by the Colorado Academic Standards assessed at their grade level. They are *academically prepared* to engage successfully in further studies in this content area. | Students who demonstrate a distinguished command of the concepts, skills, and practices embodied by the Colorado Academic Standards assessed at their grade level. They are *academically well prepared* to engage successfully in further studies in this content area. |
| Scale Score | 650–699 | 700–724 | 725–749 | 750–varies* | varies*–850 |

*Varies by grade and content area

**Table 2.3. Performance Levels and Policy Claims—Science**

| Performance Level | *Partially Met Expectations* | *Approached Expectations* | *Met Expectations* | *Exceeded Expectations* |
|---|---|---|---|---|
| Policy Claim | Students who demonstrate a limited command of the concepts, skills, and practices embodied by the Colorado Academic Standards assessed at their grade level. They will *need additional academic support* to engage successfully in further studies in this content area. | Students who demonstrate a moderate command of the concepts, skills, and practices embodied by the Colorado Academic Standards assessed at their grade level. They will *likely need additional academic support* to engage successfully in further studies in this content area. | Students who demonstrate a strong command of the concepts, skills, and practices embodied by the Colorado Academic Standards assessed at their grade level. They are *academically prepared* to engage successfully in further studies in this content area. | Students who demonstrate a distinguished command of the concepts, skills, and practices embodied by the Colorado Academic Standards assessed at their grade level. They are *academically well prepared* to engage successfully in further studies in this content area. |
| Scale Score | 650–724 | 725–749 | 750–varies* | varies*–850 |

*Varies by grade

## 2.5. Cognitive Complexity

All mathematics and ELA items are tagged with a cognitive complexity level of high, moderate/medium, or low, as described in Table 2.4.

**Table 2.4. Mathematics and ELA Cognitive Complexity Levels**

| Content Area | High | Moderate/Medium | Low |
|---|---|---|---|
| Mathematics | • Significant shift from previous content<br>• Open ended, sophisticated reasoning, critiquing, modeling<br>• Single/multi-part that requires more evidence from the student | • Moderate shift into new content<br>• Moderately scaffolded, some choice in approach<br>• Single/multi-part, multi-step, moderate reading load | • Low shift from previous content<br>• Very scaffolded, rote, recall, recognize<br>• Single part, one step with low reading load |
| ELA | Items require synthesis of ideas and details **across multiple texts or ideas** (can be single passage). For example, items may require students to construct the main idea or theme that is common across multiple texts, especially multiple texts that are not closely related in theme and/or genre. | Items require **analysis of ideas and details** across multiple sections **in a single text**. It requires more close analytic reading than low complexity items. For example, identifying the main idea or theme of a text may require inferring the main or theme or integrating ideas and details from several locations in the text. | Items require students to identify **a single idea or detail in a text** (e.g., identifying a term or phrase using context). It requires students to recall, observe, question, or represent facts or simple skills or abilities. |

Science transitioned away from Depth of Knowledge (DOK) in 2021–2022 with the adoption of the new science standards. From Achieve:

> *As states and districts develop new assessment systems, they need support for developing assessments that balance the vision and integrity of multi-dimensional standards with ensuring that they are sensitive to varying levels of student performance. This... (requires a) ...new approach to capturing and communicating the complexity of summative assessment items and tasks designed for three dimensional standards that can be used to ensure that all learners can make their thinking and abilities visible without compromising the rigor and expectations of the standards* (Achieve, 2019, p. 1).

The CMAS Science assessment now uses a cognitive complexity framework that examines items via three criteria, as summarized in Table 2.5 and presented in Appendix B. Phenomenon in the stimulus material is examined separately for its own cognitive complexity.

**Table 2.5. Science Cognitive Complexity Criteria**

| Criterion | Description |
|---|---|
| Item Dimensionality | Item alignment to one, two, or three dimensions:<br>• Content of EO (Disciplinary Core Idea DCI)<br>• Science and Engineering Practice (SEP) of EO<br>• Cross Cutting Concept (CCC) of EO<br>Items aligned to a single dimension only are **not** acceptable for CMAS Science. |
| Scaffolding/Support | The more guidance and structure the item provides the student, the lower the cognitive load required. The matrix categorizes scaffolding/support into three levels: heavy, moderate, and minimal. Heavy refers to a specific, step-by-step process is given, and the student merely needs to follow that process to supply the answer. Moderate and minimal provide increasing degrees of freedom to make choices on the part of the student and require an increasing degree of initiative to make those choices. |
| Sensemaking | Fundamental to the approach of three-dimensional standards is student use of the dimensions to make sense of scientific phenomena. Some degree of sensemaking is required for all CMAS Science items. A sensemaking situation is one in which students (1) are provided material without obvious ties/connections to content (e.g., language of the standard) and (2) use their knowledge of the standard to explain what they see in the material. |

### 2.6. Test Design

CMAS Mathematics and Science contain selected-response (SR), technology-enhanced (TE), and constructed-response (CR) items. Mathematics also contains fill-in-the-blank (FIB) items. The CMAS ELA/CSLA assessments are passage-based with a combination of literary and informational passages and contain SR, TE, and prose constructed-response (PCR) items. Multiple passages may be used to respond to some items.

For the ELA PCRs, students receive a prompt, respond to reading items, and write an extended response. It is then scored on a multi-trait rubric, as provided in Appendix C and on the CDE website at https://www.cde.state.co.us/assessment/cmas_testdesign. The ELA PCRs include three task types: literary analysis, research simulation, and narrative writing. Because it is administered on paper, CSLA forms contain SR, paper-based TE, and PCR items. The CSLA paper-based TE items are developed to have similar item formats and scoring rules to the paper-based versions of TE items developed for CMAS ELA.

All mathematics items are aligned to both an ES and an EO. The ES are grouped into three types to ensure that the full range and depth of the standards are assessed:

- Type I items:
    - Assess a specific EO, a specific part of an EO, or multiple EOs
    - Subclaims A and B
    - 1- or 2-point items (Grades 3–8) and 4-point items (Grades 6–8)
    - SR, TE, and FIB items
    - Calculator (Grades 6–8) and non-calculator (Grades 3–8)

- Type II items (reasoning):
    - Assess a specific type of mathematical reasoning and a specific scope in the EOs to reason about
    - Subclaim C
    - 3- or 4-point items
    - SR, TE, FIB, and CR parts; all items have at least one CR part
    - Calculator (Grades 6–8) and non-calculator (Grades 3–5)

- Type III items (modeling):
    - Assess a specific type of mathematical modeling and a specific scope in the EOs to model about
    - Subclaim D
    - 3- or 6-point items
    - SR, TE, FIB, and CR parts; all items have at least one CR part
    - Calculator (Grades 6–8), non-calculator (Grades 3–5)

The CMAS Science assessment is divided into item sets that present phenomenon-based scenarios as either interactive science simulations or static stimuli, followed by associated standalone items or clusters of items related to the simulation or scenario. A phenomenon is an observable event that students can use the three dimensions (DCI, SEP, and CCC) to explain or make sense of. Separate standalone items are also included that are not associated with a stimulus to target a small number of CAS not represented in the scenarios. The items are either 1-point SR, 1-point TE, or 2-point CR item types.

### 2.7. Timing of Tests

Each assessment was composed of three units with field test items embedded to allow the assessments to be administered in a reasonable timeframe, as shown in Table 2.6.

**Table 2.6. Testing Times**

| Grades | Mathematics | ELA | Science |
|---|---|---|---|
| 3–5 | Units 1–3: 65 minutes<br>Total time: 195 minutes | Units 1–3: 90 minutes<br>Total time: 270 minutes | Units 1–3: 80 minutes<br>Total time: 240 minutes |
| 6–8 | Units 1–3: 65 minutes<br>Total time: 195 minutes | Units 1–3: 110 minutes<br>Total time: 330 minutes | Units 1–3: 80 minutes<br>Total time: 240 minutes |
| High School | N/A | N/A | Units 1–3: 50 minutes<br>Total time: 150 minutes |

# Chapter 3: Item Development

The CMAS item development process results in a diverse bank of items that align to the CAS. All items are developed with the intention of being administered on multiple testing platforms, including online, online-accommodated, and paper-based assessments. The item writing process is a tiered, inter-related process that began with the development of the test blueprint for each grade level within each content area, followed by creating the item development plan (IDP) used to forecast the targeted number of items and associated stimuli across ESs or EOs needed to create a robust item bank. Once written, all newly developed items go through multiple rounds of review, including contractor, CDE, and Colorado educator content, bias, and data reviews.

As part of the test construction process, a selection of the proposed set of operational items are refreshed, as illustrated in Table 3.1. Therefore, a portion of the operational items have been used operationally on a previous CMAS form, while the remaining items are refreshed using Colorado-developed field test items. All items were reviewed by Colorado educators. (Please note that the Spring 2023 CMAS Grade 11 Science assessment included a set of core items held constant from 2022 to 2023 with a proportional reduction in length of the form.)

**Table 3.1. Refresh Rates—Mathematics and ELA**

| Content Area | Item Type | Refresh Rate Minimum Targets | Refresh Rate Maximums |
|---|---|---|---|
| Mathematics | Type I: 1-point | 25% | 50% |
| | Type I: 2- and 4-point | 40% | 60% |
| | Type II | 33% | 67% |
| | Type III | 50% | 50% |
| ELA | Selected Response | 50% | – |
| | Short Constructed Response | 50% | – |
| | Extended Constructed Response | 50% | – |
| | Passage Sets | 50% | – |
| Science | Regular Cluster | 33% | – |
| | Mini cluster | 50% | – |
| | Overall items | 33% | 66% |

## 3.1. Item Banking System

Pearson's proprietary software, ABBI (Assessment Banking and Building solutions for Interoperable assessments), is used to support the test development process from initial content authoring through the review cycles. ABBI is the authoritative source for all content, data, and functionality for all CMAS system components. It serves as the repository where the item bank is housed, item revisions are catalogued, and items and item metadata are uploaded and revised by assessment specialists. Items can be moved into various statuses, each representing a step in the item development process. The items and associated stimuli are tracked, and revisions are recorded from creation through retirement in a secure environment.

Custom development reports can be generated out of ABBI, which allows users to generate Excel reports that capture metadata (e.g., unique item number, ES, task type, cognitive complexity, associated stimulus, item status, item statistics, and comments) useful for analyzing the item bank. ABBI is the source of reference for how and when changes to the item and the metadata have been implemented.

### 3.2. Item Development Plan

An IDP for each content area and grade is created at the beginning of each item development cycle to determine the number of items, passages, and science cluster stimuli needed to construct the assessments based on the blueprint requirements, with development targets that address any task model, passage type, ES, EO, item/task type, and cognitive complexity shortages. To accomplish this, the item bank is analyzed, and the ES, EO, task type, and cognitive complexity gaps are identified so a variety of item types aligning to the ES, EOs, and the corresponding CAS can be created.

### 3.3. ELA Passage Development

Item development for ELA begins with the research and selection of high-quality literary and informational texts. Due to the availability of appropriate passages and challenges with acquiring permissions, passages to be used on the CSLA forms are commissioned by Tri-Lin, either in-house or by professional passage writers. The number and types of needed passages are determined by the test construction specifications, a gap analysis of the pool of available passages, and the IDP. The passage selection (and writing) guidelines, task model descriptions, and cognitive complexity framework define the number of texts/passages by text type, genre, length, and complexity. Contractor assessment specialists train passage searchers to find (or write for the CSLA items) relevant and rich texts that permit a range of content to be developed.

Passage searchers and writers submit the passages for the contractor assessment specialists to review and evaluate using approved criteria, including adherence to the cognitive demand, relevance, and purpose of the test and the appropriate use of graphics to improve text comprehension. Test passages are analyzed and rated for text complexity. The assessment specialists check the passages for clarity, correctness of language, appropriateness of language for the grade level, and adherence to the style guidelines.

Accepted passages are presented to CDE for review. Once the passages are accepted by CDE, committees of educators review them for content and bias. The committees are comprised of educators from throughout the state representing a variety of student populations, including students with disabilities and ML students. Passages accepted by both CDE and the educator committees are then used for item writing.

### 3.4. Science Scenario Development

Item development for science begins with the preliminary conception and composition of the interactive science simulations and cluster stimuli. The number and types of needed simulations and cluster stimuli are determined by the test construction specifications, a gap analysis of the pool of available SIMs and stimuli, and the IDP, and the topics are researched for suitability of science content, alignment to the standards, and grade-level appropriateness.

Simulations and cluster stimuli follow slightly different paths through the development process, but both include multiple steps of review and evaluation by assessment specialists using approved criteria such as adherence to cognitive complexity requirements, relevance to standards, purpose of the test, and the appropriate use of graphics and or animations. Pearson checks all stimulus text for scientific accuracy, clarity, correctness of language, appropriateness of language and science concepts for the grade level, and adherence to the style guidelines.

Simulation ideas are presented to CDE for review and feedback in the form of storyboards illustrating the intended virtual interaction, along with suggested EOs that the simulations address. CDE provides feedback on how to move forward with the development of the simulations. Revised storyboards are then reviewed by committees of educators from throughout the state representing a variety of student populations, including students with disabilities and EL/ML students. The simulations are then developed into animated interactions and reviewed by CDE, after which items are written to a variety of EOs, either internally or by educators.

Cluster stimuli are proposed as topics to CDE and then developed into drafts based on CDE feedback. Drafts are refined by Pearson with CDE input and presented to educators for review and item writing using the same criteria used for the simulations.

## 3.5. Item Writing

Item writer workshops (IWWs) with Colorado educators were conducted for the development of new items for the 2022–2023 cycle for mathematics, ELA, and science. IWW participants are educators from across the state representing a variety of student populations, including students with disabilities and students with limited English proficiency. CSLA item writers are proficient in written academic Spanish and begin developing CSLA items after receiving training. The educators are given item writing assignments and develop a variety of items across task types, ES, and EOs. The item writers work with Pearson and/or Tri-Lin assessment specialists when clarification is needed for CSLA items. Content specialists from CDE are also present to assist as needed. Item writers use the ESs and EOs; the CAS; secure item specification documents, including item-writing guidelines (universal design guidelines, bias and sensitivity guidelines, and editorial guidelines); and an item writing checklist to guide them in completing their assignments.

All item writers author the items in ABBI, where Pearson or Tri-Lin assessment specialists complete their initial review. The assessment specialists review and suggest revisions to the items and metadata for the item authors, who then make the revisions and resubmit the items within ABBI.

## 3.6. Item Review

### 3.6.1. Internal Review

Pearson and Tri-Lin assessment specialists evaluate each newly developed item for content correctness; grade appropriateness; and ES, EO, CAS, and cognitive complexity alignment, focusing on the quality of the items, adherence to the principles of universal design, cognitive demand, relevance to the purpose of the test, and appropriateness of graphics. Research librarians perform additional fact checking to ensure accuracy. Pearson and Tri-Lin copy editors check items for clarity, correctness of language, appropriateness of language for the grade level, adherence to style guidelines, and conformity with acceptable item-writing practices.

When appropriate, human-scored CR items are reviewed for their scorability by a Scoring Services director, and items and/or scoring rubrics with score points deemed "difficult to score" are revised in collaboration with the assessment specialist(s). Equation editor/CR items scored by an automated engine are reviewed for their scorability by a mathematics product analyst, and items and/or scoring rubrics are revised in collaboration with the assessment specialist(s).

Pearson and Tri-Lin assessment specialists also perform a universal design review to assess item accessibility irrespective of diversity of background, cultural tradition, and viewpoints; to evaluate changing roles and attitudes toward various groups; to review the role of language in setting and changing attitudes toward various groups; to appraise contributions of diverse groups (including ethnic and minority groups, individuals with disabilities, and women) to the history and culture of the United States and the achievements of individuals within these groups; and to edit for inappropriate language usage or stereotyping with regard to sex, race, culture, ethnicity, class, disability, or geographic region. The universal design review also includes reviewing items for potential bias to ensure that all items are fair and all students would have an equal opportunity to demonstrate achievement regardless of their gender, ethnic background, religion, socioeconomic status, disability, or geographic region. Items are also reviewed for visual bias, accessibility for students with disabilities, and convertibility to braille and text-to-speech.

Once the internal reviews are complete, each item's status is updated in ABBI and a lead assessment specialist conducts a final content review. Item statuses are updated in ABBI upon approval, and items are presented to CDE for review. Adhering to these processes ensures that each Colorado item measures the ES or EO and standard, is content- and grade-appropriate, is factually accurate, has appropriate answers and distractors, is accessible to all populations required to take the assessments, is free from any bias, and follows the Colorado style guidelines.

### 3.6.2. CDE Review

CDE reviews items in ABBI to ensure that the content is correct, the alignment is sound, the cognitive complexity is appropriate, the language and content are grade-appropriate, the graphics are clear and relevant to the item, and the content is free of bias/sensitivity issues. Once complete, CDE alerts Pearson or Tri-Lin assessment specialists. CDE's comments and determinations regarding the status of the items are recorded in ABBI, as indicated below:

- Items marked "Accept" need no more revisions and are ready for external Colorado educator content and bias reviews.
- Items marked "Accept with Edits" are revised per CDE's feedback and re-reviewed by the internal review team if necessary. These items are then reviewed by CDE again, reconciled with the assessment specialists, and deemed either "Accept" or "Reject."
- Items marked "Reject" are rejected and given a status of "Do Not Use" in ABBI. These items are either rewritten or replaced with items written by an assessment specialist. In either case, the items go through the same rigorous review process as newly developed items.

### 3.6.3. External Content and Bias Review

All items that pass the internal and CDE reviews are brought to external content and bias committees comprised of Colorado educators. The purposes of these educator reviews are to (1) ensure that the items are properly aligned to the CAS, accurately measure the intended content, and are grade-appropriate; and (2) identify any potential bias or stereotypes in the items. Separate committees are convened for each content area, as well as for the accommodated CSLA items. The meetings are conducted either in person or virtually and include group training on the expectations and processes of each meeting, followed by breakout groups by content area and grade where additional training is provided.

The Colorado educators are selected from across the state with diverse backgrounds and experience working with diverse learners (e.g., based on gender, race/ethnicity, income, and geography), standards and content expertise, and special population expertise (i.e., students with disabilities and EL/ML students). For science, educators are also selected based on their experience in the domain they are reviewing. For the accommodated CSLA items, an effort is made to involve educators who teach EL/ML students, are familiar with the instruction and needs of the students in an English language development program that uses native language instruction, and are proficient in written Spanish.

The committee members are trained and instructed to verify that each item and stimulus

- displays and functions correctly in TestNav 8 Preview (i.e., Pearson's online testing platform students use to access the assessment);
- aligns to the ES and/or EO;
- uses clear, unambiguous, and grade-appropriate language;
- avoids construct-irrelevant complex sentence structure;
- uses everyday words to convey meaning when vocabulary is not part of the tested construct;
- has one correct answer (depending on the item type);
- contains plausible distractors that represent feasible misunderstandings of the content (depending on the item type);
- represents the range of cognitive complexities and includes challenging items for students performing at all levels;
- is appropriate for students in the assigned grade in terms of reading level, vocabulary, interest, and experience;
- has scoring guidelines that capture exemplar responses at each score point for CR items;
- includes appropriate and clear graphics/art/photos that are relevant to the item and accessible to all testing populations;
- is free of ethnic, gender, political, and religious bias;
- avoids construct-irrelevant content that may unfairly advantage or disadvantage any student subgroup; and
- considers access issues at the time of item writing (e.g., determine how students with visual disabilities would access items with needed visuals/graphics/animation).

The committees make one of three recommendations on every item: "Accept," "Accept with Edits," or "Reject." Following the educator meetings, CDE, Pearson, and Tri-Lin review committee comments, reconcile proposed edits, and finalize item outcomes. ABBI is updated to reflect the edits and outcomes. The approved items, passages, and simulations/clusters are then made ready for inclusion on the spring operational forms as embedded field test items.

### 3.7. Data Review
After item development is complete, selected items are placed on the operational assessments in embedded field test positions. The goal of field testing is to allow for the evaluation of the quality of the items through a review of item performance data to determine their inclusion in the operational item pool. To accomplish this, psychometricians perform statistical analyses on the field tested items following their administration in a field test environment to evaluate their quality.

Classical statistics include item means (*p*-values), item-total correlations/point biserials, and distribution of responses across answer options or score points, depending on the item type. Differential item functioning (DIF) analyses are conducted on various subgroups (gender, ethnicity, free and reduced lunch, IEP, and MLs) using Mantel–Haenszel Delta DIF statistics (Dorans & Holland, 1992). The same analysis methods are used for CSLA items, but the DIF analyses are conducted by gender only due to the population of students taking the form. Classification rules derived from National Assessment of Educational Progress (NAEP) guidelines (Allen et al., 1999) were used to classify items as having either negligible, moderate, or significant DIF. Items are then flagged based on the criteria in Table 3.2, and flagged items are taken to a data review meeting where a committee of educators reviews the flagged items and their statistics along with student performance data.

Table 3.2 presents the statistical flags applied to the field tested items. Classical statistics include item means (*p*-values), item-total correlations/point biserials, and distribution of responses across answer options or score points, depending on the item type. Differential item functioning (DIF) analyses are conducted on various subgroups (gender, ethnicity, free and reduced lunch, IEP, and MLs) using Mantel–Haenszel Delta DIF statistics (Dorans & Holland, 1992). The same analysis methods are used for CSLA items, but the DIF analyses are conducted by gender only due to the population of students taking the form. Classification rules derived from National Assessment of Educational Progress (NAEP) guidelines (Allen et al., 1999) were used to classify items as having either negligible, moderate, or significant DIF. Items are then flagged based on the criteria in Table 3.2, and flagged items are taken to a data review meeting where a committee of educators reviews the flagged items and their statistics along with student performance data.

**Table 3.2. Item Statistical Flagging Criteria**

| Statistic | Criterion | Possible Indication |
|---|---|---|
| *P*-value | < 0.1 or > 0.9 | Very difficult or easy item |
| Item-total correlation | < 0.15 | Poorly discriminating item |
| Distractor item-total correlation (SR only) | > 0.0 | Possible miskey* |
| Score point percentage (multi-point items only)** | <1%, >50%, or >60% | Very few students or many students got a certain score |
| Differential item functioning (DIF)*** | B, C | Item could be biased toward a certain student demographic group |

*Possible miskey because the key should have a positive item-total correlation
**If a multi-point item has less than 1% for a score point or more than 50% 0s, the item is flagged. The rule is 50%+ 0s for mathematics, ELA, and CSLA and 60%+ for science.
***B DIF indicates moderate DIF, whereas C DIF indicates significant DIF.

Separate data review committees are convened for each content area, including the accommodated CSLA items. Participants are provided item images and metadata, along with the classical and DIF statistics. During the data review meetings, educators are trained to interpret the statistical information and judge the appropriateness of the flagged items. The committee members use the data as a tool to direct them toward potential flaws in an item and discuss whether there are construct-irrelevant reasons for a data flag. A data flag, by itself, is not the sole reason an item is rejected. Committee members are instructed that their final judgments about the appropriateness or fairness of an item for any individual and subgroup encompassed by the data flag should be based on their expertise with their content area and experience as Colorado educators.

Committee members review each item and recommend whether to accept or reject it. An accepted item indicates that the educators, through their varying expertise, determined that there is not a construct-irrelevant reason for the data flag within the item, whereas a rejected item indicates that the educators determined there is a construct-irrelevant reason for the data flag. Construct-irrelevant reasons for data flags could include issues such as language that is above grade-level or content that is biased against a particular group. In contrast, construct-relevant explanations could be difficult content that is part of the standards or distractors that reflect a very common misunderstanding of the concept covered by the item, which would not be a reason to reject the item.

Following the data review meetings, CDE reviews the committees' recommendations and makes final decisions. All accepted items are moved into "Ready for Operational" status. Table 3.3 presents the final results following the data review based on Spring 2023 data (i.e., the number of field tested items that were either accepted, accepted for revision and re-field test, or rejected as a result of the data review).

**Table 3.3. Data Review Results**

| Content Area | Grade | #Accepted | #Accepted for Revision and Re-Field Test | #Rejected |
|---|---|---|---|---|
| Mathematics | 3 | 17 | 2 | 0 |
|  | 4 | 9 | 0 | 0 |
|  | 5 | 15 | 2 | 0 |
|  | 6 | 28 | 3 | 0 |
|  | 7 | 24 | 3 | 0 |
|  | 8 | 18 | 0 | 0 |
| ELA | 3 | 7 | 0 | 4 |
|  | 4 | 29 | 0 | 1 |
|  | 5 | 31 | 0 | 3 |
|  | 6 | 28 | 0 | 1 |
|  | 7 | 42 | 0 | 3 |
|  | 8 | 47 | 0 | 5 |
| CSLA | 3 | 4 | 0 | 1 |
|  | 4 | 2 | 0 | 3 |
| Science | 5 | 87 | 2 | 2 |
|  | 8 | 87 | 1 | 2 |
|  | 11 | 84 | 5 | 15 |

# Chapter 4: Test Construction

The Spring 2023 ELA and science grades 5 and 8 operational test forms were newly developed test forms developed by Pearson, whereas the Spring 2023 mathematics operational test forms were either intended for use in the postponed 2019–2020 test administration or were newly developed test forms for use in the 2021–2022 test administration. The Spring 2023 CSLA newly constructed forms were constructed through an iterative process between Pearson and Tri-Lin. The Spring 2023 CMAS Science grade 11 test form was a subset of the 2022 core form based on the proportional blueprint reduction due to speededness. Items were selected as anchors only if they were found in the first part of a unit that showed any speededness concerns. Once the test forms were constructed, CDE reviewed the forms, provided feedback, and gave final approval.

## 4.1. Test Form Construction

Most students take the CMAS assessments online, which allows for the use of innovative item types and for accessibility features such as text-to-speech and color contrast to be available to all students in both English and Spanish for mathematics and science and in English for the online ELA forms. When building the test forms, assessment specialists select a set of operational items in accordance with the test blueprint and test construction specifications. Items selected for operational use must meet the blueprint requirements and should include a variety of topics and contexts with specified psychometric targets. The following guidelines were used during the Spring 2023 form construction:

- Adherence to the test blueprints and test construction specification targets
  - Exact match to blueprint for subclaims
  - Same distribution of cognitive complexity
  - Same percentage of TEs
- Review of the item statistics and adherence to the statistical criteria in the test construction specifications
  - Evaluation of item means, point biserial correlations, and score point distributions
  - Evaluation of item response theory (IRT) item parameter estimates
  - Evaluation of item fit statistics
  - Mirroring of 2018 test characteristic curves (TCCs) and conditional standard error of measurement (CSEM) curves (mathematics and ELA only[5])
  - Minimization of CSEM curves around the cut scores
- Balance in the representation of gender, ethnicity, geographic regions, and relevant demographic factors
- Thorough review of individual items to establish that the content within items is up-to-date and relevant
- Selection of items with various stimulus types throughout the test form to enhance the test-taking experience by providing variation in the appearance of item types presented
- Efficient and deliberate use of varied content representative of the knowledge and skills in the ESs or EOs
- Review of the full form, including field test items, for clueing and/or content overlap

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[5] There was no mirroring of the CSEM curves for the Spring 2023 science assessments because the 2023 curves serve as the base to which future forms will need to mirror.

After the initial operational item pull is complete, assessment specialists verify that the test forms meet the blueprint and test construction specifications (i.e., the required ES or EO coverage, claim and subclaim coverage, cognitive complexity allocation, and task type). The form is then presented to a Pearson psychometrician who verifies that the form falls within the established psychometric and blueprint parameters and identifies the anchor item set within each operational form. (See Chapter 9 for details about the anchor sets.) Once the form is vetted internally, the form is presented to CDE for review. If needed, the assessment specialists, Pearson psychometricians, and CDE collaborate to finalize the form. This can be an iterative process, with the result being CDE's approval of the form.

After the operational form is approved, field test items are selected from the item bank. Items chosen for field testing are placed on a form in a designated section and sequence. Pearson and Tri-Lin assessment specialists assemble field test sets of items so that they comprise the appropriate distribution of standards, subclaims, task types, topic coverage, cognitive levels, and key distributions to meet the required item refresh rates in following years.

## 4.2. Accommodated Test Forms

Accommodated test forms are available for students who need them and include paper, large print, and braille forms, as well as auditory/signed presentation scripts and online forms designed to work with assistive technology such as screen readers. Auditory/signed presentation scripts are available for the paper forms in both English and Spanish for mathematics and science. English auditory/signed presentation scripts are available for both online and paper forms for local translation into languages other than Spanish including sign language. Due to the effort involved in creating an approved accommodated form, these forms are not refreshed at the same rate as the online forms.

### 4.2.1. Paper

Paper-based versions of the CMAS assessments are available as an accommodation or for schools that choose not to test online as allowed by state law. CSLA is the accommodated version of CMAS ELA for eligible Spanish-speaking students in Grades 3 and 4 and is administered on paper. A Spanish transadaptation is also available on paper for CMAS Mathematics and Science.

The paper form is parallel to the online form, meaning the paper and online forms include the same operational items. To support this, parallel paper-based items were developed for TE items in a way that was comparable in terms of student interaction. In some cases, this was achieved with traditional SR items, and in others it required an item that had to be human-scored. For example, a drag-and-drop TE item may have been converted to an item in which the student had to draw lines from the draggers to the drop bays. During equating, the TE item statistics are compared to the paper-based version to confirm equivalence. CSLA also has paper-based versions of TE items that were developed to be similar to the ELA paper-based versions of TE items, although the CSLA paper-based TE items were all machine scored.

The Spring 2023 operational items on the ELA and science paper-based forms were the same as the operational items on the online forms. The Spanish version of the science paper form was the same as the operational items on the English paper form. The mathematics paper-based forms in grades 3, 5 and 7 were the same as the 2020 administration, and the mathematics paper-based forms in grades 4, 6 and 8 were the same as the 2022 administration.

### 4.2.2. Braille

After approval of the paper test materials, a braille version of the assessments is created according to the process outlined below:

1. Pearson Braille Services uses constructed test forms to review the items and clusters for identifying potential modifications related to spacing constraints, visual bias in response expectations, and illustration complexity. Recommendations are documented for modifications to text and images.
2. The modifications document is provided to Pearson assessment specialists to ensure compliance with item constructs and assessed standards.
3. Pearson assessment specialists and CDE review the recommendations and provide feedback regarding any modification concerns.
4. Pearson Braille Services translates the test form into braille and designs print images as tactile graphics.
5. The braille form is proofread by a two-person proof team consisting of a native braille reader, certified as a braille proofreader by the National Library Service, and a sighted copyholder.
6. Edits to text and graphics are made based on the proof team's feedback.
7. The braille form is reviewed by a committee of Pearson staff, CDE staff, and Colorado Teachers of the Visually Impaired (TVI).
8. The braille form is finalized, and hardcopy test books are produced.

The Spring 2023 mathematics assessments in grades 3, 5, and 7 used the same braille form intended for use in the 2020 administration, whereas the Spring 2023 mathematics assessments in grades 4, 6, and 8 used the same braille form intended for use in the 2022 administration.

### 4.2.3. Large Print

Large print versions of the CMAS assessments are a 50% enlargement of the regular paper form and are printed on 14" × 18" paper. When needed, the large print version includes a visual description booklet that contains a description of artwork (maps, photographs) for which it may be difficult for a student with visual impairments to see the subtleties within the art. CDE reviews the paper form and identifies which pieces of art need to be described in the visual description test booklet.

# Chapter 5: Test Administration

The CMAS assessments are administered in TestNav, Pearson's online testing platform. PearsonAccess[next] is the student test management portal Assessment Coordinators and Test Administrators use to manage student tests and registrations and order materials if needed. Prior to the administration of the assessments, districts, schools, and teachers are to ensure that their students and systems are prepared for the assessments. Such information is communicated to the appropriate individuals via manuals, virtual trainings, and recorded modules.

## 5.1. Manuals

The following manuals are available online at https://coassessments.com/manuals/ to support the CMAS administration:

- The *CMAS Test Administrator Manual* for both online and paper-based testing describes the procedures Test Administrators are to follow when administering the assessments. Test administration policies and procedures are to be followed as written so all testing conditions are uniform statewide. The guidelines and test administration scripts in these manuals are provided to ensure that every student in Colorado receives the same standard directions during the test administration by content area, grade level, and accommodation.
- The *CMAS and CoAlt Procedures Manual* provides instructions for coordination of the CMAS assessments. Instructions include the protocols all school staff are to follow related to test security, test administration, and providing accommodations to students with disabilities and ML students and accessibility features to all students. The manual also includes the tasks to be completed by District Assessment Coordinators (DACs), School Assessment Coordinators (SACs), and District Technology Coordinators (DTCs) before, during, and after the test administration.
- The *PearsonAccess[next] Online User Guide* provides guidance for DACs, SACs, DTCs, Test Administrators, and student enrollment/sensitive data personnel who use PearsonAccess[next].

## 5.2. Administration Training

Administration training is intended to make sure all individuals involved in CMAS assessment activities at the school and district levels are prepared to follow administration processes and procedures with fidelity, as well as to support adherence to security procedures. Fidelity to standardized test administration processes and procedures helps ensure the comparability of resulting scores and accurate interpretation of results.

Live virtual trainings were conducted by CDE for groups of DACs, during which the DACs independently accessed CDE- and Pearson-developed lessons through an interactive training platform. The lessons contained information regarding proper procedures for administration, security requirements, receiving and returning materials to Pearson, and the use of PearsonAccess[next] with TestNav. Upon completion of each training lesson, CDE provided additional details pertaining to the covered information and an opportunity for questions and answers. After CDE trained the DACs, the DACs trained the SACs, Test Administrators, and any other individuals within the district who planned to participate in the CMAS administration.

Pearson customer service center staff were also trained to answer questions about the administration and to escalate inquiries as necessary. A knowledge base of common questions was created by CDE and Pearson based on information covered in the training materials and manuals to ensure accurate and consistent responses to school and district personnel, with revisions and additions made as needed. CDE met with Pearson daily during the administration window to review questions from districts and ensure that appropriate answers were provided. Policy questions received by the Pearson customer service center were referred to CDE.

Live webinar accommodations and accessibility features training was also conducted by CDE for district-level personnel to ensure that all individuals providing these supports across the state follow the procedures associated with each accommodation and accessibility feature. Providing accessibility features and accommodations in a standardized manner helps to ensure the comparability of resulting scores and accurate interpretation of results.

Resources used during the live trainings are posted on the CDE website at http://www.cde.state.co.us/assessment/trainings-archive. Administration training materials such as slide decks, manuals, and how-to guides were also available on the CDE Assessment Unit website for training SACs and Test Administrators.

### 5.3. Practice Resources

Colorado Practice Resources (CPRs) are available online at https://coassessments.com/practice-resources/ to help students become familiar with the CMAS item types. The CPRs are updated as needed to reflect current accessibility features and any updates to TestNav that may impact student interactions with the assessment. Accommodated versions of the CPRs are also available so students can practice using accommodations and accessibility features such as English text-to-speech, color contrast, and Spanish text-to-speech. Paper sample items for students taking the paper versions of the assessments are available in PDF format for download. CPRs are accompanied by scoring guides that include performance metrics and alignment to the CAS.

### 5.4. Onsite Preparation

Districts were instructed in site readiness preparations, TestNav, proctor caching, and use of the SystemCheck tool to configure their testing technology environments and evaluate their configuration for district readiness. Districts were also provided tools and resources to test their environment readiness status and infrastructure systems.

### 5.5. Accessibility Features and Accommodations

Accessibility is considered from the beginning of the test development process and is inherent within the CMAS assessment and administration. For example, TestNav includes tools and accessibility features that are available to all students to increase the accessibility of the assessments (e.g., highlighter, online color contrast). Also included is the text-to-speech accessibility feature for mathematics and science that allows for text to be read to students by the embedded software audio feature. Although this feature is available to all students, only students who need text-to-speech are assigned to it in advance of testing. Similarly, the CSLA assessments were developed to be linguistically accommodated Spanish tests and, as such, are designed to be linguistically accessible for eligible Spanish-speaking students.

Accommodations are also available to the population of students with IEP or 504 plans or ML students. For example, students may have extended time as required by their IEP or as allowed for students classified as ML. The test is also available with Spanish text-to-speech (mathematics and science only) and paper transadaptations or auditory presentation scripts that can be translated into other languages. Accommodations are intended to provide a student with an opportunity to access the assessment without impacting the measured construct. Accommodations can be adjustments to the test presentation, materials, environment, or response mode of the student and are based on individual student need. They should not provide an unfair advantage to any student. Providing an accommodation for the sole purpose of increasing test scores is not ethical.

Accommodations must be documented and used regularly during classroom instruction and assessments prior to the testing window to ensure that the student can successfully use the accommodation. However, although accommodations are used for classroom instruction and assessments, some may not be appropriate for use on statewide assessments. As a result, it is important that educators become familiar with the state assessment policies about the appropriate use of accommodations and that districts have a plan in place to ensure and monitor the appropriate use of accommodations.

Certain accommodations are allowed only in special cases with CDE approval due to being an inherent violation of the intended construct. For example, the accommodations of calculator on non-calculator sections of mathematics and a scribe for CR items for ELA/CSLA require approval to preserve the intended constructs of mathematics and writing according to the CAS.

Some of the available accommodations for CMAS include CSLA in place of ELA (other linguistic accommodations do not apply as CSLA is the linguistic accommodation), English auditory/signed presentation scripts (mathematics and science), Spanish auditory/signed presentation scripts (mathematics and science), auditory/signed presentation scripts for signed presentation and local translation into languages other than English and Spanish, braille forms, large print forms, assistive technology forms for screen readers (mathematics and ELA only), and Spanish forms with and without text-to-speech for mathematics and science.

**5.6. Test Security**
Test security procedures are put in place to enhance the likelihood that security is maintained before, during, and after the assessment administration. For example, materials used during the paper administration of the assessment are to be kept in locked storage locations when not under the direct supervision of Pearson or approved testing coordinators and administrators. All district and school personnel involved in the CMAS test administration are required to participate in annual local training. DACs are responsible for overseeing training for the district, including verifying that the DTC and SACs are trained. SACs are responsible for ensuring that Test Administrators and all other individuals involved in test administration at the school level are trained and subsequently act in accordance with all security requirements.

A chain of custody plan for materials is required to be written and implemented to ensure that materials are securely distributed from DACs to SACs to Test Administrators and securely returned from Test Administrators to SACs and then to DACs. SACs are required to distribute materials to and collect materials from the Test Administrators each day of testing and to securely store and deliver materials to DACs after testing is completed in accordance with the instructions in the *CMAS and CoAlt Procedures Manual*.

All individuals involved in the test administration are required to sign a security agreement prior to handling test materials, which requires them to follow all procedures set forth in the aforementioned manuals and prevents them from divulging the contents of the assessment, copying any part of the assessment, reviewing test items with the students, allowing students to remove test materials from the testing room, or interfering with the independent work of any student taking the assessment. During online testing, all computer functions not necessary to complete the test are disabled, and access is restricted to disallow activities in all applications outside the testing program.

PearsonAccess[next], the assessment management system used during the administration, includes permissions-based user role access to all information within the system, including accessing student information, setting up and delivering test sessions (preparing, starting, and stopping sessions), administering tests (unlocking, resuming, and locking units), and accessing reports. Access to the online assessments through the student testing system, TestNav, is tightly controlled before, during, and after test administration, requiring a login ID and password to enter the system for each unit. Test content is locked and cannot be accessed by students or district/school-level users after the students submit their answers. Each unit of the paper test requires students to break the unit seal before accessing the test content. To enhance security during test administration, test forms are spiraled, decreasing the likelihood that a student would be working on the same items as their peers at the same time.

After all test sessions are completed at a school, used and unused materials are required to be securely stored and returned to the DAC by the district deadline for shipment to Pearson. DACs are required to report any missing test materials or test irregularities and to complete the appropriate documentation.

# Chapter 6: Scoring

The CMAS assessments use a combination of machine, human, and automated scoring. All SR and TE items are machine-scored, with point values varying by item type and assessment. Most mathematics and all science CR items are handscored, with a small number of CR mathematics items scored by the math reasoning engine (MRE). The ELA PCR items are scored on two trait dimensions using a combination of human scoring and automated scoring. Pearson's Scoring Services team conducted the handscoring for the CR, human PCR, and parallel paper-based versions of the TE items for CMAS. Appendix C presents the holistic rubrics used to score both the CMAS ELA/CSLA PCR items. To maintain comparability, scoring rules for the machine-scored items and rubrics, anchor papers, rules and scoring methods for the handscored items were preserved from previous years.

## 6.1. Machine Scoring

Machine-scored items include key-based and rule-based items. Key-based items tend to be a version of multiple-choice and multiple-select (i.e., students select more than one correct answer) items. Rule-based items are machine-scored TE items. Initial scoring expectations are developed during item development and are included in the item review process. The scoring rules and correct responses are included in the items' XML coding. Prior to scoring, key checks and adjudication are completed for all machine-scored items to verify that the machine is correctly identifying correct and incorrect responses. If there is a discrepancy in the scoring, content experts review the item and adjustments are made as needed. During testing, actual distribution of scores is compared to expected distribution. Further evaluation is completed if a discrepancy is identified.

## 6.2. Human Scoring

### 6.2.1. Operational Scoring

Human-scored operational items are scored using either a distributed or synchronous scoring model depending on the content area. Items on the CSLA form and paper-based TE items are scored synchronously, while scoring for all other human-scored items is completed through distributed scoring. At times, distributed scorers are leveraged to score paper-based TE items. Scoring includes several components that together provide a comprehensive performance scoring model. For example:

- All scorers are required to pass a background check and sign a nondisclosure agreement, agreeing to adhere to all security and confidentiality requirements.
- All scorers have a four-year degree at a minimum. Scorers are assigned to content areas based on their educational backgrounds, related fields of work, and their demonstrated knowledge in the content area.
- Scorers of CSLA items must be proficient in written Spanish and English languages.
- Scorers are trained using comprehensive training materials developed by scoring experts that rely on student responses scored at the rangefinding meetings. Prior to qualifying for an item, scorers review an online training module that includes an overview of scoring; information specific to the item such as the prompt and rubric; and anchor sets. Scorers then score multiple practice sets prior to attempting qualification. After successful qualification, scorers begin scoring the item.

- For CSLA items, training is led by a Pearson scoring director who presents item-specific materials, including the prompt and rubric. The scoring team then receives training on anchor sets prior to moving into the online portion of training where scorers apply scores on multiple practice sets within the electronic scoring system. After each practice set, the scoring director reviews the practice set results with the scorers prior to scorers taking the qualification sets. After successful qualification, scorers begin scoring the item.
- Scorers must pass a qualifying test for the item types that they score. Qualification sets are designed to test scorer accuracy across the range of score points for a given item.
- Student responses are converted to electronic images at Pearson facilities and are then transmitted for computer-based scoring.
- Distributed scorers are located across the United States and work from their homes. Their computers are set up for image-based scoring. A comprehensive set of scoring and monitoring tools are integrated into the scoring system, and content supervisory staff are available by phone to help answer any training or scoring questions. With distributed scoring, scorers are able to score seven days per week with extended evening hours.
- Synchronous scorers are located across the United States and also work from their homes; however, they are only permitted to score while attending daily Microsoft Teams meetings with content supervisory staff. As with distributed scoring, synchronous scoring uses a comprehensive set of scoring and monitoring tools integrated into the scoring system, with content supervisory staff available within the Microsoft Teams interface to help answer any training or scoring questions. Unlike distributed scoring, synchronous scoring is typically only completed Monday through Friday during normal business hours. Synchronous scorers are used for CSLA forms and paper-based TE items.
- Additional security procedures are in place for distributed scoring. Data are securely transmitted through HTTPS and SSL technology using secure protocols for system authentication. Student responses are randomly routed through the scoring platform to prevent scorer knowledge of student information, unless a student self-identified in the response. Scorers agree not to use shared, institutional, or public computers to score and not to save student responses or test materials. Scorer printing capabilities of materials, such as anchor papers, are only approved for printing after they have undergone and passed a personally identifiable information review by CDE. Scorers agree to securely destroy or return printed materials to Pearson at the conclusion of scoring.

Pearson's processes and tools provide a replicable quality system that strengthens consistency across projects and locations within Pearson's Scoring Services operations. Pearson's Scoring Services team uses a comprehensive system for continually monitoring and maintaining the accuracy of scoring at both the group and individual levels. This system includes daily analysis of a comprehensive set of statistical monitoring reports, as well as regular "backreading" of scorers. Reliability statistics are monitored during scoring, and interventions are applied if a scorer or item is not meeting the minimum requirements.

### 6.2.2. Field Test Scoring

Embedded field test scoring is completed using synchronous scoring that took place within daily Microsoft Teams meetings. All scorers are required to have a four-year college degree. Field test scorers receive stand-up training led by a Pearson scoring director who presents item-specific materials, including the prompt and rubric. Scorers then review the anchor sets in a group setting prior to scoring practice sets on paper.

*6.2.3. Rangefinding*

Scoring rubrics are generated for each unique item for mathematics and science, while ELA/CSLA use holistic rubrics for each item type (as shown in Appendix C:). Rubrics are finalized during rangefinding and are maintained, along with the training materials for each item, by Pearson's Scoring Services group.

Rangefinding meetings take place following the administration in which an item was field tested. The purpose of rangefinding is to define the range of performance levels within the score points of the rubrics using student responses. Each rangefinding committee includes Pearson's Scoring Services and content staff, state content representatives, and educators with relevant grade-level and content expertise and experience with special populations. Participants create consensus scores for a sample set of student responses that are subsequently used to develop effective training materials for scoring of the CR items.

Pearson's scoring directors construct one rangefinding set per item, which includes approximately 30 responses. For multi-point items, pre-constructed sets with additional responses are brought to the meeting. Responses included in these sets represent the full spectrum of scores to the greatest extent possible. The responses for each item are randomly ordered to provide committee members an opportunity to determine the spectrum of scores without bias, although actual scores are not revealed to committee members. Each set includes responses clearly earning each available score point for each item type. The set also includes sample responses that may have been challenging to score (i.e., the score points earned were not necessarily clear).

Following an introductory session presented by a member of the Scoring Services group, the rangefinding committee is divided into several breakout groups based on educator expertise. Each group is assigned a range of field test items to be reviewed based on the following process:

1. The scoring director introduces each item. The committee reviews the item and corresponding rubric.
2. The committee reads student responses—individually or as a group—and then discusses and decides the most appropriate score for each response.
3. The scoring director records committee members' comments and the final consensus score for each student response. Consensus is reached when a majority of committee members agree on a particular score point for a response and all members agree to accept the score of the majority.
4. A designated committee member records consensus scores. After reviewing responses for each item, the committee member compares their notes with those kept by the scoring director and provides sign-off to indicate agreement with the recorded scores.

Following the rangefinding meetings, Scoring Services creates training materials with an anchor set that is used for initial training (up to 15 responses) and a full practice set (up to 10 responses). For ELA, two anchor sets are used per item, one for content and one for conventions. Each CR item is then scored with the associated training materials.

### 6.2.4. Backreading

Backreading is the method of immediately monitoring a scorer's performance and is an important tool for Pearson's scoring supervisors. Backreading is performed in conjunction with the statistics provided by reader performance reports and as indicated by scoring directors, allowing scoring supervisors to target particular readers and areas of concern. Scorers showing low inter-rater agreement or those showing anomalous frequency distributions are given immediate, constructive feedback and monitored closely until sufficient improvement is demonstrated. Scorers who demonstrate through their agreement rates and frequency distributions that they are scoring accurately are continued to be spot-checked as an added confirmation of their accuracy. The agreement rate requirements are as follows:

- 1-point item: 90% perfect and 95% perfect plus adjacent agreement
- 2-point item: 90% perfect and 95% perfect plus adjacent agreement
- 3-point item: 80% perfect and 95% perfect plus adjacent agreement
- 4-point item: 70% perfect and 95% perfect plus adjacent agreement
- 5+-point item: 65% perfect and 95% perfect plus adjacent agreement

Section 11.5 of this technical report presents an explanation of the rater agreement statistics and the results from the Spring 2023 administration.

### 6.2.5. Calibration

Calibration sets are responses selected as examples that help clarify scoring issues, define more clearly the lines between certain score points, and reinforce the scoring guidelines as presented in the original training sets. They can be applied to groups, a subset of groups, or individual scorers as needed. These sets are used to proactively promote accuracy by exploring project-specific issues, score boundaries, or types of responses that are particularly challenging to score consistently. Scoring directors administer calibration sets as needed, particularly for more difficult items.

### 6.2.6. Validity Papers

As a quality monitoring tool used during scoring, validity papers are student responses chosen by Pearson scoring directors to measure the accuracy of a scorer when applying the scoring rubric. Validity papers are blind to scorers, which means a scorer is not aware when they are scoring a validity paper. Scoring directors may choose to include an annotation with a validity paper so that a scorer will receive immediate feedback if a validity paper is scored incorrectly. Validity statistics are monitored by scoring directors throughout the life of a scoring project.

## 6.3. MRE Scoring

The math reasoning engine (MRE) evaluates responses based on rubric criteria specific to the expected item responses and does not require human scoring to train the engine. Because the engine can reason about the student's math, there is no need to enumerate all possible correct responses (as one would with other more traditional machine scoring). The MRE scoring criteria are defined in terms of the mathematical characteristics of a response the engine uses to evaluate the extent to which a student response satisfies a scoring rubric (e.g., equivalence, form, precision, and constraints).

Before a mathematics item is scored operationally, it goes through a rubric refinement and validation process. After field testing, online student responses are aggregated into a set of individual unique responses that are back-read by human scorers. When the human scorers disagree with the score assigned by the scoring engine, they flag the response for further review. The flagged responses are then reviewed by Pearson content experts to determine if scoring rules should be adjusted to better fit the rubric.

If scoring rule adjustments are made, MRE can rescore the entire item based on the new scoring rules configuration. During rescores, every changed response score is identified and reviewed by content experts to evaluate the impact of the rule change on all responses to ensure that the change had the intended effect and nothing more. The data provided to committee members is based on the final scoring rules reflecting how the responses are scored operationally and includes the most common field test item responses providing committee members with additional information to evaluate item quality.

## 6.4. Automated Scoring

Pearson's Intelligent Essay Assessor (IEA) was used for scoring one of the 12 operational PCRs in 2023 for the CMAS ELA assessment. The prompt had an automated scoring model based on training from prior operational years and was also checked for quality using second scores by human scorers. Ten percent of responses were randomly selected and given a second reliability score to provide data for evaluating the consistency of scoring.

Some responses were not scored by the engine at all and received a first human score based on Smart Routing. The use of Smart Routing during operational scoring increases the quality of automated scoring by routing responses that are more likely to disagree with a human score to receive an additional human score. Because the cases that result from "in between" scores are based on modeling human scores, it follows that human scores may be less certain as well. Therefore, responses are more likely to be double-scored and resolved if the IEA and human scores are non-adjacent. Smart routing is used as needed to achieve targeted quality metrics (e.g., validity agreement or agreement with human scorers).

### 6.4.1. Quality Criteria for Evaluating Automated Scoring

The primary evaluation criteria for IEA are based on responses to validity papers with "known" scores assigned by experts. A set of validity papers seeded into human scoring throughout the administration is used to monitor the human-scoring process over time. The expectation is that IEA can score validity papers at least as accurately as humans can score the papers. Additional measures for evaluating automated scoring include Pearson correlation, kappa, quadratic-weighted kappa (QWK), exact agreement, and standardized mean difference (SMD) that are computed between pairs of human scores and between IEA and humans to evaluate how performance is the same or different. Criteria for evaluating the training of IEA given these measures include the following:

- Pearson correlation between IEA and human scores should be within 0.1 of human–human correlation.
- Kappa between IEA and human scores should be within 0.1 of human–human kappa.
- QWK between IEA and human scores should be within 0.1 of human–human QWK.

- Exact agreement rate for IEA and human scores should be within 3.0% of the human–human exact agreement rate.
- SMD between IEA and human scores should be less than 0.15.

The specific criteria for evaluating IEA included both primary and secondary criteria, as described below.

### 6.4.1.1. Primary Criterion

The performance of IEA was evaluated by comparing IEA scores with human scores for the set of validity papers. The primary criterion is stated as follows: *With smart routing applied as needed, IEA agreement is as good as or better than human agreement for each trait score.* For a given prompt, this criterion is operationalized as follows:

1. Determine agreement of the human scores with the validity papers for each trait.
2. Calculate agreement of the IEA scores with the validity papers for each trait.
3. Compare the IEA-human agreement on the validity papers.
4. Deploy IEA operationally if the IEA validity agreement is greater than or equal to the human agreement for each trait.

When it is not possible to use human-scored validity responses in evaluating IEA performance, IEA is evaluated based on IEA–human exact agreement for each trait score and compared to agreement based on responses that are double-scored by humans. IEA-human agreement is evaluated on a portion of the data according to the following steps:

1. Determine exact agreement of the two human scores with each other for each trait.
2. Calculate agreement of the IEA scores with the human scores for each trait.
3. Compare the IEA-human agreement with the human-human agreement.
4. Deploy IEA operationally if the IEA-human agreement is within 5.25% of the human-human agreement.

In addition to the overall comparison, the following performance thresholds are targeted in the test dataset: (1) at least 65% overall IEA-human agreement and (2) 50% IEA-human agreement by score point (i.e., conditioned on the human score). These targets go beyond the contingent primary criteria approved by the consortium state leads.

### 6.4.1.2. Secondary Criterion

The secondary criterion involves comparing agreement indices for IEA-human scoring for various demographic subgroups and is stated as follows: *With smart routing applied as needed, IEA-human differences on statistical measures for each trait score are within the Williamson et al. (2012) tolerances for subgroups with at least 50 responses.* IEA-human agreement is evaluated according to the following steps:

1. Determine exact agreement of the two human scores with each other for each trait.
2. Calculate agreement of the IEA scores with the human scores for each trait.
3. Compare the IEA-human agreement with the human–human agreement.
4. For subgroups with at least 50 IEA-human scores and at least 50 human-human scores, compare agreement indices to the following criteria:

a. Pearson correlation between IEA-human should be within 0.1 of human-human.
b. Kappa between IEA-human should be within 0.1 of human–human.
c. Quadratic-weighted kappa between IEA-human should be within 0.1 of human-human.
d. Exact agreement between IEA-human should be within 5.25% of human-human.
e. SMD between IEA-human should be less than ±0.15 (this criterion was applied to subgroups with at least 50 IEA-human scores).

Although it is not expected that these criteria will be met for all subgroups for all prompts, if results of the evaluation between IEA and human scoring for subgroups for any prompt indicate that IEA performance persistently fails on the criteria listed above, considerations would be given to resetting the responses scored by IEA and reverting to human scoring until such time that an alternate IEA model could be established with improved subgroup performance.

In addition to the secondary criterion, the performance of IEA is also compared with the following targets on the various measures for subgroups with at least 50 responses:

- Pearson correlation between IEA-human should be 0.70 or above.
- Kappa between IEA-human should be 0.40 or above.
- Quadratic-weighted kappa between IEA-human should be 0.70 or above.
- Exact agreement between IEA-human should be 65% or above.

### 6.4.2. Hierarchy of Assigned Scores for Reporting
When multiple scores are assigned for a given response, the following hierarchy determines which score is reported operationally:

- The IEA score is reported if it is the only score assigned.
- If an IEA score and a human score are assigned, the human score is reported.
- If two human scores are assigned, the first human score is reported.
- If a backread score and human and/or IEA scores are assigned, the last backread score is reported.
- If a resolution score is assigned, the resolution score is reported. If nonadjacent scores are encountered, responses are automatically routed to resolution.

# Chapter 7: Standard Setting

To support the interpretation of student results, student performance on the CMAS assessments is described in terms of performance levels as presented in Table 2.2. Standard setting is the process of translating those policy-driven performance standards into scores on the assessment. The purpose of standard setting is to determine the boundaries—or cut scores—along the score scale that differentiate student performance among those levels (e.g., Cizek et al., 2004; Kane, 1994).

Table 7.1 presents the cut scores for each content area and grade. The mathematics and ELA cut scores were set in 2015 in collaboration with the PARCC consortium using the Evidence-Based Standard Setting (EBSS) method (Beimers et al., 2012), as detailed in the 2015 PARCC *Performance Level Setting Technical Report* (Davis & Moyer, 2015). CSLA cut scores were set in 2016 using the Modified Extended Angoff method, as detailed in the *CSLA Colorado Spanish Language Arts Standard Setting Report* (CDE, 2016). Standard setting for the new science assessment took place from September 27–28, 2022, using a modified version of the Item Descriptor (ID) Matching method (Ferrara et al., 2008), as detailed in the *CMAS Science 2022 Standard Setting Report* (Pearson, 2024).

**Table 7.1. Performance Level Cut Scores**

| Content Area | Grade | Did Not Yet Meet Expectations | Partially Met Expectations | Approached Expectations | Met Expectations | Exceeded Expectations |
|---|---|---|---|---|---|---|
| Mathematics | 3 | 650–699 | 700–724 | 725–749 | 750–789 | 790–850 |
|  | 4 | 650–699 | 700–724 | 725–749 | 750–795 | 796–850 |
|  | 5 | 650–699 | 700–724 | 725–749 | 750–789 | 790–850 |
|  | 6 | 650–699 | 700–724 | 725–749 | 750–787 | 788–850 |
|  | 7 | 650–699 | 700–724 | 725–749 | 750–785 | 786–850 |
|  | 8 | 650–699 | 700–724 | 725–749 | 750–800 | 801–850 |
| ELA | 3 | 650–699 | 700–724 | 725–749 | 750–809 | 810–850 |
|  | 4 | 650–699 | 700–724 | 725–749 | 750–789 | 790–850 |
|  | 5 | 650–699 | 700–724 | 725–749 | 750–798 | 799–850 |
|  | 6 | 650–699 | 700–724 | 725–749 | 750–789 | 790–850 |
|  | 7 | 650–699 | 700–724 | 725–749 | 750–784 | 785–850 |
|  | 8 | 650–699 | 700–724 | 725–749 | 750–793 | 794–850 |
| Science | 5 | – | 650–724 | 725–749 | 750–788 | 789–850 |
|  | 8 | – | 650–724 | 725–749 | 750–796 | 797–850 |
|  | 11 | – | 650–724 | 725–749 | 750–786 | 787–850 |
| CSLA | 3 | 650–699 | 700–724 | 725–749 | 750–778 | 779–850 |
|  | 4 | 650–699 | 700–724 | 725–749 | 750–771 | 772–850 |

The ELA assessment also includes a Reading score that has the same range and cut score for all grades. There is only one cut score that corresponds to the *Met Expectations* overall performance level, as shown in Table 7.2, that was determined using the cut information from setting the standards on the overall ELA test (i.e., it was not set separately at the standard setting meeting).

**Table 7.2. ELA Reading *Met Expectations* Cut Score**

| Scale Range | Cut Score |
|---|---|
| 110–190 | 150 |

Science also includes performance indicator cut scores that indicate average performance in each reporting category compared to the state, as shown in Table 7.3. These cuts are not used for accountability and change from year to year. Students with scores below this range scored "lower than average" in the reporting category, and students above the range scored "higher than average."

**Table 7.3. 2023 CMAS Science Performance Indicator Cut Scores**

| Grade | Physical Science | Life Science | Earth and Space Science | SEP |
|---|---|---|---|---|
| 5 | 441–519 | 440–522 | 446–519 | 448–517 |
| 8 | 444–515 | 440–516 | 442–516 | 447–514 |
| 11 | 442–511 | 441–512 | 440–512 | 447–509 |

# Chapter 8: Reporting

## 8.1. Description of Scores

The CMAS reports provide information on student performance in terms of scale scores, performance levels, percentile ranks, and percent earned scores, as described below.

### 8.1.1. Scale Scores

A scale score is a conversion of a student's response pattern to a common scale that allows for a numerical comparison between students. Scale scores are particularly useful for comparing test scores over time and creating comparable scores when a test has multiple forms. Students taking CMAS mathematics and science receive overall scale scores, whereas students taking the CMAS ELA/CSLA assessments receive scale scores at the overall test and Reading claim levels. Science reports also provide separate scale scores for content standards and SEPs (referred to as reporting categories). The overall scale for each content area assessment ranges from 650 to 850, and the ELA Reading scale ranges from 110 to 190, as shown in Table 7.1 and Table 7.2 in the previous chapter. The science content standards scale score ranges from 400 to 600, although the graph displayed on the student reports ends at 550. Any student who earned a score greater than 550 still had their score written on the report but the diamond representing this performance would appear at the end of the graph at 550.

### 8.1.2. Performance Levels

Performance levels and their accompanying PLDs are reported at the overall assessment level. Students are classified into performance levels based on their scale score and the cut scores obtained from standard setting. The CMAS Mathematics and ELA assessments have five performance levels (*Did Not Yet Meet Expectations*, *Partially Met Expectations*, *Approached Expectations*, *Met Expectations*, and *Exceeded Expectations*), whereas CMAS Science has four performance levels (*Partially Met Expectations*, *Approached Expectations*, *Met Expectations*, and *Exceeded Expectations*). Students in the top two performance levels met or exceeded the expectations of the CAS and are considered on track for the next grade level in that content area.

### 8.1.3. Percentile Ranking

Percentile rankings are provided on student performance reports to indicate how the student performed compared with other students in the state. For example, a student with a percentile ranking of 70 performed better than 70% of students in Colorado. The percentile rankings are based on the overall scale score.

### 8.1.4. Percent Earned

To prevent incorrect interpretations and provide a metric that is more generally understood, student performance for subclaims and the Writing claim (ELA/CSLA) are reported as the percentage of points earned (i.e., the number of points a student earned out of the total number of points possible within a claim or subclaim). Unlike scale scores, the percent of points possible scores cannot be compared across years because individual items change from year to year and are not constructed to be comparable in difficulty at the claim, subclaim, or subscale level. Performance on different subclaims or subscales also cannot be compared within an administration because the number of items and the difficulty of the items within each claim, subclaim or subscale may not be the same.

The percent of points possible can be compared to aggregated state, district, and school performance. The student performance reports also include an indicator of how students who scored just above the *Met Expectations* cut score on the overall assessment performed on each category. This indicator gives similar information to the *Met Expectations* cuts.

## 8.2. Score Reports

Two types of score reports are provided: (1) the student-level Student Performance Report and (2) the aggregate reports at the school and district levels. Appendix D presents sample Student Performance Reports, and examples of each type of aggregate report are provided in the *CMAS and CoAlt Interpretive Guide to Assessment Reports*. For a detailed explanation of the information provided in all reports, refer to the *CMAS and CoAlt Interpretive Guide to Assessment Reports* located online at https://www.cde.state.co.us/assessment/cmas_coalt_interpretiveguide_2023. CSLA assessments are parallel and comparable to the CMAS ELA assessments in scoring and reporting. Therefore, separate CSLA reports are not included (please refer to the CMAS ELA examples).

### 8.2.1. Student Performance Reports

The Student Performance Report provides information about the performance of a particular student. The student's scale score, performance level, percentile ranking, and percent of points possible scores are displayed on a two-page report, along with comparative information related to the student's school, district, and state performance. PLDs are also provided. In addition to the electronic versions made available to districts and schools, two copies of the Student Performance Report are printed and shipped to districts for distributing to parents/guardians and for maintaining locally.

### 8.2.2. Aggregate Reports

The following aggregate reports are produced at the school and/or district levels and provide summary information for a given school or district. They are provided electronically through PearsonAccess[Next], with access limited to authorized users. The participation report provides a comparison of the demographic characteristics of the tested students compared to all students eligible for testing. This information can assist districts and schools in determining how to interpret their aggregated results.

- Performance Level Summaries
- Content Standards Rosters
- Evidence Statement Analysis Reports (mathematics and ELA only)
- Item Analysis Report (science only)
- District Summary of Schools (district level only)
- District and School Participation Reports

# Chapter 9: Test Results and Analysis

This chapter presents the test results and statistical analyses for the Spring 2023 CMAS assessments in mathematics, ELA/CSLA, and science.

## 9.1. Student Participation

Table 9.1 presents a breakdown of the number of students who took the assessment online compared with those who took accommodated forms, and Appendix E presents n-counts for various demographic characteristics for the students who took the CMAS assessments. Most students took the assessments online.

**Table 9.1. Student Participation N-Count by Form**

| Content Area | Form | Grade 3 | Grade 4 | Grade 5 | Grade 6 | Grade 7 | Grade 8 | Grade 11 |
|---|---|---|---|---|---|---|---|---|
| Mathematics | Online | 51,956 | 51,828 | 52,685 | 52,174 | 50,536 | 48,825 | – |
| | Spanish Online | 1,188 | 1,084 | 617 | 346 | 372 | 335 | – |
| | Paper | 4,127 | 3,810 | 3,549 | 3,370 | 3,207 | 2,843 | – |
| | Spanish Paper | 93 | 39 | 14 | 5 | 12 | 12 | – |
| | Text-to-Speech | 12,430 | 11,426 | 10,405 | 5,211 | 4,089 | 3,620 | – |
| | Spanish Text-to-Speech | 649 | 530 | 355 | 138 | 125 | 130 | |
| | Assistive Technology | 7 | 11 | 6 | 7 | 11 | 6 | – |
| | Total | 57,371 | 56,772 | 56,871 | 55,902 | 54,138 | 52,021 | – |
| ELA | Online | 51,525 | 51,652 | 53,041 | 52,552 | 51,105 | 49,260 | – |
| | Paper | 4,201 | 3,854 | 3,604 | 3,038 | 2,771 | 2,489 | – |
| | Assistive Technology | 11 | 13 | 12 | 12 | 19 | 11 | – |
| | Total | 55,737 | 55,519 | 56,657 | 55,602 | 53,895 | 51,760 | – |
| CSLA | Paper | 1,440 | 1,180 | – | – | – | – | – |
| Science | Online | – | – | 43,155 | – | – | 45,087 | 29,886 |
| | Spanish Online | – | – | 203 | – | – | 189 | 131 |
| | Paper | – | – | 2,586 | – | – | 2,037 | 816 |
| | Spanish Paper | – | – | 10 | – | – | 12 | 1 |
| | Text-to-Speech | – | – | 10,175 | – | – | 3,499 | 855 |
| | Spanish Text-to-Speech | – | – | 299 | – | – | 123 | 78 |
| | Total | – | – | 56,428 | – | – | 50,947 | 31,767 |

## 9.2. Performance Results

Table 9.2 presents summary statistics for the overall scale scores, including the mean, standard deviation (SD), and median. The previous year's results are also included for comparison. The tables also include the coefficient alpha (see Section 11.1 for more information). Table 9.3 presents the performance level distributions and includes the distributions from last year's administration for comparison.

Appendix F presents the cumulative scale score distributions by grade, Appendix G displays the same information in graphical form, and Appendix H presents the summary statistics for the overall scale scores by demographic subgroup.

**Table 9.2. Scale Score Performance Summary**

| Content Area | Grade | 2023 N | 2023 Mean | 2023 SD | 2023 Median | 2022 N | 2022 Mean | 2022 SD | 2022 Median |
|---|---|---|---|---|---|---|---|---|---|
| Mathematics | 3 | 57,382 | 738 | 39.5 | 739 | 56,482 | 737 | 39.3 | 738 |
| | 4 | 56,789 | 733 | 33.5 | 733 | 56,886 | 732 | 32.9 | 732 |
| | 5 | 56,896 | 737 | 35.2 | 736 | 57,423 | 736 | 35.1 | 734 |
| | 6 | 55,913 | 730 | 33.3 | 729 | 55,936 | 728 | 32.5 | 728 |
| | 7 | 54,148 | 731 | 28.1 | 729 | 55,283 | 730 | 27.7 | 728 |
| | 8 | 52,036 | 732 | 40.9 | 728 | 52,804 | 731 | 40.1 | 728 |
| ELA | 3 | 55,737 | 737 | 43.6 | 738 | 55,081 | 737 | 43.9 | 739 |
| | 4 | 55,519 | 742 | 36.9 | 744 | 55,746 | 740 | 36.4 | 744 |
| | 5 | 56,657 | 747 | 33.8 | 747 | 57,362 | 745 | 32.8 | 745 |
| | 6 | 55,602 | 743 | 33.0 | 744 | 55,960 | 742 | 34.1 | 743 |
| | 7 | 53,895 | 744 | 38.0 | 745 | 55,265 | 741 | 37.2 | 742 |
| | 8 | 51,760 | 741 | 40.7 | 742 | 52,727 | 742 | 40.9 | 743 |
| ELA – Reading | 3 | 55,737 | 145 | 17.7 | 145 | 55,081 | 145 | 17.7 | 145 |
| | 4 | 55,519 | 147 | 14.8 | 147 | 55,746 | 146 | 14.6 | 148 |
| | 5 | 56,657 | 149 | 13.6 | 149 | 57,362 | 148 | 13.2 | 148 |
| | 6 | 55,602 | 147 | 13.2 | 147 | 55,960 | 147 | 13.7 | 147 |
| | 7 | 53,895 | 148 | 15.1 | 148 | 55,265 | 146 | 14.8 | 146 |
| | 8 | 51,760 | 147 | 16.2 | 147 | 52,727 | 147 | 16.2 | 147 |
| CSLA | 3 | 1,440 | 724 | 27.3 | 725 | 1,301 | 726 | 26.9 | 726 |
| | 4 | 1,180 | 725 | 23.8 | 725 | 1,151 | 726 | 22.0 | 727 |
| CSLA – Reading | 3 | 1,440 | 140 | 10.2 | 139 | 1,301 | 140 | 10.5 | 139 |
| | 4 | 1,180 | 140 | 9.3 | 140 | 1,151 | 141 | 8.3 | 140 |
| Science | 5 | 56,428 | 733 | 33.9 | 737 | – | – | – | – |
| | 8 | 50,947 | 731 | 33.0 | 735 | – | – | – | – |
| | 11 | 31,767 | 729 | 29.5 | 732 | – | – | – | – |

*Note*. The Spring 2022 CMAS Science assessment reported percentile ranks only.

**Table 9.3. Performance Level Distribution: Percent of Students in Each Performance Level**

| Content Area | Grade | 2023 1 | 2023 2 | 2023 3 | 2023 4 | 2023 5 | 2022 1 | 2022 2 | 2022 3 | 2022 4 | 2022 5 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mathematics | 3 | 17.76 | 18.62 | 23.25 | 31.02 | 9.34 | 18.68 | 18.95 | 23.00 | 30.73 | 8.64 |
| | 4 | 17.38 | 23.48 | 26.46 | 29.75 | 2.93 | 18.05 | 24.05 | 27.20 | 28.28 | 2.43 |
| | 5 | 15.17 | 23.48 | 24.85 | 29.05 | 7.44 | 16.17 | 24.31 | 24.59 | 28.06 | 6.86 |
| | 6 | 19.93 | 24.86 | 26.97 | 24.17 | 4.07 | 20.33 | 26.02 | 27.37 | 22.84 | 3.44 |
| | 7 | 12.10 | 31.95 | 29.69 | 23.46 | 2.79 | 12.01 | 32.73 | 30.21 | 22.49 | 2.56 |
| | 8 | 23.74 | 23.27 | 20.32 | 26.98 | 5.68 | 23.60 | 23.05 | 20.97 | 27.42 | 4.96 |
| ELA | 3 | 22.19 | 17.03 | 20.91 | 34.92 | 4.95 | 22.14 | 16.56 | 20.55 | 35.86 | 4.88 |
| | 4 | 14.52 | 16.47 | 25.22 | 35.05 | 8.72 | 15.11 | 15.59 | 25.18 | 36.85 | 7.27 |
| | 5 | 7.93 | 18.51 | 25.80 | 41.11 | 6.65 | 8.21 | 19.34 | 27.05 | 40.62 | 4.79 |
| | 6 | 10.31 | 20.16 | 26.16 | 35.75 | 7.62 | 11.49 | 18.52 | 26.95 | 35.64 | 7.40 |
| | 7 | 13.23 | 17.52 | 24.24 | 30.35 | 14.67 | 15.09 | 18.93 | 24.21 | 29.46 | 12.30 |
| | 8 | 16.54 | 17.95 | 23.14 | 32.12 | 10.26 | 16.65 | 17.08 | 22.33 | 33.29 | 10.65 |
| CSLA | 3 | 19.93 | 29.65 | 31.74 | 16.81 | 1.88 | 18.45 | 27.98 | 33.74 | 17.60 | 2.23 |
| | 4 | 13.98 | 34.07 | 37.71 | 12.20 | 2.03 | 11.56 | 33.54 | 41.18 | 12.51 | 1.22 |

| | | 2023 | | | | | 2022 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Content Area | Grade | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| Science | 5 | – | 35.33 | 30.79 | 31.15 | 2.73 | – | – | – | – | – |
| | 8 | – | 38.53 | 30.18 | 30.76 | 0.53 | – | – | – | – | – |
| | 11 | – | 38.79 | 36.63 | 23.84 | 0.75 | – | – | – | – | – |

*Note*. The Spring 2022 CMAS Science assessment reported percentile ranks only. 1 = *Did Not Yet Meet Expectations*, 2 = *Partially Met Expectations*, 3 = *Approached Expectations*, 4 = *Met Expectations*, 5 = *Exceeded Expectations*. Percentages may not sum to 100 due to rounding.

Appendix I presents the summary statistics for points earned by subclaim. While the overall scale scores and Reading scale scores are comparable to results from previous administrations, the assessments are not designed to permit meaningful comparisons across percent earned scores, either within an assessment or across administration years. The difficulty of the items that make up each subscore can vary across subscores and from year to year, making it inappropriate to make inferences based on percent earned performance across subscores or based on subscore performance across years. The only percent earned subscore comparisons supported by the CMAS assessments are those comparing individual or group performance within one subclaim with the performance of other students or groups within the same subclaim and administration.

### 9.3. Classical Item Analysis

Appendix J presents the item-level classical statistics for each CMAS assessment, including the omit rate, *p*-value, item-total correlation, and the percentage of students earning each score point (CR items only).

Item difficulty is measured by the *p*-value, which is bounded by 0.0 and 1.0. The *p*-value for 1-point items is the proportion of students who answered an item correctly and is calculated by dividing the number of students who got the item correct by the total number of students who answered it. For multiple-point items, the *p*-value is the average item score (i.e., the sum of student scores on an item divided by the total number of students who responded to the item) that is then put on a 0 to 1 scale by dividing the average item score by the maximum number of points for the item. A high *p*-value indicates that an item is easy (high proportion of students answered it correctly), whereas a low *p*-value indicates that an item is difficult. Easy and hard items are both necessary to include on an assessment to balance the test difficulty.

Item discrimination is represented by the item-total correlation (also known as the point-biserial correlation), is bounded by -1.0 and 1.0, and indicates how well an item discriminates, or distinguishes, between low-performing and high-performing students. The item-total correlation is based on the relationship between student performance on a specific item and performance on the entire test based on their test score. Students who do well on a test are expected to do well on a given item, and students who do not do well on a test are expected to not do well on a given item. This means that for a highly discriminating item, students who get the item correct will have a higher average test score than students who get the item incorrect. An item with a high positive item-total correlation discriminates between low-performing and high-performing students better than an item with an item-total correlation near zero. A negative item-total correlation indicates that low-performing students did better on that item than high-performing students.

## 9.4. Subclaim Correlations

The ELA/CSLA tests include Reading and Writing claim scores and five subclaim scores: Reading: Literary Text (RL), Reading: Informational Text (RI), Reading: Vocabulary (RV), Writing: Written Expression (WE), and Writing: Knowledge and Use of Language Conventions (WKL). The Reading score is a composite of RL, RI, and RV, and the Writing score is a composite of WE and WKL reported as a percentage of points earned. It comprises PCR items only. The operational test analyses were performed by evaluating the separate trait scores of WE and WKL. Some PCR items also include RL or RI points, but the reading points for those items were a duplicate of the WE score and were not included in calibrations.

The mathematics tests have four subclaim scores: Subclaim A: Major Content, Subclaim B: Additional & Supporting Content, Subclaim C: Expressing Mathematical Reasoning, and Subclaim D: Modeling & Application. The science test has four subclaim scores: Physical Science, Life Science, Earth Systems Science, and Science and Engineering Practices (SEPs).

One way to assess the internal structure of a test is through the evaluation of correlations among subscores, as presented in Table 9.4 – Table 9.8. For CMAS ELA/CSLA, these analyses were conducted between the Reading and Writing claim scores and the subclaims (RL, RI, RV, WE, and WKL). For CMAS Mathematics and Science, the analyses were conducted between the subclaim scores. There is evidence of unidimensionality if the components within a content area are strongly related to each other.

The intercorrelations for the mathematics and science subclaims were higher overall than the ELA/CSLA intercorrelations. Correlations between subclaims for mathematics and science ranged from 0.61 to 0.83, while for ELA/CSLA they ranged from 0.27 to 0.91. For CMAS ELA/CSLA, the two writing subclaims tended to have higher correlations with one another than they did with any of the reading subclaims. Correlations between the subclaims and the total test ranged from 0.63 to 0.96.

**Table 9.4. Correlations Between Subclaims—Mathematics**

| Grade | Subclaim | Subclaim B | Subclaim C | Subclaim D | Total Test |
|-------|----------|------------|------------|------------|------------|
| 3 | A | 0.831 | 0.736 | 0.756 | 0.957 |
|   | B | – | 0.697 | 0.722 | 0.901 |
|   | C | – | – | 0.692 | 0.855 |
|   | D | – | – | – | 0.860 |
| 4 | A | 0.744 | 0.791 | 0.732 | 0.960 |
|   | B | – | 0.666 | 0.625 | 0.815 |
|   | C | – | – | 0.702 | 0.894 |
|   | D | – | – | – | 0.843 |
| 5 | A | 0.781 | 0.784 | 0.765 | 0.960 |
|   | B | – | 0.699 | 0.714 | 0.866 |
|   | C | – | – | 0.747 | 0.883 |
|   | D | – | – | – | 0.873 |
| 6 | A | 0.712 | 0.768 | 0.748 | 0.943 |
|   | B | – | 0.662 | 0.632 | 0.829 |
|   | C | – | – | 0.729 | 0.891 |
|   | D | – | – | – | 0.861 |

| Grade | Subclaim | Subclaim B | Subclaim C | Subclaim D | Total Test |
|---|---|---|---|---|---|
| 7 | A | 0.682 | 0.779 | 0.740 | 0.946 |
| | B | – | 0.648 | 0.610 | 0.797 |
| | C | – | – | 0.744 | 0.900 |
| | D | – | – | – | 0.860 |
| 8 | A | 0.715 | 0.794 | 0.768 | 0.957 |
| | B | – | 0.667 | 0.674 | 0.820 |
| | C | – | – | 0.745 | 0.889 |
| | D | – | – | . – | 0.877 |

**Table 9.5. Correlations Between Subclaims—ELA**

| Grade | Subclaim | RI | RV | WE | WKL | Total Test |
|---|---|---|---|---|---|---|
| 3 | RL | 0.724 | 0.674 | 0.659 | 0.551 | 0.904 |
| | RI | – | 0.703 | 0.577 | 0.504 | 0.876 |
| | RV | – | – | 0.535 | 0.478 | 0.826 |
| | WE | – | – | – | 0.603 | 0.811 |
| | WKL | – | – | – | – | 0.673 |
| 4 | RL | 0.684 | 0.683 | 0.691 | 0.615 | 0.898 |
| | RI | – | 0.646 | 0.543 | 0.525 | 0.845 |
| | RV | – | – | 0.547 | 0.505 | 0.800 |
| | WE | – | – | – | 0.783 | 0.844 |
| | WKL | – | – | – | – | 0.766 |
| 5 | RL | 0.679 | 0.595 | 0.616 | 0.582 | 0.871 |
| | RI | – | 0.538 | 0.685 | 0.631 | 0.862 |
| | RV | – | – | 0.496 | 0.459 | 0.706 |
| | WE | – | – | – | 0.817 | 0.877 |
| | WKL | – | – | – | – | 0.806 |
| 6 | RL | 0.738 | 0.619 | 0.644 | 0.632 | 0.881 |
| | RI | – | 0.621 | 0.702 | 0.677 | 0.899 |
| | RV | – | – | 0.504 | 0.489 | 0.729 |
| | WE | – | – | – | 0.885 | 0.877 |
| | WKL | – | – | – | – | 0.841 |
| 7 | RL | 0.729 | 0.722 | 0.731 | 0.700 | 0.901 |
| | RI | – | 0.672 | 0.616 | 0.607 | 0.852 |
| | RV | – | – | 0.589 | 0.581 | 0.802 |
| | WE | – | – | – | 0.906 | 0.896 |
| | WKL | – | – | – | – | 0.863 |
| 8 | RL | 0.759 | 0.692 | 0.665 | 0.661 | 0.867 |
| | RI | – | 0.692 | 0.741 | 0.725 | 0.909 |
| | RV | – | – | 0.580 | 0.578 | 0.781 |
| | WE | – | – | – | 0.943 | 0.909 |
| | WKL | – | – | – | – | 0.890 |

*Note*. RL = Reading: Literary Text, RI = Reading: Informational Text, RV = Reading: Vocabulary, WE = Writing: Written Expression, WKL = Writing: Knowledge and Use of Language Conventions.

**Table 9.6. Correlations Between Subclaims—CSLA**

| Grade | Subclaim | RI | RV | WE | WKL | Total Test |
|---|---|---|---|---|---|---|
| 3 | RL | 0.564 | 0.735 | 0.689 | 0.500 | 0.895 |
|   | RI | – | 0.584 | 0.463 | 0.334 | 0.722 |
|   | RV | – | – | 0.561 | 0.442 | 0.824 |
|   | WE | – | – | – | 0.626 | 0.866 |
|   | WKL | – | – | – | – | 0.668 |
| 4 | RL | 0.534 | 0.649 | 0.706 | 0.490 | 0.898 |
|   | RI | – | 0.499 | 0.424 | 0.268 | 0.685 |
|   | RV | – | – | 0.503 | 0.294 | 0.730 |
|   | WE | – | – | – | 0.565 | 0.880 |
|   | WKL | – | – | – | – | 0.626 |

*Note*. RL = Reading: Literary Text, RI = Reading: Informational Text, RV = Reading: Vocabulary, WE = Writing: Written Expression, WKL = Writing: Knowledge and Use of Language Conventions.

**Table 9.7. Correlations between Subclaims—Reading vs. Writing**

| Content Area | Grade | Correlation |
|---|---|---|
| ELA | 3 | 0.697 |
|   | 4 | 0.691 |
|   | 5 | 0.718 |
|   | 6 | 0.727 |
|   | 7 | 0.730 |
|   | 8 | 0.754 |
| CSLA | 3 | 0.678 |
|   | 4 | 0.671 |

**Table 9.8. Correlations Between Subclaims—Science**

| Grade | Subclaim | Life Science | Earth and Space Science | Total Test |
|---|---|---|---|---|
| 5 | Physical Science | 0.693 | 0.784 | 0.928 |
|   | Life Science | – | 0.698 | 0.844 |
|   | Earth and Space Science | – | – | 0.931 |
| 8 | Physical Science | 0.812 | 0.766 | 0.933 |
|   | Life Science | – | 0.768 | 0.939 |
|   | Earth and Space Science | – | – | 0.900 |
| 11 | Physical Science | 0.760 | 0.751 | 0.930 |
|   | Life Science | – | 0.726 | 0.906 |
|   | Earth and Space Science | – | – | 0.896 |

*Note*. For Grade 5, the subclaim is Physical Science/Life Science.

# Chapter 10: Calibration, Equating, and Scaling

Item response theory (IRT) was used to develop, calibrate, equate, and scale the CMAS assessments. All test analyses including calibration, scaling, and item model fit were accomplished within the IRT framework. The CMAS Mathematics and ELA scales were equated to the previous CMAS (i.e., PARCC) base scale. The calibration of the first operational administration determined the base scale for CSLA and CMAS Science.

Calibration is the process of estimating the parameters (such as item difficulty) for each item on an assessment so that all items are placed on a common scale. To maintain the same performance standards across different administrations of a particular test, it is necessary for each administration of the test to be of comparable difficulty. It is not fair to compare students to a common standard if the overall difficulty of the forms changes from year to year. Maintaining test form difficulty across administrations is achieved through equating. Equating adjusts for differences in overall test difficulty of test forms so that the scores resulting from two different administrations can be considered interchangeable.

Equating and scaling typically occur in sequence. First, equating is used to adjust for differences in test difficulty so resulting estimates of student proficiency (i.e., equated raw scores, theta estimates) are on a common metric. The equated estimates of proficiency are then converted to scale scores for reporting purposes.

Calibration, equating, and scaling analyses for the operational and field test items were as follows for the Spring 2023 administration. The entire process was completed for each CMAS assessment, and all steps were independently replicated by at least two members of the Pearson psychometrics team to ensure accuracy.

- CMAS Mathematics
  - Operational items
    - All items had parameter estimates already equated to the base scale
    - Estimated student abilities using ISE (Chien & Shin, 2012)
  - Embedded field test items
    - Used IRTPRO control files and IDM to obtain item parameter estimates of the operational and field test items
    - Used STUIRT to scale the field test items to the operational scale using the online operational items as the anchor set
    - Calculated item fit statistics and plotted expected vs. observed IRFs for each field test item

- CMAS ELA
  - Operational items
    - Obtained the online operational item parameter estimates using IRTPRO (Vector Psychometric Group, 2022) control files and incomplete data matrix (IDM)
    - Evaluated the consistency of scoring and stability of the anchor items
    - Scaled the 2023 operational items to the operational scale using STUIRT (Kim & Kolen, 2004)

- Calculated item fit statistics and plotted expected vs. observed item response functions (IRFs) for each operational item
- Estimated student abilities using ISE (Chien & Shin, 2012)
  - o Embedded field test items
    - Obtained item parameter estimates of the operational and field test items using IRTPRO control files and IDM
    - Scaled the field test items to the operational scale using STUIRT and the online operational items as the anchor set
    - Calculated item fit statistics and plotted expected vs. observed IRFs for each field test item

- CSLA
  - o Operational items
    - Obtained the non-anchor operational item parameter estimates using Winsteps (Linacre, 2011) control files and IDM
    - Evaluated the stability of the anchor items to obtain the final anchor set
    - Scale the 2023 non-anchor items to the operational scale using the final anchor set in Winsteps
    - Obtained item difficulty values, step deviation values, and item fit values for all items
    - Estimated student abilities using Winsteps
  - o Embedded field test items
    - Scale the field test item parameter estimates to the operational scale by fixing the item parameter estimates of the operational items using Winsteps control files and IDM
    - Obtained field test item difficulty values, step deviation values, and item fit values for each field test item

- CMAS Science
  - o Operational items
    - Obtained the online operational item parameter estimates using IRTPRO (Vector Psychometric Group, 2022) control files and IDM
    - Evaluated the consistency of scoring and stability of the anchor items
    - Scaled the 2022 items and cut scores to the operational scale using STUIRT (Kim & Kolen, 2004)
    - Calculated item fit statistics and plotted expected vs. observed item response functions (IRFs) for each operational item
    - Estimated student abilities using ISE (Chien & Shin, 2012)
  - o Embedded field test items
    - Obtained item parameter estimates of the operational and field test items using IRTPRO control files and IDM
    - Scale the field test items to the operational scale using STUIRT and the online operational items as the anchor set
    - Calculated item fit statistics and plotted expected vs. observed IRFs for each field test item

## 10.1. IRT Models

The two-parameter logistic (2PL; Birnbaum, 1968) and generalized partial credit (GPC; Muraki, 1992) models were applied to CMAS Mathematics and ELA; the 2PL, three-parameter logistic (3PL; Birnbaum, 1968), and GPC models were applied to CMAS Science; and the Rasch partial credit model (RPCM) was applied to CSLA. The 2PL model uses two item parameters to relate the probability of person $i$ correctly answering a dichotomously scored item $j$:

$$P_{ij}(\theta) = \frac{1}{1 + \exp\left[-Da_j(\theta_i - b_j)\right]}$$

where $D$ is set equal to 1 when defined on the logistic scale, as IRTPRO parameterizes all models. The item discrimination parameter is $a_j$, and the item difficulty parameter is $b_j$. The 3PL model adds an item parameter:

$$P_{ij}(\theta) = c_j + \frac{1 - c_j}{1 + \exp\left[-Da_j(\theta_i - b_j)\right]}$$

where $c_j$ is the item pseudo-guessing parameter. The GPC model has three item parameters to relate the probability of person $i$ responding in the $x$-th category to a polytomous scored item $j$:

$$P_{ij}(\theta) = \frac{\exp\left[\sum_{v=0}^{x} Da_j(\theta_i - b_j + d_{jv})\right]}{\sum_{k=0}^{M_i} \exp\left[\sum_{v=0}^{k} Da_j(\theta_i - b_j + d_{jv})\right]}, x = 0, 1, \dots, M_j$$

where all parameters are as they were before, and $d_{jv}$ is the category parameter for category $v$ of item $j$ and $M_j$ is the maximum score on item $j$. To put the parameters on the normal ogive metric, the $a_j$ is then divided by 1.7.

The RPCM used for CSLA is an extension of the Rasch one-parameter IRT model attributed to Georg Rasch (1966), as extended by Wright and Stone (1979), Masters (1982), and Wright and Masters (1982). The RPCM is a mathematical measurement model with a single item parameter relating a student's performance on a given item involving $m+1$ score categories. The probability of student $n$ scoring $x$ on $m$ steps of item $i$ is a function of the student's proficiency level, $\theta_n$ (also referred to as "ability"), and the step difficulties, $\delta_{ij}$, of the $m$ steps in question $i$ as follows:

$$P_{xni} = \frac{\exp \sum_{j=0}^{x}(\theta_n - \delta_{ij})}{\sum_{k=0}^{m_i} \exp \sum_{j=0}^{k}(\theta_n - \delta_{ij})}, x = 0, 1, \dots m_i$$

## 10.2. Item Response Curves (IRCs) and Item Characteristic Curves (ICCs)

The IRFs of the 2PL, 3PL, and GPC IRT models relate student ability to the probability of observing a particular item response given the item's characteristics, whereas the item characteristic function (ICF) relates student ability to the expected student score. The graphical representation of the IRF and ICF are the item response curves (IRCs) and item characteristic curves (ICCs), respectively. The IRF and ICF for dichotomous items are equal, but the IRC and ICF are different for polytomous items.

For example, consider Figure 10.1 that depicts a 2PL item that falls at approximately 0.85 on the ability (horizontal) scale. When a student answers an item at the same level as their ability, they have a roughly 50% probability of answering the item correctly. Another way of expressing this is that in a group of 100 students, all of whom have an ability of 0.85, about 50% of them would be expected to answer the item correctly. A student whose ability is above 0.85 would have a higher probability of getting the item right, while a student whose ability is below 0.85 would have a lower probability of getting the item right.

**Figure 10.1. Sample 2PL Item Characteristic Curve (ICC)**
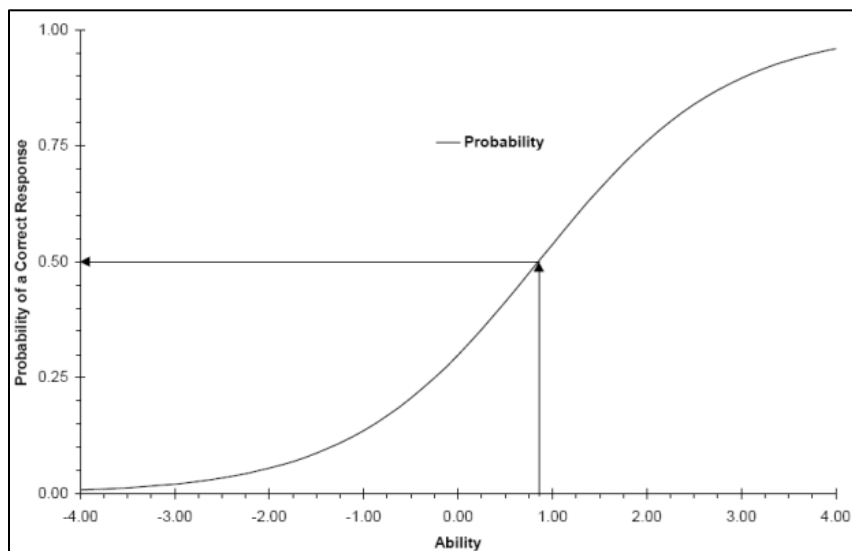


Figure 10.2 shows IRCs of obtaining a wrong answer or a right answer. The dotted-line curve ($j=0$) shows the probability of getting a score of 0, while the solid-line curve ($j=1$) shows the probability of getting a score of 1. The point at which the two curves cross indicates the transition point on the ability scale where the most likely response changes from a 0 to a 1. At this intersection, the probability of answering the item correctly is 50%.

**Figure 10.2. Sample 2PL Item Response Curves (IRCs)**
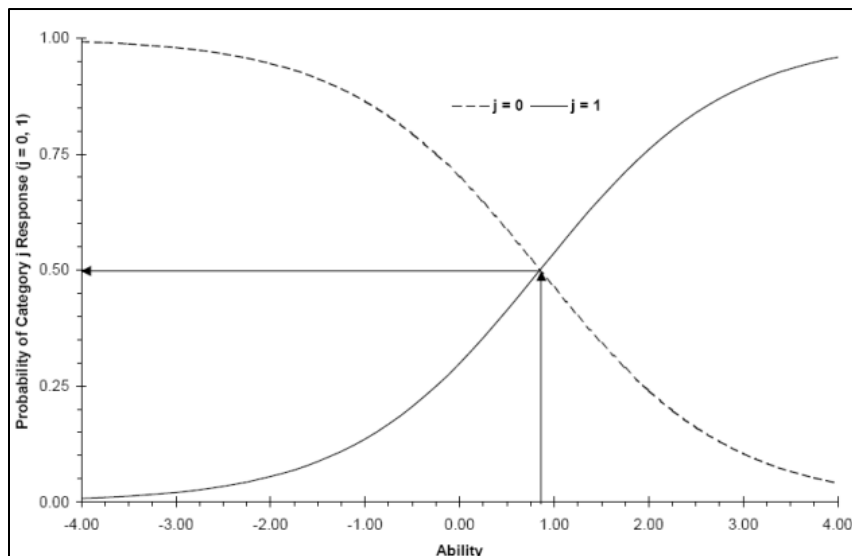
Figure 10.3 shows IRCs of obtaining each score category for a polytomously scored item. The dotted-line curve (*j*=0) shows the probability of getting a score of 0. Those of very low ability (e.g., below -2) are likely to be in this category. Those receiving a 1 (partial credit) tend to fall in the middle range of abilities (the thick, solid-line curve, *j*=1). The final, thin, solid-line curve (*j*=2) represents the probability for those receiving scores of 2 (completely correct). Very high-ability students are more likely to be in this category, but there are still some of average and low ability who can get full credit for the item.

The points at which the lines cross have a similar interpretation as that for dichotomous items. For abilities to the left of (or less than) the point at which the *j*=0 line crosses the *j*=1 line, indicated by the left arrow, the probability is greatest for a 0 response. To the right of (or above) this point and up to the point at which the *j*=1 and *j*=2 lines cross (marked by the right arrow), the most likely response is a 1. For abilities to the right of this point, the most likely response is a 2. The probability of scoring a 1 response (*j*=1) declines in both directions as ability decreases to the low extreme and increases to the high extreme. These points may be thought of as the difficulties of crossing the *thresholds* between categories.

**Figure 10.3. Item Response Curves (IRCs) for a 2-point Polytomous Item**
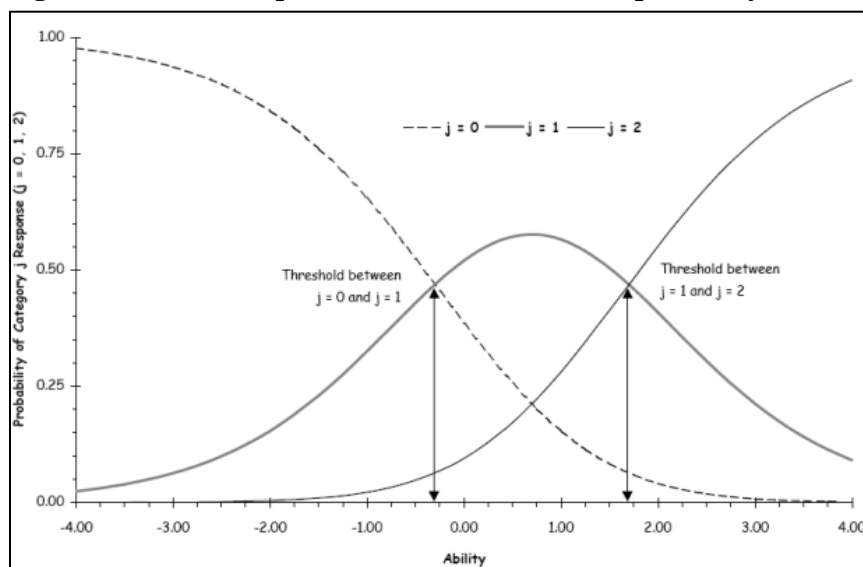


## 10.3. Data Preparation

Prior to any analyses, several steps were completed as preparation:

- Verify the data file containing student responses and apply the exclusion rules.
- Complete a traditional item analysis (TRIAN) and adjudication, where applicable, on all items.
- Create incomplete data matrices (IDMs).

A TRIAN of all SR items was conducted prior to calibration. The purpose of this review is to use classical statistics to identify potential test administration and score issues. Items with one or more of the following characteristics are flagged:

- *P*-value <0.15
- Item-total score correlation < 0.10
- Incorrect option selected by more high-performing students (top 33%) than the keyed response
- Distractor *p*-value ≥ 40%
- Distractor-total score correlation > 0
- One or more score points earned by less than 5% of students

A list of flagged items is communicated to the assessment specialists for review and confirmation that the correct key has been applied. Figure 10.4 presents a sample TRIAN report.

**Figure 10.4. Sample Key Check (TRIAN) Report**

| Item | Form | Key | Corr. | * | PV<15 | A% | * | B% | * | C% | * | D% | * | Omit% | Ncount |
|------|------|-----|-------|---|-------|-----|---|-----|---|-----|---|-----|---|-------|--------|
| 1 | ALL | B | 0.49 | | | 11 | | **46** | | 24 | | 17 | | 3 | 6578 |
| 2 | ALL | D | 0.46 | | | 17 | | 12 | | 9 | | **59** | | 2 | 6560 |
| 3 | ALL | B | 0.40 | | | 16 | | **50** | | 16 | | 12 | | **6** | 6572 |
| 4 | ALL | D | 0.47 | | | 5 | | 9 | | 21 | | **63** | | 2 | 6605 |
| 5 | ALL | C | 0.40 | | | 3 | | 19 | | **51** | | 26 | | 2 | 6643 |
| 6 | ALL | C | 0.46 | | | 12 | | 5 | | **78** | | 4 | | 2 | 6614 |
| 7 | ALL | A | 0.30 | | | **33** | | 36 | | 15 | | 13 | | 3 | 6643 |
| 8 | ALL | C | 0.43 | | | 21 | | 35 | | **35** | | 6 | | 3 | 6646 |

All TE items and ELA SR items are put through an adjudication process. For each item, the frequency distribution of responses that are scored correctly is created, along with the frequency distribution of responses that are scored as incorrect. Assessment specialists review each response in the frequency reports and indicate whether the response should be scored as correct. The assessment specialists' indications are then cross-referenced with how the responses are scored to confirm that scoring is accurate. Figure 10.5 presents a sample adjudication spreadsheet.

**Figure 10.5. Sample Adjudication Spreadsheet**

| Item ID | Func. | Item Response | Scored Response | Freq. Count | % of Total Freq. | Date 1st Reviewer | 1st Reviewer Initials | Issue? (Y/N) | Description of Issue | Date 2nd Reviewer | 2nd Reviewer Initials | Issue? (Y/N) | Description of Issue |
|---------|-------|---------------|-----------------|-------------|------------------|-------------------|----------------------|--------------|---------------------|-------------------|----------------------|--------------|---------------------|
| Item1 | | A_A1:B_B2 | 2 | 28339 | 59 | | | | | | | | |
| Item1 | | A_A1 | 1 | 35 | 0 | | | | | | | | |
| Item1 | | A_A1:A_A2 | 1 | 3782 | 8 | | | | | | | | |
| Item1 | | A_A1:C_C2 | 1 | 4803 | 10 | | | | | | | | |
| Item1 | | A_A1:D_D2 | 1 | 970 | 2 | | | | | | | | |
| Item1 | | | 0 | 56 | 0 | | | | | | | | |
| Item1 | | A_A2 | 0 | 1 | 0 | | | | | | | | |
| Item1 | | B_B1 | 0 | 12 | 0 | | | | | | | | |
| Item1 | | B_B1:A_A2 | 0 | 464 | 1 | | | | | | | | |
| Item1 | | B_B1:B_B2 | 0 | 1038 | 2 | | | | | | | | |
| Item1 | | B_B1:C_C2 | 0 | 844 | 2 | | | | | | | | |
| Item1 | | B_B1:D_D2 | 0 | 405 | 1 | | | | | | | | |
| Item1 | | B_B2 | 0 | 4 | 0 | | | | | | | | |

| Item ID | Func. | Item Response | Scored Response | Freq. Count | % of Total Freq. | Date 1st Reviewer | 1st Reviewer Initials | Issue? (Y/N) | Description of Issue | Date 2nd Reviewer | 2nd Reviewer Initials | Issue? (Y/N) | Description of Issue |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Item1 | | C_C1 | 0 | 10 | 0 | | | | | | | | |
| Item1 | | C_C1:A_A2 | 0 | 501 | 1 | | | | | | | | |
| Item1 | | C_C1:B_B2 | 0 | 841 | 2 | | | | | | | | |
| Item1 | | C_C1:C_C2 | 0 | 582 | 1 | | | | | | | | |
| Item1 | | C_C1:D_D2 | 0 | 1510 | 3 | | | | | | | | |
| Item1 | | C_C2 | 0 | 1 | 0 | | | | | | | | |
| Item1 | | D_D1 | 0 | 10 | 0 | | | | | | | | |
| Item1 | | D_D1:A_A2 | 0 | 652 | 1 | | | | | | | | |

## 10.4. Checking Model Assumptions

It is important to evaluate how the IRT models applied for CMAS fit the data because reported scale scores are derived from theta estimated under the IRT models. Two major assumptions are investigated: unidimensionality and item fit.

### 10.4.1. Unidimensionality (Factor Analysis)

An assumption under the IRT models is unidimensionality, that there is exactly one latent variable (e.g., mathematics proficiency) that an instrument intends to measure. This is a more traditional and strict definition of the unidimensionality assumption. On the other hand, essential unidimensionality, in which there is one dominant latent variable with some minor latent variable(s), is a more practically applicable assumption (Stout, 1990). A factor analysis was performed on the item response data for the CMAS assessments to analyze the number of dimensions the assessments appear to be measuring. Given that unidimensional IRT models are used for calibration and scaling, it is important that there be evidence to support their use.

Appendix K presents the scree plots for the Spring 2023 administration. For most of the assessments, one factor explained most of the variance, which supports the use of a unidimensional IRT model, although the ELA/CSLA scree plots do suggest that Reading and Writing are distinct subscores. The loadings for Factor 2 for ELA were all much higher for the PCR trait items than any other items. This may indicate the influence of a writing construct that is separate from what is measured by the reading items.

### 10.4.2. Item Fit

Appendix M presents the item fit results. (The results are not included if a test is pre-equated.) Item fit refers to how well the data fit the IRT calibration model, and it is evaluated using Yen's (1981) $Q_1$ statistic that allows for the evaluation of an item's IRT model fit to observed student performance. In the calculations of $Q_1$, the observed and expected (based on the model) frequencies were compared at 10 intervals, or deciles, along the scale. Yen's $Q_1$ fit statistic was computed for each item using the following formula:

$$Q_{1_i} = \sum_{j=1}^{10} \frac{N_{ij}(O_{ij} - E_{ij})^2}{E_{ij}(1 - E_{ij})}$$

where $N_{ij}$ is the number of students in interval $j$ for item $I$, and $O_{ij}$ and $E_{ij}$ are the observed and expected proportions of students in interval $j$ for item $i$. The $Q_1$ statistic was then transformed so that items with different degrees of freedom can have comparable fit statistics:

$$Z_{Q_{1_i}} = \frac{Q_{1_i} - df}{\sqrt{2df}}$$

where *df* is the degree of freedom for the statistic (*df* = 10–the number of parameters estimated; *df* = 7 for SR items in a 3PL model). If $Z_{Q_{1_i}}$ is greater than $Z_{crit}$, the item is flagged for poor model fit:

$$Z_{crit} = \frac{N_i * 4}{1500}$$

where $N_i$ is the sample size.

## 10.5. Calibration

Calibration refers to the estimation of item parameters in the IRT framework, which places items and students on a common scale. To obtain item parameter estimates for CMAS ELA, the GPC model was applied to the items. IRTPRO was used for all calibrations, and all operational item parameters were estimated in a single calibration (i.e., concurrent calibration) for each assessment. For CSLA, the RPCM was applied to all items to obtain item parameter estimates. All operational items within a grade were also calibrated concurrently. Winsteps was used for all CSLA calibrations.

PCR items were calibrated at the (unweighted) trait score level rather than as aggregated scores. To account for potential local dependence between the two trait scores, the item response matrix was modified before operational calibrations. For each PCR item, one of the two trait scores for each student was randomly selected, and the non-selected trait score was then removed from the dataset and treated as missing for calibration. The resulting item response dataset, known as a "Moulder" matrix, contained roughly half as many observations for each PCR trait score as for the non-PCR items. However, the datasets still contained an adequate number of student responses to conduct the calibrations. Due to the small population of students taking the CSLA assessment, trait scores were not removed from the data when conducting calibrations for CSLA.

For each CMAS Science assessment, a concurrent calibration was conducted to obtain item parameters for all the operational items.

## 10.6. Equating

Equating is used to place new forms onto the operational base scale. Equating of the operational test forms involves adjusting for differences in the difficulty of forms, both within and across assessment administrations, to ensure that students taking one form of a test are neither advantaged nor disadvantaged when compared to students taking a different form. Each time a new form is constructed, equating is used to allow scores on the new form to be comparable to scores on the previous form. If the IRT models fit the data and the model assumptions are met, calibration of test items places both items and students on a scale that is independent of any sample of students up to a linear transformation. Equating is used to determine and apply a scale transformation that allows for meaningful comparisons of student performance across different forms or administrations of the test.

To maintain comparability with prior administrations, CMAS Mathematics and ELA item parameter estimates were equated to the established base scale used in 2017, and the CSLA item parameter estimates were equated to the Spring 2016 CSLA base scale. The 2023 scale was chosen to be the base scale for CMAS Science due to concerns about the validity of the 2022 administration since it was the first time students had seen items aligned to the new standards. The Spring 2022 items were equated to the 2023 scale so that all items from the bank would be available for future test construction.

*10.6.1. Mathematics*

10.6.1.1. Pre-Equating Design

The Spring 2023 CMAS Mathematics assessments were equated to the base scales using an item pre-equating design, meaning all items had already been administered, with item parameters already estimated and placed onto the base scale. Students were scored based on these previously banked item parameter estimates. All operational items on these forms had been previously calibrated and equated to the base scale.[6] The forms were subsequently scored using these existing item parameters rather than performing a new calibration and equating. To help ensure the stability of item parameter estimates across administration, items were positioned as closely as possible to their positions when they were calibrated. To ensure that the assumptions of pre-equating were met, a post-equating check was performed using anchor sets identified during test construction. The results of this check were compared with the pre-equated results during a post-equating check.

10.6.1.2. Post-Equating Check

Because pre-equating relies on stronger assumptions than post-equating, an additional post-equating analysis was conducted and compared with the pre-equated results for the CMAS mathematics assessments in 2022. (A post-equating check was not conducted in 2023 because the 2023 forms were identical.) Large discrepancies between the two could suggest that pre-equating assumptions have not been met. Conversely, similarity between pre- and post-equated item parameters suggests that the pre-equated item parameters are appropriate for students taking the current form. The post-equating check followed the same procedures as those of the other post-equated assessments, using an anchor set for each assessment that was identified during test construction and that met the operational anchor test specifications.

Results of the post-equating check from 2022 suggested that pre- and post-equated item parameters were quite similar. Appendix L compares the 2022 pre-equated and post-equated test characteristic curves (TCCs) for each assessment. The results show that post-equated scores would have been highly similar to the pre-equated results. The high degree of similarity across the entire scale score range for each grade suggests that pre-equating assumptions were met and that the pre-equated item parameters were appropriate for this administration.

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[6] Please refer to previous versions of the CMAS technical reports for information on these calibration and equating procedures, located on the CDE website at https://www.cde.state.co.us/assessment/cmas_coalt_techreport.

*10.6.2. ELA*

The Spring 2023 CMAS ELA assessments were calibrated and post-equated to the base scale following the procedures described below. The ELA assessments have historically been post-equated. All post-equating analyses were conducted using a representative sample of students that was evaluated based on the following demographics to ensure that the expected population demographic distributions were met: gender, ethnicity/race, economic disadvantage, language proficiency, students with disabilities, and district setting.

A common items approach was used for equating the operational forms. Forms from adjacent administrations contain a set of items that are the same across the two administrations. This set of items represents the blueprint in terms of content and represents roughly 40% of a full form.

10.6.2.1. Consistency of Constructed-Response Scoring Check

Because the ELA assessments include a high percentage of CR items, the anchor sets include CR items to be more reflective of the construct being measured. For accurate equating, it is important that the items in the anchor sets be consistently scored across administrations. With SR items, scoring is the same each time the item is administered (e.g., 'A' is always scored as the correct answer) such that changes in item performance across administrations can be solely attributed to changes in student performance. With CR items, scoring is done by human raters, so it is important that scoring be monitored both within an administration and across administrations to maintain consistent scoring throughout. Such procedures were in place, including consistency in training and the use of validity papers throughout scoring.

As an additional check, the consistency of the CR scoring was examined prior to equating via the rescoring of a subset of the previous year's papers to remove any items that exhibited statistical drift in scoring characteristics so that the accuracy of the equating was not jeopardized. If a CR item appeared to lack consistency across the administrations, considerations were given to removing the item from the anchor set.

10.6.2.2. Stability Check

The item parameter stability check for the anchor items was conducted using classical item analyses, scatterplots of item parameter estimates, and ICC comparison. For the ICC comparison, old and new ICCs were compared using the $z$-score approach based on $D^2$ (Wells et al., 2014), as outlined below:

1. Obtain the theoretically weighted estimated posterior theta distribution using 31 quadrature points (-5 to 5).
2. Compute the slope and intercept constants using the Stocking and Lord (1993) method with all anchor items in the linking set.
3. Place the original anchor item parameter estimates onto the baseline scale by applying the constants obtained in Step 2.
4. For each anchor item, calculate $D^2$ between the ICCs based on old (x) and new (y) parameters at each point in this theta distribution:

$$D_i^2 = \sum^{k} \left[ P_{ix}(\theta_k) - P_{iy}(\theta_k) \right]^2 \bullet g(\theta_k)$$

where $i$ = item, $x$ = old form, $y$ = new form, $k$ = theta quadrature point, and $g$ = theoretically weighted posterior theta distribution.

5. Compute the mean and standard deviation of the $D^2$ values.
6. Flag the items with a $D^2$ more than 2 standard deviations above the mean.

### 10.6.2.3. Calibration and Anchor Set Evaluation

The initial calibration results were reviewed for problematic item parameter estimates, and fit plots were examined to detect items with poor model–data fit. Review of anchor item stability analyses resulted in dropping one to four items from the anchor set, depending on grade. The final anchor sets for ELA represented between 39% and 47% of the unweighted total test points. The online and paper versions were constructed to be parallel, and item parameter estimates were assumed to be the same. The information provided for the item statistics and IRT curves are based on the online estimates.

### 10.6.2.4. Final Anchor Sets

Items flagged from the stability check and consistency of CR scoring check were examined, and consideration was given to the impact of flagged item(s) on the content representativeness of the resulting anchor set. A flag alone was not the sole criteria for removing an item from the linking set; it was important to also make sure that the remaining anchor set continued to be representative of the overall content and structure of the test.

### 10.6.2.5. Equating Method

Using the item parameter estimates for the anchor set from the item bank and the current administration, the computer program STUIRT was used to obtain the transformation constants to place the current administration's items on the operational scale using the Stocking and Lord (1983) method. The scale transformation constants, Slope A and Intercept B, were applied to the item parameter estimates to place the new test items (new, N) on the operational scale (old, O) (Kolen & Brennan, 2004), as follows:

$$\alpha_{jO} = \alpha_{jN}/A$$

$$b_{jO} = A * b_{jN} + B$$

$$d_{jvO} = A * d_{jvN}$$

### 10.6.2.6. Paper Forms

Online and paper items were developed to be parallel to the online items. Operational paper items deemed identical to the operational online items were assumed to have the same item parameter estimates. Paper items were fixed to their online counterparts' item parameter estimates. This process produced item parameter estimates for all paper items.

### 10.6.3. CSLA

A common items approach was used to equate the CSLA operational forms. Forms from adjacent administrations contained a set of items that were the same across the two administrations (i.e., anchor items). Anchor items were operational items already equated to the base scale. The anchor items were placed in the same positions across all test forms within a grade and anchored the scale between the new test form and the base scale. This set of items represents the blueprint in terms of content and represents roughly 30% of a full form.

### 10.6.3.1. Stability Check

The stability check for the CSLA anchor items was conducted using classical item analysis, scatter plots of item difficulty, and displacement estimates from Winsteps. Items were flagged if the absolute value of the displacement estimate was greater than or equal to 0.30.

### 10.6.3.2. Final Anchor Sets

Items flagged from the stability check were examined, and consideration was given to the impact of flagged item(s) on the content representativeness of the resulting anchor set. A flag alone was not the sole criteria for removing an item from the linking set. It was important to also make sure that the remaining anchor set continues to be representative of the overall content and structure of the test. The final anchor sets for Grades 3 and 4 represented 42% and 36%, respectively, of the unweighted total test points.

### 10.6.3.3. Equating Method

To obtain equated Rasch parameter estimates for the Spring 2023 assessments, anchor item parameter estimates for each grade-level assessment were fixed to their previously equated item parameter estimates before calibrating the remaining non-anchor operational items on that assessment. This method placed the non-anchor operational items on the same scale as the anchor items.

### *10.6.4. Science*

The Spring 2023 CMAS Science assessments were calibrated and the 2022 item parameters and cut scores were post-equated to the 2023 scale using a representative sample of students that was evaluated based on the following demographics to ensure that the expected population demographic distributions were met: gender, ethnicity/race, economic disadvantage, language proficiency, students with disabilities, and district setting. A common items approach was used for equating the operational forms. Forms from adjacent administrations contain a set of items that are the same across the two administrations. This set of items represents the blueprint in terms of content and represents roughly 30% of a full form.

### 10.6.4.1. Consistency of Constructed-Response Scoring Check

Because the Science assessments include a high percentage of CR items, the anchor sets include CR items to be more reflective of the construct being measured. For accurate equating, it is important that the items in the anchor sets be consistently scored across administrations. With SR items, scoring is the same each time the item is administered (e.g., 'A' is always scored as the correct answer) such that changes in item performance across administrations can be solely attributed to changes in student performance. With CR items, scoring is done by human raters, so it is important that scoring be monitored both within an administration and across administrations to maintain consistent scoring throughout. Such procedures were in place, including consistency in training and the use of validity papers throughout scoring.

As an additional check, the consistency of the CR scoring was examined prior to equating via the rescoring of a subset of the previous year's papers to remove any items that exhibited statistical drift in scoring characteristics so that the accuracy of the equating was not jeopardized. If a CR item appeared to lack consistency across the administrations, considerations were given to removing the item from the anchor set.

10.6.4.2. Stability Check

The item parameter stability check for the anchor items was conducted using classical item analyses, scatterplots of item parameter estimates, and ICC comparison. For the ICC comparison, old and new ICCs were compared using the $z$-score approach based on $D^2$ (Wells et al., 2014), as outlined below:

1. Obtain the theoretically weighted estimated posterior theta distribution using 31 quadrature points (-5 to 5).
2. Compute the slope and intercept constants using the Stocking and Lord (1993) method with all anchor items in the linking set.
3. Place the original anchor item parameter estimates onto the baseline scale by applying the constants obtained in Step 2.
4. For each anchor item, calculate $D^2$ between the ICCs based on old (x) and new (y) parameters at each point in this theta distribution:

$$D_i^2 = \sum^k \left[ P_{ix}(\theta_k) - P_{iy}(\theta_k) \right]^2 \bullet g(\theta_k)$$

   where $i$ = item, $x$ = old form, $y$ = new form, $k$ = theta quadrature point, and $g$ = theoretically weighted posterior theta distribution.

5. Compute the mean and standard deviation of the $D^2$ values.
6. Flag the items with a $D^2$ more than 2 standard deviations above the mean.

10.6.4.3. Calibration and Anchor Set Evaluation

The initial calibration results were reviewed for problematic item parameter estimates, and fit plots were examined to detect items with poor model–data fit. Review of anchor item stability analyses resulted in dropping one to four items from the anchor set, depending on grade. The final anchor sets for Science represented between 25% and 45% of the unweighted total test points. The online and paper versions were constructed to be parallel, and item parameter estimates were assumed to be the same. The information provided for the item statistics and IRT curves are based on the online estimates.

10.6.4.4. Final Anchor Sets

Items flagged from the stability check and consistency of CR scoring check were examined, and consideration was given to the impact of flagged item(s) on the content representativeness of the resulting anchor set. A flag alone was not the sole criteria for removing an item from the linking set; it was important to also make sure that the remaining anchor set continued to be representative of the overall content and structure of the test.

10.6.4.5. Equating Method

Using the item parameter estimates for the anchor set from the item bank and the current administration, the computer program STUIRT was used to obtain the transformation constants to place the current administration's items on the operational scale using the Stocking and Lord (1983) method. The scale transformation constants, Slope A and Intercept B, were applied to the item parameter estimates to place the 2022 test items (new, N) on the operational (2023) scale (old, O) (Kolen & Brennan, 2004), as follows:

$$\alpha_{jO} = \alpha_{jN}/A$$

$$b_{jO} = A * b_{jN} + B$$

$$d_{jvO} = A * d_{jvN}$$

10.6.4.6. Paper Forms

Paper items were developed to be parallel to the online items. Operational paper items deemed identical to the operational online items were assumed to have the same item parameter estimates. Paper items were fixed to their online counterparts' item parameter estimates. This process produced item parameter estimates for all paper items.

**10.7. Field Test Equating**

The field test equating process is similar to that of operational equating, except that the anchor items are the operational items. This process places the field test item parameter estimates onto the operational base scale. All field test items are calibrated concurrently, with the exception of the ELA PCR items.

A minimum of 3,000 student responses for each field tested PCR item per trait is sampled for scoring and calibration. Due to possible dependency between the two trait scores for each PCR item, the field test items on each ELA assessment went through two calibrations. The first calibration included all field test items except the Writing Knowledge Language and Conventions (WKL) trait scores, and the second calibration included all field test items except the Writing Written Expression (WE) trait scores (with all operational items serving as anchor items in both cases).

The estimates from each calibration were then equated to the base scale separately following the same procedures as the operational equating. Finally, the two sets of equated field test parameters were combined by adding the equated field test WKL trait estimates to the equated estimates from the first calibration. This "double-calibration" method allowed for separate calibration of the field test trait scores while reducing the number of field test responses that needed to be scored per trait. Using a "Moulder" calibration method (as in the operational item calibration) would have meant using scoring resources to score traits that were never actually used for calibration or scoring.

**10.8. Ability Estimates**

*10.8.1. Mathematics, ELA, and Science*

Student ability was estimated using IRT pattern scoring based on student responses and the operational item parameter estimates for all students who met the relevant attemptedness criterion. Student ability was estimated at the overall test level, as well as for Reading on the ELA assessment. Estimates were obtained via the maximum likelihood method (MLE) applied within the ISE software program. Pattern scores use the student's individual item response pattern (overall or Reading claim) to determine their ability estimate, which may lead to different ability estimates for the same raw score.

*10.8.2. CSLA*

After the item parameter estimates were obtained for the CSLA operational items, student abilities were estimated for each grade-level assessment by conducting an anchored calibration of the operational items' item parameter estimates. Student abilities were calculated for the overall test and for Reading. To obtain student ability estimates for the overall test, all the operational items were included in the anchored calibration. To obtain student ability estimates for Reading, only the operational items representing the specific claim were included in the anchored calibration. The calibrations included the weighting of the PCR WE trait score. Student ability estimates were obtained via the joint maximum likelihood method (JMLE) applied within Winsteps.

## 10.9. Overall and Subscale Scale Scores

For CMAS Mathematics and ELA/CSLA, student ability estimates for the overall test were transformed to scale scores ranging from 650 to 850 using the same scaling transformations as the prior year's administrations. For CMAS Science, the student ability estimates for the overall test were transformed to scale scores ranging from 650 to 850 using the scaling transformations determined from standard setting. The student ability estimates for the subscores for CMAS Science were transformed to scale scores ranging from 400 to 600. For ELA/CSLA, the student ability estimates for Reading were transformed to scale scores ranging from 110 to 190. The following linear transformation was used to convert examinee theta estimates into scale scores where *A* and *B* are unique scaling constants for each subject/grade:

$$SS = A^* \theta + B$$

After the scale scores were calculated, the lowest obtainable scale score (LOSS) and highest obtainable scale score (HOSS) were applied. LOSS and HOSS were set to 650 and 850, respectively, for the overall test scale. For the Reading scale, LOSS and HOSS were set to 110 and 190. For the subscores of CMAS Science, LOSS and HOSS were set to 400 and 600.

## 10.10. Item-Level IRT Statistics

Appendix M presents the item parameter estimates for each grade. (The results are not included if a test is pre-equated.) The item numbers are merely identifiers and do not reflect the sequence of items as they were presented to students. The "Item Type" uses the coding of SR for selected-response, XI for technology-enhanced, and CR for constructed-response items. The "Model" refers to the IRT model under which the item was estimated (2PL, 3PL, GPC, or RPCM). The "A" column shows the item parameter estimate for discrimination, "B" for difficulty, and "D1" through "D7" for GPC or RPCM category threshold estimates. Not all item parameters apply to each item. For example, there are no category threshold estimates for 2PL items.

The last column of the ELA and science tables reflects whether an item was flagged for misfit based on Q1 for those calibrated assessments. Several items in each grade were flagged for misfit. Misfit plots for all items were reviewed, and misfit statistics were compared with data from the previous administration. Based on these reviews, no additional items were removed due to misfit flags. The last two columns for CSLA reflect the infit and outfit statistics generated from Winsteps. Fit values were reviewed, and no items were removed due to misfit.

## 10.11. IRT Curves

Appendix N presents the test characteristic curves (TCCs), test information curves (TICs), and CSEM curves for both the overall scale scores and the Reading scale scores. The curves for CMAS Mathematics are from 2022 because the forms were reused for 2023 and item parameters were held the same. The 2023 CMAS ELA TCCs matched those from 2018 in terms of shape and position. The 2023 TCCs were reviewed across the distribution and at the cuts to ensure the match between years. Colorado's established maximum TCC difference of 0.05 was also maintained between the 2018 and 2023 forms. The TCCs are provided in terms of expected percent correct rather than expected raw score. Along with the curves, each cut score for a given grade is indicated with a red vertical line, as are the cut scores for Reading. On the overall scale score TCCs for science, mathematics, and ELA, the vertical line at a scale score of 750 corresponds to the cut for *Met Expectations* for each assessment.

## 10.12. Comparability of Online and Paper Forms

The scale score distributions for students taking the online and paper CMAS Mathematics, Science, and ELA assessments were examined using a matched samples approach to investigate the extent to which the online and paper forms produced comparable scores. Multiple variables were used for determining the matched groups to result in "equal" groups of online and paper students. The matching variables included sex, race/ethnicity, free and reduced lunch status, language proficiency, IEP, and district setting, plus the prior year's overall test score.

Because science is not assessed in consecutive grade levels, the prior year's score did not come from science. Rather, the Grade 4 mathematics score was used for Grade 5 science and the Grade 7 mathematics score was used for the Grade 8 science assessment. There were an insufficient (<1,000) number of students who took the Grade 11 CMAS Science assessment on paper to complete a comparability and mode analysis.

Scale score distributions of CMAS scores between the matched samples were compared to estimate the mode effect. To quantify the differences between the two distributions, the effect size of the differences between the two distributions was calculated as Cohen's *d* (Cohen, 1977) using the mean scale score from each group and the pooled standard deviation:

$$d = \frac{M_{group1} - M_{group2}}{SD_{pooled}}$$

Suggested interpretations of Cohen's *d* are as follows:

- 0.2 = a small effect size
- 0.5 = a medium effect size
- 0.8 = a large effect size

A threshold for a possible mode effect was set to an effect size of 0.1 or greater and a matched sample size of at least 1,000 students. The effect size was calculated for the mathematics and ELA assessments in each grade, and for science in Grades 5 and 8. The results were presented to CDE who made the final decision on whether to make an adjustment for mode differences for each assessment. Table 10.1 presents the mode effect sizes from the Spring 2023 administration.

Based on evaluation of the effect sizes, mode adjustments were made for ELA Grades 3 and 5–7 and mathematics Grades 7 and 8. For assessments where an adjustment was deemed necessary, scores from the paper form were adjusted using a linear transformation to match the mean and standard deviation of the online form. The conversion was applied to the overall scores. For ELA, the conversion was also applied to the Reading score. For the paper-based mathematics assessments from the prior administration, mode adjustments from that prior administration were applied to those forms.

**Table 10.1. Online vs. Paper Comparability Mode Effect Sizes**

| Grade | Mathematics | | ELA | | Science | |
|---|---|---|---|---|---|---|
| | N | Effect Size | N | Effect Size | N | Effect Size |
| 3 | 4,484 | 0.00 | 4,186 | -0.15 | – | – |
| 4 | 3,316 | 0.02 | 3,478 | -0.01 | – | – |
| 5 | 3,185 | 0.06 | 3,255 | 0.10 | 1,788 | 0.04 |
| 6 | 3,000 | -0.08 | 2,751 | -0.19 | – | – |
| 7 | 2,873 | -0.10 | 2,481 | -0.10 | – | – |
| 8 | 2,691 | -0.12 | 2,270 | -0.08 | 1,454 | -0.02 |
| 11 | – | – | – | – | N/A | N/A |

*Note*. N/A = not applicable. Comparability analyses were not conducted for science Grade 11 because the n-count was less than 1,000.

# Chapter 11: Reliability

The *Standards for Educational and Psychological Testing* (AERA et al., 2014) refer to reliability as the "consistency of scores across replications of a testing procedure" (p. 33). A reliable test produces stable scores; very similar score distributions would result if the test were administered repeatedly under similar conditions to the same students without memory or fatigue affecting the scores. The level of reliability/precision of scores has implications for validity. In other words, scores must be consistent and precise enough to be useful for intended purposes. If scores are to be meaningful, tests should produce stable scores if the same group of students were to take the same test repeatedly without any fatigue or memory of the test. The range of certainty around the score should also be small enough to support educational decisions. Reliability for the CMAS assessments is evaluated with the following analyses:

- Internal consistency (coefficient alpha)
- Standard error of measurement (SEM)
- Conditional standard error of measurement (CSEM)
- Decision consistent and accuracy
- Inter-rater agreement

## 11.1. Internal Consistency (Coefficient Alpha)

Within the framework of classical test theory, an observed test score is defined as the sum of a student's true score and error ($X = T + E$, where $X$ = the observed score, $T$ = the true score, and $E$ = error). A true score is considered the student's true standing on the measure, while the error score reflects a random error component. Thus, error is the discrepancy between a student's observed and true score. Internal consistency is typically measured via correlations among the items on an assessment and provides an indication of how much the items measure the same general construct. High reliability of test scores implies that the test items within a subclaim are measuring a single construct, which is a necessary condition for validity when the intention is to measure a single construct.

The reliability coefficient of a measure is the proportion of variance in observed scores accounted for by the variance in true scores. The coefficient can be interpreted as the degree to which scores remain consistent over parallel forms of an assessment (Ferguson & Takane, 1989; Crocker & Algina, 1986). In the internal consistency method used to estimate reliability for the CMAS assessments, a single form is administered to the same group of students to determine whether students respond consistently across the items within a test. A basic estimate of internal consistency reliability is Cronbach's coefficient alpha statistic (Cronbach, 1951). Coefficient alpha is equivalent to the average split-half correlation based on all possible divisions of a test into two halves. Coefficient alpha can be used on any combination of dichotomous and polytomous test items and is computed as follows:

$$\alpha = \frac{n}{n-1}\left(1 - \frac{\sum_{j=1}^{n} S_j^2}{S_X^2}\right)$$

where $n$ is the number of items, $S_j^2$ is the variance of students' scores on item $j$, and $S_X^2$ is the variance of the total-test scores.

Coefficient alpha ranges from 0.0 to 1.0, where higher values indicate a greater proportion of observed score variance. Two factors affect estimates of internal consistency: test length and homogeneity of items. The longer the test, the more observed score variance is likely to be true score variance. The more similar the items, the more likely students will respond consistently across items within the test.

Table 11.1 – Table 11.4 present the coefficient alpha results overall and by subclaim for each content area. Appendix H presents the coefficient alpha estimates by demographic subgroup. The internal consistency values for the overall test ranged from 0.89 to 0.93. Given the differences in length, it is expected that the coefficient alpha for the overall test will be higher than that of the subscales.

The overall test reliability does not correspond directly with the overall student scale scores, as those are based on IRT pattern scoring. However, the overall estimates do provide evidence of unidimensionality of the assessments. Furthermore, the subgroup reliabilities were consistent for the various demographic subgroups, except for those based on language proficiency. The reliability of the tests tended to be lower for students identified as non-English proficient or limited English proficient.

**Table 11.1. Coefficient Alpha by Subclaim—Mathematics**

| Grade | Overall | Subclaim A | Subclaim B | Subclaim C | Subclaim D |
|-------|---------|-----------|-----------|-----------|-----------|
| 3 | 0.92 | 0.87 | 0.79 | 0.67 | 0.67 |
| 4 | 0.91 | 0.88 | 0.63 | 0.73 | 0.51 |
| 5 | 0.93 | 0.88 | 0.72 | 0.74 | 0.66 |
| 6 | 0.91 | 0.84 | 0.63 | 0.75 | 0.63 |
| 7 | 0.90 | 0.82 | 0.57 | 0.76 | 0.56 |
| 8 | 0.91 | 0.85 | 0.43 | 0.78 | 0.68 |

**Table 11.2. Coefficient Alpha by Subclaim—ELA**

| Grade | Overall | Reading: Literary Text | Reading: Informational Text | Reading: Vocabulary | Writing: Written Expression | Writing: Knowledge and Use of Language Conventions | Reading | Writing |
|-------|---------|------------------------|------------------------------|---------------------|-----------------------------|----------------------------------------------------|---------|---------|
| 3 | 0.90 | 0.80 | 0.76 | 0.68 | 0.64 | 0.75 | 0.90 | 0.67 |
| 4 | 0.89 | 0.72 | 0.72 | 0.64 | 0.48 | 0.75 | 0.87 | 0.74 |
| 5 | 0.88 | 0.78 | 0.69 | 0.44 | 0.54 | 0.75 | 0.86 | 0.75 |
| 6 | 0.90 | 0.80 | 0.70 | 0.55 | 0.81 | 0.80 | 0.87 | 0.80 |
| 7 | 0.90 | 0.78 | 0.73 | 0.66 | 0.81 | 0.83 | 0.89 | 0.82 |
| 8 | 0.90 | 0.78 | 0.79 | 0.60 | 0.72 | 0.85 | 0.90 | 0.84 |

**Table 11.3. Coefficient Alpha by Subclaim—CSLA**

| Grade | Overall | Reading: Literary Text | Reading: Informational Text | Reading: Vocabulary | Writing: Written Expression | Writing: Knowledge and Use of Language Conventions | Reading | Writing |
|---|---|---|---|---|---|---|---|---|
| 3 | 0.88 | 0.75 | 0.61 | 0.73 | 0.67 | 0.78 | 0.86 | 0.81 |
| 4 | 0.86 | 0.75 | 0.57 | 0.63 | 0.58 | 0.74 | 0.84 | 0.76 |

**Table 11.4. Coefficient Alpha by Subclaim—Science**

| Grade | Overall | Physical Science | Life Science | Earth and Space Science |
|---|---|---|---|---|
| 5 | 0.89 | 0.79 | 0.60 | 0.76 |
| 8 | 0.92 | 0.81 | 0.82 | 0.75 |
| 11 | 0.90 | 0.77 | 0.74 | 0.72 |

*Note*. For Grade 5, the subclaim is Physical Science/Life Science.

## 11.2. Standard Error of Measurement (SEM)

The SEM is another measure of reliability. This statistic uses the standard deviation of test scores along with a reliability coefficient (e.g., coefficient alpha) to estimate the number of score points that a student's test score would be expected to vary if the student was tested multiple times with equivalent forms of the assessment. It is calculated as follows:

$$ SEM = s_x \sqrt{1 - p_{XX}} $$

where $s_x$ is the standard deviation of test scores, and $p_{XX}$ is the reliability coefficient.

There is an inverse relationship between the reliability coefficient and SEM: the higher the reliability, the lower the SEM. Table 11.5 – Table 11.8 present the SEM results by subclaim for each content area. The classical SEM estimate is not reported for the overall test scale scores and the Reading subscore, as those scores are based on IRT pattern scoring rather than the sum of item scores.

**Table 11.5. SEM by Subclaim—Mathematics**

| Grade | Subclaim A | Subclaim B | Subclaim C | Subclaim D |
|---|---|---|---|---|
| 3 | 1.91 | 1.15 | 1.53 | 1.32 |
| 4 | 2.15 | 1.10 | 1.70 | 1.87 |
| 5 | 2.08 | 1.23 | 1.37 | 1.47 |
| 6 | 1.93 | 1.48 | 1.53 | 1.46 |
| 7 | 1.98 | 1.23 | 1.36 | 1.45 |
| 8 | 2.04 | 1.42 | 1.12 | 1.34 |

**Table 11.6. SEM by Subclaim—ELA**

| Grade | Reading: Literary Text | Reading: Informational Text | Reading: Vocabulary | Writing: Written Expression | Writing: Knowledge and Use of Language Conventions | Writing |
|---|---|---|---|---|---|---|
| 3 | 1.87 | 1.82 | 1.61 | 1.99 | 0.54 | 2.33 |
| 4 | 2.60 | 2.28 | 1.57 | 2.34 | 0.49 | 2.07 |
| 5 | 2.12 | 1.87 | 1.51 | 2.56 | 0.57 | 2.38 |
| 6 | 2.13 | 2.86 | 1.57 | 1.71 | 1.01 | 2.41 |
| 7 | 1.91 | 2.39 | 1.63 | 2.47 | 0.76 | 3.12 |
| 8 | 2.04 | 2.30 | 1.70 | 2.85 | 0.65 | 2.79 |

**Table 11.7. SEM by Subclaim—CSLA**

| Grade | Reading: Literary Text | Reading: Informational Text | Reading: Vocabulary | Writing: Written Expression | Writing: Knowledge and Use of Language Conventions | Writing |
|---|---|---|---|---|---|---|
| 3 | 2.01 | 1.77 | 1.51 | 0.89 | 0.76 | 1.25 |
| 4 | 2.21 | 2.00 | 1.40 | 1.16 | 0.93 | 1.56 |

**Table 11.8. SEM by Subclaim—Science**

| Grade | Physical Science | Life Science | Earth and Space Science |
|---|---|---|---|
| 5 | 1.95 | 1.67 | 2.08 |
| 8 | 1.93 | 2.03 | 1.84 |
| 11 | 1.90 | 1.70 | 1.67 |

*Note*. For Grade 5, the subclaim is Physical Science/Life Science.

## 11.3. Conditional Standard Error of Measurement (CSEM)

While the SEM provides an estimate of precision for an assessment, conditional standard error of measurement (CSEM) gives an indication of how measurement error varies across the score scale. While coefficient alpha is reported as a measure of internal consistency of the items that each scale comprises, IRT-based CSEM is a more appropriate measure of the measurement error associated with these scale scores because the reported scale scores for both the overall test and Reading are determined using IRT pattern scoring.

The CSEM is defined as the standard deviation of observed scores given a particular true score and is estimated within the IRT framework as the inverse of the test information function. Plots of test information curves (TICs) and CSEM across the score scale range are provided in Appendix N for both the overall scale scores and Reading scores.

Each scale score has a CSEM estimate that indicates what the most likely range of scores would be for students receiving that score if they tested multiple times. The CMAS assessments measure more accurately at a scale score near the middle of the scale than at the ends of the scale. During test construction, CSEMs are reviewed to ensure that they are minimized around the performance level cut scores.

## 11.4. Decision Consistency and Accuracy

The CMAS Mathematics and ELA/CSLA scales are divided into five performance levels that a student is placed in based on their scale score: *Did Not Yet Meet Expectations*, *Partially Met Expectations*, *Approached Expectations*, *Met Expectations*, and *Exceeded Expectations*. The consistency of a decision refers to the extent to which the same classification would result if a student were to take two parallel forms of the same assessment. However, since test-retest data are not available, psychometric models can be used to estimate the decision consistency based on test scores from a single administration. The accuracy of a decision refers to the agreement between a student's observed score classification and a student's true score classification if a student's true score could be known.

Procedures developed by Livingston and Lewis (1995) were used to estimate the consistency and accuracy of performance level classifications. For the overall test, consistency and accuracy estimates, along with PChance (i.e., the probability of a consistent classification due to chance) and Cohen's Kappa ($\kappa$) coefficient (Cohen, 1960), are calculated as follows:

$$K = \frac{P - P_c}{1 - P_c}$$

where *P* is the probability of consistent classification, and $P_c$ is the probability of consistent classification by chance (Lee et al., 2000).

Table 11.9 presents the kappa interpretations. Table 11.10 presents the decision consistency and accuracy results, and Table 11.11 and Table 11.12 present the consistency and accuracy estimates at each cut score.

**Table 11.9. Kappa Values**

| Value of Kappa | Strength of Agreement |
|---|---|
| < 0.20 | Poor |
| 0.21 – 0.40 | Fair |
| 0.41 – 0.60 | Moderate |
| 0.61 – 0.80 | Good |
| 0.81 – 1.00 | Very Good |

**Table 11.10. Decision Consistency and Accuracy Estimates**

| Content Area | Grade | Accuracy | Consistency | PChance | Kappa |
|---|---|---|---|---|---|
| Mathematics | 3 | 0.73 | 0.63 | 0.22 | 0.52 |
| | 4 | 0.75 | 0.65 | 0.24 | 0.54 |
| | 5 | 0.76 | 0.67 | 0.23 | 0.57 |
| | 6 | 0.74 | 0.64 | 0.23 | 0.53 |
| | 7 | 0.75 | 0.65 | 0.26 | 0.53 |
| | 8 | 0.72 | 0.62 | 0.23 | 0.51 |
| ELA | 3 | 0.72 | 0.63 | 0.25 | 0.50 |
| | 4 | 0.70 | 0.59 | 0.24 | 0.47 |
| | 5 | 0.72 | 0.62 | 0.28 | 0.48 |
| | 6 | 0.73 | 0.63 | 0.25 | 0.51 |
| | 7 | 0.70 | 0.59 | 0.22 | 0.48 |
| | 8 | 0.70 | 0.60 | 0.23 | 0.48 |
| Science | 5 | 0.77 | 0.69 | 0.32 | 0.54 |
| | 8 | 0.82 | 0.75 | 0.34 | 0.62 |
| | 11 | 0.76 | 0.69 | 0.34 | 0.53 |
| CSLA | 3 | 0.72 | 0.62 | 0.26 | 0.49 |
| | 4 | 0.72 | 0.62 | 0.29 | 0.46 |

**Table 11.11. Accuracy of Cut Scores**

| Content Area | Grade | *Partially Met Expectations* Cut | *Approached Expectations* Cut | *Met Expectations* Cut | *Exceeded Expectations* Cut |
|---|---|---|---|---|---|
| Mathematics | 3 | 0.95 | 0.92 | 0.91 | 0.89 |
| | 4 | 0.94 | 0.91 | 0.91 | 0.96 |
| | 5 | 0.95 | 0.92 | 0.92 | 0.91 |
| | 6 | 0.94 | 0.91 | 0.92 | 0.95 |
| | 7 | 0.95 | 0.90 | 0.92 | 0.97 |
| | 8 | 0.92 | 0.90 | 0.92 | 0.93 |
| ELA | 3 | 0.93 | 0.91 | 0.90 | 0.94 |
| | 4 | 0.95 | 0.91 | 0.89 | 0.89 |
| | 5 | 0.96 | 0.91 | 0.89 | 0.92 |
| | 6 | 0.96 | 0.91 | 0.90 | 0.91 |
| | 7 | 0.95 | 0.91 | 0.90 | 0.83 |
| | 8 | 0.94 | 0.91 | 0.90 | 0.88 |
| Science | 5 | – | 0.92 | 0.87 | 0.97 |
| | 8 | – | 0.93 | 0.90 | 0.99 |
| | 11 | – | 0.92 | 0.85 | 0.99 |
| CSLA | 3 | 0.93 | 0.89 | 0.92 | 0.98 |
| | 4 | 0.94 | 0.88 | 0.92 | 0.98 |

**Table 11.12. Consistency of Cut Scores**

| Content Area | Grade | *Partially Met Expectations* Cut | *Approached Expectations* Cut | *Met Expectations* Cut | *Exceeded Expectations* Cut |
|---|---|---|---|---|---|
| Mathematics | 3 | 0.92 | 0.89 | 0.88 | 0.87 |
| | 4 | 0.92 | 0.87 | 0.88 | 0.96 |
| | 5 | 0.93 | 0.89 | 0.89 | 0.90 |
| | 6 | 0.91 | 0.87 | 0.88 | 0.94 |
| | 7 | 0.92 | 0.86 | 0.89 | 0.96 |
| | 8 | 0.89 | 0.87 | 0.88 | 0.92 |
| ELA | 3 | 0.90 | 0.87 | 0.87 | 0.93 |
| | 4 | 0.93 | 0.88 | 0.85 | 0.87 |
| | 5 | 0.94 | 0.87 | 0.85 | 0.91 |
| | 6 | 0.94 | 0.88 | 0.86 | 0.89 |
| | 7 | 0.93 | 0.88 | 0.86 | 0.81 |
| | 8 | 0.91 | 0.87 | 0.86 | 0.86 |
| Science | 5 | – | 0.89 | 0.82 | 0.97 |
| | 8 | – | 0.90 | 0.85 | 0.99 |
| | 11 | – | 0.89 | 0.80 | 0.99 |
| CSLA | 3 | 0.90 | 0.85 | 0.88 | 0.97 |
| | 4 | 0.91 | 0.83 | 0.89 | 0.97 |

## 11.5. Inter-Rater Agreement

For CR items, inter-rater agreement examines the extent to which students would obtain the same score if scored by different scorers. For each operational item, 10% of the responses were scored by a second reader, which allowed for rater agreement statistics to be calculated. 0 presents the inter-rater agreement statistics for the CR operational items (i.e., the percentage of operational items with exact agreement, adjacent agreement, and non-adjacent agreement). The target exact plus adjacent agreement rate is 95% for all items. The following agreement rates were calculated for each CR item:

- Exact agreement, which represents exact agreement between the two raters
- Adjacent agreement, which represents adjacent agreement between the two raters (i.e., a difference of 1 score points)
- Non-adjacent agreement, which represents a difference of more than 1 score point between the two raters

For the PCR items, the following additional analyses were also conducted:

- Quadratic kappa (Kappa), $KAPPA = \frac{E([X_1 - Y_1]^2)}{E([X_1 - Y_2]^2)}$, which is a comparison between the mean square error of rating pairs that are supposed to agree $(X_1, Y_1)$ and those that are unrelated $(X_1, Y_2)$

- Standardized mean differences (MD): $\bar{Z} = \frac{|\bar{X}_{R_1} - \bar{X}_{R_2}|}{\sqrt{\frac{sd_{R_1}^2 + sd_{R_2}^2}{2}}}$

- Correlations (CORR): $\bar{Z} = \frac{|\bar{X}_{R_1} - \bar{X}_{R_2}|}{\sqrt{\frac{sd_{R_1}^2 + sd_{R_2}^2}{2}}}$

# Chapter 12: Validity

"Validity refers to the degree to which evidence and theory support the interpretations of test scores for proposed uses of tests" (AERA et al., 2014). As such, it is not the CMAS assessments that are validated but rather the interpretations of the scores. The purpose of the CMAS assessments is to provide information about a student's level of mastery of the Colorado Academic Standards (CAS). Mastery of the standards in the elementary and middle school grades indicates that a student is on track to being college and career ready at each grade level. In support of these ends, this technical report has described processes that were implemented throughout the CMAS assessment cycle with validity and fairness considerations in mind. This chapter describes the various sources of validity evidence for CMAS as outlined in the *Standards for Educational and Psychological Testing* (AERA et al., 2014), often referencing other chapters and sections of this report.

## 12.1. Evidence Based on Test Content

Evidence based on the content of the assessment is supported by the degree of correspondence between test items and content standards. The degree to which the test measures what it claims to measure is known as construct validity. The CMAS assessments adhere to the principles of evidence-centered design, in which the standards to be measured (i.e., the CAS) are identified, and the performance a student needs to achieve to meet those standards is delineated in the evidence statements (ESs) or evidence outcomes (EOs). Test items are reviewed for adherence to universal design principles to maximize the participation of the widest possible range of students.

### 12.1.1. Test Development Process

The item development process is driven by targets at the ES or EO level. Before developing items, Pearson uses target spreadsheets to create an internal item development plan (IDP) aligned with the expectations of test design and with consideration of attrition rates at committee review and data review. The validity of a state assessment relies on the methodology that frames the development and design of the assessment. In support of that claim, Pearson upholds these considerations as the cornerstones of the CMAS item and test development:

- The item development process ensures that the mathematics and ELA/CSLA items align to the ESs and EOs and that the science items align to the EOs.
- IDPs were designed to produce and maintain a robust item bank; items are written to address the scope of measured standards, grade-level difficulties, and cognitive complexity.
- The item and test development processes promote the equivalency of the online and paper-based assessments.
- Items were developed with the intention of being administered on multiple testing platforms.
- Item and test development processes are compliant with industry standards.

Content is also aligned through the articulation of performance in the performance level descriptors (PLDs). At the policy level, the PLDs include policy claims about the educational achievement of students who attain a particular performance level, and a broad description of the grade-level knowledge, skills, and practices that students performing at a particular achievement level are able to demonstrate. Those policy-level descriptors are the foundation for the subject- and grade-specific PLDs, which, along with the ES or EO framework, guide the development of the items and tasks.

Gathering construct validity evidence for the CMAS assessments is embedded in the process by which the test content is developed and validated. At each step in the test development process, educators, assessment experts, and bias and sensitivity experts were involved in review of text, items, and tasks for accuracy, appropriateness, and freedom from bias, as described in Chapter 3: Item Development. In the early stages of development, Pearson conducted research studies to validate the item and task development approach. One such study focused on student task interaction and was designed to collect data on students' experience with the assessment tasks and technological functionalities, as well as the amount of time needed to answer each task. Pearson also conducted a rubric choice study that compared the functioning of two rubrics developed to score the ELA PCR tasks. Quantitative and qualitative evidence was collected to support the use of a condensed or expanded trait scoring rubric.

An important consideration when constructing test forms is recognition of items that may introduce construct-irrelevant variance. Such items should not be included on test forms to help ensure fairness to all student subgroups. Data reviews and content and bias reviews are held with Colorado educators to identify any issues with items before they are included on an operational test form. Accommodations were also made available based on individual need documented in the student's approved IEP or 504 Plan, as described in Section 5.5.

The CMAS operational test forms were carefully constructed to align with the test blueprints and specifications based on the CAS. Chapter 4: Test Construction provides details on the construction of the operational assessment forms, which demonstrates that all test forms for mathematics and ELA adhered to the same test design used in previous years or were previously used operationally. Science was a new assessment administered in Spring 2022; as such, validity evidence based on test content for science will continue to be documented in future iterations of this technical report as the test continues to be developed.

### 12.1.2. Alignment Study

An independent alignment study was conducted by the Human Resources Research Organization (HumRRO) in 2023 to provide further evidence to support the claim that the content of the CMAS Science test items matches the intended content as specified in the 2020 CAS (Revivo et al., 2023). For the study, three panels (one per grade) of Colorado educators were convened to review the alignment between the CMAS Science items and the CAS. Every effort was made to recruit panels consisting of teachers reflecting the various demographic subgroups and regions across Colorado. HumRRO applied alignment criteria they developed that was approved by CDE. This procedure required the panelists to (a) provide cognitive complexity ratings for each item, (b) indicate the CAS best aligned to each item, and (c) indicate if each item aligned to an SEP or CCC.

Overall, the results of the study provide validity evidence to support the claim that the content of the CMAS Science test items matches the intended content as specified in the CAS and test blueprint. Across all grades, items represented the intended content and reflected the multidimensional nature of the CAS, although only Grade 5 items reflected appropriate levels of cognitive complexity whereas Grades 8 and 11 items narrowly missed the cognitive complexity criterion requirements. The results of the alignment study have been considered during the item development process for subsequent administrations.

## 12.2. Evidence Based on Internal Structure

Analyses of the internal structure of a test typically involve studies of the relationships among test items and/or test components (i.e., subclaims) in the interest of establishing the degree to which the items or components appear to reflect the construct on which a test score interpretation is based (AERA et al., 2014, p. 16). The term *construct* refers to the characteristics that a test is intended to measure; in the case of the CMAS assessments, the characteristics of interest are the knowledge and skills defined by the test blueprints.

The CMAS assessments provide a full summative test score and a Reading score, as well as percent of points earned scores for Writing and mathematics, ELA, and science subclaims. The goal of reporting at this level is to provide criterion-referenced data to assess the strengths and weaknesses of a student's achievement in specific components of each content area compared with other students taking the same assessment (for overall and subclaim scores) and students who took the assessment in prior years (for overall scores). This information can then be used for a variety of purposes as indicated in Section 1.4. Evidence based on internal structure is provided in the following sections of this technical report:

- Subclaim correlations (Section 9.4)
- Internal consistency (Section 11.1)
- Factor analysis (Section 10.4.1)

## 12.3. Evidence Based on Relationships to Other Variables

Correlations were calculated between the mathematics, ELA, and science assessments, as shown in Table 12.1. (The samples include only students with valid scores on both assessments.) These scores may be expected to have lower correlations if the tests are measuring distinct constructs. The correlations between the scale scores of the CMAS assessments ranged from 0.75 to 0.82; these values are also very close to the 2018 values.

**Table 12.1. Correlations Between CMAS Scale Scores**

| Grade | ELA & Mathematics | | ELA & Science | | Mathematics & Science | |
|---|---|---|---|---|---|---|
| | N | Correlation | N | Correlation | N | Correlation |
| 3 | 55,537 | 0.78 | – | – | – | – |
| 4 | 55,290 | 0.77 | – | – | – | – |
| 5 | 56,377 | 0.75 | 55,619 | 0.81 | 55,771 | 0.78 |
| 6 | 55,413 | 0.77 | – | – | – | – |
| 7 | 53,606 | 0.77 | – | – | – | – |
| 8 | 51,376 | 0.77 | 50,050 | 0.82 | 50,236 | 0.78 |

## 12.4. Evidence Based on Response Processes

As noted in the *Standards for Educational and Psychological Testing* (AERA et al., 2014), additional support for a particular score interpretation or use can be provided by theoretical and empirical evidence indicating that students are using the intended response processes when responding to the items in a test. This type of evidence may be gathered from interacting with students to understand what processes underlie their item responses. Evidence may also be derived from feedback provided by test proctors/teachers involved in the administration of the test and raters involved in the scoring of CR items. Evidence may also be gathered by evaluating the correct and incorrect responses to short CR items (e.g., items requiring a few words to respond) or by evaluating the response patterns to multi-part items.

Prior to the 2016 administration, the PARCC consortium undertook research investigating the quality of the items, tasks, and stimuli, focusing on whether students interact with the online items/tasks as intended through cognitive labs. In these studies, students were asked to narrate how they interact with an item and answer questions about their experience with the item and online platform.

Cognitive labs were conducted for CMAS Science with Colorado students in May 2013. Students attempted a variety of item types on the TestNav platform and were asked to "think-aloud" as they worked through each item. Students showed a high degree of facility in responding to the items, and only a small bit of supplemental training was speculated to be needed to acquaint them with the tools and navigation of the TestNav interface. Surveys were given to the students after completion of the assessment, which included a question that asked them to indicate whether they preferred paper or computer-based tests. Most students indicated that they preferred the computer-based version, and many commented that it had been an enjoyable experience. For a full report on the cognitive labs, see the *2013–2014 CMAS Technical Report*.

As new items are developed, the field test responses are reviewed. Sample responses to the CR items are also reviewed by educator committees during rangefinding to ensure that the rubrics make sense and provide example scored responses. During the data review meeting, item statistics are reviewed to ensure that the students are responding to items in the expected way. Low item item-total correlations and aberrant response distributions can all indicate that there are unexpected issues with either the correct or incorrect responses. Items where the correct response is not accurate or there are distractor responses that are technically correct can be identified and rejected at this step. During the adjudication step, incorrect responses to fill-in-the-blank items are also reviewed to make sure that no technically correct responses are excluded. These include entry issues such as extra spaces or unexpected responses such as adding an unnecessary decimal (e.g., 3.0 rather than 3).

## 12.5. Evidence Based on the Consequences of Testing

Because state tests are administered "with the expectation that some benefit will be realized from the intended use of the scores" (AERA et al., 2014), validity evidence supporting the use and interpretation of CMAS results may be investigated as a consequence of testing. One intended consequence of testing is that more students will demonstrate mastery over the CAS over time, as evidenced by more students achieving in the top performance levels, if the data are used appropriately to make improvements in programming at the school and district levels.

Table 12.2 presents the percentage of students who have reached proficiency on the CMAS assessments over the years. The CMAS Mathematics and ELA assessments have been administered to Colorado students since Spring 2015, and CSLA has been administered since Spring 2016. While CMAS Science has been administered since Spring 2014, it is not included in the table because a new CMAS science assessment based on new standards was administered for the first time in Spring 2022.

As shown in the table, student performance has improved since the first administration with the exception of Grade 6 mathematics and Grade 3 CSLA. The decrease in 2021 of the percent of students meeting or exceeding in the required grades was expected given the learning disruptions caused by COVID-19 in 2020 and 2021. The pandemic's continued impact on student learning opportunities should be considered when interpreting the 2022 performance results. There have also been changes in the available assessments by grade for Grades 7 and 8 mathematics across administrations, so comparisons across years for those grades are not included.

**Table 12.2. Student Performance Over Time**

| Content Area | Grade | First Administration %Met or Exceeded | 2019 %Met or Exceeded | 2021 %Met or Exceeded | 2022 %Met or Exceeded | 2023 %Met or Exceeded | % Change, First Administration to 2019 | % Change, First Administration to 2021 | % Change, First Administration to 2022 | % Change, First Administration to 2023 |
|---|---|---|---|---|---|---|---|---|---|---|
| Mathematics | 3 | 36.7 | 41.0 | – | 39.4 | 40.4 | 4.3 | – | 2.7 | 3.7 |
| | 4 | 30.2 | 33.6 | 28.5 | 30.7 | 32.7 | 3.4 | -1.7 | 0.5 | 2.5 |
| | 5 | 30.1 | 35.7 | – | 34.9 | 36.5 | 5.6 | – | 4.8 | 6.4 |
| | 6 | 31.7 | 29.5 | 24.1 | 26.3 | 28.2 | -2.2 | -7.6 | -5.4 | -3.5 |
| ELA | 3 | 38.2 | 41.3 | 39.1 | 40.7 | 39.9 | 3.1 | 0.9 | 2.5 | 1.7 |
| | 4 | 41.7 | 48.0 | – | 44.1 | 43.8 | 6.3 | – | 2.4 | 2.1 |
| | 5 | 40.5 | 48.4 | 47.2 | 45.4 | 47.8 | 7.9 | 6.7 | 4.9 | 7.3 |
| | 6 | 39.1 | 43.6 | – | 43.0 | 43.4 | 4.5 | – | 3.9 | 4.3 |
| | 7 | 41.0 | 46.5 | 42.6 | 41.8 | 45.0 | 5.5 | 1.6 | 0.8 | 4.0 |
| | 8 | 40.9 | 46.9 | – | 43.9 | 42.4 | 5.9 | – | 3.0 | 1.5 |
| CSLA | 3 | 22.0 | 27.5 | 15.4 | 19.8 | 18.7 | 5.5 | -6.6 | -2.2 | -3.3 |
| | 4 | 13.9 | 19.1 | – | 13.7 | 14.2 | 5.2 | – | -0.2 | 0.3 |
| Science | 5 | 33.9 | – | – | – | 33.9 | – | – | – | – |
| | 8 | 31.3 | – | – | – | 31.3 | – | – | – | – |
| | 11 | 24.6 | – | – | – | 24.6 | – | – | – | – |

*Note*. The first administration for mathematics and ELA was Spring 2015, the first administration for which scale scores and performance levels were generated for science was Spring 2023, and the first administration for CSLA was Spring 2016. Performance results are not included for the Spring 2021 mathematics, ELA, and CSLA opt-in grades.

**12.6. Fairness**

Fairness is an important aspect of validity, as it is critical that an assessment provide accurate measurements for **all** students. To that end, the following fairness considerations were woven into the development and administration of the CMAS assessments:

- Sample items that provide the opportunity for teachers and students to become familiar with the test design and scoring of the assessments before experiencing the items on an operational test (Section 5.3)
- Universal design principles that are adhered to during the test development process with the goal of avoiding construct-irrelevant aspects of the assessment that could impact student performance (Chapter 3: Item Development)
- Items are reviewed by educators for potential issues which could impact the performance of student groups prior to field testing (Chapter 3: Item Development).
- Differential item functioning (DIF) analyses to identify any items that appear to be unfairly favoring one subgroup over another. All items which show DIF are reviewed by educators for potential bias in the item. (Section 3.7)
- Accessibility tools and accommodations to allow students to fully demonstrate their content knowledge without being hindered by non-construct related elements (Sections 4.2 and 5.5)

Participation information must also be reviewed and taken into consideration thoughtfully when interpreting the district and school results. As participation rates vary across student, school, and district groups, challenges with interpreting results increase. Depending on the specific school or district, some student groups may have been overrepresented in the results and others may have been underrepresented. Students may have also experienced ongoing reduced, disrupted, and/or adjusted learning opportunities during the school year. Due to these factors and many more challenges experienced due to COVID-19, districts and schools should be cautious when interpreting results because the data may not support all cross-state comparisons and historical uses when participation rates are low and/or representativeness is limited.

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# Appendix A: Test Blueprints

The following tables present the percentage targets for each content area and grade-level assessment.

**Table A.1. Test Blueprint—Mathematics Grades 3–5**

| Item Type/Subclaim/Calculator Use | Grade 3 | Grade 4 | Grade 5 |
|---|---|---|---|
| Total #Points | 50–51 | 50–51 | 50–51 |
| Type I | 61–62% | 61–61% | 61–62% |
| 1.1 | 49–50% | 37–38% | 37–38% |
| 1.2 | 12% | 24% | 24% |
| 1.4 | – | – | – |
| Subclaim A: Major Content | 43–44% | 47–48% | 45–46% |
| Subclaim B: Supporting Content | 18% | 14% | 16% |
| Type II | 20–22% | 20–22% | 20–22% |
| 2.3 | 6–12% | 6–12% | 6–12% |
| 2.4 | 8–16% | 8–16% | 8–16% |
| Subclaim C: Expressing Mathematical Reasoning | 20–22% | 20–22% | 20–22% |
| Type III | 18% | 18% | 18% |
| 3.3 | 6% | 6% | 6% |
| 3.6 | 12% | 12% | 12% |
| Subclaim D: Modeling and Application | 18% | 18% | 18% |
| Calculator | – | – | – |
| Non-Calculator | 100% | 100% | 100% |

**Table A.2. Test Blueprint—Mathematics Grades 6–8**

| Item Type/Subclaim/Calculator Use | Grade 6 | Grade 7 | Grade 8 |
|---|---|---|---|
| Total #Points | 50–51 | 50–51 | 50–51 |
| Type I | 61–62% | 61–62% | 61–62% |
| 1.1 | 37–38% | 37–38% | 33–34% |
| 1.2 | 16% | 16% | 12–20% |
| 1.4 | 8% | 8% | 8–16% |
| Subclaim A: Major Content | 39–40% | 45–46% | 41–42% |
| Subclaim B: Supporting Content | 22% | 16% | 20% |
| Type II | 20–22% | 20–22% | 20–22% |
| 2.3 | 6–12% | 6–12% | 6–12% |
| 2.4 | 8–16% | 8–16% | 8–16% |
| Subclaim C: Expressing Mathematical Reasoning | 20–22% | 20–22% | 20–22% |
| Type III | 18% | 18% | 18% |
| 3.3 | 6% | 6% | 6% |
| 3.6 | 12% | 12% | 12% |
| Subclaim D: Modeling and Application | 18% | 18% | 18% |
| Calculator | 72–73% | 76% | 72–73% |
| Non-Calculator | 27–28% | 24% | 27–28% |

**Table A.3. Test Blueprint—ELA Grades 3–5**

| Subclaim | Grade 3 (includes CSLA) | Grade 4 (includes CSLA) | Grade 5 |
|---|---|---|---|
| Total #Points | 53 (65) | 59 (73) | 57 (71) |
| Reading | 77% (63%) | 78% (63%) | 77% (62%) |
| Literary Text | 32% (26%) | 31–34% (25–27%) | 32% (25%) |
| Informational Text | 26% (22%) | 31% (25%) | 32% (25%) |
| Vocabulary | 19% (15%) | 14–17% (11–14%) | 14% (11%) |
| Writing | 23% (37%) | 22% (37%) | 23% (38%) |
| Written Expression | 11% (28%) | 12% (29%) | 12% (30%) |
| Knowledge and Use of Language Conventions | 11% (9%) | 10% (8%) | 10% (8%) |

*Note*. The numbers in parantheses bare based on weighted Written Expression scores. Scores may not add up as expected due to rounding.

**Table A.4. Test Blueprint—ELA Grades 6–8**

| Subclaim | Grade 6 | Grade 7 | Grade 8 |
|---|---|---|---|
| Total #Points | 62 (78) | 64 (80) | 64 (80) |
| Reading | 77% (62%) | 78% (63%) | 78% (63%) |
| Literary Text | 26–29% (21–23%) | 28% (23%) | 28% (23%) |
| Informational Text | 35% (28%) | 34% (28%) | 34% (28%) |
| Vocabulary | 13–16% (10–13%) | 16% (13%) | 16% (13%) |
| Writing | 23% (38%) | 22% (38%) | 22% (38%) |
| Written Expression | 13% (31%) | 13% (30%) | 13% (30%) |
| Knowledge and Use of Language Conventions | 10% (8%) | 9% (8%) | 9% (8%) |

*Note*. The numbers in parantheses bare based on weighted Written Expression scores. Scores may not add up as expected due to rounding.

**Table A.5. Test Blueprint—Science Grade 5**

| Standard/Item Type | %Total Test Score Points | #Points | | |
|---|---|---|---|---|
| | | Cluster | Mini Cluster | Standalone |
| Physical | 35 | 7-9 | 0-6 | 3-7 |
| Physical/Life | 24 | 7-9 | 0-6 | 0-7 |
| Earth and Space | 41 | 7-9 | 0-6 | 4-10 |
| Science and Engineering Practices | 65–75 | – | – | – |
| SR and TE | 53 | – | – | – |
| CR | 47 | – | – | – |
| Total | 100 | 24-26 | 10-12 | 15 |

**Table A.6. Test Blueprint—Science Grade 8 (MS)**

| Standard/Item Type | %Total Test Score Points | #Points | | |
|---|---|---|---|---|
| | | Cluster | Mini Cluster | Standalone |
| Physical | 34 | 7 | 6-12 | 0-6 |
| Life | 36 | 7 | 6-12 | 1-7 |
| Earth and Space | 30 | 7 | 6 | 3 |
| Science and Engineering Practices | 65–74 | – | – | – |
| SR and TE | 53 | – | – | – |
| CR | 47 | – | – | – |
| Total | 100 | 21 | 24 | 16 |

**Table A.7. Test Blueprint—Science Grade 11 (HS)**

| Standard/Item Type | %Total Test Score Points | #Points | | |
|---|---|---|---|---|
| | | Cluster | Mini Cluster | Standalone |
| Physical | 46 | 6 | 5-9 | 4-7 |
| Life | 32 | 6 | 4-8 | 2-6 |
| Earth and Space | 31 | 9 | 5-8 | 2-5 |
| Science and Engineering Practices | 65–74 | – | – | – |
| SR and TE | 53 | – | – | – |
| CR | 47 | – | – | – |
| Total | 100 | 18 | 19 | 13 |

## Appendix B: Science Cognitive Complexity Framework

### Colorado Measures of Academic Success (CMAS) Science

Final Cognitive Complexity Framework, January 2023

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#### Item Cognitive Complexity

**Note**: Examples provided are not intended to be comprehensive of all items meeting that descriptor.

| Item Cognitive Complexity | | | |
|---|---|---|---|
| | **Low - Single Dimension** | **Medium - Two Dimensions** | **High - All Three Dimensions** |
| **Item Dimensionality[1]** | Item requires demonstration of only one dimension. | Item requires integration of two dimensions, described in the CAS Learning Progressions documents. | Item requires integration of three dimensions, described in the CAS Learning Progressions documents. |
| | **Low - Heavy** | **Medium - Moderate** | **High - Minimal** |
| **Scaffolding/Support** | The task prescribes a *fully specified* approach for responding.<br>- All components are provided and commonplace; student does not need to infer or select from them:<br>  ○ formulas<br>  ○ Punnett squares<br>  ○ components of energy in a system<br>  ○ unbalanced chemical equations<br>  ○ labels to be applied to familiar models<br>- Problem-solving steps are provided in the stimulus; student only executes them. | The task focuses student to *apply* an approach that is only partially specified.<br>- Student is provided either a partial set of components for a routine task or an excess of components for a more complex task; student must either infer what is missing or discard what is irrelevant:<br>  ○ suggest original components to incorporate into an incomplete model<br>  ○ apply the correct formula(s) out of several available options<br>  ○ explain an observed instance using a specified concept<br>  ○ describe the missing steps from an incomplete investigational procedure<br>- There is some uncertainty associated with the outcome of the scenario.<br>- Some portion of the task is accomplished by way of provided problem-solving steps, but the student must choose or devise some portion of the process. | The task frames a situation that the student must *interpret to select or develop multiple steps* of an approach.<br>- Student is presented with multiple informational inputs between which the relationship is not immediately obvious.<br>- A high degree of uncertainty is associated with the outcome of the scenario.<br>- Student selects or develops multiple problem-solving steps to complete a specific, structured, defined task or goal:<br>  ○ design an investigation<br>  ○ use listed materials to develop an original model<br>  ○ explain an observed instance using one or more unspecified concepts<br>  ○ determine and apply a sequence of formulas to solve a problem |

Final CMAS Cognitive Complexity Framework 2023
Adapted from Achieve Cognitive Complexity in Science Assessments and Task Analysis Guide for Science

|  | Low - Minimal | Medium - Surface | High - Intensive |
|---|---|---|---|
| **Sensemaking** Sensemaking situation: students are provided material without obvious ties/connections to content (e.g., language of the standard); they must use their knowledge of the standard to explain what they see in the material. | - Task is answerable via rote knowledge connected to the phenomenon solely by context.<br>- Item requires no engagement with the stimulus.<br>- The student can correctly answer without addressing the central concept [mystery/puzzle] of the phenomenon.<br>- Focused on identifying an answer, not on explaining phenomena.<br>  ○ identify the components of a familiar system without explaining their importance to the system.<br>  ○ identify the trend in a graph without using it to explain or predict anything. | - Making sense of a phenomenon or addressing a problem is necessary to accomplish at least a portion of the item, or answering the item is a strategic step toward a sensemaking goal.<br>- Answer requires:<br>  ○ use of information, data, or a model to develop an explanation or argument<br>  ○ connection of multiple pieces of information.<br>- Task asks for standards-based explanation of observations, but not the detailed relationships behind those observations:<br>  ○ determine which of several data sets correlates with the trend under observation<br>  ○ determine which portion of a system is most directly connected to the phenomenon<br>  ○ given data and a proposed cause for a phenomenon, provide support for that cause from the data | - Making sense of a phenomenon or addressing a problem is the fundamental source of challenge in the item.<br>- Meaningful (valid, accurate, causal, etc.) information must be distinguished from other information through reasoning:<br>  ○ speculate a cause for an unusual observation and provide support for that cause from given data<br>  ○ determine corresponding trends between multiple data sets and evaluate for causation<br>  ○ notice patterns within data and connect them to the phenomenon under consideration<br>  ○ predict how a change to one part of a system will impact another part<br>- Task requires use of pertinent standard knowledge to explain both observations and the detailed relationships behind those observations. |

[1] - Disciplinary Core Ideas (DCI), Science and Engineering Practices (SEP), Crosscutting Concepts (CCC)

**Overall Item Cognitive Complexity Rating**

The overall cognitive complexity rating for the item follows a majority rules approach when comparing the ratings for dimensionality, scaffolding/support, and sensemaking.

- Item complexity is **High** if at least two of the three categories are rated at the highest level
- Item complexity is **Low** if two are rated at the lowest level.
- Item complexity is **Medium** in all other cases.

Final CMAS Cognitive Complexity Framework 2023
Adapted from Achieve Cognitive Complexity in Science Assessments and Task Analysis Guide for Science

## Cluster Stimulus Cognitive Complexity

Note: Use the following **only for** the purpose of rating cluster and simulation stimuli.

| Cluster Stimulus Complexity | | | |
| --- | --- | --- | --- |
| | **1 - Low** | **2 - Medium** | **3 - High** |
| **Phenomenon/ Stimulus Material** | - The task provides a problem or a phenomenon that students are already familiar with how to explain or solve.<br>- Student is presented a simple, probably familiar situation/scenario and selects the appropriate, direct scientific explanation for the phenomenon.<br>- Context is rudimentary or taken directly from the EO, Clarification Statement, or DCI.<br>- Information is limited to that specifically needed to address the task. | - The scenario presents a relatively new phenomenon that students might have some familiarity with, which contains some specific uncertainty for tasks to focus on.<br>- The scenario has multiple facets of information for students to interpret at a grade-appropriate level of sophistication.<br>- Within the scenario there are explicit cues and/or scaffolding to focus students toward related tasks.<br>- The provided components are sufficient for students to arrive at the appropriate scientific explanation for the phenomenon.<br>- Context is substantial and goes beyond examples listed in the standards text. | - The scenario presents a new phenomenon or problem that<br>  o is at a level that "figuring out" would be real and authentic for students<br>  o is not immediately explainable by the student<br>  o likely involves multiple appropriate ways to engage and pursue the task<br>- Connection of context to the standards is indirect or unobvious. |

Final CMAS Cognitive Complexity Framework 2023
Adapted from Achieve Cognitive Complexity in Science Assessments and Task Analysis Guide for Science

# Appendix C: ELA and CSLA Scoring Rubrics

## Grade 3
### CMAS Scoring Rubric for Prose Constructed Response Items

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### Research Simulation Task (RST) and Literary Analysis Task (LAT)

| Construct Measured | Score Point 3 | Score Point 2 | Score Point 1 | Score Point 0 |
|---|---|---|---|---|
| Reading Comprehension and Written Expression | The student response<br><br>• demonstrates **full comprehension** by providing an **accurate** explanation/description/comparison;<br>• addresses the prompt and provides **effective** development of the topic that is **consistently appropriate** to task, purpose, and audience;<br>• uses **clear** reasoning supported by **relevant**, text-based evidence in the development of the topic;<br>• is **effectively** organized with **clear and coherent** writing;<br>• uses language **effectively** to clarify ideas. | The student response<br><br>• demonstrates **comprehension** by providing a **mostly accurate** explanation/description/comparison;<br>• addresses the prompt and provides **some** development of the topic that is **generally appropriate** to task, purpose, and audience;<br>• uses reasoning and **relevant**, text-based evidence in the development of the topic;<br>• is organized with **mostly clear and coherent** writing;<br>• uses language in a way that is **mostly effective** to clarify ideas. | The student response<br><br>• demonstrates **limited comprehension**;<br>• addresses the prompt and provides **minimal** development of the topic that is **limited in its appropriateness** to task, purpose, and audience;<br>• uses **limited** reasoning and text-based evidence;<br>• demonstrates **limited** organization and coherence;<br>• uses language to express ideas with **limited** clarity. | The student response<br><br>• **does not** demonstrate comprehension;<br>• is **undeveloped and/or inappropriate** to the task, purpose, and audience;<br>• includes **little to no** text-based evidence;<br>• **lacks** organization and coherence;<br>• **does not** use language to express ideas with clarity. |
| Knowledge of Language and Conventions | The student response to the prompt demonstrates **full command** of the conventions of standard English at an appropriate level of complexity. There **may be a few minor errors** in mechanics, grammar, and usage, but **meaning is clear**. | The student response to the prompt demonstrates **some command** of the conventions of standard English at an appropriate level of complexity. There **may be errors** in mechanics, grammar, and usage that **occasionally impede understanding**, but the **meaning is generally clear**. | The student response to the prompt demonstrates **limited command** of the conventions of standard English at an appropriate level of complexity. There **may be errors** in mechanics, grammar, and usage that **often impede understanding**. | The student response to the prompt **does not demonstrate command** of the conventions of standard English at the appropriate level of complexity. **Frequent and varied errors** in mechanics, grammar, and usage **impede understanding**. |

Grade 3 CMAS Scoring Rubric for Prose Constructed Response Items

## Narrative Task (NT)

| Construct Measured | Score Point 3 | Score Point 2 | Score Point 1 | Score Point 0 |
|---|---|---|---|---|
| **Written Expression** | The student response<br><br>• is **effectively** developed with narrative elements and is **consistently appropriate** to the task;<br>• is **effectively** organized with **clear and coherent** writing<br>• uses language **effectively** to clarify ideas. | The student response<br><br>• is developed with **some** narrative elements and is **generally appropriate** to the task;<br>• is organized with **mostly coherent** writing;<br>• uses language in a way that is **mostly effective** to clarify ideas. | The student response<br><br>• is **minimally** developed with **few** narrative elements and is **limited in its appropriateness** to the task;<br>• demonstrates **limited** organization and coherence;<br>• uses language to express ideas with **limited** clarity. | The student response<br><br>• is **undeveloped** and/or **inappropriate** to the task;<br>• **lacks** organization and coherence;<br>• **does not** use language to express ideas with clarity. |
| **Knowledge of Language and Conventions** | The student response to the prompt demonstrates **full command** of the conventions of standard English at an appropriate level of complexity. There may be a **few minor errors** in mechanics, grammar, and usage, but **meaning is clear**. | The student response to the prompt demonstrates **some command** of the conventions of standard English at an appropriate level of complexity. There **may be errors** in mechanics, grammar, and usage that **occasionally impede understanding**, but the **meaning is generally clear**. | The student response to the prompt demonstrates **limited command** of the conventions of standard English at an appropriate level of complexity. There **may be errors** in mechanics, grammar, and usage that **often impede understanding**. | The student response to the prompt **does not demonstrate command** of the conventions of standard English at the appropriate level of complexity. **Frequent and varied errors** in mechanics, grammar, and usage **impede understanding**. |

**NOTE:**
- The reading dimension is not scored for elicited narrative stories.
- Per the CCSS, narrative elements in grades 3-5 may include: establishing a situation; organizing a logical event sequence; describing scenes, objects, or people; developing characters' personalities; and using dialogue as appropriate.
- The elements of organization to be assessed are expressed in the grade-level standards W1-W3.

**Developed collaboratively with PARCC.**

# Grades 4 and 5
## CMAS Scoring Rubric for Prose Constructed Response Items

**COLORADO**
Department of Education

## Research Simulation Task (RST) and Literary Analysis Task (LAT)

| Construct Measured | Score Point 4 | Score Point 3 | Score Point 2 | Score Point 1 | Score Point 0 |
|---|---|---|---|---|---|
| **Reading Comprehension and Written Expression** | The student response<br><br>• demonstrates **full comprehension** of ideas stated explicitly and/or inferentially by providing an **accurate** analysis;<br>• addresses the prompt and provides **effective** development of the topic that is **consistently appropriate** to task, purpose, and audience;<br>• uses **clear** reasoning supported by **relevant**, text-based evidence in the development of the topic;<br>• is **effectively** organized with **clear and coherent** writing;<br>• uses language **effectively** to clarify ideas. | The student response<br><br>• demonstrates **comprehension** of ideas stated explicitly and/or inferentially by providing a **mostly accurate** analysis;<br>• addresses the prompt and provides **mostly effective** development of the topic that is **appropriate** to task, purpose, and audience;<br>• uses **mostly clear** reasoning supported by **relevant** text-based evidence in the development of the topic;<br>• is organized with **mostly clear and coherent** writing;<br>• uses language that is **mostly effective** to clarify ideas. | The student response<br><br>• demonstrates **basic comprehension** of ideas stated explicitly and/or inferentially by providing a **generally accurate** analysis;<br>• addresses the prompt and provides **some** development of the topic that is **somewhat appropriate** to task, purpose, and audience;<br>• uses **some** reasoning and text-based evidence in the development of the topic;<br>• demonstrates **some** organization with **somewhat** coherent writing;<br>• uses language to express ideas with **some** clarity. | The student response<br><br>• demonstrates **limited comprehension** of ideas by providing a **minimally accurate** analysis;<br>• addresses the prompt and provides **minimal** development of the topic that is **limited in its appropriateness** to task, purpose, and audience;<br>• uses **limited** reasoning and text-based evidence;<br>• demonstrates **limited** organization and coherence;<br>• uses language to express ideas with **limited** clarity. | The student response<br><br>• demonstrates **no comprehension** of ideas by providing an **inaccurate or no** analysis.<br>• is **undeveloped and/or inappropriate** to the task, purpose, and audience;<br>• includes **little to no** text-based evidence;<br>• **lacks** organization and coherence;<br>• **does not** use language to express ideas with clarity. |
| **Knowledge of Language and Conventions** | | The student response to the prompt demonstrates **full command** of the conventions of standard English at an appropriate level of complexity. There **may be a few minor errors** in mechanics, grammar, and usage, but **meaning is clear**. | The student response to the prompt demonstrates **some command** of the conventions of standard English at an appropriate level of complexity. There **may be errors** in mechanics, grammar, and usage that **occasionally impede understanding**, but the **meaning is generally clear**. | The student response to the prompt demonstrates **limited command** of the conventions of standard English at an appropriate level of complexity. There **may be errors** in mechanics, grammar, and usage that **often impede understanding**. | The student response to the prompt **does not demonstrate command** of the conventions of standard English at the appropriate level of complexity. **Frequent and varied errors** in mechanics, grammar, and usage **impede understanding**. |

Grades 4 and 5 CMAS Scoring Rubric for Prose Constructed Response Items

## Narrative Task (NT)

| Construct Measured | Score Point 3 | Score Point 2 | Score Point 1 | Score Point 0 |
|---|---|---|---|---|
| Written Expression | The student response<br><br>• is **effectively** developed with narrative elements and is **consistently appropriate** to the task;<br>• is **effectively** organized with **clear and coherent** writing<br>• uses language **effectively** to clarify ideas. | The student response<br><br>• is developed with **some** narrative elements and is **generally appropriate** to the task;<br>• is organized with **mostly coherent** writing;<br>• uses language in a way that is **mostly effective** to clarify ideas. | The student response<br><br>• is **minimally** developed with **few** narrative elements and is **limited in its appropriateness** to the task;<br>• demonstrates **limited** organization and coherence;<br>• uses language to express ideas with **limited** clarity. | The student response<br><br>• is **undeveloped** and/or **inappropriate** to the task;<br>• **lacks** organization and coherence;<br>• **does not** use language to express ideas with clarity. |
| Knowledge of Language and Conventions | The student response to the prompt demonstrates **full command** of the conventions of standard English at an appropriate level of complexity. There may be a **few minor errors** in mechanics, grammar, and usage, but **meaning is clear**. | The student response to the prompt demonstrates **some command** of the conventions of standard English at an appropriate level of complexity. There **may be errors** in mechanics, grammar, and usage that **occasionally impede understanding**, but the **meaning is generally clear**. | The student response to the prompt demonstrates **limited command** of the conventions of standard English at an appropriate level of complexity. There **may be errors** in mechanics, grammar, and usage that **often impede understanding**. | The student response to the prompt **does not demonstrate command** of the conventions of standard English at the appropriate level of complexity. **Frequent and varied errors** in mechanics, grammar, and usage **impede understanding**. |

NOTE:
- The reading dimension is not scored for elicited narrative stories.
- Per the CCSS, narrative elements in grades 3-5 may include: establishing a situation; organizing a logical event sequence; describing scenes, objects, or people; developing characters' personalities; and using dialogue as appropriate.
- The elements of organization to be assessed are expressed in the grade-level standards W1-W3.

**Developed collaboratively with PARCC.**

# Grades 6 through 8

## CMAS Scoring Rubric for Prose Constructed Response Items

**COLORADO**
**Department of Education**

### Research Simulation Task (RST) and Literary Analysis Task (LAT)

| Construct Measured | Score Point 4 | Score Point 3 | Score Point 2 | Score Point 1 | Score Point 0 |
|---|---|---|---|---|---|
| **Reading Comprehension and Written Expression** | The student response <br><br>• demonstrates **full** comprehension of ideas stated explicitly and inferentially by providing an **accurate** analysis;<br>• addresses the prompt and provides **effective and comprehensive** development of the claim or topic that is **consistently appropriate** to task, purpose, and audience;<br>• uses **clear** reasoning supported by **relevant** text-based evidence in the development of the claim or topic;<br>• is **effectively** organized with **clear and coherent** writing;<br>• establishes and maintains an **effective** style. | The student response <br><br>• demonstrates comprehension of ideas stated explicitly and/or inferentially by providing a **mostly accurate** analysis;<br>• addresses the prompt and provides **mostly effective** development of claim or topic that is **mostly appropriate** to task, purpose, and audience;<br>• uses **mostly clear** reasoning supported by **relevant** text-based evidence in the development of the claim or topic;<br>• is organized with **mostly clear and coherent** writing;<br>• establishes and maintains a **mostly effective** style. | The student response <br><br>• demonstrates **basic** comprehension of ideas stated explicitly and/or inferentially by providing a **generally accurate** analysis;<br>• addresses the prompt and provides **some** development of claim or topic that is **somewhat appropriate** to task, purpose, and audience;<br>• uses **some** reasoning and text-based evidence in the development of the claim or topic;<br>• demonstrates **some** organization with **somewhat** coherent writing;<br>• has a style that is **somewhat** effective. | The student response <br><br>• demonstrates **limited** comprehension of ideas stated explicitly and/or inferentially by providing a **minimally accurate** analysis;<br>• addresses the prompt and provides **minimal** development of claim or topic that is **limited in its appropriateness** to task, purpose, and audience;<br>• uses **limited** reasoning and text-based evidence;<br>• demonstrates **limited** organization and coherence;<br>• has a style that is **minimally** effective. | The student response <br><br>• demonstrates **no** comprehension of ideas by providing an **inaccurate or no** analysis;<br>• is **undeveloped and/or inappropriate** to task, purpose, and audience;<br>• includes **little to no** text-based evidence;<br>• **lacks** organization and coherence;<br>• has an **inappropriate** style. |
| **Knowledge of Language and Conventions** | | The student response to the prompt demonstrates **full command** of the conventions of standard English at an appropriate level of complexity. There **may be a few minor errors** in mechanics, grammar, and usage, but **meaning is clear.** | The student response to the prompt demonstrates **some command** of the conventions of standard English at an appropriate level of complexity. There **may be errors** in mechanics, grammar, and usage that **occasionally impede understanding**, but the **meaning is generally clear.** | The student response to the prompt demonstrates **limited command** of the conventions of standard English at an appropriate level of complexity. There **may be errors** in mechanics, grammar, and usage that **often impede understanding.** | The student response to the prompt **does not demonstrate command** of the conventions of standard English at the appropriate level of complexity. **Frequent and varied errors** in mechanics, grammar, and usage **impede understanding.** |

Grades 6 through 8 CMAS Scoring Rubric for Prose Constructed Response Items
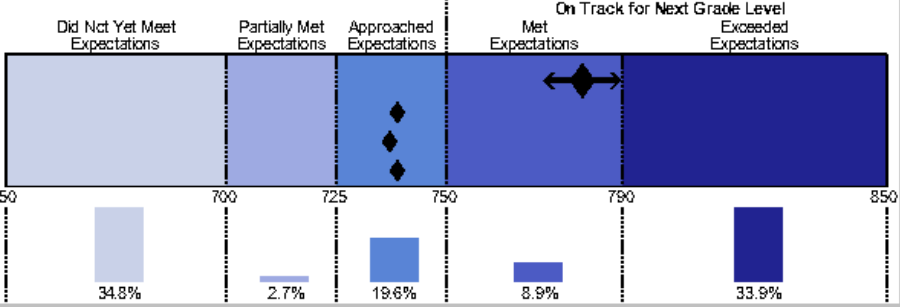
## Narrative Task (NT)

| Construct Measured | Score Point 4 | Score Point 3 | Score Point 2 | Score Point 1 | Score Point 0 |
|---|---|---|---|---|---|
| Written Expression | The student response<br><br>• is **effectively** developed with narrative elements and is **consistently appropriate** to the task;<br>• is **effectively** organized with **clear and coherent** writing<br>• establishes and maintains an **effective** style. | The student response<br><br>• is **mostly effectively** developed with narrative elements and is **mostly appropriate** to the task;<br>• is organized with **mostly clear and coherent** writing<br>• establishes and maintains a **mostly effective** style. | The student response<br><br>• is developed with **some** narrative elements and is **generally appropriate** to the task;<br>• demonstrates **some** organization with **somewhat coherent** writing;<br>• has a style that is **somewhat** effective. | The student response<br><br>• is **minimally** developed with **few** narrative elements and is **limited in its appropriateness** to the task;<br>• demonstrates **limited** organization and coherence;<br>• has a style that has **limited** effectiveness. | The student response<br><br>• is **undeveloped and/or inappropriate** to the task;<br>• **lacks** organization and coherence;<br>• has an **inappropriate** style. |
| Knowledge of Language and Conventions | | The student response to the prompt demonstrates **full command** of the conventions of standard English at an appropriate level of complexity. There may be a **few minor errors** in mechanics, grammar, and usage, but **meaning is clear**. | The student response to the prompt demonstrates **some command** of the conventions of standard English at an appropriate level of complexity. There **may** be errors in mechanics, grammar, and usage that **occasionally impede understanding**, but the **meaning is generally clear**. | The student response to the prompt demonstrates **limited command** of the conventions of standard English at an appropriate level of complexity. There **may** be errors in mechanics, grammar, and usage that **often impede understanding**. | The student response to the prompt **does not demonstrate command** of the conventions of standard English at the appropriate level of complexity. **Frequent and varied errors** in mechanics, grammar, and usage **impede understanding**. |

**NOTE:**
- The reading dimension is not scored for elicited narrative stories.
- The elements of coherence, clarity, and cohesion to be assessed are expressed in the grade-level standards 1-4 for writing.
- Tone is not assessed in grade 6.
- Per the CCSS, narrative elements in grades 3-5 may include: establishing a situation; organizing a logical event sequence; describing scenes, objects, or people; developing characters' personalities; and using dialogue as appropriate. In grades 6-8, narrative elements may include, in addition to the grades 3-5 elements: establishing a context, situating events in a time and place, developing a point of view, and developing characters' motives. The elements to be assessed are expressed in grade-level standards 3 for writing.

**Developed collaboratively with PARCC.**

# Appendix D: Sample Student Performance Reports

**Confidential Student Performance Report**

**Colorado Measures of Academic Success**

Student: **FIRSTNAME M. (PREFERRED) LASTNAME**

SASID: 9999999999     Birthdate: MM/DD/YYYY
School: ELEMENTARY SCHOOL (9999)
District: DISTRICT NAME (9999)

**Spring 2023**

## Mathematics          Grade 3

CMAS is the only assessment given to all Colorado students that measures what students should know and be able to do at the end of each grade. This report describes your student's understanding of Colorado's grade 3 Mathematics expectations. Scan the QR code at the bottom of this page to see a video that will talk you through your student's report.

**Your student's performance is shown as:**
- A scale score: A numerical score based on Colorado's grade 3 Mathematics expectations
- A performance level: Your student's performance level is described at the bottom of this page
- A percentile: How your student performed in comparison to other Colorado students

**Consider as you review this report:**
- Arrows around your student's diamond show where your student may have scored if the assessment was taken multiple times.
- Make school, district, and state comparisons with caution if participation is low.
- Talk with your student's teacher about your student's progress in Mathematics.

**Your Student's Score**

**781**

**Met Expectations**

**62nd Percentile**

School Participation: 64.2%
District Participation: 64.8%
State Participation: 73.7%

| | Did Not Yet Meet Expectations | Partially Met Expectations | Approached Expectations | Met Expectations | Exceeded Expectations |
|---|---|---|---|---|---|

On Track for Next Grade Level

Student
School: 739
District: 737
State: 739

Scale: 650 — 700 — 725 — 750 — 790 — 850

CO Students by Performance Level (%): 34.8% | 2.7% | 19.6% | 8.9% | 33.9%

## Performance Level Description* - Met Expectations

PREFERRED **Met Expectations** and is on track for the next grade level. Students in this level typically demonstrate the following:

**3**

**Major, Additional & Supporting Content**
- Determine unknown numbers in problems with one factor greater than or equal to 5.
- Justify comparisons of two fractions with the same numerator or denominator with a visual model. Demonstrate understanding of the quantity $a/b$ on a number line and its relationship to $1/b$.
- Solve one-step and two-step word problems involving addition or subtraction of time intervals. Measure and estimate liquid volumes and masses using any of the four operations. Solve one-step word problems using estimated measurements. Represent data on a scaled picture graph, a scaled bar graph, or a line plot with appropriate units.
- Represent area of a plane figure as square units. Solve mathematical problems with unknown side lengths in perimeters of polygons. Understand properties of quadrilaterals and subcategories and draw examples of quadrilaterals with stated attributes

**Expressing Mathematical Reasoning**
- Communicate reasoning with no calculation errors. Interpret and critique the reasoning of others. Use precision in grade-appropriate communication.

**Modeling & Application**
- Use approximations to apply mathematics to a real-world situation. Analyze relationships between values to draw conclusions. Create a model by selecting appropriate tools, then improve the model based upon results.

Performance level descriptors (PLDs) are organized in a manner that assumes students demonstrating higher levels of command have mastered the concepts and skills within lower levels. To view a video report and the full version of the performance level descriptor, visit https://coassessments.com/parentsandguardians or access the QR code.

*Adapted from illClassroom in Action's Performance Level Summaries

**Watch a video about this report!**

Information about the Colorado Academic Standards measured by this assessment:
**http://www.cde.state.co.us/comath/statestandards.**

Page 1 of 2      06062023-Z9999999-0130-0016 - 0000000

FIRSTNAME M. {PREFERRED} LASTNAME
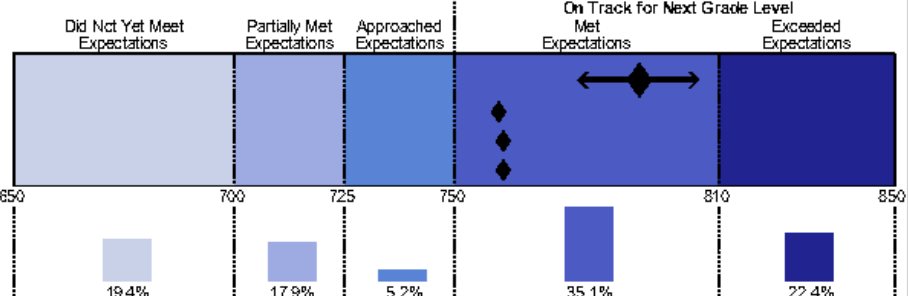
## Mathematics                                                     Confidential

**Subclaim Performance**

- ▢ The top bar in each of the other graphs shows the percent of points your student earned for each of the four mathematics assessment subclaims.
- ▭ District Averages are provided for comparison.
- ▬ State Averages are provided for comparison.
- | Average of students at the Met Expectations performance level starting point.

| | Points Possible | Percent of Points Earned* |
|---|---|---|
| **Mathematics** - Refer to page 1 for participation rates. | | |
| **Major Content** <br> Students solve problems involving multiplication and division, area, measurement, and basic fraction understanding. | 22 | 100% |
| **Additional & Supporting Content** <br> Students solve problems involving perimeter, place value, geometric shapes, and representations of data. | 9 | 100% |
| **Expressing Mathematical Reasoning** <br> Students create and justify logical mathematical solutions and analyze and correct the reasoning of others. | 11 | 9% |
| **Modeling & Application** <br> Students solve real-world problems, represent and solve problems with symbols, reason quantitatively, and strategically use appropriate tools. | 9 | 33% |

*Percent of points earned cannot be compared across years because individual items change from year to year. They also cannot be compared across subclaims because the number of items and the difficulty of items may not be the same.

For information about the CMAS assessment program, visit
http://www.cde.state.co.us/assessment/cmas.

Page 2 of 2

**Confidential Student Performance Report**

**Colorado Measures of Academic Success**

Student: FIRSTNAME M. LASTNAME

SASID: 999999999     Birthdate: MM/DD/YYYY
School: ELEMENTARY SCHOOL (9999)
District: DISTRICT NAME (9999)

**Spring 2023**

## English Language Arts/Literacy

**Grade 3**

CMAS is the only assessment given to all Colorado students that measures what students should know and be able to do at the end of each grade. This report describes your student's understanding of Colorado's grade 3 English Language Arts/Literacy expectations. Scan the QR code at the bottom of this page to see a video that will talk you through your student's report.

**Your student's performance is shown as:**

- A scale score: A numerical score based on Colorado's grade 3 English Language Arts/Literacy expectations
- A performance level: Your student's performance level is described at the bottom of this page
- A percentile: How your student performed in comparison to other Colorado students

**Consider as you review this report:**

- Arrows around your student's diamond show where your student may have scored if the assessment was taken multiple times.
- Make school, district, and state comparisons with caution if participation is low.
- Talk with your student's teacher about your student's progress in English Language Arts/Literacy.

Your Student's Score

**792**

**Met Expectations**

**66th Percentile**

School Participation:     81.5%
District Participation:    81.8%
State Participation:       88.2%

Student
School: 760
District: 761
State: 761

Did Not Yet Meet Expectations | Partially Met Expectations | Approached Expectations | On Track for Next Grade Level Met Expectations | Exceeded Expectations

650    700    725    750    810    850

CO Students by Performance Level (%):   19.4%   17.9%   5.2%   35.1%   22.4%

## Performance Level Description - Met Expectations

**3** FIRSTNAME **Met Expectations** and is on track for the next grade level. Students in this level typically demonstrate the following:

**Reading**

- With very complex text: the ability to be generally accurate when asking and/or answering questions, showing general understanding of the text when referring to explicit details and examples in the text.
- With moderately complex text: the ability to be generally accurate when asking and/or answering questions, showing general understanding of the text when referring to explicit details and examples in the text.
- With readily accessible text: the ability to be mostly accurate when asking and/or answering questions, showing understanding of the text when referring to explicit details and examples in the text.

**Writing**

**Written Expression:** students typically address the prompts and provide development of ideas, including when drawing evidence from multiple sources, while in the majority of instances demonstrating purposeful and mostly controlled organization. Students typically:

- Develop the topic and/or narrative elements using reasoning, details, text-based evidence, and/or description.
- Develop topic and/or narrative elements in a manner that is mostly appropriate to the task and purpose.
- Demonstrate purposeful organization that is mostly controlled and may include an introduction and/or conclusion.
- Use linking words and phrases, descriptive words, and/or temporal words to express ideas with clarity.

**Knowledge and use of Language and Conventions:** students typically demonstrate command of the conventions of Standard English consistent with edited writing. There are errors in grammar and usage that may occasionally impede understanding.

To view a video report and the full version of the performance level descriptor, visit https://coassessments.com/parentsandguardians or access the QR code.

**Watch a video about this report!**

Information about the Colorado Academic Standards measured by this assessment:
http://www.cde.state.co.us/coreadingwriting/statestandards.

Page 1 of 2

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**COPVABCFN S. COABCPVLNME**

## English Language Arts/Literacy

**Confidential**

### Subclaim Performance

◆◆➔ The top diamond in the figure below shows your student's performance in Reading.

▭ The top bar in each of the other graphs shows the percent of points your student earned for writing and specific areas of reading and writing.

▭ District Averages are provided for comparison.

▬ State Averages are provided for comparison.

| Average of students at the Met Expectations performance level starting point.

---

**Reading** - Refer to page 1 for participation rates.

The figure below shows your student's scale score in relation to school, district, and state averages.

**Reading Scale Score**

| | | 110 130 150 170 190 |
|---|---|---|
| Student | 184 | |
| School | 152 | |
| District | 152 | |
| State | 151 | |

| | Points Possible | Percent of Points Earned* |
|---|---|---|
| | | 0%  25%  50%  75%  100% |
| **Literary Text** | 17 | 82% |
| Students read and analyze fiction, drama, and poetry. | | |
| **Informational Text** | 14 | 100% |
| Students read and analyze nonfiction, history, science, and the arts. | | |
| **Vocabulary** | 10 | 100% |
| Students use context to determine what words and phrases mean. | | |

| | Points Possible | Percent of Points Earned* |
|---|---|---|
| | | 0%  25%  50%  75%  100% |
| **Writing** - Refer to page 1 for participation rates. | | |
| **Overall** | 24 | 0% |
| Writing Overall is calculated by multiplying Written Expression points by three and adding Language and Conventions points. | | |
| **Written Expression** | 6 | 0% |
| Students compose well-developed writing using details from what they have read. | | |
| **Language and Conventions** | 6 | 0% |
| Students demonstrate knowledge of conventions and other important elements of language. | | |

*Percent of points earned cannot be compared across years because individual items change from year to year. They also cannot be compared across subclaims because the number of items and the difficulty of items may not be the same.

For information about the CMAS assessment program, visit
http://www.cde.state.co.us/assessment/cmas.

Page 2 of 2

**Colorado Measures of Academic Success**
Based on the 2020 Colorado Academic Standards

Student: **FIRSTNAME M. LASTNAME**

SASID: 9999999999    Birthdate: MM/DD/YYYY
School: ELEMENTARY SCHOOL (9999)
District: DISTRICT NAME (9999)

**Confidential Student Performance Report**

**Spring 2023**

## Science                                                          Grade 5

CMAS is the only assessment given to all Colorado students that measures what students should know and be able to do at the end of each grade. This report describes your student's understanding of Colorado's grade 5 science expectations. Scan the QR code at the bottom of this page to see a video that will talk you through your student's report.

Your student's performance is shown as:

- A scale score: A numerical score based on Colorado's grade 5 science expectations
- A performance level: Your student's performance level is described at the bottom of this page
- A percentile: How your student performed in comparison to other Colorado students

Consider as you review this report:

- Arrows around your student's diamond show where your student may have scored if the assessment was taken multiple times.
- Make school, district, and state comparisons with caution if participation is low.
- Talk with your student's teacher about your student's progress in science.

Your Student's Score

**784**

**Met Expectations**

**70th Percentile**

School Participation: 94.4%
District Participation: 94.6%
State Participation: 89.8%

Student
School: 719
District: 722
State: 723

Partially Met Expectations | Approached Expectations | Met Expectations | Exceeded Expectations

650 | 725 | 750 | 789 | 850

CO Students by Performance Level(%): 53.9% | 4.3% | 22.6% | 19.1%

## Performance Level Description - Met Expectations

FIRSTNAME showed a strong understanding of the Colorado Academic Standards' grade 5 science expectations and is ready for the next grade level. Students in the Met Expectations level typically:

- Describe matter (particles too small to be seen) as always conserved, and mixing can result in new substances.
- Make observations and measurements of properties used to identify materials.
- Describe evidence that demonstrates Earth's gravity as the cause of objects being pulled down toward its center.
- Demonstrate that all energy in food on Earth was once energy from the Sun.
- Explain matter and energy cycles in an ecosystem, and explain that plants get materials to grow from air and water.
- Describe that a star's distance from Earth affects its apparent brightness.
- Demonstrate patterns caused by Earth's orbit and rotation and the orbit of the Moon around Earth.
- Model the interactions between Earth's major systems and their impact on shaping Earth's surface.
- Describe the relative proportions of salt water and fresh water in different reservoirs on Earth.
- Communicate ways that communities use scientific ideas to protect Earth's environment and resources.

To view a video report and the full version of the performance level descriptor, visit https://coassessments.com/parentsandguardians/ or access the QR code.

**Watch a video about this report!**

Information about the Colorado Academic Standards measured by this assessment:
http://www.cde.state.co.us/coscience/statestandards.

Page 1 of 2                          06062023-Z9999999-0130-0016 - 0000000

**FIRSTNAME M. LASTNAME**

## Science

**Confidential**

### Subscale Performance
- The shaded areas below represent about 70% of student scores across the state.
- Diamonds outside of the shaded area indicate a potential weakness or strength compared to the state.

| Average of students at the Met Expectations performance level starting point.

| Reporting Category Description | Subscale Score | | 400 | Lower than Average | Average | Higher than Average | 550 |
|---|---|---|---|---|---|---|---|
| **Physical Science** | | | | | 450 | 500 | |
| Common properties, forms, and changes in matter and energy | 519 460 463 464 | Student School District State | | | | ◇ | |
| **Physical/Life Science** | | | | | 448 | 498 | |
| Characteristics of living things, processes of life, and how living things interact with each other and their environment | 538 457 461 461 | Student School District State | | | | ◇ | |
| **Earth and Space Science** | | | | | 452 | 500 | |
| Processes and interactions of Earth's systems, and the structure and dynamics of Earth and other objects in space | 550 458 461 463 | Student School District State | | | | ◇ | |
| **Science and Engineering Practices** | | | | | 453 | 502 | |
| Making sense of the natural world through investigation and problem solving | 544 459 463 464 | Student School District State | | | | ◇ | |

### Performance by Prepared Graduate Statements (PGs) and Grade Level Expectations (GLEs)
- PGs and GLEs identify what students need to master to be ready for the next grade level.
- The figure below shows the percent of points your student earned for each grade 5 science GLE.

Legend:
- Student's performance
- District average
- State average

| Standard, PG and GLE | Points Possible | Percent of Points Earned* 0% 25% 50% 75% 100% |
|---|---|---|
| **Physical Science** | | |
| PG 1: Structure, properties, and interactions of matter | | |
| GLE 1: Matter exists as particles too small to be seen; Properties can be used to identify materials | 6 | 67% |
| GLE 2: Chemical reactions and the Law of Conservation of Mass | 6 | 67% |
| GLE 3: Gravity | 6 | 50% |
| **Physical/Life Science** | | |
| PG 1: Structure, properties, and interactions of matter | | |
| GLE 4: Energy from food was once energy from the sun | | |
| PG 6: How living systems interact with the environment | 6 | 100% |
| GLE 2: Plants get most of their material for growth from air and water | | |
| PG 6: How living systems interact with the environment | | |
| GLE 1: Matter cycles between air and soil; Organisms live and die | 6 | 50% |
| **Earth and Space Science** | | |
| PG 9: The universe and Earth's place in it | | |
| GLE 1: Earth's major systems interact in multiple ways | 8 | 88% |
| GLE 2: Interactions between Earth's orbit and the moon's orbit | | |
| PG 10: How and why Earth is constantly changing | | |
| GLE 3: Earth's major systems interact in multiple ways | | |
| GLE 4: Earth's major water is in the ocean and much of Earth's freshwater is in glaciers or underground | 7 | 100% |
| GLE 5: Societal activities have major effects on land, ocean, atmosphere and even outer space | 6 | 83% |

*Percent of points earned cannot be compared across years because individual items change from year to year. They also cannot be compared across PGs because the number of items and the difficulty of items may not be the same.

Page 2 of 2

# Appendix E: Student Participation by Demographic Group

**Table E.1. Student Participation N-Count Demographic Distribution—Mathematics**

| Subgroup | Grade 3 | Grade 4 | Grade 5 | Grade 6 | Grade 7 | Grade 8 |
|---|---|---|---|---|---|---|
| No IEP | 49,964 | 49,488 | 49,824 | 49,244 | 48,095 | 46,428 |
| IEP | 7,418 | 7,301 | 7,072 | 6,669 | 6,053 | 5,608 |
| No Accommodation | 53,110 | 51,979 | 52,062 | 51,042 | 49,474 | 47,522 |
| Accommodation | 4,272 | 4,810 | 4,834 | 4,871 | 4,674 | 4,514 |
| Am. Indian/Alaska Native | 354 | 360 | 358 | 342 | 351 | 361 |
| Asian | 1,982 | 2,061 | 1,976 | 1,970 | 1,737 | 1,700 |
| Black | 2,646 | 2,617 | 2,508 | 2,412 | 2,349 | 2,285 |
| Hispanic | 19,134 | 19,426 | 19,695 | 19,778 | 19,719 | 19,525 |
| White | 29,847 | 29,091 | 29,224 | 28,353 | 27,182 | 25,671 |
| Hawaiian/Pacific Islander | 191 | 191 | 202 | 192 | 161 | 155 |
| Two or More Races | 3,225 | 3,040 | 2,930 | 2,862 | 2,640 | 2,333 |
| Missing | * | * | * | * | * | * |
| No Economic Disadvantage | 22,504 | 22,021 | 21,945 | 21,173 | 20,649 | 19,955 |
| Economic Disadvantage | 34,878 | 34,768 | 34,951 | 34,740 | 33,499 | 32,081 |
| Female | 28,318 | 27,931 | 27,700 | 27,266 | 26,065 | 24,738 |
| Male | 29,064 | 28,858 | 29,196 | 28,647 | 28,083 | 27,298 |
| Language Proficiency NA | 47,355 | 46,522 | 46,354 | 45,451 | 44,035 | 42,810 |
| Language Proficiency NEP | 2,969 | 2,387 | 1,456 | 1,364 | 1,470 | 1,433 |
| Language Proficiency LEP | 5,985 | 5,674 | 5,196 | 4,066 | 4,000 | 3,637 |
| Language Proficiency FEP | 1,073 | 2,206 | 3,890 | 5,032 | 4,643 | 4,156 |
| Not Migrant | 57,188 | 56,583 | 56,696 | 55,735 | 53,973 | 51,865 |
| Migrant | 194 | 206 | 200 | 178 | 175 | 171 |

*n-count less than 16

**Table E.2. Student Participation N-Count Demographic Distribution—ELA**

| Subgroup | Grade 3 | Grade 4 | Grade 5 | Grade 6 | Grade 7 | Grade 8 |
|---|---|---|---|---|---|---|
| No IEP | 48,525 | 48,349 | 49,580 | 48,929 | 47,822 | 46,148 |
| IEP | 7,212 | 7,170 | 7,077 | 6,673 | 6,073 | 5,612 |
| No Accommodation | 51,771 | 50,988 | 51,842 | 50,912 | 49,420 | 47,482 |
| Accommodation | 3,966 | 4,531 | 4,815 | 4,690 | 4,475 | 4,278 |
| Am. Indian/Alaska Native | 352 | 361 | 362 | 345 | 349 | 358 |
| Asian | 1,945 | 2,033 | 1,954 | 1,937 | 1,721 | 1,672 |
| Black | 2,644 | 2,621 | 2,504 | 2,397 | 2,349 | 2,268 |
| Hispanic | 17,620 | 18,202 | 19,484 | 19,559 | 19,487 | 19,315 |
| White | 29,752 | 29,056 | 29,208 | 28,323 | 27,185 | 25,646 |
| Hawaiian/Pacific Islander | 184 | 193 | 201 | 191 | 158 | 155 |
| Two or More Races | 3,237 | 3,050 | 2,941 | 2,846 | 2,637 | 2,340 |
| Missing | * | * | * | * | * | * |
| No Economic Disadvantage | 34,560 | 34,522 | 34,895 | 34,649 | 33,423 | 32,002 |
| Economic Disadvantage | 21,177 | 20,997 | 21,762 | 20,953 | 20,472 | 19,758 |
| Female | 27,479 | 27,290 | 27,614 | 27,126 | 25,982 | 24,638 |
| Male | 28,258 | 28,229 | 29,043 | 28,476 | 27,913 | 27,122 |
| Language Proficiency NA | 47,322 | 46,561 | 46,414 | 45,433 | 44,086 | 42,820 |
| Language Proficiency NEP | 2,050 | 1,647 | 1,159 | 1,067 | 1,167 | 1,168 |
| Language Proficiency LEP | 5,293 | 5,101 | 5,185 | 4,060 | 3,992 | 3,632 |
| Language Proficiency FEP | 1,072 | 2,210 | 3,899 | 5,042 | 4,650 | 4,140 |
| Not Migrant | 55,564 | 55,337 | 56,468 | 55,431 | 53,731 | 51,594 |
| Migrant | 173 | 182 | 189 | 171 | 164 | 166 |

*n-count less than 16

**Table E.3. Student Participation N-Count Demographic Distribution—CSLA**

| Subgroup | Grade 3 | Grade 4 |
|---|---|---|
| No IEP | 1,298 | 1,070 |
| IEP | 142 | 110 |
| No Accommodation | 1,239 | 976 |
| Accommodation | 201 | 204 |
| Am. Indian/Alaska Native | * | * |
| Asian | * | * |
| Black | * | * |
| Hispanic | 1,430 | 1,170 |
| White | * | * |
| Hawaiian/Pacific Islander | * | * |
| Two or More Races | * | * |
| Missing | * | * |
| No Economic Disadvantage | 241 | 191 |
| Economic Disadvantage | 1,199 | 989 |
| Female | 758 | 604 |
| Male | 682 | 576 |
| Language Proficiency NA | * | * |
| Language Proficiency NEP | 747 | 604 |
| Language Proficiency LEP | 693 | 576 |
| Language Proficiency FEP | * | * |
| Not Migrant | 1,426 | 1,163 |
| Migrant | * | 17 |

*n-count less than 16

**Table E.4. Student Participation N-Count Demographic Distribution—Science**

| Subgroup | Grade 5 | Grade 8 | Grade 11 |
|---|---|---|---|
| No IEP | 49,442 | 45,490 | 28,972 |
| IEP | 6,986 | 5,457 | 2,795 |
| No Accommodation | 52,265 | 47,278 | 29,510 |
| Accommodation | 4,163 | 3,669 | 2,257 |
| Am. Indian/Alaska Native | 359 | 352 | 223 |
| Asian | 1,967 | 1,671 | 969 |
| Black | 2,481 | 2,199 | 1,399 |
| Hispanic | 19,509 | 19,164 | 13,088 |
| White | 29,002 | 25,117 | 14,679 |
| Hawaiian/Pacific Islander | 201 | 153 | 93 |
| Two or More Races | 2,906 | 2,286 | 1,309 |
| Missing | * | * | * |
| No Economic Disadvantage | 34,695 | 31,412 | 20,014 |
| Economic Disadvantage | 21,733 | 19,535 | 11,753 |
| Female | 27,472 | 24,168 | 14,935 |
| Male | 28,956 | 26,779 | 16,832 |
| Language Proficiency NA | 45,968 | 41,893 | 27,032 |
| Language Proficiency NEP | 1,433 | 1,397 | 814 |
| Language Proficiency LEP | 5,151 | 3,568 | 1,985 |
| Language Proficiency FEP | 3,876 | 4,089 | 1,936 |
| Not Migrant | 56,232 | 50,777 | 31,674 |
| Migrant | 196 | 170 | 93 |

*n-count less than 16

# Appendix F: Scale Score Distributions

**Table F.1. Scale Score Distribution—Mathematics Grade 3**

| SS | Freq. | % | Cum. Freq. | Cum. % | SS | Freq. | % | Cum. Freq. | Cum. % |
|---|---|---|---|---|---|---|---|---|---|
| 650 | 845 | 1.47 | 845 | 1.47 | 698 | 384 | 0.67 | 9844 | 17.16 |
| 651 | 51 | 0.09 | 896 | 1.56 | 699 | 349 | 0.61 | 10193 | 17.76 |
| 652 | 83 | 0.14 | 979 | 1.71 | 700 | 358 | 0.62 | 10551 | 18.39 |
| 653 | 70 | 0.12 | 1049 | 1.83 | 701 | 381 | 0.66 | 10932 | 19.05 |
| 654 | 50 | 0.09 | 1099 | 1.92 | 702 | 357 | 0.62 | 11289 | 19.67 |
| 655 | 61 | 0.11 | 1160 | 2.02 | 703 | 393 | 0.68 | 11682 | 20.36 |
| 656 | 75 | 0.13 | 1235 | 2.15 | 704 | 395 | 0.69 | 12077 | 21.05 |
| 657 | 54 | 0.09 | 1289 | 2.25 | 705 | 366 | 0.64 | 12443 | 21.68 |
| 658 | 86 | 0.15 | 1375 | 2.40 | 706 | 411 | 0.72 | 12854 | 22.40 |
| 659 | 113 | 0.20 | 1488 | 2.59 | 707 | 399 | 0.70 | 13253 | 23.10 |
| 660 | 107 | 0.19 | 1595 | 2.78 | 708 | 400 | 0.70 | 13653 | 23.79 |
| 661 | 103 | 0.18 | 1698 | 2.96 | 709 | 451 | 0.79 | 14104 | 24.58 |
| 662 | 129 | 0.22 | 1827 | 3.18 | 710 | 401 | 0.70 | 14505 | 25.28 |
| 663 | 101 | 0.18 | 1928 | 3.36 | 711 | 418 | 0.73 | 14923 | 26.01 |
| 664 | 99 | 0.17 | 2027 | 3.53 | 712 | 442 | 0.77 | 15365 | 26.78 |
| 665 | 109 | 0.19 | 2136 | 3.72 | 713 | 392 | 0.68 | 15757 | 27.46 |
| 666 | 126 | 0.22 | 2262 | 3.94 | 714 | 426 | 0.74 | 16183 | 28.20 |
| 667 | 115 | 0.20 | 2377 | 4.14 | 715 | 440 | 0.77 | 16623 | 28.97 |
| 668 | 158 | 0.28 | 2535 | 4.42 | 716 | 444 | 0.77 | 17067 | 29.74 |
| 669 | 124 | 0.22 | 2659 | 4.63 | 717 | 465 | 0.81 | 17532 | 30.55 |
| 670 | 152 | 0.26 | 2811 | 4.90 | 718 | 467 | 0.81 | 17999 | 31.37 |
| 671 | 165 | 0.29 | 2976 | 5.19 | 719 | 498 | 0.87 | 18497 | 32.23 |
| 672 | 150 | 0.26 | 3126 | 5.45 | 720 | 465 | 0.81 | 18962 | 33.05 |
| 673 | 192 | 0.33 | 3318 | 5.78 | 721 | 462 | 0.81 | 19424 | 33.85 |
| 674 | 172 | 0.30 | 3490 | 6.08 | 722 | 476 | 0.83 | 19900 | 34.68 |
| 675 | 175 | 0.30 | 3665 | 6.39 | 723 | 513 | 0.89 | 20413 | 35.57 |
| 676 | 183 | 0.32 | 3848 | 6.71 | 724 | 466 | 0.81 | 20879 | 36.39 |
| 677 | 182 | 0.32 | 4030 | 7.02 | 725 | 516 | 0.90 | 21395 | 37.29 |
| 678 | 192 | 0.33 | 4222 | 7.36 | 726 | 477 | 0.83 | 21872 | 38.12 |
| 679 | 222 | 0.39 | 4444 | 7.74 | 727 | 495 | 0.86 | 22367 | 38.98 |
| 680 | 197 | 0.34 | 4641 | 8.09 | 728 | 540 | 0.94 | 22907 | 39.92 |
| 681 | 221 | 0.39 | 4862 | 8.47 | 729 | 534 | 0.93 | 23441 | 40.85 |
| 682 | 227 | 0.40 | 5089 | 8.87 | 730 | 494 | 0.86 | 23935 | 41.71 |
| 683 | 240 | 0.42 | 5329 | 9.29 | 731 | 508 | 0.89 | 24443 | 42.60 |
| 684 | 236 | 0.41 | 5565 | 9.70 | 732 | 548 | 0.96 | 24991 | 43.55 |
| 685 | 238 | 0.41 | 5803 | 10.11 | 733 | 480 | 0.84 | 25471 | 44.39 |
| 686 | 275 | 0.48 | 6078 | 10.59 | 734 | 560 | 0.98 | 26031 | 45.36 |
| 687 | 262 | 0.46 | 6340 | 11.05 | 735 | 574 | 1.00 | 26605 | 46.36 |
| 688 | 309 | 0.54 | 6649 | 11.59 | 736 | 520 | 0.91 | 27125 | 47.27 |
| 689 | 319 | 0.56 | 6968 | 12.14 | 737 | 529 | 0.92 | 27654 | 48.19 |
| 690 | 260 | 0.45 | 7228 | 12.60 | 738 | 531 | 0.93 | 28185 | 49.12 |
| 691 | 284 | 0.49 | 7512 | 13.09 | 739 | 584 | 1.02 | 28769 | 50.14 |
| 692 | 274 | 0.48 | 7786 | 13.57 | 740 | 547 | 0.95 | 29316 | 51.09 |
| 693 | 307 | 0.54 | 8093 | 14.10 | 741 | 558 | 0.97 | 29874 | 52.06 |
| 694 | 321 | 0.56 | 8414 | 14.66 | 742 | 543 | 0.95 | 30417 | 53.01 |
| 695 | 329 | 0.57 | 8743 | 15.24 | 743 | 565 | 0.98 | 30982 | 53.99 |
| 696 | 343 | 0.60 | 9086 | 15.83 | 744 | 523 | 0.91 | 31505 | 54.90 |
| 697 | 374 | 0.65 | 9460 | 16.49 | 745 | 584 | 1.02 | 32089 | 55.92 |

| SS | Freq. | % | Cum. Freq. | Cum. % |
|----|-------|-----|------------|--------|
| 746 | 567 | 0.99 | 32656 | 56.91 |
| 747 | 551 | 0.96 | 33207 | 57.87 |
| 748 | 498 | 0.87 | 33705 | 58.74 |
| 749 | 514 | 0.90 | 34219 | 59.63 |
| 750 | 546 | 0.95 | 34765 | 60.59 |
| 751 | 553 | 0.96 | 35318 | 61.55 |
| 752 | 528 | 0.92 | 35846 | 62.47 |
| 753 | 508 | 0.89 | 36354 | 63.35 |
| 754 | 545 | 0.95 | 36899 | 64.30 |
| 755 | 509 | 0.89 | 37408 | 65.19 |
| 756 | 522 | 0.91 | 37930 | 66.10 |
| 757 | 550 | 0.96 | 38480 | 67.06 |
| 758 | 543 | 0.95 | 39023 | 68.01 |
| 759 | 497 | 0.87 | 39520 | 68.87 |
| 760 | 533 | 0.93 | 40053 | 69.80 |
| 761 | 510 | 0.89 | 40563 | 70.69 |
| 762 | 496 | 0.86 | 41059 | 71.55 |
| 763 | 539 | 0.94 | 41598 | 72.49 |
| 764 | 468 | 0.82 | 42066 | 73.31 |
| 765 | 520 | 0.91 | 42586 | 74.21 |
| 766 | 480 | 0.84 | 43066 | 75.05 |
| 767 | 503 | 0.88 | 43569 | 75.93 |
| 768 | 479 | 0.83 | 44048 | 76.76 |
| 769 | 470 | 0.82 | 44518 | 77.58 |
| 770 | 451 | 0.79 | 44969 | 78.37 |
| 771 | 438 | 0.76 | 45407 | 79.13 |
| 772 | 454 | 0.79 | 45861 | 79.92 |
| 773 | 420 | 0.73 | 46281 | 80.65 |
| 774 | 398 | 0.69 | 46679 | 81.35 |
| 775 | 420 | 0.73 | 47099 | 82.08 |
| 776 | 398 | 0.69 | 47497 | 82.77 |
| 777 | 388 | 0.68 | 47885 | 83.45 |
| 778 | 392 | 0.68 | 48277 | 84.13 |
| 779 | 394 | 0.69 | 48671 | 84.82 |
| 780 | 383 | 0.67 | 49054 | 85.49 |
| 781 | 393 | 0.68 | 49447 | 86.17 |
| 782 | 384 | 0.67 | 49831 | 86.84 |
| 783 | 340 | 0.59 | 50171 | 87.43 |
| 784 | 355 | 0.62 | 50526 | 88.05 |
| 785 | 301 | 0.52 | 50827 | 88.58 |
| 786 | 327 | 0.57 | 51154 | 89.15 |
| 787 | 325 | 0.57 | 51479 | 89.71 |
| 788 | 280 | 0.49 | 51759 | 90.20 |
| 789 | 262 | 0.46 | 52021 | 90.66 |
| 790 | 266 | 0.46 | 52287 | 91.12 |
| 791 | 276 | 0.48 | 52563 | 91.60 |
| 792 | 247 | 0.43 | 52810 | 92.03 |
| 793 | 190 | 0.33 | 53000 | 92.36 |
| 794 | 235 | 0.41 | 53235 | 92.77 |
| 795 | 228 | 0.40 | 53463 | 93.17 |
| 796 | 201 | 0.35 | 53664 | 93.52 |
| 797 | 222 | 0.39 | 53886 | 93.91 |
| 798 | 151 | 0.26 | 54037 | 94.17 |
| 799 | 199 | 0.35 | 54236 | 94.52 |
| 800 | 187 | 0.33 | 54423 | 94.84 |

| SS | Freq. | % | Cum. Freq. | Cum. % |
|----|-------|-----|------------|--------|
| 801 | 194 | 0.34 | 54617 | 95.18 |
| 802 | 157 | 0.27 | 54774 | 95.46 |
| 803 | 108 | 0.19 | 54882 | 95.64 |
| 804 | 173 | 0.30 | 55055 | 95.94 |
| 805 | 120 | 0.21 | 55175 | 96.15 |
| 806 | 149 | 0.26 | 55324 | 96.41 |
| 807 | 110 | 0.19 | 55434 | 96.61 |
| 808 | 139 | 0.24 | 55573 | 96.85 |
| 809 | 112 | 0.20 | 55685 | 97.04 |
| 810 | 108 | 0.19 | 55793 | 97.23 |
| 811 | 72 | 0.13 | 55865 | 97.36 |
| 812 | 122 | 0.21 | 55987 | 97.57 |
| 813 | 85 | 0.15 | 56072 | 97.72 |
| 814 | 88 | 0.15 | 56160 | 97.87 |
| 815 | 50 | 0.09 | 56210 | 97.96 |
| 816 | 73 | 0.13 | 56283 | 98.08 |
| 817 | 80 | 0.14 | 56363 | 98.22 |
| 818 | 44 | 0.08 | 56407 | 98.30 |
| 819 | 78 | 0.14 | 56485 | 98.44 |
| 820 | 36 | 0.06 | 56521 | 98.50 |
| 821 | 55 | 0.10 | 56576 | 98.60 |
| 822 | 59 | 0.10 | 56635 | 98.70 |
| 823 | 40 | 0.07 | 56675 | 98.77 |
| 824 | 57 | 0.10 | 56732 | 98.87 |
| 825 | 37 | 0.06 | 56769 | 98.93 |
| 826 | 22 | 0.04 | 56791 | 98.97 |
| 827 | 38 | 0.07 | 56829 | 99.04 |
| 828 | 46 | 0.08 | 56875 | 99.12 |
| 829 | 19 | 0.03 | 56894 | 99.15 |
| 830 | 32 | 0.06 | 56926 | 99.21 |
| 831 | 37 | 0.06 | 56963 | 99.27 |
| 832 | 22 | 0.04 | 56985 | 99.31 |
| 833 | 24 | 0.04 | 57009 | 99.35 |
| 834 | 33 | 0.06 | 57042 | 99.41 |
| 835 | 30 | 0.05 | 57072 | 99.46 |
| 836 | 14 | 0.02 | 57086 | 99.48 |
| 837 | 9 | 0.02 | 57095 | 99.50 |
| 838 | 35 | 0.06 | 57130 | 99.56 |
| 839 | 27 | 0.05 | 57157 | 99.61 |
| 840 | 11 | 0.02 | 57168 | 99.63 |
| 841 | 5 | 0.01 | 57173 | 99.64 |
| 842 | 10 | 0.02 | 57183 | 99.65 |
| 843 | 10 | 0.02 | 57193 | 99.67 |
| 844 | 10 | 0.02 | 57203 | 99.69 |
| 845 | 9 | 0.02 | 57212 | 99.70 |
| 846 | 3 | 0.01 | 57215 | 99.71 |
| 847 | 8 | 0.01 | 57223 | 99.72 |
| 848 | 29 | 0.05 | 57252 | 99.77 |
| 849 | 9 | 0.02 | 57261 | 99.79 |
| 850 | 121 | 0.21 | 57382 | 100.00 |

**Table F.2. Scale Score Distribution—Mathematics Grade 4**

| SS | Freq. | % | Cum. Freq. | Cum. % | SS | Freq. | % | Cum. Freq. | Cum. % |
|----|-------|---|------------|--------|----|-------|---|------------|--------|
| 650 | 293 | 0.52 | 293 | 0.52 | 700 | 508 | 0.89 | 10377 | 18.27 |
| 651 | 37 | 0.07 | 330 | 0.58 | 701 | 528 | 0.93 | 10905 | 19.20 |
| 652 | 14 | 0.02 | 344 | 0.61 | 702 | 496 | 0.87 | 11401 | 20.08 |
| 653 | 2 | 0.00 | 346 | 0.61 | 703 | 540 | 0.95 | 11941 | 21.03 |
| 654 | 33 | 0.06 | 379 | 0.67 | 704 | 528 | 0.93 | 12469 | 21.96 |
| 655 | 33 | 0.06 | 412 | 0.73 | 705 | 524 | 0.92 | 12993 | 22.88 |
| 656 | 30 | 0.05 | 442 | 0.78 | 706 | 491 | 0.86 | 13484 | 23.74 |
| 657 | 24 | 0.04 | 466 | 0.82 | 707 | 465 | 0.82 | 13949 | 24.56 |
| 658 | 15 | 0.03 | 481 | 0.85 | 708 | 506 | 0.89 | 14455 | 25.45 |
| 659 | 27 | 0.05 | 508 | 0.89 | 709 | 508 | 0.89 | 14963 | 26.35 |
| 660 | 90 | 0.16 | 598 | 1.05 | 710 | 531 | 0.94 | 15494 | 27.28 |
| 661 | 31 | 0.05 | 629 | 1.11 | 711 | 512 | 0.90 | 16006 | 28.19 |
| 662 | 27 | 0.05 | 656 | 1.16 | 712 | 523 | 0.92 | 16529 | 29.11 |
| 663 | 92 | 0.16 | 748 | 1.32 | 713 | 572 | 1.01 | 17101 | 30.11 |
| 664 | 47 | 0.08 | 795 | 1.40 | 714 | 545 | 0.96 | 17646 | 31.07 |
| 665 | 56 | 0.10 | 851 | 1.50 | 715 | 514 | 0.91 | 18160 | 31.98 |
| 666 | 49 | 0.09 | 900 | 1.58 | 716 | 551 | 0.97 | 18711 | 32.95 |
| 667 | 74 | 0.13 | 974 | 1.72 | 717 | 560 | 0.99 | 19271 | 33.93 |
| 668 | 58 | 0.10 | 1032 | 1.82 | 718 | 559 | 0.98 | 19830 | 34.92 |
| 669 | 105 | 0.18 | 1137 | 2.00 | 719 | 551 | 0.97 | 20381 | 35.89 |
| 670 | 39 | 0.07 | 1176 | 2.07 | 720 | 570 | 1.00 | 20951 | 36.89 |
| 671 | 111 | 0.20 | 1287 | 2.27 | 721 | 564 | 0.99 | 21515 | 37.89 |
| 672 | 129 | 0.23 | 1416 | 2.49 | 722 | 581 | 1.02 | 22096 | 38.91 |
| 673 | 99 | 0.17 | 1515 | 2.67 | 723 | 552 | 0.97 | 22648 | 39.88 |
| 674 | 168 | 0.30 | 1683 | 2.96 | 724 | 555 | 0.98 | 23203 | 40.86 |
| 675 | 117 | 0.21 | 1800 | 3.17 | 725 | 593 | 1.04 | 23796 | 41.90 |
| 676 | 169 | 0.30 | 1969 | 3.47 | 726 | 562 | 0.99 | 24358 | 42.89 |
| 677 | 166 | 0.29 | 2135 | 3.76 | 727 | 548 | 0.96 | 24906 | 43.86 |
| 678 | 184 | 0.32 | 2319 | 4.08 | 728 | 556 | 0.98 | 25462 | 44.84 |
| 679 | 196 | 0.35 | 2515 | 4.43 | 729 | 546 | 0.96 | 26008 | 45.80 |
| 680 | 213 | 0.38 | 2728 | 4.80 | 730 | 594 | 1.05 | 26602 | 46.84 |
| 681 | 190 | 0.33 | 2918 | 5.14 | 731 | 591 | 1.04 | 27193 | 47.88 |
| 682 | 281 | 0.49 | 3199 | 5.63 | 732 | 614 | 1.08 | 27807 | 48.97 |
| 683 | 271 | 0.48 | 3470 | 6.11 | 733 | 614 | 1.08 | 28421 | 50.05 |
| 684 | 278 | 0.49 | 3748 | 6.60 | 734 | 607 | 1.07 | 29028 | 51.12 |
| 685 | 292 | 0.51 | 4040 | 7.11 | 735 | 642 | 1.13 | 29670 | 52.25 |
| 686 | 324 | 0.57 | 4364 | 7.68 | 736 | 609 | 1.07 | 30279 | 53.32 |
| 687 | 285 | 0.50 | 4649 | 8.19 | 737 | 621 | 1.09 | 30900 | 54.41 |
| 688 | 360 | 0.63 | 5009 | 8.82 | 738 | 574 | 1.01 | 31474 | 55.42 |
| 689 | 363 | 0.64 | 5372 | 9.46 | 739 | 641 | 1.13 | 32115 | 56.55 |
| 690 | 361 | 0.64 | 5733 | 10.10 | 740 | 639 | 1.13 | 32754 | 57.68 |
| 691 | 370 | 0.65 | 6103 | 10.75 | 741 | 602 | 1.06 | 33356 | 58.74 |
| 692 | 452 | 0.80 | 6555 | 11.54 | 742 | 557 | 0.98 | 33913 | 59.72 |
| 693 | 431 | 0.76 | 6986 | 12.30 | 743 | 629 | 1.11 | 34542 | 60.83 |
| 694 | 476 | 0.84 | 7462 | 13.14 | 744 | 604 | 1.06 | 35146 | 61.89 |
| 695 | 460 | 0.81 | 7922 | 13.95 | 745 | 581 | 1.02 | 35727 | 62.91 |
| 696 | 467 | 0.82 | 8389 | 14.77 | 746 | 627 | 1.10 | 36354 | 64.02 |
| 697 | 465 | 0.82 | 8854 | 15.59 | 747 | 623 | 1.10 | 36977 | 65.11 |
| 698 | 511 | 0.90 | 9365 | 16.49 | 748 | 628 | 1.11 | 37605 | 66.22 |
| 699 | 504 | 0.89 | 9869 | 17.38 | 749 | 625 | 1.10 | 38230 | 67.32 |

| SS | Freq. | % | Cum. Freq. | Cum. % | SS | Freq. | % | Cum. Freq. | Cum. % |
|---|---|---|---|---|---|---|---|---|---|
| 750 | 577 | 1.02 | 38807 | 68.34 | 801 | 82 | 0.14 | 55704 | 98.09 |
| 751 | 612 | 1.08 | 39419 | 69.41 | 802 | 73 | 0.13 | 55777 | 98.22 |
| 752 | 609 | 1.07 | 40028 | 70.49 | 803 | 77 | 0.14 | 55854 | 98.35 |
| 753 | 598 | 1.05 | 40626 | 71.54 | 804 | 66 | 0.12 | 55920 | 98.47 |
| 754 | 594 | 1.05 | 41220 | 72.58 | 805 | 57 | 0.10 | 55977 | 98.57 |
| 755 | 583 | 1.03 | 41803 | 73.61 | 806 | 57 | 0.10 | 56034 | 98.67 |
| 756 | 584 | 1.03 | 42387 | 74.64 | 807 | 50 | 0.09 | 56084 | 98.76 |
| 757 | 565 | 0.99 | 42952 | 75.63 | 808 | 58 | 0.10 | 56142 | 98.86 |
| 758 | 545 | 0.96 | 43497 | 76.59 | 809 | 43 | 0.08 | 56185 | 98.94 |
| 759 | 516 | 0.91 | 44013 | 77.50 | 810 | 34 | 0.06 | 56219 | 99.00 |
| 760 | 512 | 0.90 | 44525 | 78.40 | 811 | 44 | 0.08 | 56263 | 99.07 |
| 761 | 536 | 0.94 | 45061 | 79.35 | 812 | 30 | 0.05 | 56293 | 99.13 |
| 762 | 503 | 0.89 | 45564 | 80.23 | 813 | 30 | 0.05 | 56323 | 99.18 |
| 763 | 498 | 0.88 | 46062 | 81.11 | 814 | 33 | 0.06 | 56356 | 99.24 |
| 764 | 450 | 0.79 | 46512 | 81.90 | 815 | 20 | 0.04 | 56376 | 99.27 |
| 765 | 419 | 0.74 | 46931 | 82.64 | 816 | 19 | 0.03 | 56395 | 99.31 |
| 766 | 450 | 0.79 | 47381 | 83.43 | 817 | 28 | 0.05 | 56423 | 99.36 |
| 767 | 440 | 0.77 | 47821 | 84.21 | 818 | 25 | 0.04 | 56448 | 99.40 |
| 768 | 403 | 0.71 | 48224 | 84.92 | 819 | 16 | 0.03 | 56464 | 99.43 |
| 769 | 411 | 0.72 | 48635 | 85.64 | 820 | 19 | 0.03 | 56483 | 99.46 |
| 770 | 386 | 0.68 | 49021 | 86.32 | 821 | 12 | 0.02 | 56495 | 99.48 |
| 771 | 350 | 0.62 | 49371 | 86.94 | 822 | 24 | 0.04 | 56519 | 99.52 |
| 772 | 365 | 0.64 | 49736 | 87.58 | 823 | 7 | 0.01 | 56526 | 99.54 |
| 773 | 366 | 0.64 | 50102 | 88.22 | 824 | 12 | 0.02 | 56538 | 99.56 |
| 774 | 347 | 0.61 | 50449 | 88.84 | 825 | 21 | 0.04 | 56559 | 99.59 |
| 775 | 350 | 0.62 | 50799 | 89.45 | 826 | 12 | 0.02 | 56571 | 99.62 |
| 776 | 340 | 0.60 | 51139 | 90.05 | 827 | 10 | 0.02 | 56581 | 99.63 |
| 777 | 311 | 0.55 | 51450 | 90.60 | 828 | 9 | 0.02 | 56590 | 99.65 |
| 778 | 310 | 0.55 | 51760 | 91.14 | 829 | 7 | 0.01 | 56597 | 99.66 |
| 779 | 295 | 0.52 | 52055 | 91.66 | 830 | 3 | 0.01 | 56600 | 99.67 |
| 780 | 256 | 0.45 | 52311 | 92.11 | 831 | 7 | 0.01 | 56607 | 99.68 |
| 781 | 276 | 0.49 | 52587 | 92.60 | 832 | 11 | 0.02 | 56618 | 99.70 |
| 782 | 253 | 0.45 | 52840 | 93.05 | 833 | 8 | 0.01 | 56626 | 99.71 |
| 783 | 232 | 0.41 | 53072 | 93.45 | 834 | 17 | 0.03 | 56643 | 99.74 |
| 784 | 221 | 0.39 | 53293 | 93.84 | 835 | 3 | 0.01 | 56646 | 99.75 |
| 785 | 205 | 0.36 | 53498 | 94.20 | 836 | 7 | 0.01 | 56653 | 99.76 |
| 786 | 208 | 0.37 | 53706 | 94.57 | 837 | 3 | 0.01 | 56656 | 99.77 |
| 787 | 201 | 0.35 | 53907 | 94.93 | 838 | 4 | 0.01 | 56660 | 99.77 |
| 788 | 204 | 0.36 | 54111 | 95.28 | 839 | 16 | 0.03 | 56676 | 99.80 |
| 789 | 179 | 0.32 | 54290 | 95.60 | 840 | 1 | 0.00 | 56677 | 99.80 |
| 790 | 146 | 0.26 | 54436 | 95.86 | 842 | 14 | 0.02 | 56691 | 99.83 |
| 791 | 151 | 0.27 | 54587 | 96.12 | 844 | 2 | 0.00 | 56693 | 99.83 |
| 792 | 150 | 0.26 | 54737 | 96.39 | 846 | 1 | 0.00 | 56694 | 99.83 |
| 793 | 136 | 0.24 | 54873 | 96.63 | 847 | 5 | 0.01 | 56699 | 99.84 |
| 794 | 131 | 0.23 | 55004 | 96.86 | 849 | 5 | 0.01 | 56704 | 99.85 |
| 795 | 119 | 0.21 | 55123 | 97.07 | 850 | 85 | 0.15 | 56789 | 100.00 |
| 796 | 118 | 0.21 | 55241 | 97.27 | | | | | |
| 797 | 115 | 0.20 | 55356 | 97.48 | | | | | |
| 798 | 82 | 0.14 | 55438 | 97.62 | | | | | |
| 799 | 92 | 0.16 | 55530 | 97.78 | | | | | |
| 800 | 92 | 0.16 | 55622 | 97.95 | | | | | |

**Table F.3. Scale Score Distribution—Mathematics Grade 5**

| SS | Freq. | % | Cum. Freq. | Cum. % | SS | Freq. | % | Cum. Freq. | Cum. % |
|---|---|---|---|---|---|---|---|---|---|
| 650 | 218 | 0.38 | 218 | 0.38 | 700 | 442 | 0.78 | 9075 | 15.95 |
| 651 | 6 | 0.01 | 224 | 0.39 | 701 | 500 | 0.88 | 9575 | 16.83 |
| 652 | 27 | 0.05 | 251 | 0.44 | 702 | 513 | 0.90 | 10088 | 17.73 |
| 653 | 34 | 0.06 | 285 | 0.50 | 703 | 483 | 0.85 | 10571 | 18.58 |
| 654 | 35 | 0.06 | 320 | 0.56 | 704 | 516 | 0.91 | 11087 | 19.49 |
| 655 | 55 | 0.10 | 375 | 0.66 | 705 | 503 | 0.88 | 11590 | 20.37 |
| 656 | 49 | 0.09 | 424 | 0.75 | 706 | 512 | 0.90 | 12102 | 21.27 |
| 657 | 26 | 0.05 | 450 | 0.79 | 707 | 501 | 0.88 | 12603 | 22.15 |
| 658 | 33 | 0.06 | 483 | 0.85 | 708 | 528 | 0.93 | 13131 | 23.08 |
| 659 | 51 | 0.09 | 534 | 0.94 | 709 | 577 | 1.01 | 13708 | 24.09 |
| 660 | 13 | 0.02 | 547 | 0.96 | 710 | 528 | 0.93 | 14236 | 25.02 |
| 661 | 38 | 0.07 | 585 | 1.03 | 711 | 520 | 0.91 | 14756 | 25.94 |
| 662 | 27 | 0.05 | 612 | 1.08 | 712 | 531 | 0.93 | 15287 | 26.87 |
| 663 | 16 | 0.03 | 628 | 1.10 | 713 | 546 | 0.96 | 15833 | 27.83 |
| 664 | 45 | 0.08 | 673 | 1.18 | 714 | 558 | 0.98 | 16391 | 28.81 |
| 665 | 27 | 0.05 | 700 | 1.23 | 715 | 553 | 0.97 | 16944 | 29.78 |
| 666 | 64 | 0.11 | 764 | 1.34 | 716 | 544 | 0.96 | 17488 | 30.74 |
| 667 | 88 | 0.15 | 852 | 1.50 | 717 | 599 | 1.05 | 18087 | 31.79 |
| 668 | 55 | 0.10 | 907 | 1.59 | 718 | 526 | 0.92 | 18613 | 32.71 |
| 669 | 120 | 0.21 | 1027 | 1.81 | 719 | 546 | 0.96 | 19159 | 33.67 |
| 670 | 87 | 0.15 | 1114 | 1.96 | 720 | 601 | 1.06 | 19760 | 34.73 |
| 671 | 83 | 0.15 | 1197 | 2.10 | 721 | 558 | 0.98 | 20318 | 35.71 |
| 672 | 89 | 0.16 | 1286 | 2.26 | 722 | 562 | 0.99 | 20880 | 36.70 |
| 673 | 76 | 0.13 | 1362 | 2.39 | 723 | 554 | 0.97 | 21434 | 37.67 |
| 674 | 103 | 0.18 | 1465 | 2.57 | 724 | 561 | 0.99 | 21995 | 38.66 |
| 675 | 106 | 0.19 | 1571 | 2.76 | 725 | 571 | 1.00 | 22566 | 39.66 |
| 676 | 165 | 0.29 | 1736 | 3.05 | 726 | 557 | 0.98 | 23123 | 40.64 |
| 677 | 160 | 0.28 | 1896 | 3.33 | 727 | 562 | 0.99 | 23685 | 41.63 |
| 678 | 175 | 0.31 | 2071 | 3.64 | 728 | 590 | 1.04 | 24275 | 42.67 |
| 679 | 179 | 0.31 | 2250 | 3.95 | 729 | 589 | 1.04 | 24864 | 43.70 |
| 680 | 149 | 0.26 | 2399 | 4.22 | 730 | 598 | 1.05 | 25462 | 44.75 |
| 681 | 173 | 0.30 | 2572 | 4.52 | 731 | 599 | 1.05 | 26061 | 45.80 |
| 682 | 190 | 0.33 | 2762 | 4.85 | 732 | 572 | 1.01 | 26633 | 46.81 |
| 683 | 233 | 0.41 | 2995 | 5.26 | 733 | 566 | 0.99 | 27199 | 47.80 |
| 684 | 226 | 0.40 | 3221 | 5.66 | 734 | 637 | 1.12 | 27836 | 48.92 |
| 685 | 241 | 0.42 | 3462 | 6.08 | 735 | 565 | 0.99 | 28401 | 49.92 |
| 686 | 271 | 0.48 | 3733 | 6.56 | 736 | 587 | 1.03 | 28988 | 50.95 |
| 687 | 254 | 0.45 | 3987 | 7.01 | 737 | 571 | 1.00 | 29559 | 51.95 |
| 688 | 310 | 0.54 | 4297 | 7.55 | 738 | 577 | 1.01 | 30136 | 52.97 |
| 689 | 323 | 0.57 | 4620 | 8.12 | 739 | 560 | 0.98 | 30696 | 53.95 |
| 690 | 323 | 0.57 | 4943 | 8.69 | 740 | 548 | 0.96 | 31244 | 54.91 |
| 691 | 343 | 0.60 | 5286 | 9.29 | 741 | 539 | 0.95 | 31783 | 55.86 |
| 692 | 381 | 0.67 | 5667 | 9.96 | 742 | 549 | 0.96 | 32332 | 56.83 |
| 693 | 410 | 0.72 | 6077 | 10.68 | 743 | 539 | 0.95 | 32871 | 57.77 |
| 694 | 352 | 0.62 | 6429 | 11.30 | 744 | 572 | 1.01 | 33443 | 58.78 |
| 695 | 397 | 0.70 | 6826 | 12.00 | 745 | 530 | 0.93 | 33973 | 59.71 |
| 696 | 441 | 0.78 | 7267 | 12.77 | 746 | 577 | 1.01 | 34550 | 60.72 |
| 697 | 436 | 0.77 | 7703 | 13.54 | 747 | 531 | 0.93 | 35081 | 61.66 |
| 698 | 473 | 0.83 | 8176 | 14.37 | 748 | 519 | 0.91 | 35600 | 62.57 |
| 699 | 457 | 0.80 | 8633 | 15.17 | 749 | 536 | 0.94 | 36136 | 63.51 |

| SS | Freq. | % | Cum. Freq. | Cum. % | SS | Freq. | % | Cum. Freq. | Cum. % |
|---|---|---|---|---|---|---|---|---|---|
| 750 | 535 | 0.94 | 36671 | 64.45 | 801 | 161 | 0.28 | 55019 | 96.70 |
| 751 | 502 | 0.88 | 37173 | 65.33 | 802 | 136 | 0.24 | 55155 | 96.94 |
| 752 | 523 | 0.92 | 37696 | 66.25 | 803 | 124 | 0.22 | 55279 | 97.16 |
| 753 | 528 | 0.93 | 38224 | 67.18 | 804 | 117 | 0.21 | 55396 | 97.36 |
| 754 | 510 | 0.90 | 38734 | 68.08 | 805 | 112 | 0.20 | 55508 | 97.56 |
| 755 | 490 | 0.86 | 39224 | 68.94 | 806 | 119 | 0.21 | 55627 | 97.77 |
| 756 | 496 | 0.87 | 39720 | 69.81 | 807 | 111 | 0.20 | 55738 | 97.96 |
| 757 | 488 | 0.86 | 40208 | 70.67 | 808 | 77 | 0.14 | 55815 | 98.10 |
| 758 | 495 | 0.87 | 40703 | 71.54 | 809 | 78 | 0.14 | 55893 | 98.24 |
| 759 | 484 | 0.85 | 41187 | 72.39 | 810 | 84 | 0.15 | 55977 | 98.38 |
| 760 | 445 | 0.78 | 41632 | 73.17 | 811 | 61 | 0.11 | 56038 | 98.49 |
| 761 | 454 | 0.80 | 42086 | 73.97 | 812 | 91 | 0.16 | 56129 | 98.65 |
| 762 | 476 | 0.84 | 42562 | 74.81 | 813 | 72 | 0.13 | 56201 | 98.78 |
| 763 | 506 | 0.89 | 43068 | 75.70 | 814 | 48 | 0.08 | 56249 | 98.86 |
| 764 | 477 | 0.84 | 43545 | 76.53 | 815 | 58 | 0.10 | 56307 | 98.96 |
| 765 | 443 | 0.78 | 43988 | 77.31 | 816 | 68 | 0.12 | 56375 | 99.08 |
| 766 | 465 | 0.82 | 44453 | 78.13 | 817 | 30 | 0.05 | 56405 | 99.14 |
| 767 | 437 | 0.77 | 44890 | 78.90 | 818 | 38 | 0.07 | 56443 | 99.20 |
| 768 | 452 | 0.79 | 45342 | 79.69 | 819 | 29 | 0.05 | 56472 | 99.25 |
| 769 | 469 | 0.82 | 45811 | 80.52 | 820 | 32 | 0.06 | 56504 | 99.31 |
| 770 | 449 | 0.79 | 46260 | 81.31 | 821 | 23 | 0.04 | 56527 | 99.35 |
| 771 | 390 | 0.69 | 46650 | 81.99 | 822 | 22 | 0.04 | 56549 | 99.39 |
| 772 | 413 | 0.73 | 47063 | 82.72 | 823 | 30 | 0.05 | 56579 | 99.44 |
| 773 | 398 | 0.70 | 47461 | 83.42 | 824 | 30 | 0.05 | 56609 | 99.50 |
| 774 | 366 | 0.64 | 47827 | 84.06 | 825 | 24 | 0.04 | 56633 | 99.54 |
| 775 | 367 | 0.65 | 48194 | 84.71 | 826 | 16 | 0.03 | 56649 | 99.57 |
| 776 | 344 | 0.60 | 48538 | 85.31 | 827 | 24 | 0.04 | 56673 | 99.61 |
| 777 | 391 | 0.69 | 48929 | 86.00 | 828 | 17 | 0.03 | 56690 | 99.64 |
| 778 | 365 | 0.64 | 49294 | 86.64 | 829 | 16 | 0.03 | 56706 | 99.67 |
| 779 | 357 | 0.63 | 49651 | 87.27 | 830 | 6 | 0.01 | 56712 | 99.68 |
| 780 | 350 | 0.62 | 50001 | 87.88 | 831 | 14 | 0.02 | 56726 | 99.70 |
| 781 | 356 | 0.63 | 50357 | 88.51 | 832 | 12 | 0.02 | 56738 | 99.72 |
| 782 | 310 | 0.54 | 50667 | 89.05 | 833 | 7 | 0.01 | 56745 | 99.73 |
| 783 | 297 | 0.52 | 50964 | 89.57 | 834 | 11 | 0.02 | 56756 | 99.75 |
| 784 | 332 | 0.58 | 51296 | 90.16 | 835 | 10 | 0.02 | 56766 | 99.77 |
| 785 | 290 | 0.51 | 51586 | 90.67 | 836 | 14 | 0.02 | 56780 | 99.80 |
| 786 | 281 | 0.49 | 51867 | 91.16 | 837 | 17 | 0.03 | 56797 | 99.83 |
| 787 | 281 | 0.49 | 52148 | 91.65 | 838 | 17 | 0.03 | 56814 | 99.86 |
| 788 | 277 | 0.49 | 52425 | 92.14 | 839 | 2 | 0.00 | 56816 | 99.86 |
| 789 | 237 | 0.42 | 52662 | 92.56 | 840 | 3 | 0.01 | 56819 | 99.86 |
| 790 | 247 | 0.43 | 52909 | 92.99 | 841 | 7 | 0.01 | 56826 | 99.88 |
| 791 | 231 | 0.41 | 53140 | 93.40 | 842 | 3 | 0.01 | 56829 | 99.88 |
| 792 | 226 | 0.40 | 53366 | 93.80 | 843 | 4 | 0.01 | 56833 | 99.89 |
| 793 | 202 | 0.36 | 53568 | 94.15 | 844 | 4 | 0.01 | 56837 | 99.90 |
| 794 | 234 | 0.41 | 53802 | 94.56 | 846 | 1 | 0.00 | 56838 | 99.90 |
| 795 | 200 | 0.35 | 54002 | 94.91 | 847 | 2 | 0.00 | 56840 | 99.90 |
| 796 | 168 | 0.30 | 54170 | 95.21 | 850 | 56 | 0.10 | 56896 | 100.00 |
| 797 | 197 | 0.35 | 54367 | 95.56 | | | | | |
| 798 | 185 | 0.33 | 54552 | 95.88 | | | | | |
| 799 | 166 | 0.29 | 54718 | 96.17 | | | | | |
| 800 | 140 | 0.25 | 54858 | 96.42 | | | | | |

**Table F.4. Scale Score Distribution—Mathematics Grade 6**

| SS | Freq. | % | Cum. Freq. | Cum. % | SS | Freq. | % | Cum. Freq. | Cum. % |
|---|---|---|---|---|---|---|---|---|---|
| 650 | 444 | 0.79 | 444 | 0.79 | 700 | 527 | 0.94 | 11672 | 20.88 |
| 651 | 23 | 0.04 | 467 | 0.84 | 701 | 494 | 0.88 | 12166 | 21.76 |
| 652 | 2 | 0.00 | 469 | 0.84 | 702 | 520 | 0.93 | 12686 | 22.69 |
| 653 | 35 | 0.06 | 504 | 0.90 | 703 | 547 | 0.98 | 13233 | 23.67 |
| 654 | 3 | 0.01 | 507 | 0.91 | 704 | 562 | 1.01 | 13795 | 24.67 |
| 655 | 132 | 0.24 | 639 | 1.14 | 705 | 553 | 0.99 | 14348 | 25.66 |
| 656 | 25 | 0.04 | 664 | 1.19 | 706 | 534 | 0.96 | 14882 | 26.62 |
| 657 | 26 | 0.05 | 690 | 1.23 | 707 | 555 | 0.99 | 15437 | 27.61 |
| 658 | 55 | 0.10 | 745 | 1.33 | 708 | 567 | 1.01 | 16004 | 28.62 |
| 659 | 21 | 0.04 | 766 | 1.37 | 709 | 514 | 0.92 | 16518 | 29.54 |
| 660 | 9 | 0.02 | 775 | 1.39 | 710 | 572 | 1.02 | 17090 | 30.57 |
| 661 | 53 | 0.09 | 828 | 1.48 | 711 | 579 | 1.04 | 17669 | 31.60 |
| 662 | 142 | 0.25 | 970 | 1.73 | 712 | 528 | 0.94 | 18197 | 32.55 |
| 663 | 37 | 0.07 | 1007 | 1.80 | 713 | 553 | 0.99 | 18750 | 33.53 |
| 664 | 94 | 0.17 | 1101 | 1.97 | 714 | 573 | 1.02 | 19323 | 34.56 |
| 665 | 48 | 0.09 | 1149 | 2.05 | 715 | 555 | 0.99 | 19878 | 35.55 |
| 666 | 69 | 0.12 | 1218 | 2.18 | 716 | 537 | 0.96 | 20415 | 36.51 |
| 667 | 170 | 0.30 | 1388 | 2.48 | 717 | 589 | 1.05 | 21004 | 37.57 |
| 668 | 66 | 0.12 | 1454 | 2.60 | 718 | 605 | 1.08 | 21609 | 38.65 |
| 669 | 125 | 0.22 | 1579 | 2.82 | 719 | 549 | 0.98 | 22158 | 39.63 |
| 670 | 111 | 0.20 | 1690 | 3.02 | 720 | 538 | 0.96 | 22696 | 40.59 |
| 671 | 81 | 0.14 | 1771 | 3.17 | 721 | 568 | 1.02 | 23264 | 41.61 |
| 672 | 167 | 0.30 | 1938 | 3.47 | 722 | 583 | 1.04 | 23847 | 42.65 |
| 673 | 85 | 0.15 | 2023 | 3.62 | 723 | 604 | 1.08 | 24451 | 43.73 |
| 674 | 223 | 0.40 | 2246 | 4.02 | 724 | 592 | 1.06 | 25043 | 44.79 |
| 675 | 155 | 0.28 | 2401 | 4.29 | 725 | 666 | 1.19 | 25709 | 45.98 |
| 676 | 181 | 0.32 | 2582 | 4.62 | 726 | 569 | 1.02 | 26278 | 47.00 |
| 677 | 138 | 0.25 | 2720 | 4.86 | 727 | 581 | 1.04 | 26859 | 48.04 |
| 678 | 268 | 0.48 | 2988 | 5.34 | 728 | 589 | 1.05 | 27448 | 49.09 |
| 679 | 210 | 0.38 | 3198 | 5.72 | 729 | 599 | 1.07 | 28047 | 50.16 |
| 680 | 223 | 0.40 | 3421 | 6.12 | 730 | 625 | 1.12 | 28672 | 51.28 |
| 681 | 353 | 0.63 | 3774 | 6.75 | 731 | 600 | 1.07 | 29272 | 52.35 |
| 682 | 272 | 0.49 | 4046 | 7.24 | 732 | 626 | 1.12 | 29898 | 53.47 |
| 683 | 307 | 0.55 | 4353 | 7.79 | 733 | 623 | 1.11 | 30521 | 54.59 |
| 684 | 336 | 0.60 | 4689 | 8.39 | 734 | 621 | 1.11 | 31142 | 55.70 |
| 685 | 335 | 0.60 | 5024 | 8.99 | 735 | 593 | 1.06 | 31735 | 56.76 |
| 686 | 362 | 0.65 | 5386 | 9.63 | 736 | 656 | 1.17 | 32391 | 57.93 |
| 687 | 339 | 0.61 | 5725 | 10.24 | 737 | 606 | 1.08 | 32997 | 59.01 |
| 688 | 384 | 0.69 | 6109 | 10.93 | 738 | 616 | 1.10 | 33613 | 60.12 |
| 689 | 427 | 0.76 | 6536 | 11.69 | 739 | 636 | 1.14 | 34249 | 61.25 |
| 690 | 394 | 0.70 | 6930 | 12.39 | 740 | 629 | 1.12 | 34878 | 62.38 |
| 691 | 419 | 0.75 | 7349 | 13.14 | 741 | 613 | 1.10 | 35491 | 63.48 |
| 692 | 412 | 0.74 | 7761 | 13.88 | 742 | 571 | 1.02 | 36062 | 64.50 |
| 693 | 426 | 0.76 | 8187 | 14.64 | 743 | 608 | 1.09 | 36670 | 65.58 |
| 694 | 472 | 0.84 | 8659 | 15.49 | 744 | 625 | 1.12 | 37295 | 66.70 |
| 695 | 465 | 0.83 | 9124 | 16.32 | 745 | 585 | 1.05 | 37880 | 67.75 |
| 696 | 487 | 0.87 | 9611 | 17.19 | 746 | 602 | 1.08 | 38482 | 68.82 |
| 697 | 492 | 0.88 | 10103 | 18.07 | 747 | 553 | 0.99 | 39035 | 69.81 |
| 698 | 507 | 0.91 | 10610 | 18.98 | 748 | 536 | 0.96 | 39571 | 70.77 |
| 699 | 535 | 0.96 | 11145 | 19.93 | 749 | 554 | 0.99 | 40125 | 71.76 |

| SS | Freq. | % | Cum. Freq. | Cum. % |
|---|---|---|---|---|
| 750 | 577 | 1.03 | 40702 | 72.80 |
| 751 | 519 | 0.93 | 41221 | 73.72 |
| 752 | 547 | 0.98 | 41768 | 74.70 |
| 753 | 514 | 0.92 | 42282 | 75.62 |
| 754 | 512 | 0.92 | 42794 | 76.54 |
| 755 | 513 | 0.92 | 43307 | 77.45 |
| 756 | 500 | 0.89 | 43807 | 78.35 |
| 757 | 519 | 0.93 | 44326 | 79.28 |
| 758 | 478 | 0.85 | 44804 | 80.13 |
| 759 | 504 | 0.90 | 45308 | 81.03 |
| 760 | 493 | 0.88 | 45801 | 81.91 |
| 761 | 451 | 0.81 | 46252 | 82.72 |
| 762 | 426 | 0.76 | 46678 | 83.48 |
| 763 | 397 | 0.71 | 47075 | 84.19 |
| 764 | 441 | 0.79 | 47516 | 84.98 |
| 765 | 396 | 0.71 | 47912 | 85.69 |
| 766 | 385 | 0.69 | 48297 | 86.38 |
| 767 | 380 | 0.68 | 48677 | 87.06 |
| 768 | 358 | 0.64 | 49035 | 87.70 |
| 769 | 349 | 0.62 | 49384 | 88.32 |
| 770 | 308 | 0.55 | 49692 | 88.87 |
| 771 | 289 | 0.52 | 49981 | 89.39 |
| 772 | 313 | 0.56 | 50294 | 89.95 |
| 773 | 324 | 0.58 | 50618 | 90.53 |
| 774 | 312 | 0.56 | 50930 | 91.09 |
| 775 | 291 | 0.52 | 51221 | 91.61 |
| 776 | 245 | 0.44 | 51466 | 92.05 |
| 777 | 228 | 0.41 | 51694 | 92.45 |
| 778 | 251 | 0.45 | 51945 | 92.90 |
| 779 | 224 | 0.40 | 52169 | 93.30 |
| 780 | 214 | 0.38 | 52383 | 93.69 |
| 781 | 224 | 0.40 | 52607 | 94.09 |
| 782 | 164 | 0.29 | 52771 | 94.38 |
| 783 | 188 | 0.34 | 52959 | 94.72 |
| 784 | 168 | 0.30 | 53127 | 95.02 |
| 785 | 158 | 0.28 | 53285 | 95.30 |
| 786 | 185 | 0.33 | 53470 | 95.63 |
| 787 | 168 | 0.30 | 53638 | 95.93 |
| 788 | 144 | 0.26 | 53782 | 96.19 |
| 789 | 126 | 0.23 | 53908 | 96.41 |
| 790 | 130 | 0.23 | 54038 | 96.65 |
| 791 | 109 | 0.19 | 54147 | 96.84 |
| 792 | 116 | 0.21 | 54263 | 97.05 |
| 793 | 111 | 0.20 | 54374 | 97.25 |
| 794 | 88 | 0.16 | 54462 | 97.40 |
| 795 | 100 | 0.18 | 54562 | 97.58 |
| 796 | 81 | 0.14 | 54643 | 97.73 |
| 797 | 96 | 0.17 | 54739 | 97.90 |
| 798 | 84 | 0.15 | 54823 | 98.05 |
| 799 | 76 | 0.14 | 54899 | 98.19 |
| 800 | 72 | 0.13 | 54971 | 98.32 |

| SS | Freq. | % | Cum. Freq. | Cum. % |
|---|---|---|---|---|
| 801 | 64 | 0.11 | 55035 | 98.43 |
| 802 | 61 | 0.11 | 55096 | 98.54 |
| 803 | 55 | 0.10 | 55151 | 98.64 |
| 804 | 59 | 0.11 | 55210 | 98.74 |
| 805 | 45 | 0.08 | 55255 | 98.82 |
| 806 | 44 | 0.08 | 55299 | 98.90 |
| 807 | 33 | 0.06 | 55332 | 98.96 |
| 808 | 30 | 0.05 | 55362 | 99.01 |
| 809 | 31 | 0.06 | 55393 | 99.07 |
| 810 | 32 | 0.06 | 55425 | 99.13 |
| 811 | 37 | 0.07 | 55462 | 99.19 |
| 812 | 35 | 0.06 | 55497 | 99.26 |
| 813 | 22 | 0.04 | 55519 | 99.30 |
| 814 | 23 | 0.04 | 55542 | 99.34 |
| 815 | 35 | 0.06 | 55577 | 99.40 |
| 816 | 27 | 0.05 | 55604 | 99.45 |
| 817 | 20 | 0.04 | 55624 | 99.48 |
| 818 | 19 | 0.03 | 55643 | 99.52 |
| 819 | 27 | 0.05 | 55670 | 99.57 |
| 820 | 14 | 0.03 | 55684 | 99.59 |
| 821 | 15 | 0.03 | 55699 | 99.62 |
| 822 | 20 | 0.04 | 55719 | 99.65 |
| 823 | 6 | 0.01 | 55725 | 99.66 |
| 824 | 7 | 0.01 | 55732 | 99.68 |
| 825 | 11 | 0.02 | 55743 | 99.70 |
| 826 | 9 | 0.02 | 55752 | 99.71 |
| 827 | 7 | 0.01 | 55759 | 99.72 |
| 828 | 7 | 0.01 | 55766 | 99.74 |
| 829 | 9 | 0.02 | 55775 | 99.75 |
| 830 | 10 | 0.02 | 55785 | 99.77 |
| 831 | 1 | 0.00 | 55786 | 99.77 |
| 832 | 10 | 0.02 | 55796 | 99.79 |
| 833 | 4 | 0.01 | 55800 | 99.80 |
| 834 | 4 | 0.01 | 55804 | 99.81 |
| 835 | 2 | 0.00 | 55806 | 99.81 |
| 836 | 9 | 0.02 | 55815 | 99.82 |
| 837 | 3 | 0.01 | 55818 | 99.83 |
| 838 | 3 | 0.01 | 55821 | 99.84 |
| 839 | 5 | 0.01 | 55826 | 99.84 |
| 840 | 5 | 0.01 | 55831 | 99.85 |
| 842 | 9 | 0.02 | 55840 | 99.87 |
| 843 | 9 | 0.02 | 55849 | 99.89 |
| 844 | 2 | 0.00 | 55851 | 99.89 |
| 846 | 4 | 0.01 | 55855 | 99.90 |
| 847 | 2 | 0.00 | 55857 | 99.90 |
| 848 | 1 | 0.00 | 55858 | 99.90 |
| 849 | 1 | 0.00 | 55859 | 99.90 |
| 850 | 54 | 0.10 | 55913 | 100.00 |

**Table F.5. Scale Score Distribution—Mathematics Grade 7**

| SS | Freq. | % | Cum. Freq. | Cum. % | SS | Freq. | % | Cum. Freq. | Cum. % |
|---|---|---|---|---|---|---|---|---|---|
| 650 | 151 | 0.28 | 151 | 0.28 | 701 | 574 | 1.06 | 7657 | 14.14 |
| 651 | 19 | 0.04 | 170 | 0.31 | 702 | 580 | 1.07 | 8237 | 15.21 |
| 653 | 3 | 0.01 | 173 | 0.32 | 703 | 616 | 1.14 | 8853 | 16.35 |
| 654 | 17 | 0.03 | 190 | 0.35 | 704 | 667 | 1.23 | 9520 | 17.58 |
| 655 | 30 | 0.06 | 220 | 0.41 | 705 | 611 | 1.13 | 10131 | 18.71 |
| 656 | 5 | 0.01 | 225 | 0.42 | 706 | 694 | 1.28 | 10825 | 19.99 |
| 657 | 21 | 0.04 | 246 | 0.45 | 707 | 670 | 1.24 | 11495 | 21.23 |
| 658 | 6 | 0.01 | 252 | 0.47 | 708 | 675 | 1.25 | 12170 | 22.48 |
| 659 | 30 | 0.06 | 282 | 0.52 | 709 | 688 | 1.27 | 12858 | 23.75 |
| 660 | 20 | 0.04 | 302 | 0.56 | 710 | 762 | 1.41 | 13620 | 25.15 |
| 661 | 4 | 0.01 | 306 | 0.57 | 711 | 759 | 1.40 | 14379 | 26.55 |
| 662 | 36 | 0.07 | 342 | 0.63 | 712 | 728 | 1.34 | 15107 | 27.90 |
| 663 | 8 | 0.01 | 350 | 0.65 | 713 | 737 | 1.36 | 15844 | 29.26 |
| 664 | 6 | 0.01 | 356 | 0.66 | 714 | 745 | 1.38 | 16589 | 30.64 |
| 665 | 18 | 0.03 | 374 | 0.69 | 715 | 712 | 1.31 | 17301 | 31.95 |
| 666 | 36 | 0.07 | 410 | 0.76 | 716 | 731 | 1.35 | 18032 | 33.30 |
| 667 | 47 | 0.09 | 457 | 0.84 | 717 | 744 | 1.37 | 18776 | 34.68 |
| 668 | 26 | 0.05 | 483 | 0.89 | 718 | 702 | 1.30 | 19478 | 35.97 |
| 669 | 40 | 0.07 | 523 | 0.97 | 719 | 754 | 1.39 | 20232 | 37.36 |
| 670 | 32 | 0.06 | 555 | 1.02 | 720 | 735 | 1.36 | 20967 | 38.72 |
| 671 | 63 | 0.12 | 618 | 1.14 | 721 | 744 | 1.37 | 21711 | 40.10 |
| 672 | 73 | 0.13 | 691 | 1.28 | 722 | 705 | 1.30 | 22416 | 41.40 |
| 673 | 61 | 0.11 | 752 | 1.39 | 723 | 701 | 1.29 | 23117 | 42.69 |
| 674 | 27 | 0.05 | 779 | 1.44 | 724 | 737 | 1.36 | 23854 | 44.05 |
| 675 | 69 | 0.13 | 848 | 1.57 | 725 | 722 | 1.33 | 24576 | 45.39 |
| 676 | 78 | 0.14 | 926 | 1.71 | 726 | 718 | 1.33 | 25294 | 46.71 |
| 677 | 71 | 0.13 | 997 | 1.84 | 727 | 667 | 1.23 | 25961 | 47.94 |
| 678 | 69 | 0.13 | 1066 | 1.97 | 728 | 676 | 1.25 | 26637 | 49.19 |
| 679 | 104 | 0.19 | 1170 | 2.16 | 729 | 656 | 1.21 | 27293 | 50.40 |
| 680 | 98 | 0.18 | 1268 | 2.34 | 730 | 688 | 1.27 | 27981 | 51.68 |
| 681 | 107 | 0.20 | 1375 | 2.54 | 731 | 688 | 1.27 | 28669 | 52.95 |
| 682 | 140 | 0.26 | 1515 | 2.80 | 732 | 700 | 1.29 | 29369 | 54.24 |
| 683 | 138 | 0.25 | 1653 | 3.05 | 733 | 632 | 1.17 | 30001 | 55.41 |
| 684 | 143 | 0.26 | 1796 | 3.32 | 734 | 618 | 1.14 | 30619 | 56.55 |
| 685 | 188 | 0.35 | 1984 | 3.66 | 735 | 654 | 1.21 | 31273 | 57.75 |
| 686 | 202 | 0.37 | 2186 | 4.04 | 736 | 595 | 1.10 | 31868 | 58.85 |
| 687 | 205 | 0.38 | 2391 | 4.42 | 737 | 661 | 1.22 | 32529 | 60.07 |
| 688 | 238 | 0.44 | 2629 | 4.86 | 738 | 645 | 1.19 | 33174 | 61.27 |
| 689 | 244 | 0.45 | 2873 | 5.31 | 739 | 670 | 1.24 | 33844 | 62.50 |
| 690 | 242 | 0.45 | 3115 | 5.75 | 740 | 632 | 1.17 | 34476 | 63.67 |
| 691 | 281 | 0.52 | 3396 | 6.27 | 741 | 632 | 1.17 | 35108 | 64.84 |
| 692 | 314 | 0.58 | 3710 | 6.85 | 742 | 615 | 1.14 | 35723 | 65.97 |
| 693 | 336 | 0.62 | 4046 | 7.47 | 743 | 618 | 1.14 | 36341 | 67.11 |
| 694 | 370 | 0.68 | 4416 | 8.16 | 744 | 612 | 1.13 | 36953 | 68.24 |
| 695 | 387 | 0.71 | 4803 | 8.87 | 745 | 594 | 1.10 | 37547 | 69.34 |
| 696 | 391 | 0.72 | 5194 | 9.59 | 746 | 595 | 1.10 | 38142 | 70.44 |
| 697 | 422 | 0.78 | 5616 | 10.37 | 747 | 605 | 1.12 | 38747 | 71.56 |
| 698 | 435 | 0.80 | 6051 | 11.17 | 748 | 595 | 1.10 | 39342 | 72.66 |
| 699 | 502 | 0.93 | 6553 | 12.10 | 749 | 589 | 1.09 | 39931 | 73.74 |
| 700 | 530 | 0.98 | 7083 | 13.08 | 750 | 565 | 1.04 | 40496 | 74.79 |

| SS | Freq. | % | Cum. Freq. | Cum. % | SS | Freq. | % | Cum. Freq. | Cum. % |
|---|---|---|---|---|---|---|---|---|---|
| 751 | 541 | 1.00 | 41037 | 75.79 | 802 | 33 | 0.06 | 53839 | 99.43 |
| 752 | 559 | 1.03 | 41596 | 76.82 | 803 | 38 | 0.07 | 53877 | 99.50 |
| 753 | 534 | 0.99 | 42130 | 77.81 | 804 | 25 | 0.05 | 53902 | 99.55 |
| 754 | 535 | 0.99 | 42665 | 78.79 | 805 | 22 | 0.04 | 53924 | 99.59 |
| 755 | 558 | 1.03 | 43223 | 79.82 | 806 | 17 | 0.03 | 53941 | 99.62 |
| 756 | 468 | 0.86 | 43691 | 80.69 | 807 | 25 | 0.05 | 53966 | 99.66 |
| 757 | 490 | 0.90 | 44181 | 81.59 | 808 | 21 | 0.04 | 53987 | 99.70 |
| 758 | 495 | 0.91 | 44676 | 82.51 | 809 | 6 | 0.01 | 53993 | 99.71 |
| 759 | 438 | 0.81 | 45114 | 83.32 | 810 | 9 | 0.02 | 54002 | 99.73 |
| 760 | 469 | 0.87 | 45583 | 84.18 | 811 | 18 | 0.03 | 54020 | 99.76 |
| 761 | 447 | 0.83 | 46030 | 85.01 | 812 | 12 | 0.02 | 54032 | 99.79 |
| 762 | 447 | 0.83 | 46477 | 85.83 | 813 | 7 | 0.01 | 54039 | 99.80 |
| 763 | 443 | 0.82 | 46920 | 86.65 | 814 | 6 | 0.01 | 54045 | 99.81 |
| 764 | 401 | 0.74 | 47321 | 87.39 | 815 | 5 | 0.01 | 54050 | 99.82 |
| 765 | 404 | 0.75 | 47725 | 88.14 | 816 | 5 | 0.01 | 54055 | 99.83 |
| 766 | 347 | 0.64 | 48072 | 88.78 | 817 | 9 | 0.02 | 54064 | 99.84 |
| 767 | 356 | 0.66 | 48428 | 89.44 | 818 | 7 | 0.01 | 54071 | 99.86 |
| 768 | 363 | 0.67 | 48791 | 90.11 | 819 | 9 | 0.02 | 54080 | 99.87 |
| 769 | 312 | 0.58 | 49103 | 90.68 | 820 | 3 | 0.01 | 54083 | 99.88 |
| 770 | 307 | 0.57 | 49410 | 91.25 | 821 | 4 | 0.01 | 54087 | 99.89 |
| 771 | 281 | 0.52 | 49691 | 91.77 | 822 | 3 | 0.01 | 54090 | 99.89 |
| 772 | 268 | 0.49 | 49959 | 92.26 | 823 | 7 | 0.01 | 54097 | 99.91 |
| 773 | 279 | 0.52 | 50238 | 92.78 | 824 | 2 | 0.00 | 54099 | 99.91 |
| 774 | 235 | 0.43 | 50473 | 93.21 | 825 | 4 | 0.01 | 54103 | 99.92 |
| 775 | 245 | 0.45 | 50718 | 93.67 | 826 | 6 | 0.01 | 54109 | 99.93 |
| 776 | 248 | 0.46 | 50966 | 94.12 | 827 | 2 | 0.00 | 54111 | 99.93 |
| 777 | 231 | 0.43 | 51197 | 94.55 | 828 | 4 | 0.01 | 54115 | 99.94 |
| 778 | 196 | 0.36 | 51393 | 94.91 | 830 | 1 | 0.00 | 54116 | 99.94 |
| 779 | 218 | 0.40 | 51611 | 95.31 | 831 | 7 | 0.01 | 54123 | 99.95 |
| 780 | 199 | 0.37 | 51810 | 95.68 | 832 | 1 | 0.00 | 54124 | 99.96 |
| 781 | 204 | 0.38 | 52014 | 96.06 | 833 | 4 | 0.01 | 54128 | 99.96 |
| 782 | 167 | 0.31 | 52181 | 96.37 | 834 | 1 | 0.00 | 54129 | 99.96 |
| 783 | 180 | 0.33 | 52361 | 96.70 | 838 | 1 | 0.00 | 54130 | 99.97 |
| 784 | 143 | 0.26 | 52504 | 96.96 | 839 | 1 | 0.00 | 54131 | 99.97 |
| 785 | 131 | 0.24 | 52635 | 97.21 | 841 | 1 | 0.00 | 54132 | 99.97 |
| 786 | 122 | 0.23 | 52757 | 97.43 | 843 | 1 | 0.00 | 54133 | 99.97 |
| 787 | 108 | 0.20 | 52865 | 97.63 | 845 | 1 | 0.00 | 54134 | 99.97 |
| 788 | 112 | 0.21 | 52977 | 97.84 | 846 | 1 | 0.00 | 54135 | 99.98 |
| 789 | 98 | 0.18 | 53075 | 98.02 | 847 | 1 | 0.00 | 54136 | 99.98 |
| 790 | 101 | 0.19 | 53176 | 98.20 | 850 | 12 | 0.02 | 54148 | 100.00 |
| 791 | 75 | 0.14 | 53251 | 98.34 | | | | | |
| 792 | 87 | 0.16 | 53338 | 98.50 | | | | | |
| 793 | 81 | 0.15 | 53419 | 98.65 | | | | | |
| 794 | 58 | 0.11 | 53477 | 98.76 | | | | | |
| 795 | 57 | 0.11 | 53534 | 98.87 | | | | | |
| 796 | 48 | 0.09 | 53582 | 98.95 | | | | | |
| 797 | 71 | 0.13 | 53653 | 99.09 | | | | | |
| 798 | 47 | 0.09 | 53700 | 99.17 | | | | | |
| 799 | 49 | 0.09 | 53749 | 99.26 | | | | | |
| 800 | 30 | 0.06 | 53779 | 99.32 | | | | | |
| 801 | 27 | 0.05 | 53806 | 99.37 | | | | | |

**Table F.6. Scale Score Distribution—Mathematics Grade 8**

| SS | Freq. | % | Cum. Freq. | Cum. % | SS | Freq. | % | Cum. Freq. | Cum. % |
|---|---|---|---|---|---|---|---|---|---|
| 650 | 645 | 1.24 | 645 | 1.24 | 700 | 494 | 0.95 | 12849 | 24.69 |
| 651 | 40 | 0.08 | 685 | 1.32 | 701 | 501 | 0.96 | 13350 | 25.66 |
| 652 | 31 | 0.06 | 716 | 1.38 | 702 | 475 | 0.91 | 13825 | 26.57 |
| 653 | 52 | 0.10 | 768 | 1.48 | 703 | 478 | 0.92 | 14303 | 27.49 |
| 654 | 77 | 0.15 | 845 | 1.62 | 704 | 526 | 1.01 | 14829 | 28.50 |
| 655 | 52 | 0.10 | 897 | 1.72 | 705 | 482 | 0.93 | 15311 | 29.42 |
| 656 | 75 | 0.14 | 972 | 1.87 | 706 | 492 | 0.95 | 15803 | 30.37 |
| 657 | 97 | 0.19 | 1069 | 2.05 | 707 | 471 | 0.91 | 16274 | 31.27 |
| 658 | 64 | 0.12 | 1133 | 2.18 | 708 | 551 | 1.06 | 16825 | 32.33 |
| 659 | 54 | 0.10 | 1187 | 2.28 | 709 | 482 | 0.93 | 17307 | 33.26 |
| 660 | 79 | 0.15 | 1266 | 2.43 | 710 | 524 | 1.01 | 17831 | 34.27 |
| 661 | 86 | 0.17 | 1352 | 2.60 | 711 | 524 | 1.01 | 18355 | 35.27 |
| 662 | 88 | 0.17 | 1440 | 2.77 | 712 | 468 | 0.90 | 18823 | 36.17 |
| 663 | 102 | 0.20 | 1542 | 2.96 | 713 | 483 | 0.93 | 19306 | 37.10 |
| 664 | 134 | 0.26 | 1676 | 3.22 | 714 | 521 | 1.00 | 19827 | 38.10 |
| 665 | 139 | 0.27 | 1815 | 3.49 | 715 | 500 | 0.96 | 20327 | 39.06 |
| 666 | 115 | 0.22 | 1930 | 3.71 | 716 | 464 | 0.89 | 20791 | 39.96 |
| 667 | 146 | 0.28 | 2076 | 3.99 | 717 | 491 | 0.94 | 21282 | 40.90 |
| 668 | 135 | 0.26 | 2211 | 4.25 | 718 | 430 | 0.83 | 21712 | 41.72 |
| 669 | 152 | 0.29 | 2363 | 4.54 | 719 | 451 | 0.87 | 22163 | 42.59 |
| 670 | 164 | 0.32 | 2527 | 4.86 | 720 | 474 | 0.91 | 22637 | 43.50 |
| 671 | 168 | 0.32 | 2695 | 5.18 | 721 | 471 | 0.91 | 23108 | 44.41 |
| 672 | 173 | 0.33 | 2868 | 5.51 | 722 | 475 | 0.91 | 23583 | 45.32 |
| 673 | 184 | 0.35 | 3052 | 5.87 | 723 | 454 | 0.87 | 24037 | 46.19 |
| 674 | 238 | 0.46 | 3290 | 6.32 | 724 | 426 | 0.82 | 24463 | 47.01 |
| 675 | 216 | 0.42 | 3506 | 6.74 | 725 | 450 | 0.86 | 24913 | 47.88 |
| 676 | 199 | 0.38 | 3705 | 7.12 | 726 | 436 | 0.84 | 25349 | 48.71 |
| 677 | 257 | 0.49 | 3962 | 7.61 | 727 | 452 | 0.87 | 25801 | 49.58 |
| 678 | 217 | 0.42 | 4179 | 8.03 | 728 | 412 | 0.79 | 26213 | 50.37 |
| 679 | 253 | 0.49 | 4432 | 8.52 | 729 | 460 | 0.88 | 26673 | 51.26 |
| 680 | 319 | 0.61 | 4751 | 9.13 | 730 | 450 | 0.86 | 27123 | 52.12 |
| 681 | 288 | 0.55 | 5039 | 9.68 | 731 | 447 | 0.86 | 27570 | 52.98 |
| 682 | 247 | 0.47 | 5286 | 10.16 | 732 | 415 | 0.80 | 27985 | 53.78 |
| 683 | 371 | 0.71 | 5657 | 10.87 | 733 | 426 | 0.82 | 28411 | 54.60 |
| 684 | 346 | 0.66 | 6003 | 11.54 | 734 | 398 | 0.76 | 28809 | 55.36 |
| 685 | 353 | 0.68 | 6356 | 12.21 | 735 | 420 | 0.81 | 29229 | 56.17 |
| 686 | 338 | 0.65 | 6694 | 12.86 | 736 | 434 | 0.83 | 29663 | 57.00 |
| 687 | 370 | 0.71 | 7064 | 13.58 | 737 | 431 | 0.83 | 30094 | 57.83 |
| 688 | 381 | 0.73 | 7445 | 14.31 | 738 | 416 | 0.80 | 30510 | 58.63 |
| 689 | 415 | 0.80 | 7860 | 15.10 | 739 | 426 | 0.82 | 30936 | 59.45 |
| 690 | 423 | 0.81 | 8283 | 15.92 | 740 | 432 | 0.83 | 31368 | 60.28 |
| 691 | 412 | 0.79 | 8695 | 16.71 | 741 | 424 | 0.81 | 31792 | 61.10 |
| 692 | 453 | 0.87 | 9148 | 17.58 | 742 | 406 | 0.78 | 32198 | 61.88 |
| 693 | 437 | 0.84 | 9585 | 18.42 | 743 | 454 | 0.87 | 32652 | 62.75 |
| 694 | 468 | 0.90 | 10053 | 19.32 | 744 | 402 | 0.77 | 33054 | 63.52 |
| 695 | 466 | 0.90 | 10519 | 20.21 | 745 | 395 | 0.76 | 33449 | 64.28 |
| 696 | 433 | 0.83 | 10952 | 21.05 | 746 | 382 | 0.73 | 33831 | 65.01 |
| 697 | 465 | 0.89 | 11417 | 21.94 | 747 | 407 | 0.78 | 34238 | 65.80 |
| 698 | 438 | 0.84 | 11855 | 22.78 | 748 | 409 | 0.79 | 34647 | 66.58 |
| 699 | 500 | 0.96 | 12355 | 23.74 | 749 | 391 | 0.75 | 35038 | 67.33 |

| SS | Freq. | % | Cum. Freq. | Cum. % | SS | Freq. | % | Cum. Freq. | Cum. % |
|---|---|---|---|---|---|---|---|---|---|
| 750 | 366 | 0.70 | 35404 | 68.04 | 801 | 132 | 0.25 | 49211 | 94.57 |
| 751 | 407 | 0.78 | 35811 | 68.82 | 802 | 130 | 0.25 | 49341 | 94.82 |
| 752 | 365 | 0.70 | 36176 | 69.52 | 803 | 115 | 0.22 | 49456 | 95.04 |
| 753 | 389 | 0.75 | 36565 | 70.27 | 804 | 111 | 0.21 | 49567 | 95.26 |
| 754 | 371 | 0.71 | 36936 | 70.98 | 805 | 121 | 0.23 | 49688 | 95.49 |
| 755 | 388 | 0.75 | 37324 | 71.73 | 806 | 124 | 0.24 | 49812 | 95.73 |
| 756 | 372 | 0.71 | 37696 | 72.44 | 807 | 90 | 0.17 | 49902 | 95.90 |
| 757 | 367 | 0.71 | 38063 | 73.15 | 808 | 116 | 0.22 | 50018 | 96.12 |
| 758 | 387 | 0.74 | 38450 | 73.89 | 809 | 91 | 0.17 | 50109 | 96.30 |
| 759 | 350 | 0.67 | 38800 | 74.56 | 810 | 86 | 0.17 | 50195 | 96.46 |
| 760 | 390 | 0.75 | 39190 | 75.31 | 811 | 95 | 0.18 | 50290 | 96.64 |
| 761 | 374 | 0.72 | 39564 | 76.03 | 812 | 77 | 0.15 | 50367 | 96.79 |
| 762 | 339 | 0.65 | 39903 | 76.68 | 813 | 84 | 0.16 | 50451 | 96.95 |
| 763 | 345 | 0.66 | 40248 | 77.35 | 814 | 82 | 0.16 | 50533 | 97.11 |
| 764 | 345 | 0.66 | 40593 | 78.01 | 815 | 63 | 0.12 | 50596 | 97.23 |
| 765 | 297 | 0.57 | 40890 | 78.58 | 816 | 67 | 0.13 | 50663 | 97.36 |
| 766 | 333 | 0.64 | 41223 | 79.22 | 817 | 61 | 0.12 | 50724 | 97.48 |
| 767 | 299 | 0.57 | 41522 | 79.79 | 818 | 64 | 0.12 | 50788 | 97.60 |
| 768 | 322 | 0.62 | 41844 | 80.41 | 819 | 65 | 0.12 | 50853 | 97.73 |
| 769 | 310 | 0.60 | 42154 | 81.01 | 820 | 65 | 0.12 | 50918 | 97.85 |
| 770 | 325 | 0.62 | 42479 | 81.63 | 821 | 64 | 0.12 | 50982 | 97.97 |
| 771 | 306 | 0.59 | 42785 | 82.22 | 822 | 54 | 0.10 | 51036 | 98.08 |
| 772 | 271 | 0.52 | 43056 | 82.74 | 823 | 44 | 0.08 | 51080 | 98.16 |
| 773 | 287 | 0.55 | 43343 | 83.29 | 824 | 69 | 0.13 | 51149 | 98.30 |
| 774 | 271 | 0.52 | 43614 | 83.82 | 825 | 48 | 0.09 | 51197 | 98.39 |
| 775 | 322 | 0.62 | 43936 | 84.43 | 826 | 45 | 0.09 | 51242 | 98.47 |
| 776 | 277 | 0.53 | 44213 | 84.97 | 827 | 48 | 0.09 | 51290 | 98.57 |
| 777 | 265 | 0.51 | 44478 | 85.48 | 828 | 24 | 0.05 | 51314 | 98.61 |
| 778 | 258 | 0.50 | 44736 | 85.97 | 829 | 36 | 0.07 | 51350 | 98.68 |
| 779 | 244 | 0.47 | 44980 | 86.44 | 830 | 40 | 0.08 | 51390 | 98.76 |
| 780 | 261 | 0.50 | 45241 | 86.94 | 831 | 42 | 0.08 | 51432 | 98.84 |
| 781 | 243 | 0.47 | 45484 | 87.41 | 832 | 29 | 0.06 | 51461 | 98.89 |
| 782 | 248 | 0.48 | 45732 | 87.89 | 833 | 27 | 0.05 | 51488 | 98.95 |
| 783 | 212 | 0.41 | 45944 | 88.29 | 834 | 34 | 0.07 | 51522 | 99.01 |
| 784 | 211 | 0.41 | 46155 | 88.70 | 835 | 24 | 0.05 | 51546 | 99.06 |
| 785 | 246 | 0.47 | 46401 | 89.17 | 836 | 30 | 0.06 | 51576 | 99.12 |
| 786 | 208 | 0.40 | 46609 | 89.57 | 837 | 14 | 0.03 | 51590 | 99.14 |
| 787 | 209 | 0.40 | 46818 | 89.97 | 838 | 18 | 0.03 | 51608 | 99.18 |
| 788 | 203 | 0.39 | 47021 | 90.36 | 839 | 34 | 0.07 | 51642 | 99.24 |
| 789 | 221 | 0.42 | 47242 | 90.79 | 840 | 20 | 0.04 | 51662 | 99.28 |
| 790 | 206 | 0.40 | 47448 | 91.18 | 841 | 19 | 0.04 | 51681 | 99.32 |
| 791 | 172 | 0.33 | 47620 | 91.51 | 842 | 18 | 0.03 | 51699 | 99.35 |
| 792 | 180 | 0.35 | 47800 | 91.86 | 843 | 27 | 0.05 | 51726 | 99.40 |
| 793 | 188 | 0.36 | 47988 | 92.22 | 844 | 10 | 0.02 | 51736 | 99.42 |
| 794 | 170 | 0.33 | 48158 | 92.55 | 845 | 15 | 0.03 | 51751 | 99.45 |
| 795 | 160 | 0.31 | 48318 | 92.85 | 846 | 23 | 0.04 | 51774 | 99.50 |
| 796 | 171 | 0.33 | 48489 | 93.18 | 847 | 10 | 0.02 | 51784 | 99.52 |
| 797 | 146 | 0.28 | 48635 | 93.46 | 848 | 11 | 0.02 | 51795 | 99.54 |
| 798 | 161 | 0.31 | 48796 | 93.77 | 849 | 15 | 0.03 | 51810 | 99.57 |
| 799 | 147 | 0.28 | 48943 | 94.06 | 850 | 226 | 0.43 | 52036 | 100.00 |
| 800 | 136 | 0.26 | 49079 | 94.32 | | | | | |

**Table F.7. Scale Score Distribution—ELA Grade 3**

| SS | Freq. | % | Cum. Freq. | Cum. % | SS | Freq. | % | Cum. Freq. | Cum. % |
|-----|-------|------|-----------|--------|-----|-------|------|-----------|--------|
| 650 | 882 | 1.58 | 882 | 1.58 | 700 | 326 | 0.58 | 12696 | 22.78 |
| 651 | 82 | 0.15 | 964 | 1.73 | 701 | 343 | 0.62 | 13039 | 23.39 |
| 652 | 78 | 0.14 | 1042 | 1.87 | 702 | 324 | 0.58 | 13363 | 23.98 |
| 653 | 72 | 0.13 | 1114 | 2.00 | 703 | 369 | 0.66 | 13732 | 24.64 |
| 654 | 81 | 0.15 | 1195 | 2.14 | 704 | 383 | 0.69 | 14115 | 25.32 |
| 655 | 71 | 0.13 | 1266 | 2.27 | 705 | 336 | 0.60 | 14451 | 25.93 |
| 656 | 88 | 0.16 | 1354 | 2.43 | 706 | 338 | 0.61 | 14789 | 26.53 |
| 657 | 96 | 0.17 | 1450 | 2.60 | 707 | 338 | 0.61 | 15127 | 27.14 |
| 658 | 108 | 0.19 | 1558 | 2.80 | 708 | 362 | 0.65 | 15489 | 27.79 |
| 659 | 110 | 0.20 | 1668 | 2.99 | 709 | 368 | 0.66 | 15857 | 28.45 |
| 660 | 127 | 0.23 | 1795 | 3.22 | 710 | 369 | 0.66 | 16226 | 29.11 |
| 661 | 131 | 0.24 | 1926 | 3.46 | 711 | 365 | 0.65 | 16591 | 29.77 |
| 662 | 140 | 0.25 | 2066 | 3.71 | 712 | 387 | 0.69 | 16978 | 30.46 |
| 663 | 151 | 0.27 | 2217 | 3.98 | 713 | 381 | 0.68 | 17359 | 31.14 |
| 664 | 154 | 0.28 | 2371 | 4.25 | 714 | 381 | 0.68 | 17740 | 31.83 |
| 665 | 167 | 0.30 | 2538 | 4.55 | 715 | 390 | 0.70 | 18130 | 32.53 |
| 666 | 170 | 0.31 | 2708 | 4.86 | 716 | 369 | 0.66 | 18499 | 33.19 |
| 667 | 174 | 0.31 | 2882 | 5.17 | 717 | 406 | 0.73 | 18905 | 33.92 |
| 668 | 225 | 0.40 | 3107 | 5.57 | 718 | 431 | 0.77 | 19336 | 34.69 |
| 669 | 197 | 0.35 | 3304 | 5.93 | 719 | 444 | 0.80 | 19780 | 35.49 |
| 670 | 199 | 0.36 | 3503 | 6.28 | 720 | 405 | 0.73 | 20185 | 36.21 |
| 671 | 233 | 0.42 | 3736 | 6.70 | 721 | 415 | 0.74 | 20600 | 36.96 |
| 672 | 224 | 0.40 | 3960 | 7.10 | 722 | 403 | 0.72 | 21003 | 37.68 |
| 673 | 246 | 0.44 | 4206 | 7.55 | 723 | 446 | 0.80 | 21449 | 38.48 |
| 674 | 241 | 0.43 | 4447 | 7.98 | 724 | 411 | 0.74 | 21860 | 39.22 |
| 675 | 276 | 0.50 | 4723 | 8.47 | 725 | 447 | 0.80 | 22307 | 40.02 |
| 676 | 260 | 0.47 | 4983 | 8.94 | 726 | 435 | 0.78 | 22742 | 40.80 |
| 677 | 283 | 0.51 | 5266 | 9.45 | 727 | 471 | 0.85 | 23213 | 41.65 |
| 678 | 294 | 0.53 | 5560 | 9.98 | 728 | 455 | 0.82 | 23668 | 42.46 |
| 679 | 296 | 0.53 | 5856 | 10.51 | 729 | 444 | 0.80 | 24112 | 43.26 |
| 680 | 292 | 0.52 | 6148 | 11.03 | 730 | 462 | 0.83 | 24574 | 44.09 |
| 681 | 314 | 0.56 | 6462 | 11.59 | 731 | 464 | 0.83 | 25038 | 44.92 |
| 682 | 310 | 0.56 | 6772 | 12.15 | 732 | 439 | 0.79 | 25477 | 45.71 |
| 683 | 304 | 0.55 | 7076 | 12.70 | 733 | 459 | 0.82 | 25936 | 46.53 |
| 684 | 318 | 0.57 | 7394 | 13.27 | 734 | 481 | 0.86 | 26417 | 47.40 |
| 685 | 324 | 0.58 | 7718 | 13.85 | 735 | 466 | 0.84 | 26883 | 48.23 |
| 686 | 323 | 0.58 | 8041 | 14.43 | 736 | 442 | 0.79 | 27325 | 49.02 |
| 687 | 317 | 0.57 | 8358 | 15.00 | 737 | 494 | 0.89 | 27819 | 49.91 |
| 688 | 302 | 0.54 | 8660 | 15.54 | 738 | 476 | 0.85 | 28295 | 50.77 |
| 689 | 345 | 0.62 | 9005 | 16.16 | 739 | 455 | 0.82 | 28750 | 51.58 |
| 690 | 314 | 0.56 | 9319 | 16.72 | 740 | 440 | 0.79 | 29190 | 52.37 |
| 691 | 305 | 0.55 | 9624 | 17.27 | 741 | 481 | 0.86 | 29671 | 53.23 |
| 692 | 331 | 0.59 | 9955 | 17.86 | 742 | 505 | 0.91 | 30176 | 54.14 |
| 693 | 330 | 0.59 | 10285 | 18.45 | 743 | 485 | 0.87 | 30661 | 55.01 |
| 694 | 353 | 0.63 | 10638 | 19.09 | 744 | 481 | 0.86 | 31142 | 55.87 |
| 695 | 351 | 0.63 | 10989 | 19.72 | 745 | 463 | 0.83 | 31605 | 56.70 |
| 696 | 371 | 0.67 | 11360 | 20.38 | 746 | 510 | 0.92 | 32115 | 57.62 |
| 697 | 310 | 0.56 | 11670 | 20.94 | 747 | 482 | 0.86 | 32597 | 58.48 |
| 698 | 327 | 0.59 | 11997 | 21.52 | 748 | 462 | 0.83 | 33059 | 59.31 |
| 699 | 373 | 0.67 | 12370 | 22.19 | 749 | 453 | 0.81 | 33512 | 60.13 |

| SS | Freq. | % | Cum. Freq. | Cum. % | SS | Freq. | % | Cum. Freq. | Cum. % |
|---|---|---|---|---|---|---|---|---|---|
| 750 | 474 | 0.85 | 33986 | 60.98 | 801 | 162 | 0.29 | 51772 | 92.89 |
| 751 | 466 | 0.84 | 34452 | 61.81 | 802 | 171 | 0.31 | 51943 | 93.19 |
| 752 | 432 | 0.78 | 34884 | 62.59 | 803 | 156 | 0.28 | 52099 | 93.47 |
| 753 | 458 | 0.82 | 35342 | 63.41 | 804 | 167 | 0.30 | 52266 | 93.77 |
| 754 | 461 | 0.83 | 35803 | 64.24 | 805 | 147 | 0.26 | 52413 | 94.04 |
| 755 | 466 | 0.84 | 36269 | 65.07 | 806 | 145 | 0.26 | 52558 | 94.30 |
| 756 | 449 | 0.81 | 36718 | 65.88 | 807 | 131 | 0.24 | 52689 | 94.53 |
| 757 | 420 | 0.75 | 37138 | 66.63 | 808 | 147 | 0.26 | 52836 | 94.80 |
| 758 | 445 | 0.80 | 37583 | 67.43 | 809 | 141 | 0.25 | 52977 | 95.05 |
| 759 | 450 | 0.81 | 38033 | 68.24 | 810 | 121 | 0.22 | 53098 | 95.27 |
| 760 | 402 | 0.72 | 38435 | 68.96 | 811 | 156 | 0.28 | 53254 | 95.55 |
| 761 | 418 | 0.75 | 38853 | 69.71 | 812 | 103 | 0.18 | 53357 | 95.73 |
| 762 | 457 | 0.82 | 39310 | 70.53 | 813 | 116 | 0.21 | 53473 | 95.94 |
| 763 | 431 | 0.77 | 39741 | 71.30 | 814 | 147 | 0.26 | 53620 | 96.20 |
| 764 | 412 | 0.74 | 40153 | 72.04 | 815 | 83 | 0.15 | 53703 | 96.35 |
| 765 | 400 | 0.72 | 40553 | 72.76 | 816 | 106 | 0.19 | 53809 | 96.54 |
| 766 | 404 | 0.72 | 40957 | 73.48 | 817 | 73 | 0.13 | 53882 | 96.67 |
| 767 | 424 | 0.76 | 41381 | 74.24 | 818 | 111 | 0.20 | 53993 | 96.87 |
| 768 | 378 | 0.68 | 41759 | 74.92 | 819 | 91 | 0.16 | 54084 | 97.03 |
| 769 | 394 | 0.71 | 42153 | 75.63 | 820 | 59 | 0.11 | 54143 | 97.14 |
| 770 | 396 | 0.71 | 42549 | 76.34 | 821 | 120 | 0.22 | 54263 | 97.36 |
| 771 | 367 | 0.66 | 42916 | 77.00 | 822 | 71 | 0.13 | 54334 | 97.48 |
| 772 | 393 | 0.71 | 43309 | 77.70 | 823 | 73 | 0.13 | 54407 | 97.61 |
| 773 | 410 | 0.74 | 43719 | 78.44 | 824 | 78 | 0.14 | 54485 | 97.75 |
| 774 | 421 | 0.76 | 44140 | 79.19 | 825 | 65 | 0.12 | 54550 | 97.87 |
| 775 | 362 | 0.65 | 44502 | 79.84 | 826 | 57 | 0.10 | 54607 | 97.97 |
| 776 | 356 | 0.64 | 44858 | 80.48 | 827 | 54 | 0.10 | 54661 | 98.07 |
| 777 | 374 | 0.67 | 45232 | 81.15 | 828 | 41 | 0.07 | 54702 | 98.14 |
| 778 | 309 | 0.55 | 45541 | 81.71 | 829 | 60 | 0.11 | 54762 | 98.25 |
| 779 | 329 | 0.59 | 45870 | 82.30 | 830 | 42 | 0.08 | 54804 | 98.33 |
| 780 | 364 | 0.65 | 46234 | 82.95 | 831 | 41 | 0.07 | 54845 | 98.40 |
| 781 | 337 | 0.60 | 46571 | 83.55 | 832 | 64 | 0.11 | 54909 | 98.51 |
| 782 | 320 | 0.57 | 46891 | 84.13 | 833 | 56 | 0.10 | 54965 | 98.61 |
| 783 | 329 | 0.59 | 47220 | 84.72 | 834 | 33 | 0.06 | 54998 | 98.67 |
| 784 | 303 | 0.54 | 47523 | 85.26 | 835 | 51 | 0.09 | 55049 | 98.77 |
| 785 | 306 | 0.55 | 47829 | 85.81 | 836 | 36 | 0.06 | 55085 | 98.83 |
| 786 | 275 | 0.49 | 48104 | 86.31 | 837 | 23 | 0.04 | 55108 | 98.87 |
| 787 | 286 | 0.51 | 48390 | 86.82 | 838 | 17 | 0.03 | 55125 | 98.90 |
| 788 | 278 | 0.50 | 48668 | 87.32 | 839 | 36 | 0.06 | 55161 | 98.97 |
| 789 | 301 | 0.54 | 48969 | 87.86 | 840 | 27 | 0.05 | 55188 | 99.02 |
| 790 | 272 | 0.49 | 49241 | 88.35 | 841 | 39 | 0.07 | 55227 | 99.08 |
| 791 | 254 | 0.46 | 49495 | 88.80 | 842 | 35 | 0.06 | 55262 | 99.15 |
| 792 | 268 | 0.48 | 49763 | 89.28 | 843 | 18 | 0.03 | 55280 | 99.18 |
| 793 | 286 | 0.51 | 50049 | 89.79 | 844 | 23 | 0.04 | 55303 | 99.22 |
| 794 | 256 | 0.46 | 50305 | 90.25 | 845 | 31 | 0.06 | 55334 | 99.28 |
| 795 | 220 | 0.39 | 50525 | 90.65 | 846 | 34 | 0.06 | 55368 | 99.34 |
| 796 | 246 | 0.44 | 50771 | 91.09 | 847 | 14 | 0.03 | 55382 | 99.36 |
| 797 | 206 | 0.37 | 50977 | 91.46 | 848 | 21 | 0.04 | 55403 | 99.40 |
| 798 | 238 | 0.43 | 51215 | 91.89 | 849 | 12 | 0.02 | 55415 | 99.42 |
| 799 | 191 | 0.34 | 51406 | 92.23 | 850 | 322 | 0.58 | 55737 | 100.00 |
| 800 | 204 | 0.37 | 51610 | 92.60 | | | | | |

**Table F.8. Scale Score Distribution—ELA Grade 4**

| SS | Freq. | % | Cum. Freq. | Cum. % | SS | Freq. | % | Cum. Freq. | Cum. % |
|---|---|---|---|---|---|---|---|---|---|
| 650 | 455 | 0.82 | 455 | 0.82 | 700 | 260 | 0.47 | 8323 | 14.99 |
| 651 | 34 | 0.06 | 489 | 0.88 | 701 | 278 | 0.50 | 8601 | 15.49 |
| 652 | 39 | 0.07 | 528 | 0.95 | 702 | 275 | 0.50 | 8876 | 15.99 |
| 653 | 25 | 0.05 | 553 | 1.00 | 703 | 322 | 0.58 | 9198 | 16.57 |
| 654 | 26 | 0.05 | 579 | 1.04 | 704 | 277 | 0.50 | 9475 | 17.07 |
| 655 | 30 | 0.05 | 609 | 1.10 | 705 | 304 | 0.55 | 9779 | 17.61 |
| 656 | 46 | 0.08 | 655 | 1.18 | 706 | 363 | 0.65 | 10142 | 18.27 |
| 657 | 62 | 0.11 | 717 | 1.29 | 707 | 318 | 0.57 | 10460 | 18.84 |
| 658 | 57 | 0.10 | 774 | 1.39 | 708 | 328 | 0.59 | 10788 | 19.43 |
| 659 | 58 | 0.10 | 832 | 1.50 | 709 | 362 | 0.65 | 11150 | 20.08 |
| 660 | 64 | 0.12 | 896 | 1.61 | 710 | 382 | 0.69 | 11532 | 20.77 |
| 661 | 68 | 0.12 | 964 | 1.74 | 711 | 358 | 0.64 | 11890 | 21.42 |
| 662 | 72 | 0.13 | 1036 | 1.87 | 712 | 355 | 0.64 | 12245 | 22.06 |
| 663 | 69 | 0.12 | 1105 | 1.99 | 713 | 368 | 0.66 | 12613 | 22.72 |
| 664 | 77 | 0.14 | 1182 | 2.13 | 714 | 362 | 0.65 | 12975 | 23.37 |
| 665 | 75 | 0.14 | 1257 | 2.26 | 715 | 380 | 0.68 | 13355 | 24.05 |
| 666 | 85 | 0.15 | 1342 | 2.42 | 716 | 384 | 0.69 | 13739 | 24.75 |
| 667 | 118 | 0.21 | 1460 | 2.63 | 717 | 385 | 0.69 | 14124 | 25.44 |
| 668 | 108 | 0.19 | 1568 | 2.82 | 718 | 397 | 0.72 | 14521 | 26.16 |
| 669 | 105 | 0.19 | 1673 | 3.01 | 719 | 440 | 0.79 | 14961 | 26.95 |
| 670 | 115 | 0.21 | 1788 | 3.22 | 720 | 421 | 0.76 | 15382 | 27.71 |
| 671 | 135 | 0.24 | 1923 | 3.46 | 721 | 465 | 0.84 | 15847 | 28.54 |
| 672 | 125 | 0.23 | 2048 | 3.69 | 722 | 454 | 0.82 | 16301 | 29.36 |
| 673 | 151 | 0.27 | 2199 | 3.96 | 723 | 432 | 0.78 | 16733 | 30.14 |
| 674 | 131 | 0.24 | 2330 | 4.20 | 724 | 476 | 0.86 | 17209 | 31.00 |
| 675 | 159 | 0.29 | 2489 | 4.48 | 725 | 459 | 0.83 | 17668 | 31.82 |
| 676 | 157 | 0.28 | 2646 | 4.77 | 726 | 476 | 0.86 | 18144 | 32.68 |
| 677 | 157 | 0.28 | 2803 | 5.05 | 727 | 474 | 0.85 | 18618 | 33.53 |
| 678 | 183 | 0.33 | 2986 | 5.38 | 728 | 504 | 0.91 | 19122 | 34.44 |
| 679 | 168 | 0.30 | 3154 | 5.68 | 729 | 494 | 0.89 | 19616 | 35.33 |
| 680 | 223 | 0.40 | 3377 | 6.08 | 730 | 531 | 0.96 | 20147 | 36.29 |
| 681 | 217 | 0.39 | 3594 | 6.47 | 731 | 549 | 0.99 | 20696 | 37.28 |
| 682 | 185 | 0.33 | 3779 | 6.81 | 732 | 540 | 0.97 | 21236 | 38.25 |
| 683 | 213 | 0.38 | 3992 | 7.19 | 733 | 538 | 0.97 | 21774 | 39.22 |
| 684 | 206 | 0.37 | 4198 | 7.56 | 734 | 572 | 1.03 | 22346 | 40.25 |
| 685 | 255 | 0.46 | 4453 | 8.02 | 735 | 520 | 0.94 | 22866 | 41.19 |
| 686 | 219 | 0.39 | 4672 | 8.42 | 736 | 536 | 0.97 | 23402 | 42.15 |
| 687 | 241 | 0.43 | 4913 | 8.85 | 737 | 558 | 1.01 | 23960 | 43.16 |
| 688 | 244 | 0.44 | 5157 | 9.29 | 738 | 569 | 1.02 | 24529 | 44.18 |
| 689 | 210 | 0.38 | 5367 | 9.67 | 739 | 575 | 1.04 | 25104 | 45.22 |
| 690 | 260 | 0.47 | 5627 | 10.14 | 740 | 598 | 1.08 | 25702 | 46.29 |
| 691 | 253 | 0.46 | 5880 | 10.59 | 741 | 621 | 1.12 | 26323 | 47.41 |
| 692 | 255 | 0.46 | 6135 | 11.05 | 742 | 569 | 1.02 | 26892 | 48.44 |
| 693 | 239 | 0.43 | 6374 | 11.48 | 743 | 604 | 1.09 | 27496 | 49.53 |
| 694 | 265 | 0.48 | 6639 | 11.96 | 744 | 625 | 1.13 | 28121 | 50.65 |
| 695 | 285 | 0.51 | 6924 | 12.47 | 745 | 587 | 1.06 | 28708 | 51.71 |
| 696 | 314 | 0.57 | 7238 | 13.04 | 746 | 630 | 1.13 | 29338 | 52.84 |
| 697 | 282 | 0.51 | 7520 | 13.54 | 747 | 615 | 1.11 | 29953 | 53.95 |
| 698 | 273 | 0.49 | 7793 | 14.04 | 748 | 619 | 1.11 | 30572 | 55.07 |
| 699 | 270 | 0.49 | 8063 | 14.52 | 749 | 641 | 1.15 | 31213 | 56.22 |

| SS | Freq. | % | Cum. Freq. | Cum. % | SS | Freq. | % | Cum. Freq. | Cum. % |
|---|---|---|---|---|---|---|---|---|---|
| 750 | 541 | 0.97 | 31754 | 57.19 | 801 | 139 | 0.25 | 53140 | 95.71 |
| 751 | 615 | 1.11 | 32369 | 58.30 | 802 | 139 | 0.25 | 53279 | 95.97 |
| 752 | 635 | 1.14 | 33004 | 59.45 | 803 | 149 | 0.27 | 53428 | 96.23 |
| 753 | 647 | 1.17 | 33651 | 60.61 | 804 | 133 | 0.24 | 53561 | 96.47 |
| 754 | 585 | 1.05 | 34236 | 61.67 | 805 | 122 | 0.22 | 53683 | 96.69 |
| 755 | 614 | 1.11 | 34850 | 62.77 | 806 | 118 | 0.21 | 53801 | 96.91 |
| 756 | 575 | 1.04 | 35425 | 63.81 | 807 | 110 | 0.20 | 53911 | 97.10 |
| 757 | 597 | 1.08 | 36022 | 64.88 | 808 | 114 | 0.21 | 54025 | 97.31 |
| 758 | 631 | 1.14 | 36653 | 66.02 | 809 | 94 | 0.17 | 54119 | 97.48 |
| 759 | 609 | 1.10 | 37262 | 67.12 | 810 | 96 | 0.17 | 54215 | 97.65 |
| 760 | 562 | 1.01 | 37824 | 68.13 | 811 | 82 | 0.15 | 54297 | 97.80 |
| 761 | 619 | 1.11 | 38443 | 69.24 | 812 | 87 | 0.16 | 54384 | 97.96 |
| 762 | 568 | 1.02 | 39011 | 70.27 | 813 | 64 | 0.12 | 54448 | 98.07 |
| 763 | 573 | 1.03 | 39584 | 71.30 | 814 | 71 | 0.13 | 54519 | 98.20 |
| 764 | 511 | 0.92 | 40095 | 72.22 | 815 | 85 | 0.15 | 54604 | 98.35 |
| 765 | 555 | 1.00 | 40650 | 73.22 | 816 | 47 | 0.08 | 54651 | 98.44 |
| 766 | 509 | 0.92 | 41159 | 74.13 | 817 | 56 | 0.10 | 54707 | 98.54 |
| 767 | 541 | 0.97 | 41700 | 75.11 | 818 | 65 | 0.12 | 54772 | 98.65 |
| 768 | 499 | 0.90 | 42199 | 76.01 | 819 | 40 | 0.07 | 54812 | 98.73 |
| 769 | 586 | 1.06 | 42785 | 77.06 | 820 | 35 | 0.06 | 54847 | 98.79 |
| 770 | 516 | 0.93 | 43301 | 77.99 | 821 | 43 | 0.08 | 54890 | 98.87 |
| 771 | 504 | 0.91 | 43805 | 78.90 | 822 | 37 | 0.07 | 54927 | 98.93 |
| 772 | 497 | 0.90 | 44302 | 79.80 | 823 | 37 | 0.07 | 54964 | 99.00 |
| 773 | 509 | 0.92 | 44811 | 80.71 | 824 | 37 | 0.07 | 55001 | 99.07 |
| 774 | 428 | 0.77 | 45239 | 81.48 | 825 | 37 | 0.07 | 55038 | 99.13 |
| 775 | 425 | 0.77 | 45664 | 82.25 | 826 | 31 | 0.06 | 55069 | 99.19 |
| 776 | 478 | 0.86 | 46142 | 83.11 | 827 | 35 | 0.06 | 55104 | 99.25 |
| 777 | 451 | 0.81 | 46593 | 83.92 | 828 | 26 | 0.05 | 55130 | 99.30 |
| 778 | 387 | 0.70 | 46980 | 84.62 | 829 | 17 | 0.03 | 55147 | 99.33 |
| 779 | 412 | 0.74 | 47392 | 85.36 | 830 | 35 | 0.06 | 55182 | 99.39 |
| 780 | 389 | 0.70 | 47781 | 86.06 | 831 | 25 | 0.05 | 55207 | 99.44 |
| 781 | 354 | 0.64 | 48135 | 86.70 | 832 | 27 | 0.05 | 55234 | 99.49 |
| 782 | 369 | 0.66 | 48504 | 87.36 | 833 | 19 | 0.03 | 55253 | 99.52 |
| 783 | 331 | 0.60 | 48835 | 87.96 | 834 | 22 | 0.04 | 55275 | 99.56 |
| 784 | 331 | 0.60 | 49166 | 88.56 | 835 | 15 | 0.03 | 55290 | 99.59 |
| 785 | 315 | 0.57 | 49481 | 89.12 | 836 | 21 | 0.04 | 55311 | 99.63 |
| 786 | 318 | 0.57 | 49799 | 89.70 | 837 | 16 | 0.03 | 55327 | 99.65 |
| 787 | 284 | 0.51 | 50083 | 90.21 | 838 | 15 | 0.03 | 55342 | 99.68 |
| 788 | 300 | 0.54 | 50383 | 90.75 | 839 | 15 | 0.03 | 55357 | 99.71 |
| 789 | 292 | 0.53 | 50675 | 91.28 | 840 | 12 | 0.02 | 55369 | 99.73 |
| 790 | 273 | 0.49 | 50948 | 91.77 | 841 | 7 | 0.01 | 55376 | 99.74 |
| 791 | 286 | 0.52 | 51234 | 92.28 | 842 | 7 | 0.01 | 55383 | 99.76 |
| 792 | 242 | 0.44 | 51476 | 92.72 | 843 | 8 | 0.01 | 55391 | 99.77 |
| 793 | 248 | 0.45 | 51724 | 93.16 | 844 | 8 | 0.01 | 55399 | 99.78 |
| 794 | 229 | 0.41 | 51953 | 93.58 | 845 | 17 | 0.03 | 55416 | 99.81 |
| 795 | 211 | 0.38 | 52164 | 93.96 | 846 | 7 | 0.01 | 55423 | 99.83 |
| 796 | 181 | 0.33 | 52345 | 94.28 | 847 | 6 | 0.01 | 55429 | 99.84 |
| 797 | 179 | 0.32 | 52524 | 94.61 | 848 | 7 | 0.01 | 55436 | 99.85 |
| 798 | 152 | 0.27 | 52676 | 94.88 | 849 | 5 | 0.01 | 55441 | 99.86 |
| 799 | 175 | 0.32 | 52851 | 95.19 | 850 | 78 | 0.14 | 55519 | 100.00 |
| 800 | 150 | 0.27 | 53001 | 95.46 | | | | | |

**Table F.9. Scale Score Distribution—ELA Grade 5**

| SS | Freq. | % | Cum. Freq. | Cum. % | SS | Freq. | % | Cum. Freq. | Cum. % |
|----|-------|-----|------------|--------|-----|-------|------|------------|--------|
| 650 | 84 | 0.15 | 84 | 0.15 | 700 | 300 | 0.53 | 4794 | 8.46 |
| 651 | 7 | 0.01 | 91 | 0.16 | 701 | 338 | 0.60 | 5132 | 9.06 |
| 652 | 3 | 0.01 | 94 | 0.17 | 702 | 334 | 0.59 | 5466 | 9.65 |
| 653 | 11 | 0.02 | 105 | 0.19 | 703 | 336 | 0.59 | 5802 | 10.24 |
| 654 | 4 | 0.01 | 109 | 0.19 | 704 | 361 | 0.64 | 6163 | 10.88 |
| 655 | 1 | 0.00 | 110 | 0.19 | 705 | 351 | 0.62 | 6514 | 11.50 |
| 656 | 7 | 0.01 | 117 | 0.21 | 706 | 399 | 0.70 | 6913 | 12.20 |
| 657 | 14 | 0.02 | 131 | 0.23 | 707 | 375 | 0.66 | 7288 | 12.86 |
| 658 | 11 | 0.02 | 142 | 0.25 | 708 | 406 | 0.72 | 7694 | 13.58 |
| 659 | 10 | 0.02 | 152 | 0.27 | 709 | 372 | 0.66 | 8066 | 14.24 |
| 660 | 14 | 0.02 | 166 | 0.29 | 710 | 393 | 0.69 | 8459 | 14.93 |
| 661 | 13 | 0.02 | 179 | 0.32 | 711 | 428 | 0.76 | 8887 | 15.69 |
| 662 | 12 | 0.02 | 191 | 0.34 | 712 | 406 | 0.72 | 9293 | 16.40 |
| 663 | 17 | 0.03 | 208 | 0.37 | 713 | 419 | 0.74 | 9712 | 17.14 |
| 664 | 19 | 0.03 | 227 | 0.40 | 714 | 419 | 0.74 | 10131 | 17.88 |
| 665 | 23 | 0.04 | 250 | 0.44 | 715 | 438 | 0.77 | 10569 | 18.65 |
| 666 | 20 | 0.04 | 270 | 0.48 | 716 | 470 | 0.83 | 11039 | 19.48 |
| 667 | 26 | 0.05 | 296 | 0.52 | 717 | 482 | 0.85 | 11521 | 20.33 |
| 668 | 26 | 0.05 | 322 | 0.57 | 718 | 470 | 0.83 | 11991 | 21.16 |
| 669 | 26 | 0.05 | 348 | 0.61 | 719 | 472 | 0.83 | 12463 | 22.00 |
| 670 | 32 | 0.06 | 380 | 0.67 | 720 | 530 | 0.94 | 12993 | 22.93 |
| 671 | 50 | 0.09 | 430 | 0.76 | 721 | 478 | 0.84 | 13471 | 23.78 |
| 672 | 36 | 0.06 | 466 | 0.82 | 722 | 484 | 0.85 | 13955 | 24.63 |
| 673 | 45 | 0.08 | 511 | 0.90 | 723 | 475 | 0.84 | 14430 | 25.47 |
| 674 | 54 | 0.10 | 565 | 1.00 | 724 | 550 | 0.97 | 14980 | 26.44 |
| 675 | 45 | 0.08 | 610 | 1.08 | 725 | 502 | 0.89 | 15482 | 27.33 |
| 676 | 64 | 0.11 | 674 | 1.19 | 726 | 517 | 0.91 | 15999 | 28.24 |
| 677 | 77 | 0.14 | 751 | 1.33 | 727 | 556 | 0.98 | 16555 | 29.22 |
| 678 | 81 | 0.14 | 832 | 1.47 | 728 | 503 | 0.89 | 17058 | 30.11 |
| 679 | 91 | 0.16 | 923 | 1.63 | 729 | 535 | 0.94 | 17593 | 31.05 |
| 680 | 67 | 0.12 | 990 | 1.75 | 730 | 548 | 0.97 | 18141 | 32.02 |
| 681 | 83 | 0.15 | 1073 | 1.89 | 731 | 560 | 0.99 | 18701 | 33.01 |
| 682 | 115 | 0.20 | 1188 | 2.10 | 732 | 608 | 1.07 | 19309 | 34.08 |
| 683 | 99 | 0.17 | 1287 | 2.27 | 733 | 559 | 0.99 | 19868 | 35.07 |
| 684 | 112 | 0.20 | 1399 | 2.47 | 734 | 593 | 1.05 | 20461 | 36.11 |
| 685 | 124 | 0.22 | 1523 | 2.69 | 735 | 581 | 1.03 | 21042 | 37.14 |
| 686 | 118 | 0.21 | 1641 | 2.90 | 736 | 569 | 1.00 | 21611 | 38.14 |
| 687 | 167 | 0.29 | 1808 | 3.19 | 737 | 640 | 1.13 | 22251 | 39.27 |
| 688 | 149 | 0.26 | 1957 | 3.45 | 738 | 629 | 1.11 | 22880 | 40.38 |
| 689 | 160 | 0.28 | 2117 | 3.74 | 739 | 582 | 1.03 | 23462 | 41.41 |
| 690 | 193 | 0.34 | 2310 | 4.08 | 740 | 604 | 1.07 | 24066 | 42.48 |
| 691 | 174 | 0.31 | 2484 | 4.38 | 741 | 632 | 1.12 | 24698 | 43.59 |
| 692 | 184 | 0.32 | 2668 | 4.71 | 742 | 608 | 1.07 | 25306 | 44.67 |
| 693 | 227 | 0.40 | 2895 | 5.11 | 743 | 615 | 1.09 | 25921 | 45.75 |
| 694 | 255 | 0.45 | 3150 | 5.56 | 744 | 622 | 1.10 | 26543 | 46.85 |
| 695 | 267 | 0.47 | 3417 | 6.03 | 745 | 622 | 1.10 | 27165 | 47.95 |
| 696 | 279 | 0.49 | 3696 | 6.52 | 746 | 620 | 1.09 | 27785 | 49.04 |
| 697 | 249 | 0.44 | 3945 | 6.96 | 747 | 646 | 1.14 | 28431 | 50.18 |
| 698 | 262 | 0.46 | 4207 | 7.43 | 748 | 580 | 1.02 | 29011 | 51.20 |
| 699 | 287 | 0.51 | 4494 | 7.93 | 749 | 588 | 1.04 | 29599 | 52.24 |

| SS | Freq. | % | Cum. Freq. | Cum. % | SS | Freq. | % | Cum. Freq. | Cum. % |
|---|---|---|---|---|---|---|---|---|---|
| 750 | 644 | 1.14 | 30243 | 53.38 | 801 | 209 | 0.37 | 53534 | 94.49 |
| 751 | 630 | 1.11 | 30873 | 54.49 | 802 | 219 | 0.39 | 53753 | 94.87 |
| 752 | 600 | 1.06 | 31473 | 55.55 | 803 | 198 | 0.35 | 53951 | 95.22 |
| 753 | 652 | 1.15 | 32125 | 56.70 | 804 | 163 | 0.29 | 54114 | 95.51 |
| 754 | 654 | 1.15 | 32779 | 57.86 | 805 | 150 | 0.26 | 54264 | 95.78 |
| 755 | 606 | 1.07 | 33385 | 58.92 | 806 | 150 | 0.26 | 54414 | 96.04 |
| 756 | 610 | 1.08 | 33995 | 60.00 | 807 | 158 | 0.28 | 54572 | 96.32 |
| 757 | 631 | 1.11 | 34626 | 61.12 | 808 | 143 | 0.25 | 54715 | 96.57 |
| 758 | 589 | 1.04 | 35215 | 62.15 | 809 | 123 | 0.22 | 54838 | 96.79 |
| 759 | 605 | 1.07 | 35820 | 63.22 | 810 | 121 | 0.21 | 54959 | 97.00 |
| 760 | 595 | 1.05 | 36415 | 64.27 | 811 | 117 | 0.21 | 55076 | 97.21 |
| 761 | 594 | 1.05 | 37009 | 65.32 | 812 | 122 | 0.22 | 55198 | 97.42 |
| 762 | 555 | 0.98 | 37564 | 66.30 | 813 | 100 | 0.18 | 55298 | 97.60 |
| 763 | 600 | 1.06 | 38164 | 67.36 | 814 | 87 | 0.15 | 55385 | 97.75 |
| 764 | 561 | 0.99 | 38725 | 68.35 | 815 | 105 | 0.19 | 55490 | 97.94 |
| 765 | 610 | 1.08 | 39335 | 69.43 | 816 | 99 | 0.17 | 55589 | 98.11 |
| 766 | 588 | 1.04 | 39923 | 70.46 | 817 | 68 | 0.12 | 55657 | 98.23 |
| 767 | 547 | 0.97 | 40470 | 71.43 | 818 | 81 | 0.14 | 55738 | 98.38 |
| 768 | 570 | 1.01 | 41040 | 72.44 | 819 | 68 | 0.12 | 55806 | 98.50 |
| 769 | 544 | 0.96 | 41584 | 73.40 | 820 | 69 | 0.12 | 55875 | 98.62 |
| 770 | 534 | 0.94 | 42118 | 74.34 | 821 | 74 | 0.13 | 55949 | 98.75 |
| 771 | 547 | 0.97 | 42665 | 75.30 | 822 | 52 | 0.09 | 56001 | 98.84 |
| 772 | 488 | 0.86 | 43153 | 76.17 | 823 | 57 | 0.10 | 56058 | 98.94 |
| 773 | 506 | 0.89 | 43659 | 77.06 | 824 | 25 | 0.04 | 56083 | 98.99 |
| 774 | 510 | 0.90 | 44169 | 77.96 | 825 | 49 | 0.09 | 56132 | 99.07 |
| 775 | 488 | 0.86 | 44657 | 78.82 | 826 | 39 | 0.07 | 56171 | 99.14 |
| 776 | 466 | 0.82 | 45123 | 79.64 | 827 | 43 | 0.08 | 56214 | 99.22 |
| 777 | 480 | 0.85 | 45603 | 80.49 | 828 | 45 | 0.08 | 56259 | 99.30 |
| 778 | 411 | 0.73 | 46014 | 81.22 | 829 | 33 | 0.06 | 56292 | 99.36 |
| 779 | 431 | 0.76 | 46445 | 81.98 | 830 | 37 | 0.07 | 56329 | 99.42 |
| 780 | 444 | 0.78 | 46889 | 82.76 | 831 | 41 | 0.07 | 56370 | 99.49 |
| 781 | 454 | 0.80 | 47343 | 83.56 | 832 | 23 | 0.04 | 56393 | 99.53 |
| 782 | 442 | 0.78 | 47785 | 84.34 | 833 | 14 | 0.02 | 56407 | 99.56 |
| 783 | 416 | 0.73 | 48201 | 85.08 | 834 | 13 | 0.02 | 56420 | 99.58 |
| 784 | 425 | 0.75 | 48626 | 85.83 | 835 | 19 | 0.03 | 56439 | 99.62 |
| 785 | 393 | 0.69 | 49019 | 86.52 | 836 | 12 | 0.02 | 56451 | 99.64 |
| 786 | 353 | 0.62 | 49372 | 87.14 | 837 | 14 | 0.02 | 56465 | 99.66 |
| 787 | 344 | 0.61 | 49716 | 87.75 | 838 | 20 | 0.04 | 56485 | 99.70 |
| 788 | 332 | 0.59 | 50048 | 88.34 | 839 | 16 | 0.03 | 56501 | 99.72 |
| 789 | 333 | 0.59 | 50381 | 88.92 | 840 | 15 | 0.03 | 56516 | 99.75 |
| 790 | 331 | 0.58 | 50712 | 89.51 | 841 | 8 | 0.01 | 56524 | 99.77 |
| 791 | 298 | 0.53 | 51010 | 90.03 | 842 | 12 | 0.02 | 56536 | 99.79 |
| 792 | 291 | 0.51 | 51301 | 90.55 | 843 | 12 | 0.02 | 56548 | 99.81 |
| 793 | 293 | 0.52 | 51594 | 91.06 | 844 | 13 | 0.02 | 56561 | 99.83 |
| 794 | 277 | 0.49 | 51871 | 91.55 | 845 | 7 | 0.01 | 56568 | 99.84 |
| 795 | 290 | 0.51 | 52161 | 92.06 | 846 | 13 | 0.02 | 56581 | 99.87 |
| 796 | 250 | 0.44 | 52411 | 92.51 | 847 | 8 | 0.01 | 56589 | 99.88 |
| 797 | 224 | 0.40 | 52635 | 92.90 | 848 | 4 | 0.01 | 56593 | 99.89 |
| 798 | 253 | 0.45 | 52888 | 93.35 | 849 | 7 | 0.01 | 56600 | 99.90 |
| 799 | 236 | 0.42 | 53124 | 93.76 | 850 | 57 | 0.10 | 56657 | 100.00 |
| 800 | 201 | 0.35 | 53325 | 94.12 | | | | | |

**Table F.10. Scale Score Distribution—ELA Grade 6**

| SS | Freq. | % | Cum. Freq. | Cum. % | SS | Freq. | % | Cum. Freq. | Cum. % |
|---|---|---|---|---|---|---|---|---|---|
| 650 | 95 | 0.17 | 95 | 0.17 | 700 | 364 | 0.65 | 6098 | 10.97 |
| 651 | 7 | 0.01 | 102 | 0.18 | 701 | 376 | 0.68 | 6474 | 11.64 |
| 652 | 15 | 0.03 | 117 | 0.21 | 702 | 371 | 0.67 | 6845 | 12.31 |
| 653 | 4 | 0.01 | 121 | 0.22 | 703 | 399 | 0.72 | 7244 | 13.03 |
| 654 | 10 | 0.02 | 131 | 0.24 | 704 | 394 | 0.71 | 7638 | 13.74 |
| 655 | 13 | 0.02 | 144 | 0.26 | 705 | 411 | 0.74 | 8049 | 14.48 |
| 656 | 10 | 0.02 | 154 | 0.28 | 706 | 433 | 0.78 | 8482 | 15.25 |
| 657 | 12 | 0.02 | 166 | 0.30 | 707 | 449 | 0.81 | 8931 | 16.06 |
| 658 | 13 | 0.02 | 179 | 0.32 | 708 | 453 | 0.81 | 9384 | 16.88 |
| 659 | 17 | 0.03 | 196 | 0.35 | 709 | 445 | 0.80 | 9829 | 17.68 |
| 660 | 16 | 0.03 | 212 | 0.38 | 710 | 432 | 0.78 | 10261 | 18.45 |
| 661 | 9 | 0.02 | 221 | 0.40 | 711 | 424 | 0.76 | 10685 | 19.22 |
| 662 | 19 | 0.03 | 240 | 0.43 | 712 | 428 | 0.77 | 11113 | 19.99 |
| 663 | 20 | 0.04 | 260 | 0.47 | 713 | 449 | 0.81 | 11562 | 20.79 |
| 664 | 30 | 0.05 | 290 | 0.52 | 714 | 478 | 0.86 | 12040 | 21.65 |
| 665 | 20 | 0.04 | 310 | 0.56 | 715 | 444 | 0.80 | 12484 | 22.45 |
| 666 | 33 | 0.06 | 343 | 0.62 | 716 | 430 | 0.77 | 12914 | 23.23 |
| 667 | 30 | 0.05 | 373 | 0.67 | 717 | 494 | 0.89 | 13408 | 24.11 |
| 668 | 38 | 0.07 | 411 | 0.74 | 718 | 497 | 0.89 | 13905 | 25.01 |
| 669 | 42 | 0.08 | 453 | 0.81 | 719 | 515 | 0.93 | 14420 | 25.93 |
| 670 | 54 | 0.10 | 507 | 0.91 | 720 | 494 | 0.89 | 14914 | 26.82 |
| 671 | 55 | 0.10 | 562 | 1.01 | 721 | 510 | 0.92 | 15424 | 27.74 |
| 672 | 61 | 0.11 | 623 | 1.12 | 722 | 504 | 0.91 | 15928 | 28.65 |
| 673 | 62 | 0.11 | 685 | 1.23 | 723 | 498 | 0.90 | 16426 | 29.54 |
| 674 | 65 | 0.12 | 750 | 1.35 | 724 | 517 | 0.93 | 16943 | 30.47 |
| 675 | 87 | 0.16 | 837 | 1.51 | 725 | 540 | 0.97 | 17483 | 31.44 |
| 676 | 69 | 0.12 | 906 | 1.63 | 726 | 550 | 0.99 | 18033 | 32.43 |
| 677 | 87 | 0.16 | 993 | 1.79 | 727 | 518 | 0.93 | 18551 | 33.36 |
| 678 | 86 | 0.15 | 1079 | 1.94 | 728 | 560 | 1.01 | 19111 | 34.37 |
| 679 | 113 | 0.20 | 1192 | 2.14 | 729 | 534 | 0.96 | 19645 | 35.33 |
| 680 | 110 | 0.20 | 1302 | 2.34 | 730 | 527 | 0.95 | 20172 | 36.28 |
| 681 | 134 | 0.24 | 1436 | 2.58 | 731 | 568 | 1.02 | 20740 | 37.30 |
| 682 | 127 | 0.23 | 1563 | 2.81 | 732 | 553 | 0.99 | 21293 | 38.30 |
| 683 | 151 | 0.27 | 1714 | 3.08 | 733 | 541 | 0.97 | 21834 | 39.27 |
| 684 | 144 | 0.26 | 1858 | 3.34 | 734 | 596 | 1.07 | 22430 | 40.34 |
| 685 | 170 | 0.31 | 2028 | 3.65 | 735 | 584 | 1.05 | 23014 | 41.39 |
| 686 | 188 | 0.34 | 2216 | 3.99 | 736 | 607 | 1.09 | 23621 | 42.48 |
| 687 | 213 | 0.38 | 2429 | 4.37 | 737 | 593 | 1.07 | 24214 | 43.55 |
| 688 | 194 | 0.35 | 2623 | 4.72 | 738 | 599 | 1.08 | 24813 | 44.63 |
| 689 | 213 | 0.38 | 2836 | 5.10 | 739 | 568 | 1.02 | 25381 | 45.65 |
| 690 | 246 | 0.44 | 3082 | 5.54 | 740 | 627 | 1.13 | 26008 | 46.78 |
| 691 | 259 | 0.47 | 3341 | 6.01 | 741 | 596 | 1.07 | 26604 | 47.85 |
| 692 | 250 | 0.45 | 3591 | 6.46 | 742 | 575 | 1.03 | 27179 | 48.88 |
| 693 | 267 | 0.48 | 3858 | 6.94 | 743 | 608 | 1.09 | 27787 | 49.97 |
| 694 | 278 | 0.50 | 4136 | 7.44 | 744 | 621 | 1.12 | 28408 | 51.09 |
| 695 | 307 | 0.55 | 4443 | 7.99 | 745 | 618 | 1.11 | 29026 | 52.20 |
| 696 | 309 | 0.56 | 4752 | 8.55 | 746 | 609 | 1.10 | 29635 | 53.30 |
| 697 | 311 | 0.56 | 5063 | 9.11 | 747 | 623 | 1.12 | 30258 | 54.42 |
| 698 | 311 | 0.56 | 5374 | 9.67 | 748 | 612 | 1.10 | 30870 | 55.52 |
| 699 | 360 | 0.65 | 5734 | 10.31 | 749 | 617 | 1.11 | 31487 | 56.63 |

| SS | Freq. | % | Cum. Freq. | Cum. % | SS | Freq. | % | Cum. Freq. | Cum. % |
|---|---|---|---|---|---|---|---|---|---|
| 750 | 619 | 1.11 | 32106 | 57.74 | 801 | 129 | 0.23 | 53767 | 96.70 |
| 751 | 602 | 1.08 | 32708 | 58.83 | 802 | 118 | 0.21 | 53885 | 96.91 |
| 752 | 593 | 1.07 | 33301 | 59.89 | 803 | 122 | 0.22 | 54007 | 97.13 |
| 753 | 598 | 1.08 | 33899 | 60.97 | 804 | 118 | 0.21 | 54125 | 97.34 |
| 754 | 665 | 1.20 | 34564 | 62.16 | 805 | 112 | 0.20 | 54237 | 97.55 |
| 755 | 576 | 1.04 | 35140 | 63.20 | 806 | 107 | 0.19 | 54344 | 97.74 |
| 756 | 619 | 1.11 | 35759 | 64.31 | 807 | 109 | 0.20 | 54453 | 97.93 |
| 757 | 605 | 1.09 | 36364 | 65.40 | 808 | 88 | 0.16 | 54541 | 98.09 |
| 758 | 578 | 1.04 | 36942 | 66.44 | 809 | 86 | 0.15 | 54627 | 98.25 |
| 759 | 606 | 1.09 | 37548 | 67.53 | 810 | 70 | 0.13 | 54697 | 98.37 |
| 760 | 588 | 1.06 | 38136 | 68.59 | 811 | 77 | 0.14 | 54774 | 98.51 |
| 761 | 631 | 1.13 | 38767 | 69.72 | 812 | 60 | 0.11 | 54834 | 98.62 |
| 762 | 629 | 1.13 | 39396 | 70.85 | 813 | 51 | 0.09 | 54885 | 98.71 |
| 763 | 567 | 1.02 | 39963 | 71.87 | 814 | 53 | 0.10 | 54938 | 98.81 |
| 764 | 586 | 1.05 | 40549 | 72.93 | 815 | 56 | 0.10 | 54994 | 98.91 |
| 765 | 602 | 1.08 | 41151 | 74.01 | 816 | 50 | 0.09 | 55044 | 99.00 |
| 766 | 567 | 1.02 | 41718 | 75.03 | 817 | 46 | 0.08 | 55090 | 99.08 |
| 767 | 578 | 1.04 | 42296 | 76.07 | 818 | 34 | 0.06 | 55124 | 99.14 |
| 768 | 517 | 0.93 | 42813 | 77.00 | 819 | 41 | 0.07 | 55165 | 99.21 |
| 769 | 551 | 0.99 | 43364 | 77.99 | 820 | 28 | 0.05 | 55193 | 99.26 |
| 770 | 519 | 0.93 | 43883 | 78.92 | 821 | 47 | 0.08 | 55240 | 99.35 |
| 771 | 488 | 0.88 | 44371 | 79.80 | 822 | 27 | 0.05 | 55267 | 99.40 |
| 772 | 522 | 0.94 | 44893 | 80.74 | 823 | 28 | 0.05 | 55295 | 99.45 |
| 773 | 460 | 0.83 | 45353 | 81.57 | 824 | 31 | 0.06 | 55326 | 99.50 |
| 774 | 423 | 0.76 | 45776 | 82.33 | 825 | 18 | 0.03 | 55344 | 99.54 |
| 775 | 465 | 0.84 | 46241 | 83.16 | 826 | 28 | 0.05 | 55372 | 99.59 |
| 776 | 485 | 0.87 | 46726 | 84.04 | 827 | 15 | 0.03 | 55387 | 99.61 |
| 777 | 416 | 0.75 | 47142 | 84.78 | 828 | 17 | 0.03 | 55404 | 99.64 |
| 778 | 440 | 0.79 | 47582 | 85.58 | 829 | 15 | 0.03 | 55419 | 99.67 |
| 779 | 422 | 0.76 | 48004 | 86.34 | 830 | 9 | 0.02 | 55428 | 99.69 |
| 780 | 372 | 0.67 | 48376 | 87.00 | 831 | 12 | 0.02 | 55440 | 99.71 |
| 781 | 395 | 0.71 | 48771 | 87.71 | 832 | 12 | 0.02 | 55452 | 99.73 |
| 782 | 371 | 0.67 | 49142 | 88.38 | 833 | 17 | 0.03 | 55469 | 99.76 |
| 783 | 399 | 0.72 | 49541 | 89.10 | 834 | 12 | 0.02 | 55481 | 99.78 |
| 784 | 335 | 0.60 | 49876 | 89.70 | 835 | 15 | 0.03 | 55496 | 99.81 |
| 785 | 333 | 0.60 | 50209 | 90.30 | 836 | 8 | 0.01 | 55504 | 99.82 |
| 786 | 301 | 0.54 | 50510 | 90.84 | 837 | 8 | 0.01 | 55512 | 99.84 |
| 787 | 307 | 0.55 | 50817 | 91.39 | 838 | 10 | 0.02 | 55522 | 99.86 |
| 788 | 288 | 0.52 | 51105 | 91.91 | 839 | 6 | 0.01 | 55528 | 99.87 |
| 789 | 258 | 0.46 | 51363 | 92.38 | 840 | 5 | 0.01 | 55533 | 99.88 |
| 790 | 278 | 0.50 | 51641 | 92.88 | 841 | 8 | 0.01 | 55541 | 99.89 |
| 791 | 291 | 0.52 | 51932 | 93.40 | 842 | 7 | 0.01 | 55548 | 99.90 |
| 792 | 213 | 0.38 | 52145 | 93.78 | 843 | 4 | 0.01 | 55552 | 99.91 |
| 793 | 216 | 0.39 | 52361 | 94.17 | 844 | 5 | 0.01 | 55557 | 99.92 |
| 794 | 216 | 0.39 | 52577 | 94.56 | 845 | 7 | 0.01 | 55564 | 99.93 |
| 795 | 192 | 0.35 | 52769 | 94.90 | 847 | 1 | 0.00 | 55565 | 99.93 |
| 796 | 183 | 0.33 | 52952 | 95.23 | 848 | 5 | 0.01 | 55570 | 99.94 |
| 797 | 174 | 0.31 | 53126 | 95.55 | 849 | 3 | 0.01 | 55573 | 99.95 |
| 798 | 175 | 0.31 | 53301 | 95.86 | 850 | 29 | 0.05 | 55602 | 100.00 |
| 799 | 171 | 0.31 | 53472 | 96.17 | | | | | |
| 800 | 166 | 0.30 | 53638 | 96.47 | | | | | |

**Table F.11. Scale Score Distribution—ELA Grade 7**

| SS | Freq. | % | Cum. Freq. | Cum. % | SS | Freq. | % | Cum. Freq. | Cum. % |
|---|---|---|---|---|---|---|---|---|---|
| 650 | 343 | 0.64 | 343 | 0.64 | 700 | 293 | 0.54 | 7422 | 13.77 |
| 651 | 30 | 0.06 | 373 | 0.69 | 701 | 353 | 0.65 | 7775 | 14.43 |
| 652 | 19 | 0.04 | 392 | 0.73 | 702 | 317 | 0.59 | 8092 | 15.01 |
| 653 | 26 | 0.05 | 418 | 0.78 | 703 | 327 | 0.61 | 8419 | 15.62 |
| 654 | 29 | 0.05 | 447 | 0.83 | 704 | 316 | 0.59 | 8735 | 16.21 |
| 655 | 32 | 0.06 | 479 | 0.89 | 705 | 329 | 0.61 | 9064 | 16.82 |
| 656 | 33 | 0.06 | 512 | 0.95 | 706 | 347 | 0.64 | 9411 | 17.46 |
| 657 | 30 | 0.06 | 542 | 1.01 | 707 | 338 | 0.63 | 9749 | 18.09 |
| 658 | 32 | 0.06 | 574 | 1.07 | 708 | 349 | 0.65 | 10098 | 18.74 |
| 659 | 43 | 0.08 | 617 | 1.14 | 709 | 382 | 0.71 | 10480 | 19.45 |
| 660 | 41 | 0.08 | 658 | 1.22 | 710 | 341 | 0.63 | 10821 | 20.08 |
| 661 | 50 | 0.09 | 708 | 1.31 | 711 | 383 | 0.71 | 11204 | 20.79 |
| 662 | 51 | 0.09 | 759 | 1.41 | 712 | 394 | 0.73 | 11598 | 21.52 |
| 663 | 54 | 0.10 | 813 | 1.51 | 713 | 380 | 0.71 | 11978 | 22.22 |
| 664 | 40 | 0.07 | 853 | 1.58 | 714 | 400 | 0.74 | 12378 | 22.97 |
| 665 | 60 | 0.11 | 913 | 1.69 | 715 | 402 | 0.75 | 12780 | 23.71 |
| 666 | 80 | 0.15 | 993 | 1.84 | 716 | 392 | 0.73 | 13172 | 24.44 |
| 667 | 61 | 0.11 | 1054 | 1.96 | 717 | 396 | 0.73 | 13568 | 25.17 |
| 668 | 63 | 0.12 | 1117 | 2.07 | 718 | 435 | 0.81 | 14003 | 25.98 |
| 669 | 64 | 0.12 | 1181 | 2.19 | 719 | 414 | 0.77 | 14417 | 26.75 |
| 670 | 94 | 0.17 | 1275 | 2.37 | 720 | 420 | 0.78 | 14837 | 27.53 |
| 671 | 90 | 0.17 | 1365 | 2.53 | 721 | 428 | 0.79 | 15265 | 28.32 |
| 672 | 124 | 0.23 | 1489 | 2.76 | 722 | 453 | 0.84 | 15718 | 29.16 |
| 673 | 105 | 0.19 | 1594 | 2.96 | 723 | 413 | 0.77 | 16131 | 29.93 |
| 674 | 118 | 0.22 | 1712 | 3.18 | 724 | 440 | 0.82 | 16571 | 30.75 |
| 675 | 122 | 0.23 | 1834 | 3.40 | 725 | 472 | 0.88 | 17043 | 31.62 |
| 676 | 143 | 0.27 | 1977 | 3.67 | 726 | 443 | 0.82 | 17486 | 32.44 |
| 677 | 132 | 0.24 | 2109 | 3.91 | 727 | 472 | 0.88 | 17958 | 33.32 |
| 678 | 134 | 0.25 | 2243 | 4.16 | 728 | 515 | 0.96 | 18473 | 34.28 |
| 679 | 144 | 0.27 | 2387 | 4.43 | 729 | 520 | 0.96 | 18993 | 35.24 |
| 680 | 159 | 0.30 | 2546 | 4.72 | 730 | 479 | 0.89 | 19472 | 36.13 |
| 681 | 166 | 0.31 | 2712 | 5.03 | 731 | 497 | 0.92 | 19969 | 37.05 |
| 682 | 180 | 0.33 | 2892 | 5.37 | 732 | 517 | 0.96 | 20486 | 38.01 |
| 683 | 174 | 0.32 | 3066 | 5.69 | 733 | 527 | 0.98 | 21013 | 38.99 |
| 684 | 172 | 0.32 | 3238 | 6.01 | 734 | 521 | 0.97 | 21534 | 39.96 |
| 685 | 204 | 0.38 | 3442 | 6.39 | 735 | 536 | 0.99 | 22070 | 40.95 |
| 686 | 206 | 0.38 | 3648 | 6.77 | 736 | 537 | 1.00 | 22607 | 41.95 |
| 687 | 225 | 0.42 | 3873 | 7.19 | 737 | 531 | 0.99 | 23138 | 42.93 |
| 688 | 252 | 0.47 | 4125 | 7.65 | 738 | 589 | 1.09 | 23727 | 44.02 |
| 689 | 244 | 0.45 | 4369 | 8.11 | 739 | 498 | 0.92 | 24225 | 44.95 |
| 690 | 255 | 0.47 | 4624 | 8.58 | 740 | 483 | 0.90 | 24708 | 45.84 |
| 691 | 259 | 0.48 | 4883 | 9.06 | 741 | 528 | 0.98 | 25236 | 46.82 |
| 692 | 300 | 0.56 | 5183 | 9.62 | 742 | 535 | 0.99 | 25771 | 47.82 |
| 693 | 252 | 0.47 | 5435 | 10.08 | 743 | 530 | 0.98 | 26301 | 48.80 |
| 694 | 274 | 0.51 | 5709 | 10.59 | 744 | 517 | 0.96 | 26818 | 49.76 |
| 695 | 280 | 0.52 | 5989 | 11.11 | 745 | 570 | 1.06 | 27388 | 50.82 |
| 696 | 259 | 0.48 | 6248 | 11.59 | 746 | 580 | 1.08 | 27968 | 51.89 |
| 697 | 289 | 0.54 | 6537 | 12.13 | 747 | 574 | 1.07 | 28542 | 52.96 |
| 698 | 305 | 0.57 | 6842 | 12.70 | 748 | 558 | 1.04 | 29100 | 53.99 |
| 699 | 287 | 0.53 | 7129 | 13.23 | 749 | 533 | 0.99 | 29633 | 54.98 |

| SS | Freq. | % | Cum. Freq. | Cum. % | SS | Freq. | % | Cum. Freq. | Cum. % |
|---|---|---|---|---|---|---|---|---|---|
| 750 | 549 | 1.02 | 30182 | 56.00 | 801 | 185 | 0.34 | 50398 | 93.51 |
| 751 | 576 | 1.07 | 30758 | 57.07 | 802 | 169 | 0.31 | 50567 | 93.83 |
| 752 | 537 | 1.00 | 31295 | 58.07 | 803 | 172 | 0.32 | 50739 | 94.14 |
| 753 | 604 | 1.12 | 31899 | 59.19 | 804 | 170 | 0.32 | 50909 | 94.46 |
| 754 | 560 | 1.04 | 32459 | 60.23 | 805 | 146 | 0.27 | 51055 | 94.73 |
| 755 | 553 | 1.03 | 33012 | 61.25 | 806 | 160 | 0.30 | 51215 | 95.03 |
| 756 | 543 | 1.01 | 33555 | 62.26 | 807 | 144 | 0.27 | 51359 | 95.29 |
| 757 | 551 | 1.02 | 34106 | 63.28 | 808 | 118 | 0.22 | 51477 | 95.51 |
| 758 | 507 | 0.94 | 34613 | 64.22 | 809 | 135 | 0.25 | 51612 | 95.76 |
| 759 | 519 | 0.96 | 35132 | 65.19 | 810 | 127 | 0.24 | 51739 | 96.00 |
| 760 | 530 | 0.98 | 35662 | 66.17 | 811 | 145 | 0.27 | 51884 | 96.27 |
| 761 | 517 | 0.96 | 36179 | 67.13 | 812 | 131 | 0.24 | 52015 | 96.51 |
| 762 | 536 | 0.99 | 36715 | 68.12 | 813 | 113 | 0.21 | 52128 | 96.72 |
| 763 | 527 | 0.98 | 37242 | 69.10 | 814 | 99 | 0.18 | 52227 | 96.91 |
| 764 | 466 | 0.86 | 37708 | 69.97 | 815 | 98 | 0.18 | 52325 | 97.09 |
| 765 | 459 | 0.85 | 38167 | 70.82 | 816 | 91 | 0.17 | 52416 | 97.26 |
| 766 | 493 | 0.91 | 38660 | 71.73 | 817 | 92 | 0.17 | 52508 | 97.43 |
| 767 | 486 | 0.90 | 39146 | 72.63 | 818 | 92 | 0.17 | 52600 | 97.60 |
| 768 | 457 | 0.85 | 39603 | 73.48 | 819 | 76 | 0.14 | 52676 | 97.74 |
| 769 | 482 | 0.89 | 40085 | 74.38 | 820 | 83 | 0.15 | 52759 | 97.89 |
| 770 | 424 | 0.79 | 40509 | 75.16 | 821 | 63 | 0.12 | 52822 | 98.01 |
| 771 | 446 | 0.83 | 40955 | 75.99 | 822 | 72 | 0.13 | 52894 | 98.14 |
| 772 | 423 | 0.78 | 41378 | 76.78 | 823 | 75 | 0.14 | 52969 | 98.28 |
| 773 | 397 | 0.74 | 41775 | 77.51 | 824 | 71 | 0.13 | 53040 | 98.41 |
| 774 | 421 | 0.78 | 42196 | 78.29 | 825 | 55 | 0.10 | 53095 | 98.52 |
| 775 | 401 | 0.74 | 42597 | 79.04 | 826 | 54 | 0.10 | 53149 | 98.62 |
| 776 | 425 | 0.79 | 43022 | 79.83 | 827 | 49 | 0.09 | 53198 | 98.71 |
| 777 | 386 | 0.72 | 43408 | 80.54 | 828 | 53 | 0.10 | 53251 | 98.81 |
| 778 | 393 | 0.73 | 43801 | 81.27 | 829 | 50 | 0.09 | 53301 | 98.90 |
| 779 | 378 | 0.70 | 44179 | 81.97 | 830 | 48 | 0.09 | 53349 | 98.99 |
| 780 | 398 | 0.74 | 44577 | 82.71 | 831 | 33 | 0.06 | 53382 | 99.05 |
| 781 | 342 | 0.63 | 44919 | 83.35 | 832 | 33 | 0.06 | 53415 | 99.11 |
| 782 | 352 | 0.65 | 45271 | 84.00 | 833 | 36 | 0.07 | 53451 | 99.18 |
| 783 | 365 | 0.68 | 45636 | 84.68 | 834 | 26 | 0.05 | 53477 | 99.22 |
| 784 | 355 | 0.66 | 45991 | 85.33 | 835 | 29 | 0.05 | 53506 | 99.28 |
| 785 | 350 | 0.65 | 46341 | 85.98 | 836 | 36 | 0.07 | 53542 | 99.35 |
| 786 | 310 | 0.58 | 46651 | 86.56 | 837 | 21 | 0.04 | 53563 | 99.38 |
| 787 | 335 | 0.62 | 46986 | 87.18 | 838 | 19 | 0.04 | 53582 | 99.42 |
| 788 | 323 | 0.60 | 47309 | 87.78 | 839 | 17 | 0.03 | 53599 | 99.45 |
| 789 | 296 | 0.55 | 47605 | 88.33 | 840 | 15 | 0.03 | 53614 | 99.48 |
| 790 | 272 | 0.50 | 47877 | 88.83 | 841 | 28 | 0.05 | 53642 | 99.53 |
| 791 | 280 | 0.52 | 48157 | 89.35 | 842 | 16 | 0.03 | 53658 | 99.56 |
| 792 | 238 | 0.44 | 48395 | 89.79 | 843 | 17 | 0.03 | 53675 | 99.59 |
| 793 | 242 | 0.45 | 48637 | 90.24 | 844 | 16 | 0.03 | 53691 | 99.62 |
| 794 | 267 | 0.50 | 48904 | 90.74 | 845 | 25 | 0.05 | 53716 | 99.67 |
| 795 | 251 | 0.47 | 49155 | 91.21 | 846 | 20 | 0.04 | 53736 | 99.70 |
| 796 | 219 | 0.41 | 49374 | 91.61 | 847 | 14 | 0.03 | 53750 | 99.73 |
| 797 | 213 | 0.40 | 49587 | 92.01 | 848 | 12 | 0.02 | 53762 | 99.75 |
| 798 | 208 | 0.39 | 49795 | 92.39 | 849 | 8 | 0.01 | 53770 | 99.77 |
| 799 | 204 | 0.38 | 49999 | 92.77 | 850 | 125 | 0.23 | 53895 | 100.00 |
| 800 | 214 | 0.40 | 50213 | 93.17 | | | | | |

**Table F.12. Scale Score Distribution—ELA Grade 8**

| SS | Freq. | % | Cum. Freq. | Cum. % | SS | Freq. | % | Cum. Freq. | Cum. % |
|---|---|---|---|---|---|---|---|---|---|
| 650 | 513 | 0.99 | 513 | 0.99 | 700 | 300 | 0.58 | 8862 | 17.12 |
| 651 | 30 | 0.06 | 543 | 1.05 | 701 | 305 | 0.59 | 9167 | 17.71 |
| 652 | 44 | 0.09 | 587 | 1.13 | 702 | 326 | 0.63 | 9493 | 18.34 |
| 653 | 48 | 0.09 | 635 | 1.23 | 703 | 328 | 0.63 | 9821 | 18.97 |
| 654 | 52 | 0.10 | 687 | 1.33 | 704 | 349 | 0.67 | 10170 | 19.65 |
| 655 | 72 | 0.14 | 759 | 1.47 | 705 | 325 | 0.63 | 10495 | 20.28 |
| 656 | 50 | 0.10 | 809 | 1.56 | 706 | 338 | 0.65 | 10833 | 20.93 |
| 657 | 64 | 0.12 | 873 | 1.69 | 707 | 329 | 0.64 | 11162 | 21.56 |
| 658 | 54 | 0.10 | 927 | 1.79 | 708 | 331 | 0.64 | 11493 | 22.20 |
| 659 | 52 | 0.10 | 979 | 1.89 | 709 | 374 | 0.72 | 11867 | 22.93 |
| 660 | 62 | 0.12 | 1041 | 2.01 | 710 | 391 | 0.76 | 12258 | 23.68 |
| 661 | 75 | 0.14 | 1116 | 2.16 | 711 | 357 | 0.69 | 12615 | 24.37 |
| 662 | 91 | 0.18 | 1207 | 2.33 | 712 | 361 | 0.70 | 12976 | 25.07 |
| 663 | 104 | 0.20 | 1311 | 2.53 | 713 | 376 | 0.73 | 13352 | 25.80 |
| 664 | 78 | 0.15 | 1389 | 2.68 | 714 | 392 | 0.76 | 13744 | 26.55 |
| 665 | 72 | 0.14 | 1461 | 2.82 | 715 | 362 | 0.70 | 14106 | 27.25 |
| 666 | 90 | 0.17 | 1551 | 3.00 | 716 | 369 | 0.71 | 14475 | 27.97 |
| 667 | 111 | 0.21 | 1662 | 3.21 | 717 | 431 | 0.83 | 14906 | 28.80 |
| 668 | 108 | 0.21 | 1770 | 3.42 | 718 | 389 | 0.75 | 15295 | 29.55 |
| 669 | 132 | 0.26 | 1902 | 3.67 | 719 | 434 | 0.84 | 15729 | 30.39 |
| 670 | 130 | 0.25 | 2032 | 3.93 | 720 | 396 | 0.77 | 16125 | 31.15 |
| 671 | 131 | 0.25 | 2163 | 4.18 | 721 | 412 | 0.80 | 16537 | 31.95 |
| 672 | 150 | 0.29 | 2313 | 4.47 | 722 | 438 | 0.85 | 16975 | 32.80 |
| 673 | 132 | 0.26 | 2445 | 4.72 | 723 | 448 | 0.87 | 17423 | 33.66 |
| 674 | 158 | 0.31 | 2603 | 5.03 | 724 | 430 | 0.83 | 17853 | 34.49 |
| 675 | 173 | 0.33 | 2776 | 5.36 | 725 | 446 | 0.86 | 18299 | 35.35 |
| 676 | 166 | 0.32 | 2942 | 5.68 | 726 | 463 | 0.89 | 18762 | 36.25 |
| 677 | 186 | 0.36 | 3128 | 6.04 | 727 | 452 | 0.87 | 19214 | 37.12 |
| 678 | 190 | 0.37 | 3318 | 6.41 | 728 | 449 | 0.87 | 19663 | 37.99 |
| 679 | 183 | 0.35 | 3501 | 6.76 | 729 | 394 | 0.76 | 20057 | 38.75 |
| 680 | 215 | 0.42 | 3716 | 7.18 | 730 | 448 | 0.87 | 20505 | 39.62 |
| 681 | 187 | 0.36 | 3903 | 7.54 | 731 | 450 | 0.87 | 20955 | 40.48 |
| 682 | 210 | 0.41 | 4113 | 7.95 | 732 | 473 | 0.91 | 21428 | 41.40 |
| 683 | 212 | 0.41 | 4325 | 8.36 | 733 | 504 | 0.97 | 21932 | 42.37 |
| 684 | 232 | 0.45 | 4557 | 8.80 | 734 | 463 | 0.89 | 22395 | 43.27 |
| 685 | 233 | 0.45 | 4790 | 9.25 | 735 | 456 | 0.88 | 22851 | 44.15 |
| 686 | 243 | 0.47 | 5033 | 9.72 | 736 | 482 | 0.93 | 23333 | 45.08 |
| 687 | 218 | 0.42 | 5251 | 10.14 | 737 | 500 | 0.97 | 23833 | 46.05 |
| 688 | 225 | 0.43 | 5476 | 10.58 | 738 | 520 | 1.00 | 24353 | 47.05 |
| 689 | 239 | 0.46 | 5715 | 11.04 | 739 | 490 | 0.95 | 24843 | 48.00 |
| 690 | 246 | 0.48 | 5961 | 11.52 | 740 | 512 | 0.99 | 25355 | 48.99 |
| 691 | 264 | 0.51 | 6225 | 12.03 | 741 | 505 | 0.98 | 25860 | 49.96 |
| 692 | 307 | 0.59 | 6532 | 12.62 | 742 | 473 | 0.91 | 26333 | 50.88 |
| 693 | 263 | 0.51 | 6795 | 13.13 | 743 | 502 | 0.97 | 26835 | 51.85 |
| 694 | 271 | 0.52 | 7066 | 13.65 | 744 | 488 | 0.94 | 27323 | 52.79 |
| 695 | 314 | 0.61 | 7380 | 14.26 | 745 | 530 | 1.02 | 27853 | 53.81 |
| 696 | 287 | 0.55 | 7667 | 14.81 | 746 | 483 | 0.93 | 28336 | 54.74 |
| 697 | 285 | 0.55 | 7952 | 15.36 | 747 | 490 | 0.95 | 28826 | 55.69 |
| 698 | 305 | 0.59 | 8257 | 15.95 | 748 | 518 | 1.00 | 29344 | 56.69 |
| 699 | 305 | 0.59 | 8562 | 16.54 | 749 | 484 | 0.94 | 29828 | 57.63 |

| SS | Freq. | % | Cum. Freq. | Cum. % | SS | Freq. | % | Cum. Freq. | Cum. % |
|---|---|---|---|---|---|---|---|---|---|
| 750 | 448 | 0.87 | 30276 | 58.49 | 801 | 166 | 0.32 | 48036 | 92.81 |
| 751 | 468 | 0.90 | 30744 | 59.40 | 802 | 160 | 0.31 | 48196 | 93.11 |
| 752 | 458 | 0.88 | 31202 | 60.28 | 803 | 160 | 0.31 | 48356 | 93.42 |
| 753 | 458 | 0.88 | 31660 | 61.17 | 804 | 147 | 0.28 | 48503 | 93.71 |
| 754 | 456 | 0.88 | 32116 | 62.05 | 805 | 155 | 0.30 | 48658 | 94.01 |
| 755 | 482 | 0.93 | 32598 | 62.98 | 806 | 146 | 0.28 | 48804 | 94.29 |
| 756 | 458 | 0.88 | 33056 | 63.86 | 807 | 137 | 0.26 | 48941 | 94.55 |
| 757 | 473 | 0.91 | 33529 | 64.78 | 808 | 144 | 0.28 | 49085 | 94.83 |
| 758 | 450 | 0.87 | 33979 | 65.65 | 809 | 120 | 0.23 | 49205 | 95.06 |
| 759 | 454 | 0.88 | 34433 | 66.52 | 810 | 122 | 0.24 | 49327 | 95.30 |
| 760 | 465 | 0.90 | 34898 | 67.42 | 811 | 132 | 0.26 | 49459 | 95.55 |
| 761 | 450 | 0.87 | 35348 | 68.29 | 812 | 132 | 0.26 | 49591 | 95.81 |
| 762 | 418 | 0.81 | 35766 | 69.10 | 813 | 106 | 0.20 | 49697 | 96.01 |
| 763 | 467 | 0.90 | 36233 | 70.00 | 814 | 91 | 0.18 | 49788 | 96.19 |
| 764 | 496 | 0.96 | 36729 | 70.96 | 815 | 119 | 0.23 | 49907 | 96.42 |
| 765 | 427 | 0.82 | 37156 | 71.79 | 816 | 100 | 0.19 | 50007 | 96.61 |
| 766 | 424 | 0.82 | 37580 | 72.60 | 817 | 99 | 0.19 | 50106 | 96.80 |
| 767 | 421 | 0.81 | 38001 | 73.42 | 818 | 93 | 0.18 | 50199 | 96.98 |
| 768 | 376 | 0.73 | 38377 | 74.14 | 819 | 87 | 0.17 | 50286 | 97.15 |
| 769 | 384 | 0.74 | 38761 | 74.89 | 820 | 95 | 0.18 | 50381 | 97.34 |
| 770 | 421 | 0.81 | 39182 | 75.70 | 821 | 83 | 0.16 | 50464 | 97.50 |
| 771 | 384 | 0.74 | 39566 | 76.44 | 822 | 80 | 0.15 | 50544 | 97.65 |
| 772 | 387 | 0.75 | 39953 | 77.19 | 823 | 76 | 0.15 | 50620 | 97.80 |
| 773 | 370 | 0.71 | 40323 | 77.90 | 824 | 62 | 0.12 | 50682 | 97.92 |
| 774 | 376 | 0.73 | 40699 | 78.63 | 825 | 57 | 0.11 | 50739 | 98.03 |
| 775 | 360 | 0.70 | 41059 | 79.33 | 826 | 76 | 0.15 | 50815 | 98.17 |
| 776 | 355 | 0.69 | 41414 | 80.01 | 827 | 62 | 0.12 | 50877 | 98.29 |
| 777 | 346 | 0.67 | 41760 | 80.68 | 828 | 48 | 0.09 | 50925 | 98.39 |
| 778 | 321 | 0.62 | 42081 | 81.30 | 829 | 65 | 0.13 | 50990 | 98.51 |
| 779 | 347 | 0.67 | 42428 | 81.97 | 830 | 46 | 0.09 | 51036 | 98.60 |
| 780 | 321 | 0.62 | 42749 | 82.59 | 831 | 52 | 0.10 | 51088 | 98.70 |
| 781 | 327 | 0.63 | 43076 | 83.22 | 832 | 35 | 0.07 | 51123 | 98.77 |
| 782 | 326 | 0.63 | 43402 | 83.85 | 833 | 38 | 0.07 | 51161 | 98.84 |
| 783 | 285 | 0.55 | 43687 | 84.40 | 834 | 47 | 0.09 | 51208 | 98.93 |
| 784 | 285 | 0.55 | 43972 | 84.95 | 835 | 41 | 0.08 | 51249 | 99.01 |
| 785 | 287 | 0.55 | 44259 | 85.51 | 836 | 27 | 0.05 | 51276 | 99.06 |
| 786 | 295 | 0.57 | 44554 | 86.08 | 837 | 35 | 0.07 | 51311 | 99.13 |
| 787 | 262 | 0.51 | 44816 | 86.58 | 838 | 17 | 0.03 | 51328 | 99.17 |
| 788 | 298 | 0.58 | 45114 | 87.16 | 839 | 28 | 0.05 | 51356 | 99.22 |
| 789 | 280 | 0.54 | 45394 | 87.70 | 840 | 29 | 0.06 | 51385 | 99.28 |
| 790 | 293 | 0.57 | 45687 | 88.27 | 841 | 29 | 0.06 | 51414 | 99.33 |
| 791 | 285 | 0.55 | 45972 | 88.82 | 842 | 27 | 0.05 | 51441 | 99.38 |
| 792 | 247 | 0.48 | 46219 | 89.29 | 843 | 24 | 0.05 | 51465 | 99.43 |
| 793 | 233 | 0.45 | 46452 | 89.74 | 844 | 29 | 0.06 | 51494 | 99.49 |
| 794 | 245 | 0.47 | 46697 | 90.22 | 845 | 15 | 0.03 | 51509 | 99.52 |
| 795 | 223 | 0.43 | 46920 | 90.65 | 846 | 14 | 0.03 | 51523 | 99.54 |
| 796 | 220 | 0.43 | 47140 | 91.07 | 847 | 7 | 0.01 | 51530 | 99.56 |
| 797 | 186 | 0.36 | 47326 | 91.43 | 848 | 15 | 0.03 | 51545 | 99.58 |
| 798 | 197 | 0.38 | 47523 | 91.81 | 849 | 25 | 0.05 | 51570 | 99.63 |
| 799 | 180 | 0.35 | 47703 | 92.16 | 850 | 190 | 0.37 | 51760 | 100.00 |
| 800 | 167 | 0.32 | 47870 | 92.48 | | | | | |

**Table F.13. Scale Score Distribution—CSLA Grade 3**

| SS | Freq. | % | Cum. Freq. | Cum. % | SS | Freq. | % | Cum. Freq. | Cum. % |
|---|---|---|---|---|---|---|---|---|---|
| 650 | 17 | 1.18 | 17 | 1.18 | 779 | 1 | 0.07 | 1414 | 98.19 |
| 665 | 22 | 1.53 | 39 | 2.71 | 782 | 8 | 0.56 | 1422 | 98.75 |
| 676 | 36 | 2.50 | 75 | 5.21 | 784 | 4 | 0.28 | 1426 | 99.03 |
| 684 | 39 | 2.71 | 114 | 7.92 | 787 | 3 | 0.21 | 1429 | 99.24 |
| 690 | 59 | 4.10 | 173 | 12.01 | 789 | 4 | 0.28 | 1433 | 99.51 |
| 695 | 62 | 4.31 | 235 | 16.32 | 792 | 1 | 0.07 | 1434 | 99.58 |
| 699 | 52 | 3.61 | 287 | 19.93 | 796 | 1 | 0.07 | 1435 | 99.65 |
| 700 | 49 | 3.40 | 336 | 23.33 | 799 | 2 | 0.14 | 1437 | 99.79 |
| 706 | 65 | 4.51 | 401 | 27.85 | 804 | 1 | 0.07 | 1438 | 99.86 |
| 709 | 39 | 2.71 | 440 | 30.56 | 809 | 1 | 0.07 | 1439 | 99.93 |
| 712 | 47 | 3.26 | 487 | 33.82 | 815 | 1 | 0.07 | 1440 | 100.00 |
| 715 | 44 | 3.06 | 531 | 36.88 | | | | | |
| 717 | 53 | 3.68 | 584 | 40.56 | | | | | |
| 719 | 57 | 3.96 | 641 | 44.51 | | | | | |
| 721 | 38 | 2.64 | 679 | 47.15 | | | | | |
| 723 | 35 | 2.43 | 714 | 49.58 | | | | | |
| 725 | 45 | 3.13 | 759 | 52.71 | | | | | |
| 727 | 34 | 2.36 | 793 | 55.07 | | | | | |
| 729 | 31 | 2.15 | 824 | 57.22 | | | | | |
| 730 | 39 | 2.71 | 863 | 59.93 | | | | | |
| 732 | 21 | 1.46 | 884 | 61.39 | | | | | |
| 734 | 37 | 2.57 | 921 | 63.96 | | | | | |
| 735 | 29 | 2.01 | 950 | 65.97 | | | | | |
| 737 | 27 | 1.88 | 977 | 67.85 | | | | | |
| 738 | 26 | 1.81 | 1003 | 69.65 | | | | | |
| 740 | 25 | 1.74 | 1028 | 71.39 | | | | | |
| 741 | 26 | 1.81 | 1054 | 73.19 | | | | | |
| 743 | 21 | 1.46 | 1075 | 74.65 | | | | | |
| 744 | 30 | 2.08 | 1105 | 76.74 | | | | | |
| 746 | 21 | 1.46 | 1126 | 78.19 | | | | | |
| 747 | 21 | 1.46 | 1147 | 79.65 | | | | | |
| 748 | 24 | 1.67 | 1171 | 81.32 | | | | | |
| 750 | 27 | 1.88 | 1198 | 83.19 | | | | | |
| 751 | 17 | 1.18 | 1215 | 84.38 | | | | | |
| 753 | 17 | 1.18 | 1232 | 85.56 | | | | | |
| 754 | 9 | 0.63 | 1241 | 86.18 | | | | | |
| 756 | 15 | 1.04 | 1256 | 87.22 | | | | | |
| 757 | 20 | 1.39 | 1276 | 88.61 | | | | | |
| 759 | 15 | 1.04 | 1291 | 89.65 | | | | | |
| 760 | 14 | 0.97 | 1305 | 90.63 | | | | | |
| 762 | 13 | 0.90 | 1318 | 91.53 | | | | | |
| 763 | 21 | 1.46 | 1339 | 92.99 | | | | | |
| 765 | 19 | 1.32 | 1358 | 94.31 | | | | | |
| 766 | 13 | 0.90 | 1371 | 95.21 | | | | | |
| 768 | 8 | 0.56 | 1379 | 95.76 | | | | | |
| 770 | 7 | 0.49 | 1386 | 96.25 | | | | | |
| 772 | 7 | 0.49 | 1393 | 96.74 | | | | | |
| 773 | 7 | 0.49 | 1400 | 97.22 | | | | | |
| 775 | 8 | 0.56 | 1408 | 97.78 | | | | | |
| 777 | 5 | 0.35 | 1413 | 98.13 | | | | | |

**Table F.14. Scale Score Distribution—CSLA Grade 4**

| SS | Freq. | % | Cum. Freq. | Cum. % | SS | Freq. | % | Cum. Freq. | Cum. % |
|---|---|---|---|---|---|---|---|---|---|
| 650 | 2 | 0.17 | 2 | 0.17 | 765 | 5 | 0.42 | 1137 | 96.36 |
| 656 | 7 | 0.59 | 9 | 0.76 | 766 | 7 | 0.59 | 1144 | 96.95 |
| 667 | 11 | 0.93 | 20 | 1.69 | 768 | 6 | 0.51 | 1150 | 97.46 |
| 675 | 9 | 0.76 | 29 | 2.46 | 770 | 6 | 0.51 | 1156 | 97.97 |
| 681 | 20 | 1.69 | 49 | 4.15 | 772 | 3 | 0.25 | 1159 | 98.22 |
| 686 | 23 | 1.95 | 72 | 6.10 | 774 | 4 | 0.34 | 1163 | 98.56 |
| 690 | 23 | 1.95 | 95 | 8.05 | 776 | 4 | 0.34 | 1167 | 98.90 |
| 694 | 30 | 2.54 | 125 | 10.59 | 778 | 1 | 0.08 | 1168 | 98.98 |
| 697 | 40 | 3.39 | 165 | 13.98 | 780 | 3 | 0.25 | 1171 | 99.24 |
| 700 | 33 | 2.80 | 198 | 16.78 | 782 | 4 | 0.34 | 1175 | 99.58 |
| 703 | 35 | 2.97 | 233 | 19.75 | 785 | 2 | 0.17 | 1177 | 99.75 |
| 705 | 37 | 3.14 | 270 | 22.88 | 788 | 1 | 0.08 | 1178 | 99.83 |
| 708 | 43 | 3.64 | 313 | 26.53 | 791 | 1 | 0.08 | 1179 | 99.92 |
| 710 | 30 | 2.54 | 343 | 29.07 | 819 | 1 | 0.08 | 1180 | 100.00 |
| 712 | 30 | 2.54 | 373 | 31.61 | | | | | |
| 714 | 35 | 2.97 | 408 | 34.58 | | | | | |
| 716 | 30 | 2.54 | 438 | 37.12 | | | | | |
| 718 | 32 | 2.71 | 470 | 39.83 | | | | | |
| 720 | 22 | 1.86 | 492 | 41.69 | | | | | |
| 721 | 35 | 2.97 | 527 | 44.66 | | | | | |
| 723 | 40 | 3.39 | 567 | 48.05 | | | | | |
| 725 | 29 | 2.46 | 596 | 50.51 | | | | | |
| 726 | 21 | 1.78 | 617 | 52.29 | | | | | |
| 728 | 26 | 2.20 | 643 | 54.49 | | | | | |
| 729 | 31 | 2.63 | 674 | 57.12 | | | | | |
| 731 | 32 | 2.71 | 706 | 59.83 | | | | | |
| 732 | 28 | 2.37 | 734 | 62.20 | | | | | |
| 733 | 26 | 2.20 | 760 | 64.41 | | | | | |
| 735 | 33 | 2.80 | 793 | 67.20 | | | | | |
| 736 | 25 | 2.12 | 818 | 69.32 | | | | | |
| 737 | 21 | 1.78 | 839 | 71.10 | | | | | |
| 739 | 21 | 1.78 | 860 | 72.88 | | | | | |
| 740 | 20 | 1.69 | 880 | 74.58 | | | | | |
| 741 | 17 | 1.44 | 897 | 76.02 | | | | | |
| 743 | 24 | 2.03 | 921 | 78.05 | | | | | |
| 744 | 19 | 1.61 | 940 | 79.66 | | | | | |
| 745 | 13 | 1.10 | 953 | 80.76 | | | | | |
| 747 | 20 | 1.69 | 973 | 82.46 | | | | | |
| 748 | 17 | 1.44 | 990 | 83.90 | | | | | |
| 749 | 22 | 1.86 | 1012 | 85.76 | | | | | |
| 750 | 12 | 1.02 | 1024 | 86.78 | | | | | |
| 752 | 16 | 1.36 | 1040 | 88.14 | | | | | |
| 753 | 18 | 1.53 | 1058 | 89.66 | | | | | |
| 755 | 13 | 1.10 | 1071 | 90.76 | | | | | |
| 756 | 13 | 1.10 | 1084 | 91.86 | | | | | |
| 757 | 14 | 1.19 | 1098 | 93.05 | | | | | |
| 759 | 6 | 0.51 | 1104 | 93.56 | | | | | |
| 760 | 7 | 0.59 | 1111 | 94.15 | | | | | |
| 762 | 8 | 0.68 | 1119 | 94.83 | | | | | |
| 763 | 13 | 1.10 | 1132 | 95.93 | | | | | |

**Table F.15. Scale Score Distribution—Science Grade 5**

| SS | Freq. | % | Cum. Freq. | Cum. % | SS | Freq. | % | Cum. Freq. | Cum. % |
|---|---|---|---|---|---|---|---|---|---|
| 650 | 2413 | 4.28 | 2413 | 4.28 | 700 | 297 | 0.53 | 8835 | 15.66 |
| 651 | 27 | 0.05 | 2440 | 4.32 | 701 | 336 | 0.60 | 9171 | 16.25 |
| 652 | 32 | 0.06 | 2472 | 4.38 | 702 | 312 | 0.55 | 9483 | 16.81 |
| 653 | 37 | 0.07 | 2509 | 4.45 | 703 | 331 | 0.59 | 9814 | 17.39 |
| 654 | 24 | 0.04 | 2533 | 4.49 | 704 | 316 | 0.56 | 10130 | 17.95 |
| 655 | 38 | 0.07 | 2571 | 4.56 | 705 | 362 | 0.64 | 10492 | 18.59 |
| 656 | 36 | 0.06 | 2607 | 4.62 | 706 | 378 | 0.67 | 10870 | 19.26 |
| 657 | 58 | 0.10 | 2665 | 4.72 | 707 | 390 | 0.69 | 11260 | 19.95 |
| 658 | 57 | 0.10 | 2722 | 4.82 | 708 | 392 | 0.69 | 11652 | 20.65 |
| 659 | 29 | 0.05 | 2751 | 4.88 | 709 | 459 | 0.81 | 12111 | 21.46 |
| 660 | 52 | 0.09 | 2803 | 4.97 | 710 | 467 | 0.83 | 12578 | 22.29 |
| 661 | 38 | 0.07 | 2841 | 5.03 | 711 | 470 | 0.83 | 13048 | 23.12 |
| 662 | 54 | 0.10 | 2895 | 5.13 | 712 | 435 | 0.77 | 13483 | 23.89 |
| 663 | 63 | 0.11 | 2958 | 5.24 | 713 | 462 | 0.82 | 13945 | 24.71 |
| 664 | 61 | 0.11 | 3019 | 5.35 | 714 | 502 | 0.89 | 14447 | 25.60 |
| 665 | 66 | 0.12 | 3085 | 5.47 | 715 | 475 | 0.84 | 14922 | 26.44 |
| 666 | 57 | 0.10 | 3142 | 5.57 | 716 | 497 | 0.88 | 15419 | 27.33 |
| 667 | 82 | 0.15 | 3224 | 5.71 | 717 | 505 | 0.89 | 15924 | 28.22 |
| 668 | 80 | 0.14 | 3304 | 5.86 | 718 | 561 | 0.99 | 16485 | 29.21 |
| 669 | 77 | 0.14 | 3381 | 5.99 | 719 | 532 | 0.94 | 17017 | 30.16 |
| 670 | 95 | 0.17 | 3476 | 6.16 | 720 | 570 | 1.01 | 17587 | 31.17 |
| 671 | 82 | 0.15 | 3558 | 6.31 | 721 | 569 | 1.01 | 18156 | 32.18 |
| 672 | 110 | 0.19 | 3668 | 6.50 | 722 | 564 | 1.00 | 18720 | 33.18 |
| 673 | 119 | 0.21 | 3787 | 6.71 | 723 | 584 | 1.03 | 19304 | 34.21 |
| 674 | 102 | 0.18 | 3889 | 6.89 | 724 | 632 | 1.12 | 19936 | 35.33 |
| 675 | 115 | 0.20 | 4004 | 7.10 | 725 | 590 | 1.05 | 20526 | 36.38 |
| 676 | 120 | 0.21 | 4124 | 7.31 | 726 | 646 | 1.14 | 21172 | 37.52 |
| 677 | 114 | 0.20 | 4238 | 7.51 | 727 | 665 | 1.18 | 21837 | 38.70 |
| 678 | 124 | 0.22 | 4362 | 7.73 | 728 | 680 | 1.21 | 22517 | 39.90 |
| 679 | 143 | 0.25 | 4505 | 7.98 | 729 | 650 | 1.15 | 23167 | 41.06 |
| 680 | 135 | 0.24 | 4640 | 8.22 | 730 | 681 | 1.21 | 23848 | 42.26 |
| 681 | 138 | 0.24 | 4778 | 8.47 | 731 | 679 | 1.20 | 24527 | 43.47 |
| 682 | 159 | 0.28 | 4937 | 8.75 | 732 | 635 | 1.13 | 25162 | 44.59 |
| 683 | 138 | 0.24 | 5075 | 8.99 | 733 | 671 | 1.19 | 25833 | 45.78 |
| 684 | 164 | 0.29 | 5239 | 9.28 | 734 | 730 | 1.29 | 26563 | 47.07 |
| 685 | 158 | 0.28 | 5397 | 9.56 | 735 | 666 | 1.18 | 27229 | 48.25 |
| 686 | 158 | 0.28 | 5555 | 9.84 | 736 | 699 | 1.24 | 27928 | 49.49 |
| 687 | 181 | 0.32 | 5736 | 10.17 | 737 | 709 | 1.26 | 28637 | 50.75 |
| 688 | 203 | 0.36 | 5939 | 10.52 | 738 | 754 | 1.34 | 29391 | 52.09 |
| 689 | 205 | 0.36 | 6144 | 10.89 | 739 | 708 | 1.25 | 30099 | 53.34 |
| 690 | 202 | 0.36 | 6346 | 11.25 | 740 | 704 | 1.25 | 30803 | 54.59 |
| 691 | 210 | 0.37 | 6556 | 11.62 | 741 | 757 | 1.34 | 31560 | 55.93 |
| 692 | 206 | 0.37 | 6762 | 11.98 | 742 | 691 | 1.22 | 32251 | 57.15 |
| 693 | 222 | 0.39 | 6984 | 12.38 | 743 | 718 | 1.27 | 32969 | 58.43 |
| 694 | 233 | 0.41 | 7217 | 12.79 | 744 | 747 | 1.32 | 33716 | 59.75 |
| 695 | 236 | 0.42 | 7453 | 13.21 | 745 | 727 | 1.29 | 34443 | 61.04 |
| 696 | 267 | 0.47 | 7720 | 13.68 | 746 | 760 | 1.35 | 35203 | 62.39 |
| 697 | 280 | 0.50 | 8000 | 14.18 | 747 | 729 | 1.29 | 35932 | 63.68 |
| 698 | 279 | 0.49 | 8279 | 14.67 | 748 | 696 | 1.23 | 36628 | 64.91 |
| 699 | 259 | 0.46 | 8538 | 15.13 | 749 | 682 | 1.21 | 37310 | 66.12 |

| SS | Freq. | % | Cum. Freq. | Cum. % | SS | Freq. | % | Cum. Freq. | Cum. % |
|---|---|---|---|---|---|---|---|---|---|
| 750 | 669 | 1.19 | 37979 | 67.31 | 795 | 79 | 0.14 | 55634 | 98.59 |
| 751 | 683 | 1.21 | 38662 | 68.52 | 796 | 72 | 0.13 | 55706 | 98.72 |
| 752 | 732 | 1.30 | 39394 | 69.81 | 797 | 58 | 0.10 | 55764 | 98.82 |
| 753 | 689 | 1.22 | 40083 | 71.03 | 798 | 62 | 0.11 | 55826 | 98.93 |
| 754 | 693 | 1.23 | 40776 | 72.26 | 799 | 60 | 0.11 | 55886 | 99.04 |
| 755 | 638 | 1.13 | 41414 | 73.39 | 800 | 52 | 0.09 | 55938 | 99.13 |
| 756 | 657 | 1.16 | 42071 | 74.56 | 801 | 52 | 0.09 | 55990 | 99.22 |
| 757 | 656 | 1.16 | 42727 | 75.72 | 802 | 50 | 0.09 | 56040 | 99.31 |
| 758 | 620 | 1.10 | 43347 | 76.82 | 803 | 38 | 0.07 | 56078 | 99.38 |
| 759 | 614 | 1.09 | 43961 | 77.91 | 804 | 30 | 0.05 | 56108 | 99.43 |
| 760 | 646 | 1.14 | 44607 | 79.05 | 805 | 27 | 0.05 | 56135 | 99.48 |
| 761 | 615 | 1.09 | 45222 | 80.14 | 806 | 35 | 0.06 | 56170 | 99.54 |
| 762 | 584 | 1.03 | 45806 | 81.18 | 807 | 33 | 0.06 | 56203 | 99.60 |
| 763 | 568 | 1.01 | 46374 | 82.18 | 808 | 21 | 0.04 | 56224 | 99.64 |
| 764 | 538 | 0.95 | 46912 | 83.14 | 809 | 22 | 0.04 | 56246 | 99.68 |
| 765 | 525 | 0.93 | 47437 | 84.07 | 810 | 18 | 0.03 | 56264 | 99.71 |
| 766 | 540 | 0.96 | 47977 | 85.02 | 811 | 21 | 0.04 | 56285 | 99.75 |
| 767 | 469 | 0.83 | 48446 | 85.85 | 812 | 11 | 0.02 | 56296 | 99.77 |
| 768 | 475 | 0.84 | 48921 | 86.70 | 813 | 15 | 0.03 | 56311 | 99.79 |
| 769 | 460 | 0.82 | 49381 | 87.51 | 814 | 6 | 0.01 | 56317 | 99.80 |
| 770 | 440 | 0.78 | 49821 | 88.29 | 815 | 13 | 0.02 | 56330 | 99.83 |
| 771 | 418 | 0.74 | 50239 | 89.03 | 816 | 10 | 0.02 | 56340 | 99.84 |
| 772 | 433 | 0.77 | 50672 | 89.80 | 817 | 6 | 0.01 | 56346 | 99.85 |
| 773 | 388 | 0.69 | 51060 | 90.49 | 818 | 11 | 0.02 | 56357 | 99.87 |
| 774 | 379 | 0.67 | 51439 | 91.16 | 819 | 8 | 0.01 | 56365 | 99.89 |
| 775 | 361 | 0.64 | 51800 | 91.80 | 820 | 9 | 0.02 | 56374 | 99.90 |
| 776 | 334 | 0.59 | 52134 | 92.39 | 821 | 3 | 0.01 | 56377 | 99.91 |
| 777 | 318 | 0.56 | 52452 | 92.95 | 822 | 4 | 0.01 | 56381 | 99.92 |
| 778 | 287 | 0.51 | 52739 | 93.46 | 823 | 5 | 0.01 | 56386 | 99.93 |
| 779 | 300 | 0.53 | 53039 | 93.99 | 824 | 3 | 0.01 | 56389 | 99.93 |
| 780 | 277 | 0.49 | 53316 | 94.49 | 825 | 2 | 0.00 | 56391 | 99.93 |
| 781 | 245 | 0.43 | 53561 | 94.92 | 827 | 3 | 0.01 | 56394 | 99.94 |
| 782 | 209 | 0.37 | 53770 | 95.29 | 828 | 6 | 0.01 | 56400 | 99.95 |
| 783 | 230 | 0.41 | 54000 | 95.70 | 830 | 6 | 0.01 | 56406 | 99.96 |
| 784 | 187 | 0.33 | 54187 | 96.03 | 833 | 1 | 0.00 | 56407 | 99.96 |
| 785 | 186 | 0.33 | 54373 | 96.36 | 834 | 1 | 0.00 | 56408 | 99.96 |
| 786 | 195 | 0.35 | 54568 | 96.70 | 835 | 1 | 0.00 | 56409 | 99.97 |
| 787 | 158 | 0.28 | 54726 | 96.98 | 836 | 4 | 0.01 | 56413 | 99.97 |
| 788 | 161 | 0.29 | 54887 | 97.27 | 840 | 1 | 0.00 | 56414 | 99.98 |
| 789 | 130 | 0.23 | 55017 | 97.50 | 841 | 1 | 0.00 | 56415 | 99.98 |
| 790 | 124 | 0.22 | 55141 | 97.72 | 845 | 1 | 0.00 | 56416 | 99.98 |
| 791 | 120 | 0.21 | 55261 | 97.93 | 846 | 2 | 0.00 | 56418 | 99.98 |
| 792 | 111 | 0.20 | 55372 | 98.13 | 848 | 1 | 0.00 | 56419 | 99.98 |
| 793 | 96 | 0.17 | 55468 | 98.30 | 849 | 1 | 0.00 | 56420 | 99.99 |
| 794 | 87 | 0.15 | 55555 | 98.45 | 850 | 8 | 0.01 | 56428 | 100.00 |

**Table F.16. Scale Score Distribution—Science Grade 8**

| SS | Freq. | % | Cum. Freq. | Cum. % | SS | Freq. | % | Cum. Freq. | Cum. % |
|---|---|---|---|---|---|---|---|---|---|
| 650 | 1545 | 3.03 | 1545 | 3.03 | 700 | 318 | 0.62 | 9133 | 17.93 |
| 651 | 26 | 0.05 | 1571 | 3.08 | 701 | 326 | 0.64 | 9459 | 18.57 |
| 652 | 30 | 0.06 | 1601 | 3.14 | 702 | 377 | 0.74 | 9836 | 19.31 |
| 653 | 91 | 0.18 | 1692 | 3.32 | 703 | 333 | 0.65 | 10169 | 19.96 |
| 654 | 67 | 0.13 | 1759 | 3.45 | 704 | 342 | 0.67 | 10511 | 20.63 |
| 655 | 54 | 0.11 | 1813 | 3.56 | 705 | 361 | 0.71 | 10872 | 21.34 |
| 656 | 60 | 0.12 | 1873 | 3.68 | 706 | 362 | 0.71 | 11234 | 22.05 |
| 657 | 67 | 0.13 | 1940 | 3.81 | 707 | 364 | 0.71 | 11598 | 22.76 |
| 658 | 77 | 0.15 | 2017 | 3.96 | 708 | 414 | 0.81 | 12012 | 23.58 |
| 659 | 70 | 0.14 | 2087 | 4.10 | 709 | 418 | 0.82 | 12430 | 24.40 |
| 660 | 60 | 0.12 | 2147 | 4.21 | 710 | 387 | 0.76 | 12817 | 25.16 |
| 661 | 58 | 0.11 | 2205 | 4.33 | 711 | 428 | 0.84 | 13245 | 26.00 |
| 662 | 66 | 0.13 | 2271 | 4.46 | 712 | 407 | 0.80 | 13652 | 26.80 |
| 663 | 66 | 0.13 | 2337 | 4.59 | 713 | 417 | 0.82 | 14069 | 27.61 |
| 664 | 68 | 0.13 | 2405 | 4.72 | 714 | 452 | 0.89 | 14521 | 28.50 |
| 665 | 76 | 0.15 | 2481 | 4.87 | 715 | 451 | 0.89 | 14972 | 29.39 |
| 666 | 73 | 0.14 | 2554 | 5.01 | 716 | 494 | 0.97 | 15466 | 30.36 |
| 667 | 102 | 0.20 | 2656 | 5.21 | 717 | 487 | 0.96 | 15953 | 31.31 |
| 668 | 100 | 0.20 | 2756 | 5.41 | 718 | 510 | 1.00 | 16463 | 32.31 |
| 669 | 103 | 0.20 | 2859 | 5.61 | 719 | 492 | 0.97 | 16955 | 33.28 |
| 670 | 111 | 0.22 | 2970 | 5.83 | 720 | 532 | 1.04 | 17487 | 34.32 |
| 671 | 108 | 0.21 | 3078 | 6.04 | 721 | 493 | 0.97 | 17980 | 35.29 |
| 672 | 100 | 0.20 | 3178 | 6.24 | 722 | 531 | 1.04 | 18511 | 36.33 |
| 673 | 125 | 0.25 | 3303 | 6.48 | 723 | 530 | 1.04 | 19041 | 37.37 |
| 674 | 116 | 0.23 | 3419 | 6.71 | 724 | 590 | 1.16 | 19631 | 38.53 |
| 675 | 141 | 0.28 | 3560 | 6.99 | 725 | 523 | 1.03 | 20154 | 39.56 |
| 676 | 139 | 0.27 | 3699 | 7.26 | 726 | 554 | 1.09 | 20708 | 40.65 |
| 677 | 160 | 0.31 | 3859 | 7.57 | 727 | 540 | 1.06 | 21248 | 41.71 |
| 678 | 174 | 0.34 | 4033 | 7.92 | 728 | 587 | 1.15 | 21835 | 42.86 |
| 679 | 161 | 0.32 | 4194 | 8.23 | 729 | 593 | 1.16 | 22428 | 44.02 |
| 680 | 171 | 0.34 | 4365 | 8.57 | 730 | 574 | 1.13 | 23002 | 45.15 |
| 681 | 160 | 0.31 | 4525 | 8.88 | 731 | 580 | 1.14 | 23582 | 46.29 |
| 682 | 190 | 0.37 | 4715 | 9.25 | 732 | 620 | 1.22 | 24202 | 47.50 |
| 683 | 194 | 0.38 | 4909 | 9.64 | 733 | 619 | 1.21 | 24821 | 48.72 |
| 684 | 169 | 0.33 | 5078 | 9.97 | 734 | 610 | 1.20 | 25431 | 49.92 |
| 685 | 199 | 0.39 | 5277 | 10.36 | 735 | 606 | 1.19 | 26037 | 51.11 |
| 686 | 188 | 0.37 | 5465 | 10.73 | 736 | 604 | 1.19 | 26641 | 52.29 |
| 687 | 215 | 0.42 | 5680 | 11.15 | 737 | 622 | 1.22 | 27263 | 53.51 |
| 688 | 204 | 0.40 | 5884 | 11.55 | 738 | 623 | 1.22 | 27886 | 54.74 |
| 689 | 252 | 0.49 | 6136 | 12.04 | 739 | 632 | 1.24 | 28518 | 55.98 |
| 690 | 208 | 0.41 | 6344 | 12.45 | 740 | 636 | 1.25 | 29154 | 57.22 |
| 691 | 261 | 0.51 | 6605 | 12.96 | 741 | 615 | 1.21 | 29769 | 58.43 |
| 692 | 244 | 0.48 | 6849 | 13.44 | 742 | 707 | 1.39 | 30476 | 59.82 |
| 693 | 265 | 0.52 | 7114 | 13.96 | 743 | 666 | 1.31 | 31142 | 61.13 |
| 694 | 259 | 0.51 | 7373 | 14.47 | 744 | 660 | 1.30 | 31802 | 62.42 |
| 695 | 252 | 0.49 | 7625 | 14.97 | 745 | 609 | 1.20 | 32411 | 63.62 |
| 696 | 295 | 0.58 | 7920 | 15.55 | 746 | 631 | 1.24 | 33042 | 64.86 |
| 697 | 281 | 0.55 | 8201 | 16.10 | 747 | 702 | 1.38 | 33744 | 66.23 |
| 698 | 324 | 0.64 | 8525 | 16.73 | 748 | 610 | 1.20 | 34354 | 67.43 |
| 699 | 290 | 0.57 | 8815 | 17.30 | 749 | 652 | 1.28 | 35006 | 68.71 |

| SS | Freq. | % | Cum. Freq. | Cum. % | SS | Freq. | % | Cum. Freq. | Cum. % |
|---|---|---|---|---|---|---|---|---|---|
| 750 | 625 | 1.23 | 35631 | 69.94 | 788 | 123 | 0.24 | 50180 | 98.49 |
| 751 | 654 | 1.28 | 36285 | 71.22 | 789 | 82 | 0.16 | 50262 | 98.66 |
| 752 | 631 | 1.24 | 36916 | 72.46 | 790 | 82 | 0.16 | 50344 | 98.82 |
| 753 | 660 | 1.30 | 37576 | 73.76 | 791 | 72 | 0.14 | 50416 | 98.96 |
| 754 | 613 | 1.20 | 38189 | 74.96 | 792 | 59 | 0.12 | 50475 | 99.07 |
| 755 | 590 | 1.16 | 38779 | 76.12 | 793 | 52 | 0.10 | 50527 | 99.18 |
| 756 | 575 | 1.13 | 39354 | 77.24 | 794 | 52 | 0.10 | 50579 | 99.28 |
| 757 | 561 | 1.10 | 39915 | 78.35 | 795 | 50 | 0.10 | 50629 | 99.38 |
| 758 | 557 | 1.09 | 40472 | 79.44 | 796 | 48 | 0.09 | 50677 | 99.47 |
| 759 | 571 | 1.12 | 41043 | 80.56 | 797 | 45 | 0.09 | 50722 | 99.56 |
| 760 | 527 | 1.03 | 41570 | 81.59 | 798 | 32 | 0.06 | 50754 | 99.62 |
| 761 | 496 | 0.97 | 42066 | 82.57 | 799 | 33 | 0.06 | 50787 | 99.69 |
| 762 | 492 | 0.97 | 42558 | 83.53 | 800 | 15 | 0.03 | 50802 | 99.72 |
| 763 | 444 | 0.87 | 43002 | 84.41 | 801 | 22 | 0.04 | 50824 | 99.76 |
| 764 | 488 | 0.96 | 43490 | 85.36 | 802 | 11 | 0.02 | 50835 | 99.78 |
| 765 | 466 | 0.91 | 43956 | 86.28 | 803 | 15 | 0.03 | 50850 | 99.81 |
| 766 | 464 | 0.91 | 44420 | 87.19 | 804 | 15 | 0.03 | 50865 | 99.84 |
| 767 | 405 | 0.79 | 44825 | 87.98 | 805 | 10 | 0.02 | 50875 | 99.86 |
| 768 | 380 | 0.75 | 45205 | 88.73 | 806 | 8 | 0.02 | 50883 | 99.87 |
| 769 | 403 | 0.79 | 45608 | 89.52 | 807 | 8 | 0.02 | 50891 | 99.89 |
| 770 | 391 | 0.77 | 45999 | 90.29 | 808 | 12 | 0.02 | 50903 | 99.91 |
| 771 | 390 | 0.77 | 46389 | 91.05 | 809 | 3 | 0.01 | 50906 | 99.92 |
| 772 | 350 | 0.69 | 46739 | 91.74 | 810 | 6 | 0.01 | 50912 | 99.93 |
| 773 | 292 | 0.57 | 47031 | 92.31 | 811 | 2 | 0.00 | 50914 | 99.94 |
| 774 | 313 | 0.61 | 47344 | 92.93 | 812 | 2 | 0.00 | 50916 | 99.94 |
| 775 | 297 | 0.58 | 47641 | 93.51 | 813 | 4 | 0.01 | 50920 | 99.95 |
| 776 | 301 | 0.59 | 47942 | 94.10 | 815 | 3 | 0.01 | 50923 | 99.95 |
| 777 | 279 | 0.55 | 48221 | 94.65 | 816 | 4 | 0.01 | 50927 | 99.96 |
| 778 | 255 | 0.50 | 48476 | 95.15 | 817 | 2 | 0.00 | 50929 | 99.96 |
| 779 | 241 | 0.47 | 48717 | 95.62 | 818 | 5 | 0.01 | 50934 | 99.97 |
| 780 | 244 | 0.48 | 48961 | 96.10 | 819 | 1 | 0.00 | 50935 | 99.98 |
| 781 | 206 | 0.40 | 49167 | 96.51 | 821 | 4 | 0.01 | 50939 | 99.98 |
| 782 | 181 | 0.36 | 49348 | 96.86 | 822 | 2 | 0.00 | 50941 | 99.99 |
| 783 | 152 | 0.30 | 49500 | 97.16 | 823 | 1 | 0.00 | 50942 | 99.99 |
| 784 | 153 | 0.30 | 49653 | 97.46 | 824 | 2 | 0.00 | 50944 | 99.99 |
| 785 | 125 | 0.25 | 49778 | 97.71 | 826 | 1 | 0.00 | 50945 | 100.00 |
| 786 | 146 | 0.29 | 49924 | 97.99 | 827 | 1 | 0.00 | 50946 | 100.00 |
| 787 | 133 | 0.26 | 50057 | 98.25 | 831 | 1 | 0.00 | 50947 | 100.00 |

**Table F.17. Scale Score Distribution—Science Grade 11**

| SS | Freq. | % | Cum. Freq. | Cum. % | SS | Freq. | % | Cum. Freq. | Cum. % |
|---|---|---|---|---|---|---|---|---|---|
| 650 | 1304 | 4.10 | 1304 | 4.10 | 700 | 190 | 0.60 | 4540 | 14.29 |
| 651 | 17 | 0.05 | 1321 | 4.16 | 701 | 200 | 0.63 | 4740 | 14.92 |
| 652 | 16 | 0.05 | 1337 | 4.21 | 702 | 190 | 0.60 | 4930 | 15.52 |
| 653 | 10 | 0.03 | 1347 | 4.24 | 703 | 187 | 0.59 | 5117 | 16.11 |
| 654 | 12 | 0.04 | 1359 | 4.28 | 704 | 215 | 0.68 | 5332 | 16.78 |
| 655 | 10 | 0.03 | 1369 | 4.31 | 705 | 244 | 0.77 | 5576 | 17.55 |
| 656 | 23 | 0.07 | 1392 | 4.38 | 706 | 243 | 0.76 | 5819 | 18.32 |
| 657 | 24 | 0.08 | 1416 | 4.46 | 707 | 275 | 0.87 | 6094 | 19.18 |
| 658 | 12 | 0.04 | 1428 | 4.50 | 708 | 276 | 0.87 | 6370 | 20.05 |
| 659 | 15 | 0.05 | 1443 | 4.54 | 709 | 285 | 0.90 | 6655 | 20.95 |
| 660 | 11 | 0.03 | 1454 | 4.58 | 710 | 268 | 0.84 | 6923 | 21.79 |
| 661 | 18 | 0.06 | 1472 | 4.63 | 711 | 315 | 0.99 | 7238 | 22.78 |
| 662 | 9 | 0.03 | 1481 | 4.66 | 712 | 319 | 1.00 | 7557 | 23.79 |
| 663 | 19 | 0.06 | 1500 | 4.72 | 713 | 356 | 1.12 | 7913 | 24.91 |
| 664 | 19 | 0.06 | 1519 | 4.78 | 714 | 348 | 1.10 | 8261 | 26.00 |
| 665 | 28 | 0.09 | 1547 | 4.87 | 715 | 374 | 1.18 | 8635 | 27.18 |
| 666 | 19 | 0.06 | 1566 | 4.93 | 716 | 359 | 1.13 | 8994 | 28.31 |
| 667 | 22 | 0.07 | 1588 | 5.00 | 717 | 393 | 1.24 | 9387 | 29.55 |
| 668 | 20 | 0.06 | 1608 | 5.06 | 718 | 410 | 1.29 | 9797 | 30.84 |
| 669 | 21 | 0.07 | 1629 | 5.13 | 719 | 387 | 1.22 | 10184 | 32.06 |
| 670 | 22 | 0.07 | 1651 | 5.20 | 720 | 449 | 1.41 | 10633 | 33.47 |
| 671 | 33 | 0.10 | 1684 | 5.30 | 721 | 415 | 1.31 | 11048 | 34.78 |
| 672 | 36 | 0.11 | 1720 | 5.41 | 722 | 435 | 1.37 | 11483 | 36.15 |
| 673 | 50 | 0.16 | 1770 | 5.57 | 723 | 425 | 1.34 | 11908 | 37.49 |
| 674 | 34 | 0.11 | 1804 | 5.68 | 724 | 413 | 1.30 | 12321 | 38.79 |
| 675 | 28 | 0.09 | 1832 | 5.77 | 725 | 475 | 1.50 | 12796 | 40.28 |
| 676 | 58 | 0.18 | 1890 | 5.95 | 726 | 466 | 1.47 | 13262 | 41.75 |
| 677 | 45 | 0.14 | 1935 | 6.09 | 727 | 476 | 1.50 | 13738 | 43.25 |
| 678 | 48 | 0.15 | 1983 | 6.24 | 728 | 445 | 1.40 | 14183 | 44.65 |
| 679 | 56 | 0.18 | 2039 | 6.42 | 729 | 460 | 1.45 | 14643 | 46.10 |
| 680 | 66 | 0.21 | 2105 | 6.63 | 730 | 464 | 1.46 | 15107 | 47.56 |
| 681 | 72 | 0.23 | 2177 | 6.85 | 731 | 491 | 1.55 | 15598 | 49.10 |
| 682 | 99 | 0.31 | 2276 | 7.16 | 732 | 513 | 1.61 | 16111 | 50.72 |
| 683 | 79 | 0.25 | 2355 | 7.41 | 733 | 507 | 1.60 | 16618 | 52.31 |
| 684 | 86 | 0.27 | 2441 | 7.68 | 734 | 488 | 1.54 | 17106 | 53.85 |
| 685 | 88 | 0.28 | 2529 | 7.96 | 735 | 518 | 1.63 | 17624 | 55.48 |
| 686 | 96 | 0.30 | 2625 | 8.26 | 736 | 495 | 1.56 | 18119 | 57.04 |
| 687 | 98 | 0.31 | 2723 | 8.57 | 737 | 485 | 1.53 | 18604 | 58.56 |
| 688 | 105 | 0.33 | 2828 | 8.90 | 738 | 468 | 1.47 | 19072 | 60.04 |
| 689 | 91 | 0.29 | 2919 | 9.19 | 739 | 438 | 1.38 | 19510 | 61.42 |
| 690 | 105 | 0.33 | 3024 | 9.52 | 740 | 424 | 1.33 | 19934 | 62.75 |
| 691 | 132 | 0.42 | 3156 | 9.93 | 741 | 464 | 1.46 | 20398 | 64.21 |
| 692 | 117 | 0.37 | 3273 | 10.30 | 742 | 484 | 1.52 | 20882 | 65.73 |
| 693 | 129 | 0.41 | 3402 | 10.71 | 743 | 467 | 1.47 | 21349 | 67.20 |
| 694 | 132 | 0.42 | 3534 | 11.12 | 744 | 399 | 1.26 | 21748 | 68.46 |
| 695 | 162 | 0.51 | 3696 | 11.63 | 745 | 456 | 1.44 | 22204 | 69.90 |
| 696 | 149 | 0.47 | 3845 | 12.10 | 746 | 449 | 1.41 | 22653 | 71.31 |
| 697 | 149 | 0.47 | 3994 | 12.57 | 747 | 408 | 1.28 | 23061 | 72.59 |
| 698 | 168 | 0.53 | 4162 | 13.10 | 748 | 453 | 1.43 | 23514 | 74.02 |
| 699 | 188 | 0.59 | 4350 | 13.69 | 749 | 442 | 1.39 | 23956 | 75.41 |

| SS | Freq. | % | Cum. Freq. | Cum. % | SS | Freq. | % | Cum. Freq. | Cum. % |
|---|---|---|---|---|---|---|---|---|---|
| 750 | 365 | 1.15 | 24321 | 76.56 | 781 | 58 | 0.18 | 31287 | 98.49 |
| 751 | 391 | 1.23 | 24712 | 77.79 | 782 | 59 | 0.19 | 31346 | 98.67 |
| 752 | 378 | 1.19 | 25090 | 78.98 | 783 | 55 | 0.17 | 31401 | 98.85 |
| 753 | 392 | 1.23 | 25482 | 80.22 | 784 | 45 | 0.14 | 31446 | 98.99 |
| 754 | 371 | 1.17 | 25853 | 81.38 | 785 | 46 | 0.14 | 31492 | 99.13 |
| 755 | 340 | 1.07 | 26193 | 82.45 | 786 | 36 | 0.11 | 31528 | 99.25 |
| 756 | 365 | 1.15 | 26558 | 83.60 | 787 | 41 | 0.13 | 31569 | 99.38 |
| 757 | 337 | 1.06 | 26895 | 84.66 | 788 | 30 | 0.09 | 31599 | 99.47 |
| 758 | 330 | 1.04 | 27225 | 85.70 | 789 | 22 | 0.07 | 31621 | 99.54 |
| 759 | 289 | 0.91 | 27514 | 86.61 | 790 | 17 | 0.05 | 31638 | 99.59 |
| 760 | 299 | 0.94 | 27813 | 87.55 | 791 | 23 | 0.07 | 31661 | 99.67 |
| 761 | 274 | 0.86 | 28087 | 88.42 | 792 | 24 | 0.08 | 31685 | 99.74 |
| 762 | 240 | 0.76 | 28327 | 89.17 | 793 | 13 | 0.04 | 31698 | 99.78 |
| 763 | 285 | 0.90 | 28612 | 90.07 | 794 | 11 | 0.03 | 31709 | 99.82 |
| 764 | 240 | 0.76 | 28852 | 90.82 | 795 | 8 | 0.03 | 31717 | 99.84 |
| 765 | 259 | 0.82 | 29111 | 91.64 | 796 | 8 | 0.03 | 31725 | 99.87 |
| 766 | 239 | 0.75 | 29350 | 92.39 | 797 | 6 | 0.02 | 31731 | 99.89 |
| 767 | 209 | 0.66 | 29559 | 93.05 | 798 | 2 | 0.01 | 31733 | 99.89 |
| 768 | 205 | 0.65 | 29764 | 93.69 | 799 | 6 | 0.02 | 31739 | 99.91 |
| 769 | 173 | 0.54 | 29937 | 94.24 | 800 | 7 | 0.02 | 31746 | 99.93 |
| 770 | 173 | 0.54 | 30110 | 94.78 | 801 | 6 | 0.02 | 31752 | 99.95 |
| 771 | 167 | 0.53 | 30277 | 95.31 | 802 | 4 | 0.01 | 31756 | 99.97 |
| 772 | 132 | 0.42 | 30409 | 95.73 | 803 | 1 | 0.00 | 31757 | 99.97 |
| 773 | 138 | 0.43 | 30547 | 96.16 | 804 | 2 | 0.01 | 31759 | 99.97 |
| 774 | 118 | 0.37 | 30665 | 96.53 | 805 | 1 | 0.00 | 31760 | 99.98 |
| 775 | 114 | 0.36 | 30779 | 96.89 | 807 | 2 | 0.01 | 31762 | 99.98 |
| 776 | 123 | 0.39 | 30902 | 97.28 | 808 | 1 | 0.00 | 31763 | 99.99 |
| 777 | 88 | 0.28 | 30990 | 97.55 | 816 | 1 | 0.00 | 31764 | 99.99 |
| 778 | 82 | 0.26 | 31072 | 97.81 | 824 | 1 | 0.00 | 31765 | 99.99 |
| 779 | 92 | 0.29 | 31164 | 98.10 | 836 | 1 | 0.00 | 31766 | 100.00 |
| 780 | 65 | 0.20 | 31229 | 98.31 | 842 | 1 | 0.00 | 31767 | 100.00 |

# Appendix G: Scale Score Distribution Graphs

**Figure G.1. Scale Score Distribution—Mathematics Grade 3**
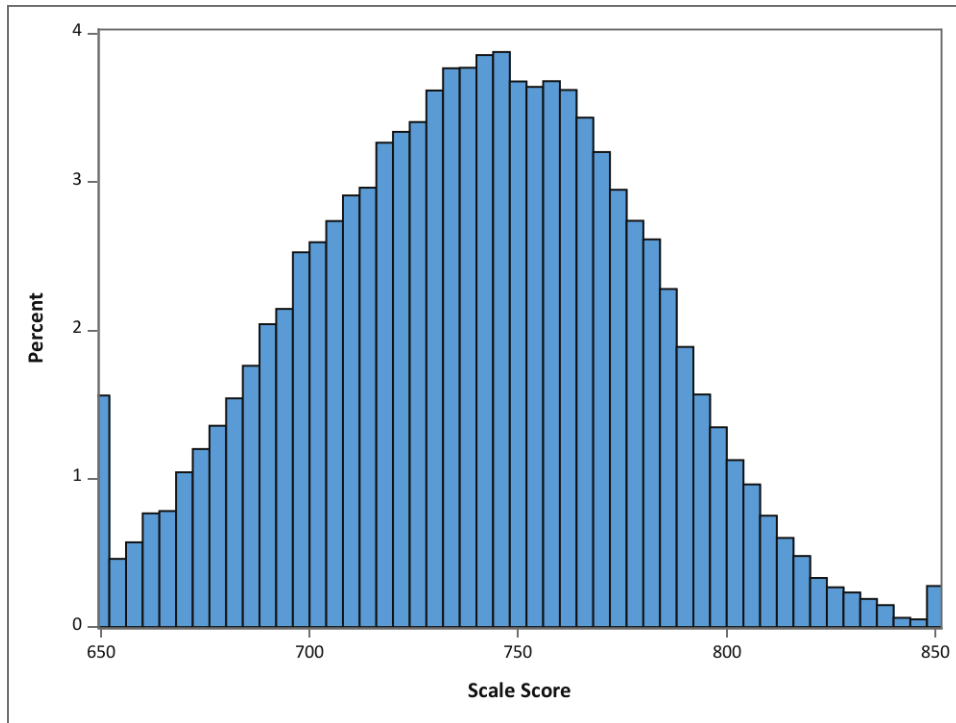


**Figure G.2. Scale Score Distribution—Mathematics Grade 4**
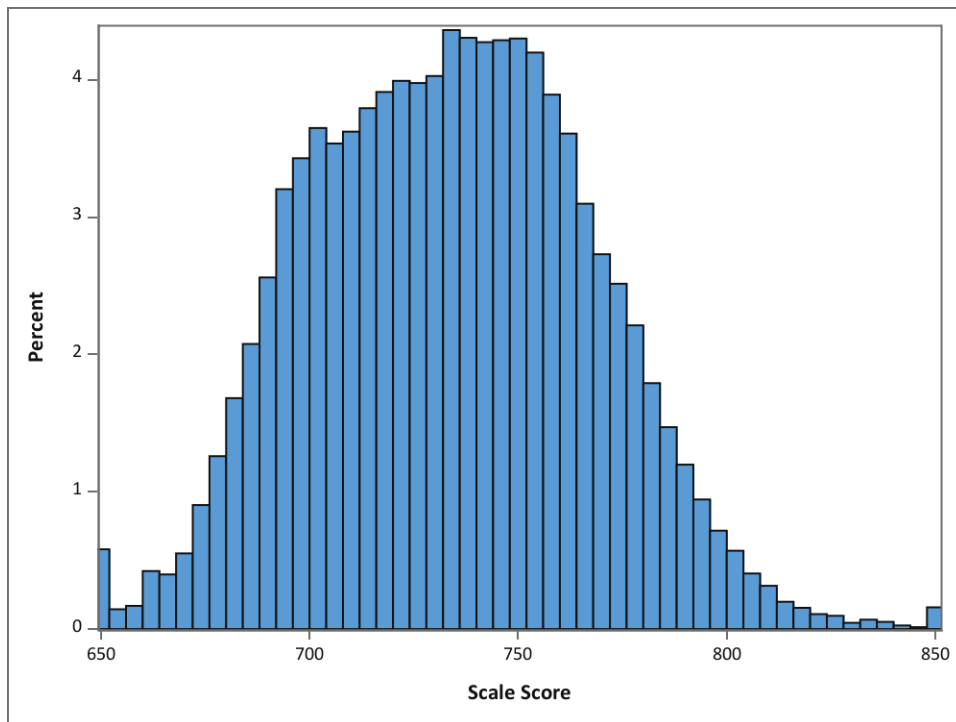
**Figure G.3. Scale Score Distribution—Mathematics Grade 5**
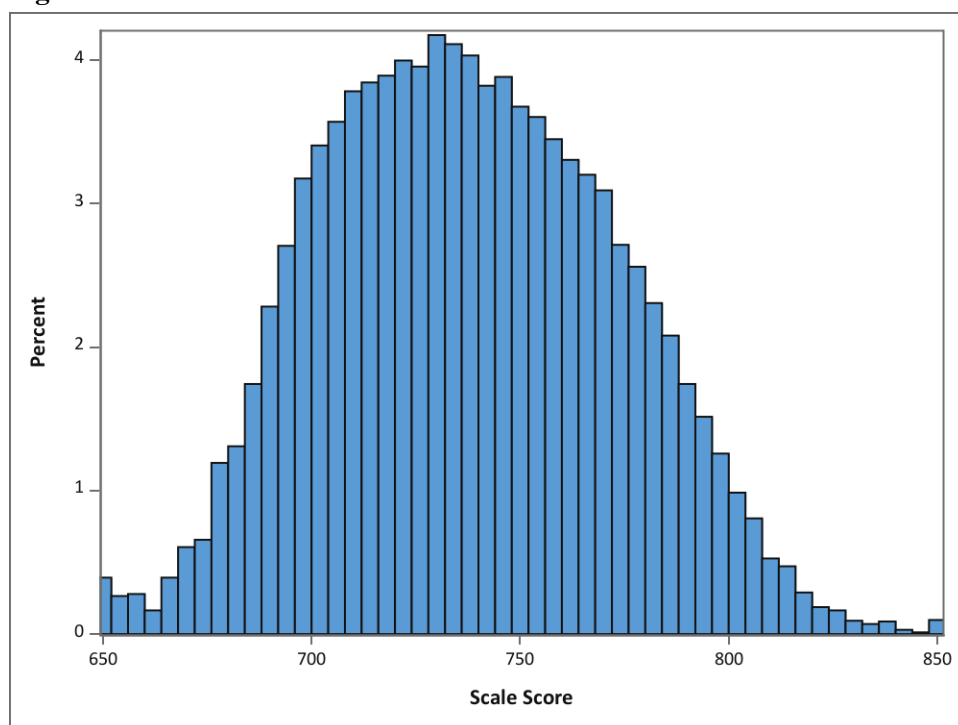


**Figure G.4. Scale Score Distribution—Mathematics Grade 6**
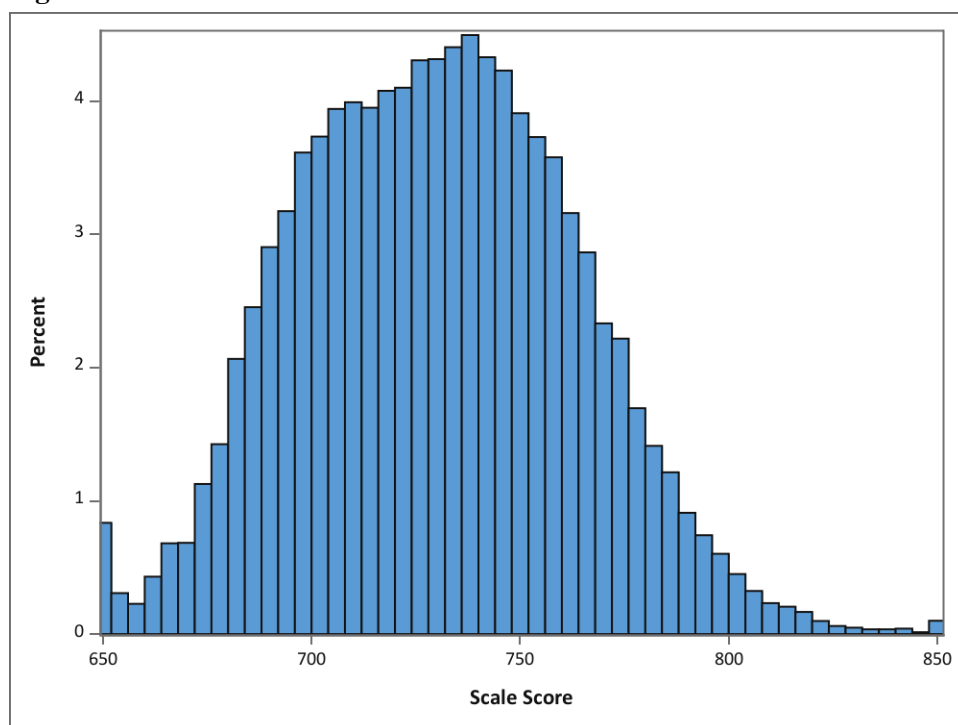
**Figure G.5. Scale Score Distribution—Mathematics Grade 7**
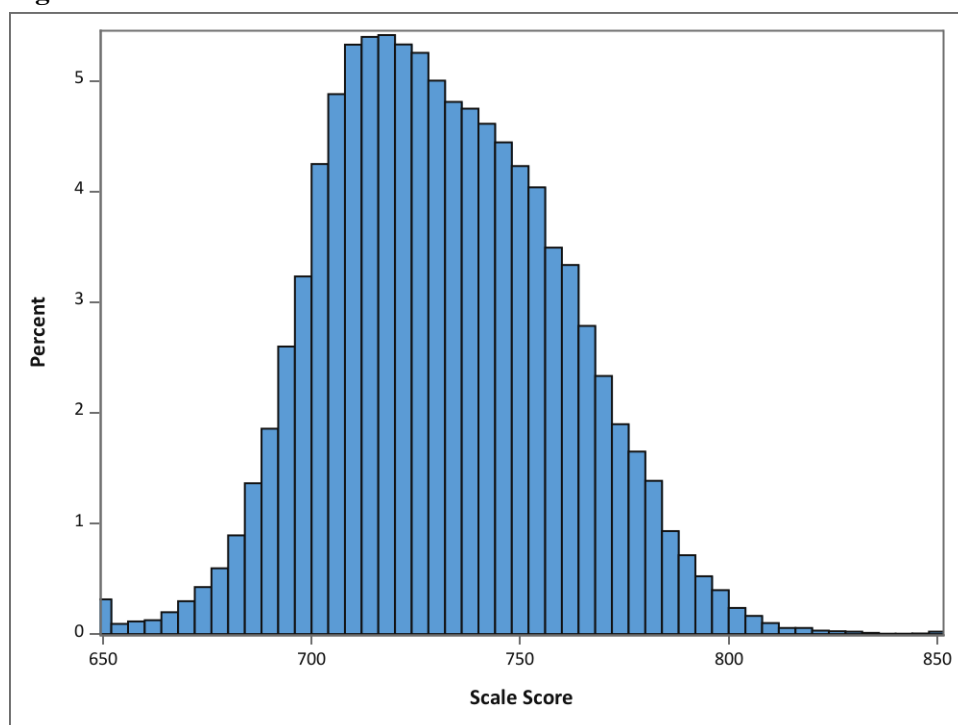


**Figure G.6. Scale Score Distribution—Mathematics Grade 8**
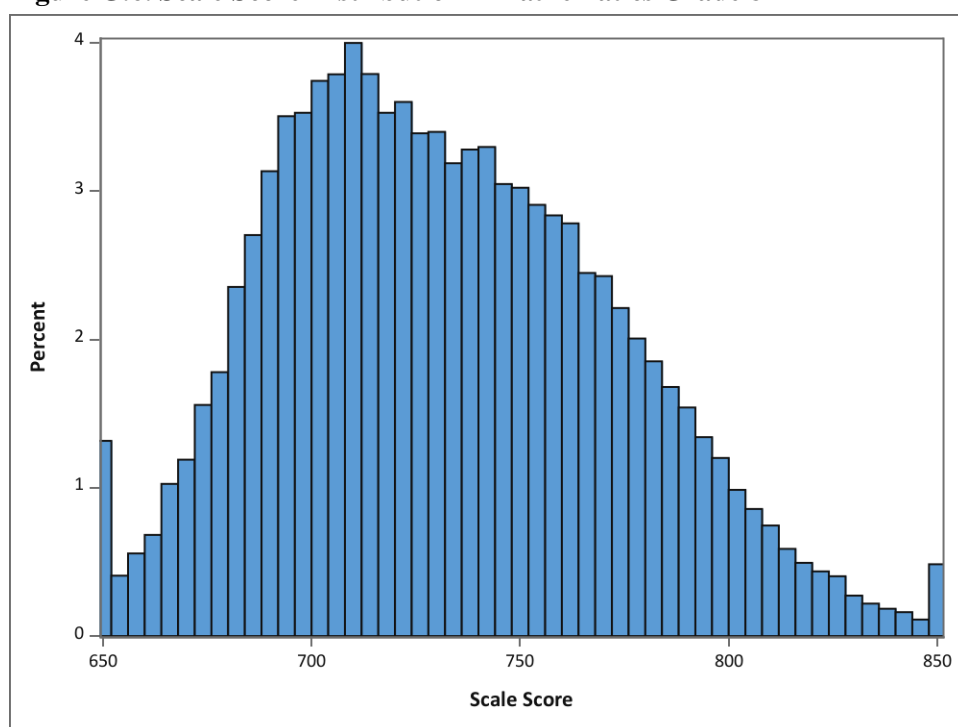
**Figure G.7. Scale Score Distribution—ELA Grade 3**
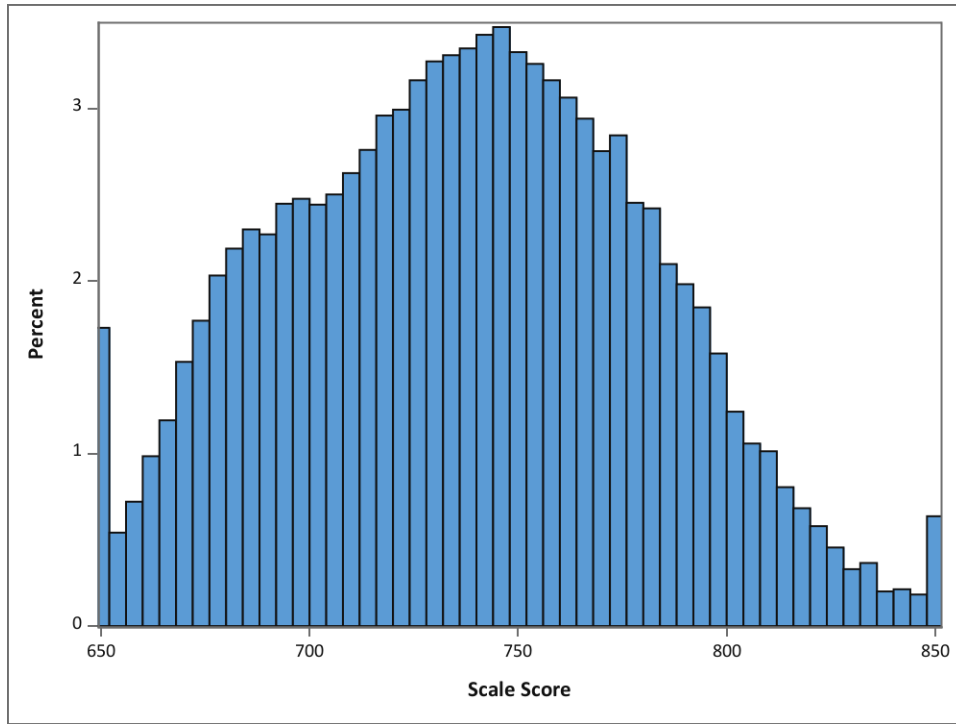


**Figure G.8. Scale Score Distribution—ELA Grade 4**
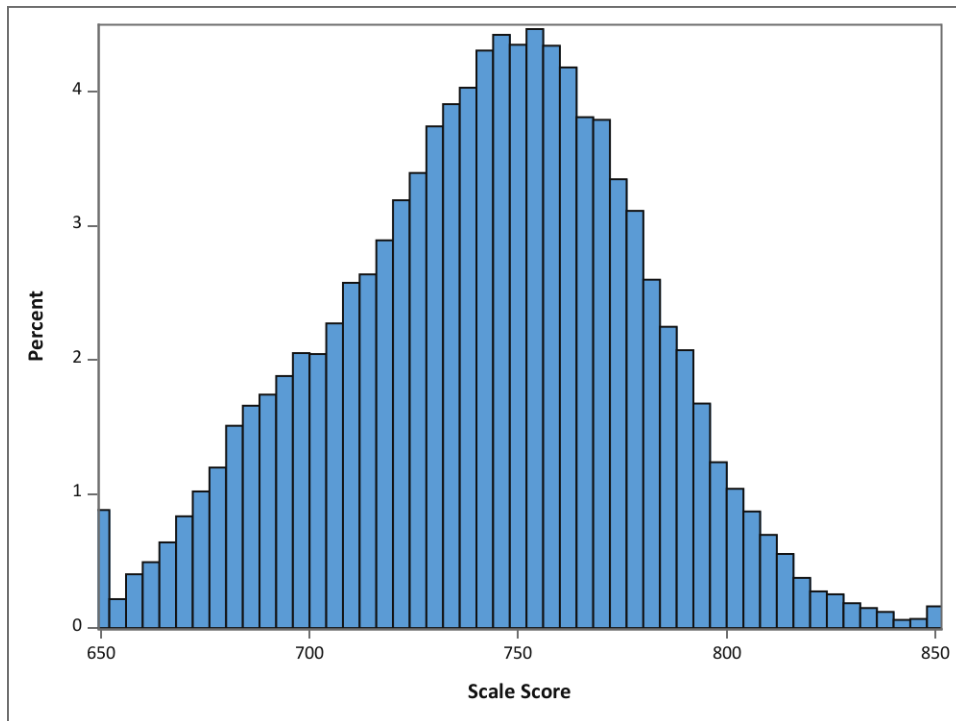
**Figure G.9. Scale Score Distribution—ELA Grade 5**
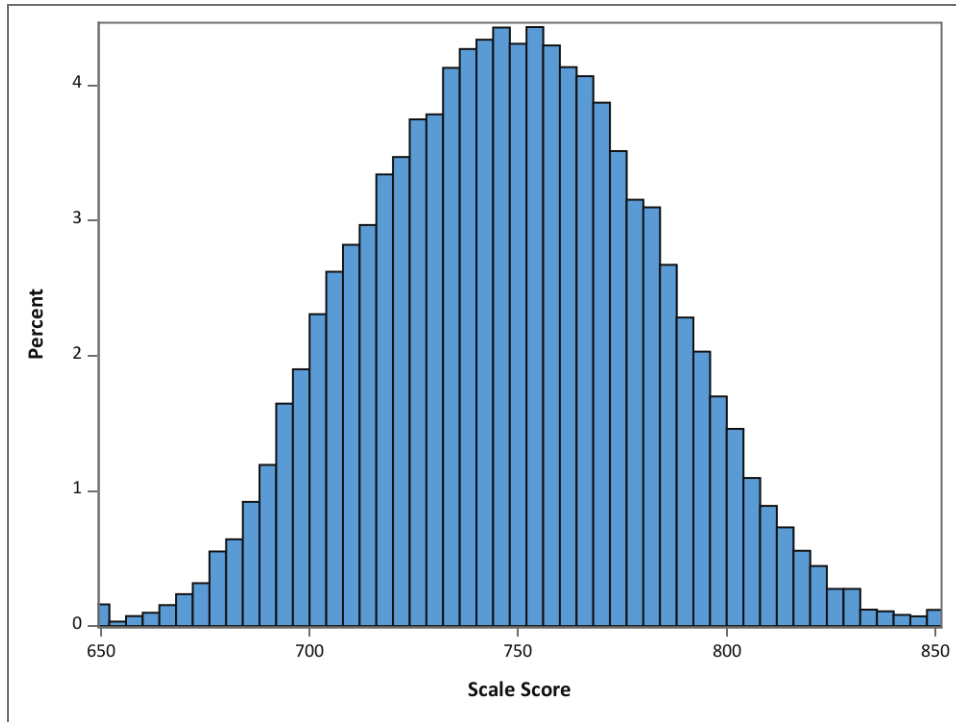


**Figure G.10. Scale Score Distribution—ELA Grade 6**
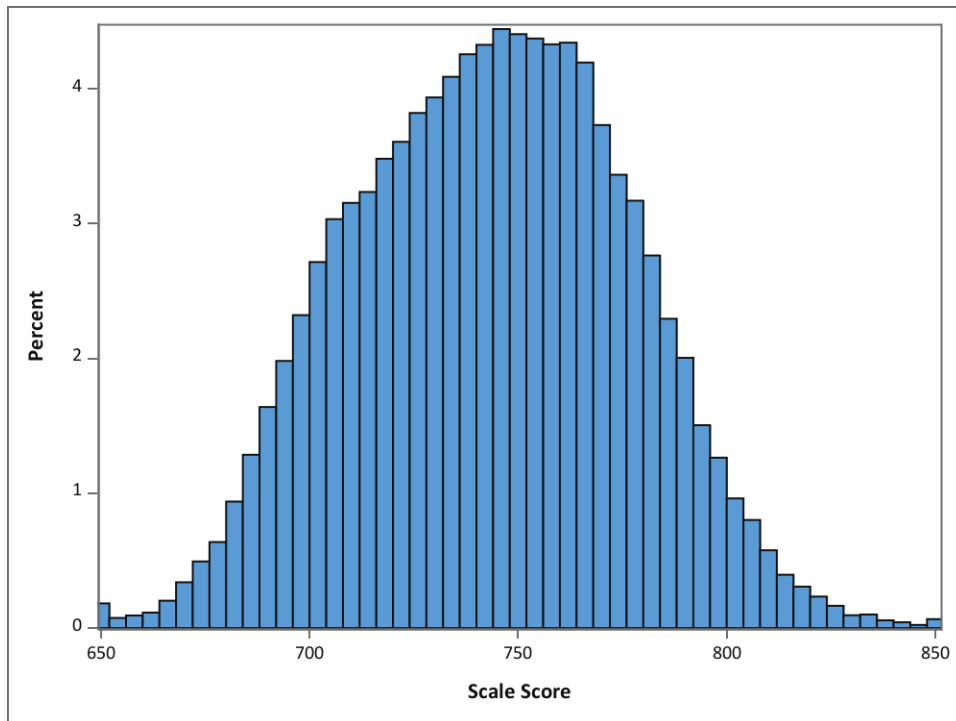
**Figure G.11. Scale Score Distribution—ELA Grade 7**
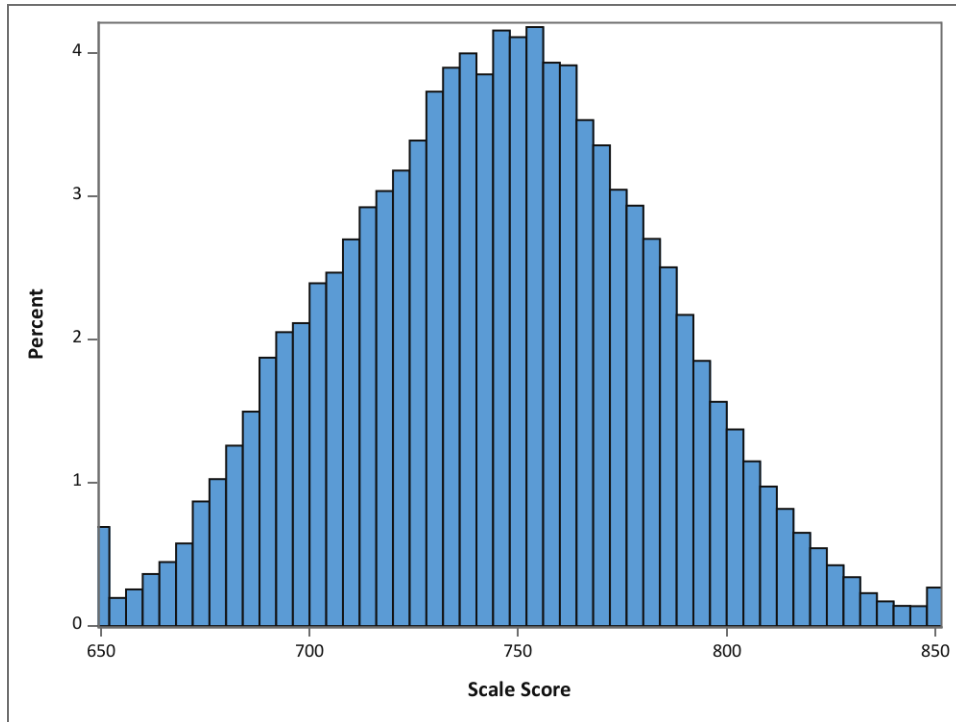


**Figure G.12. Scale Score Distribution—ELA Grade 8**
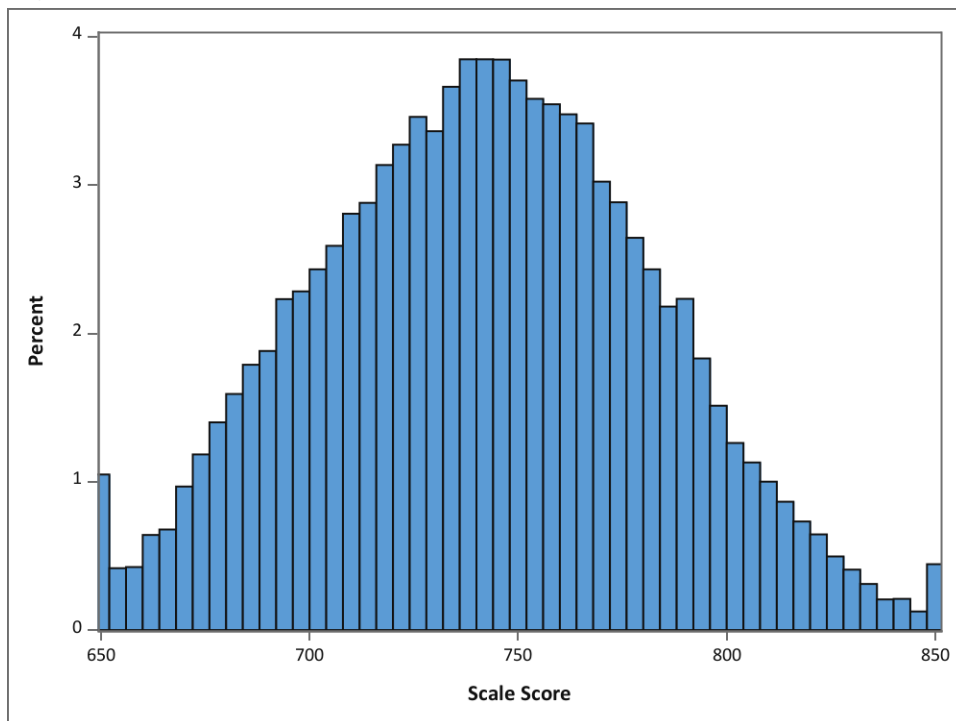
**Figure G.13. Scale Score Distribution—CSLA Grade 3**
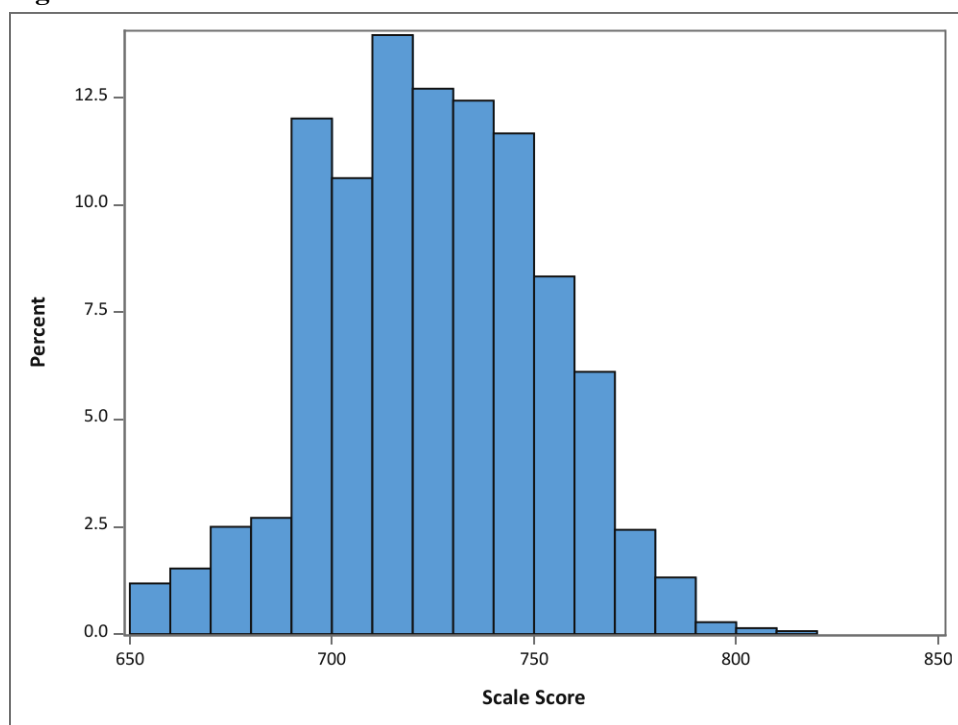


**Figure G.14. Scale Score Distribution—CSLA Grade 4**
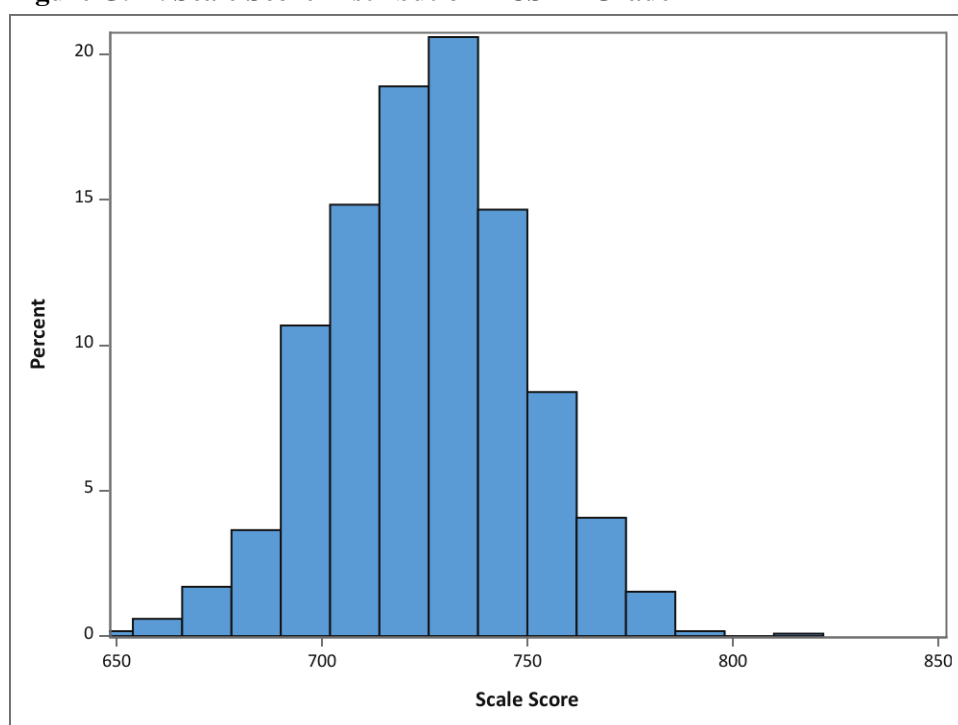
**Figure G.15. Scale Score Distribution—Science Grade 5**
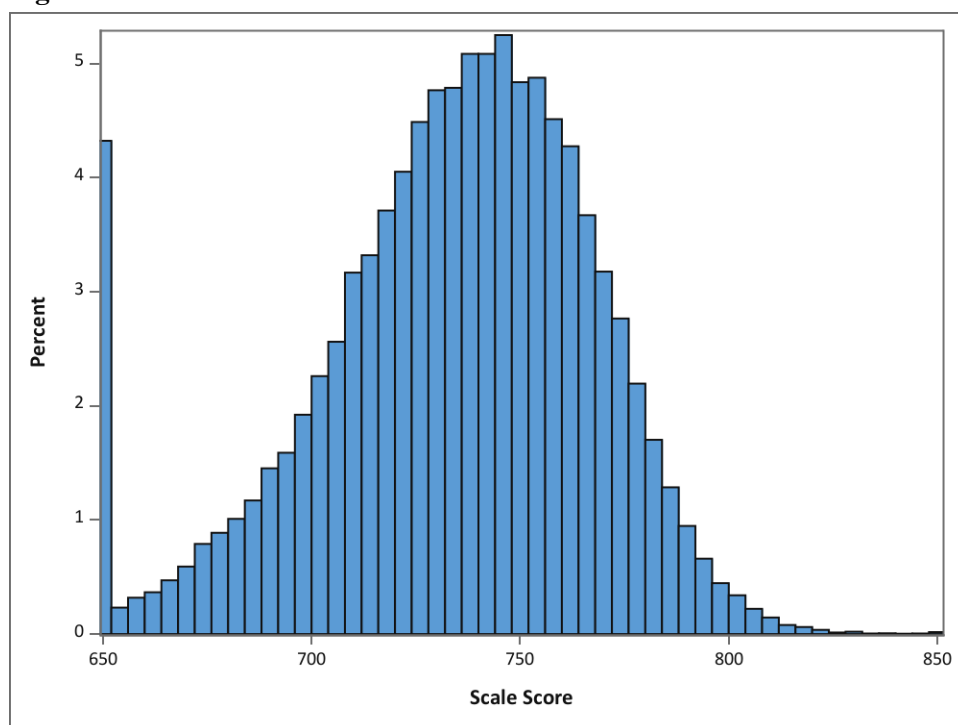


**Figure G.16. Scale Score Distribution—Science Grade 8**
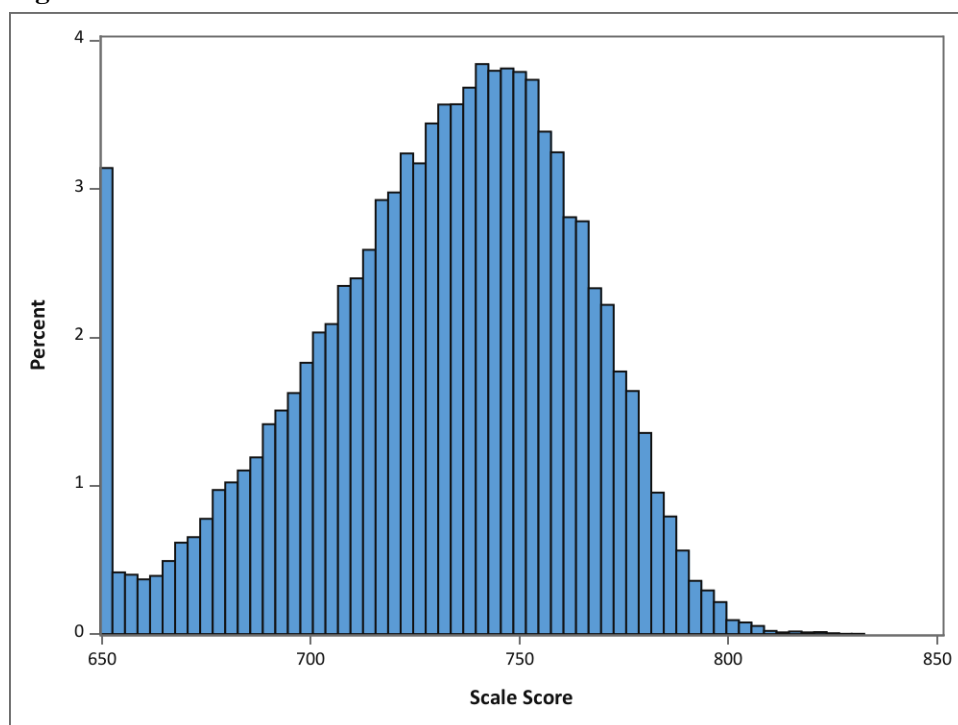
**Figure G.17. Scale Score Distribution—Science Grade 11**
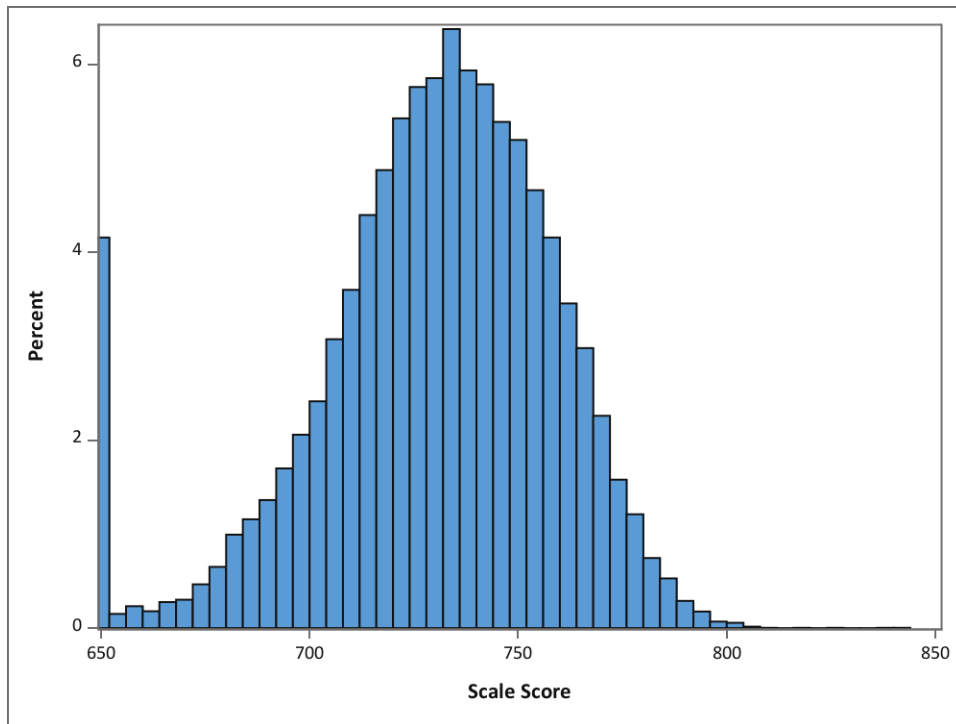
# Appendix H: Scale Score Summary Statistics by Demographic Group

**Table H.1. Performance by Subgroup—Mathematics Grade 3**

| Subgroup | N | Mean | SD | Min. | Max. | Alpha |
|---|---|---|---|---|---|---|
| No IEP | 49,964 | 742.73 | 37.66 | 650 | 850 | 0.91 |
| IEP | 7,418 | 707.40 | 37.74 | 650 | 850 | 0.92 |
| No Accommodation | 53,110 | 740.61 | 38.70 | 650 | 850 | 0.92 |
| Accommodation | 4,272 | 707.79 | 36.53 | 650 | 850 | 0.92 |
| Am. Indian/Alaska Native | 354 | 714.82 | 39.08 | 650 | 850 | 0.92 |
| Asian | 1,982 | 756.38 | 41.13 | 650 | 850 | 0.92 |
| Black | 2,646 | 718.98 | 37.41 | 650 | 837 | 0.92 |
| Hispanic | 19,134 | 720.87 | 36.42 | 650 | 850 | 0.91 |
| White | 29,847 | 749.50 | 36.53 | 650 | 850 | 0.91 |
| Hawaiian/Pacific Islander | 191 | 718.52 | 38.65 | 650 | 842 | 0.92 |
| Two or More Races | 3,225 | 744.19 | 38.83 | 650 | 850 | 0.92 |
| Missing | * | * | * | * | * | * |
| No Economic Disadvantage | 34,878 | 750.17 | 36.90 | 650 | 850 | 0.91 |
| Economic Disadvantage | 22,504 | 719.55 | 36.03 | 650 | 850 | 0.91 |
| Female | 28,318 | 735.76 | 38.61 | 650 | 850 | 0.92 |
| Male | 29,064 | 740.51 | 40.20 | 650 | 850 | 0.92 |
| Language Proficiency NA | 47,355 | 742.64 | 38.44 | 650 | 850 | 0.92 |
| Language Proficiency NEP | 2,969 | 692.69 | 30.00 | 650 | 850 | 0.88 |
| Language Proficiency LEP | 5,985 | 721.31 | 32.89 | 650 | 849 | 0.90 |
| Language Proficiency FEP | 1,073 | 760.69 | 31.74 | 650 | 850 | 0.88 |
| Not Migrant | 57,188 | 738.26 | 39.47 | 650 | 850 | 0.92 |
| Migrant | 194 | 709.07 | 36.61 | 650 | 815 | 0.92 |

*n-count less than 16

**Table H.2. Performance by Subgroup—Mathematics Grade 4**

| Subgroup | N | Mean | SD | Min. | Max. | Alpha |
|---|---|---|---|---|---|---|
| No IEP | 49,488 | 737.19 | 32.34 | 650 | 850 | 0.91 |
| IEP | 7,301 | 706.72 | 28.70 | 650 | 850 | 0.90 |
| No Accommodation | 51,979 | 735.55 | 32.95 | 650 | 850 | 0.91 |
| Accommodation | 4,810 | 708.63 | 29.00 | 650 | 838 | 0.90 |
| Am. Indian/Alaska Native | 360 | 717.56 | 28.76 | 650 | 826 | 0.89 |
| Asian | 2,061 | 751.36 | 34.93 | 650 | 850 | 0.92 |
| Black | 2,617 | 718.18 | 30.54 | 650 | 849 | 0.90 |
| Hispanic | 19,426 | 718.47 | 30.07 | 650 | 850 | 0.90 |
| White | 29,091 | 742.94 | 31.43 | 650 | 850 | 0.90 |
| Hawaiian/Pacific Islander | 191 | 717.92 | 28.93 | 650 | 788 | 0.89 |
| Two or More Races | 3,040 | 738.92 | 33.82 | 650 | 850 | 0.91 |
| Missing | * | * | * | * | * | * |
| No Economic Disadvantage | 34,768 | 743.43 | 31.99 | 650 | 850 | 0.91 |
| Economic Disadvantage | 22,021 | 717.24 | 29.25 | 650 | 850 | 0.90 |

| Subgroup | N | Mean | SD | Min. | Max. | Alpha |
|---|---|---|---|---|---|---|
| Female | 27,931 | 731.09 | 32.55 | 650 | 850 | 0.91 |
| Male | 28,858 | 735.39 | 34.23 | 650 | 850 | 0.92 |
| Language Proficiency NA | 46,522 | 737.24 | 32.90 | 650 | 850 | 0.91 |
| Language Proficiency NEP | 2,387 | 696.96 | 22.20 | 650 | 830 | 0.83 |
| Language Proficiency LEP | 5,674 | 711.58 | 24.95 | 650 | 819 | 0.86 |
| Language Proficiency FEP | 2,206 | 744.75 | 28.33 | 650 | 850 | 0.89 |
| Not Migrant | 56,583 | 733.35 | 33.48 | 650 | 850 | 0.91 |
| Migrant | 206 | 711.98 | 26.10 | 666 | 792 | 0.90 |

*n-count less than 16

**Table H.3. Performance by Subgroup—Mathematics Grade 5**

| Subgroup | N | Mean | SD | Min. | Max. | Alpha |
|---|---|---|---|---|---|---|
| No IEP | 49,824 | 741.12 | 34.04 | 650 | 850 | 0.92 |
| IEP | 7,072 | 708.26 | 29.17 | 650 | 833 | 0.91 |
| No Accommodation | 52,062 | 739.23 | 34.74 | 650 | 850 | 0.92 |
| Accommodation | 4,834 | 713.31 | 30.92 | 650 | 850 | 0.92 |
| Am. Indian/Alaska Native | 358 | 721.61 | 32.45 | 650 | 850 | 0.92 |
| Asian | 1,976 | 756.00 | 35.32 | 650 | 850 | 0.92 |
| Black | 2,508 | 721.61 | 30.88 | 650 | 850 | 0.91 |
| Hispanic | 19,695 | 721.71 | 30.91 | 650 | 850 | 0.91 |
| White | 29,224 | 747.25 | 33.81 | 650 | 850 | 0.92 |
| Hawaiian/Pacific Islander | 202 | 720.47 | 32.02 | 650 | 824 | 0.92 |
| Two or More Races | 2,930 | 741.56 | 34.98 | 650 | 850 | 0.92 |
| Missing | * | * | * | * | * | * |
| No Economic Disadvantage | 34,951 | 747.49 | 33.90 | 650 | 850 | 0.92 |
| Economic Disadvantage | 21,945 | 720.38 | 30.46 | 650 | 850 | 0.91 |
| Female | 27,700 | 734.55 | 34.13 | 650 | 850 | 0.92 |
| Male | 29,196 | 739.38 | 36.00 | 650 | 850 | 0.93 |
| Language Proficiency NA | 46,354 | 741.18 | 34.80 | 650 | 850 | 0.92 |
| Language Proficiency NEP | 1,456 | 700.08 | 23.09 | 650 | 819 | 0.85 |
| Language Proficiency LEP | 5,196 | 709.95 | 25.17 | 650 | 850 | 0.87 |
| Language Proficiency FEP | 3,890 | 737.66 | 30.57 | 650 | 850 | 0.91 |
| Not Migrant | 56,696 | 737.13 | 35.18 | 650 | 850 | 0.93 |
| Migrant | 200 | 710.42 | 25.74 | 652 | 787 | 0.89 |

*n-count less than 16

**Table H.4. Performance by Subgroup—Mathematics Grade 6**

| Subgroup | N | Mean | SD | Min. | Max. | Alpha |
|---|---|---|---|---|---|---|
| No IEP | 49,244 | 733.37 | 32.21 | 650 | 850 | 0.90 |
| IEP | 6,669 | 701.25 | 26.89 | 650 | 850 | 0.86 |
| No Accommodation | 51,042 | 731.87 | 32.76 | 650 | 850 | 0.90 |
| Accommodation | 4,871 | 705.11 | 28.67 | 650 | 838 | 0.88 |
| Am. Indian/Alaska Native | 342 | 715.15 | 29.10 | 650 | 830 | 0.87 |
| Asian | 1,970 | 749.64 | 36.36 | 650 | 850 | 0.92 |
| Black | 2,412 | 714.22 | 30.47 | 650 | 850 | 0.89 |
| Hispanic | 19,778 | 714.93 | 29.15 | 650 | 850 | 0.88 |
| White | 28,353 | 739.35 | 31.47 | 650 | 850 | 0.90 |
| Hawaiian/Pacific Islander | 192 | 713.80 | 32.22 | 650 | 813 | 0.90 |
| Two or More Races | 2,862 | 735.20 | 33.64 | 650 | 850 | 0.91 |
| Missing | * | * | * | * | * | * |
| No Economic Disadvantage | 34,740 | 739.27 | 32.15 | 650 | 850 | 0.90 |
| Economic Disadvantage | 21,173 | 713.58 | 28.65 | 650 | 850 | 0.87 |
| Female | 27,266 | 727.72 | 32.54 | 650 | 850 | 0.90 |
| Male | 28,647 | 731.27 | 33.90 | 650 | 850 | 0.91 |
| Language Proficiency NA | 45,451 | 733.69 | 32.85 | 650 | 850 | 0.90 |
| Language Proficiency NEP | 1,364 | 692.43 | 21.95 | 650 | 778 | 0.75 |
| Language Proficiency LEP | 4,066 | 701.12 | 23.73 | 650 | 797 | 0.80 |
| Language Proficiency FEP | 5,032 | 725.10 | 28.01 | 650 | 850 | 0.87 |
| Not Migrant | 55,735 | 729.61 | 33.28 | 650 | 850 | 0.91 |
| Migrant | 178 | 706.17 | 27.07 | 650 | 786 | 0.87 |

*n-count less than 16

**Table H.5. Performance by Subgroup—Mathematics Grade 7**

| Subgroup | N | Mean | SD | Min. | Max. | Alpha |
|---|---|---|---|---|---|---|
| No IEP | 48,095 | 733.85 | 27.50 | 650 | 850 | 0.90 |
| IEP | 6,053 | 708.20 | 21.10 | 650 | 805 | 0.81 |
| No Accommodation | 49,474 | 732.75 | 27.81 | 650 | 850 | 0.90 |
| Accommodation | 4,674 | 712.21 | 23.27 | 650 | 850 | 0.86 |
| Am. Indian/Alaska Native | 351 | 717.57 | 25.81 | 650 | 800 | 0.88 |
| Asian | 1,737 | 749.85 | 30.87 | 650 | 850 | 0.92 |
| Black | 2,349 | 718.12 | 25.35 | 650 | 825 | 0.87 |
| Hispanic | 19,719 | 718.74 | 24.03 | 650 | 839 | 0.85 |
| White | 27,182 | 739.56 | 26.68 | 650 | 850 | 0.89 |
| Hawaiian/Pacific Islander | 161 | 713.78 | 25.17 | 660 | 783 | 0.86 |
| Two or More Races | 2,640 | 736.01 | 29.09 | 650 | 850 | 0.91 |
| Missing | * | * | * | * | * | * |
| No Economic Disadvantage | 33,499 | 739.11 | 27.52 | 650 | 850 | 0.90 |
| Economic Disadvantage | 20,649 | 717.79 | 23.53 | 650 | 817 | 0.85 |
| Female | 26,065 | 730.07 | 28.20 | 650 | 850 | 0.90 |
| Male | 28,083 | 731.83 | 27.88 | 650 | 850 | 0.90 |

| Subgroup | N | Mean | SD | Min. | Max. | Alpha |
|---|---|---|---|---|---|---|
| Language Proficiency NA | 44,035 | 734.64 | 27.80 | 650 | 850 | 0.90 |
| Language Proficiency NEP | 1,470 | 702.13 | 17.78 | 650 | 773 | 0.60 |
| Language Proficiency LEP | 4,000 | 708.61 | 18.39 | 650 | 789 | 0.68 |
| Language Proficiency FEP | 4,643 | 724.64 | 24.32 | 650 | 850 | 0.86 |
| Not Migrant | 53,973 | 731.04 | 28.05 | 650 | 850 | 0.90 |
| Migrant | 175 | 711.90 | 21.01 | 650 | 770 | 0.75 |

*n-count less than 16

**Table H.6. Performance by Subgroup—Mathematics Grade 8**

| Subgroup | N | Mean | SD | Min. | Max. | Alpha |
|---|---|---|---|---|---|---|
| No IEP | 46,428 | 735.78 | 40.30 | 650 | 850 | 0.91 |
| IEP | 5,608 | 698.44 | 28.32 | 650 | 850 | 0.82 |
| No Accommodation | 47,522 | 734.22 | 40.61 | 650 | 850 | 0.91 |
| Accommodation | 4,514 | 705.77 | 33.81 | 650 | 850 | 0.88 |
| Am. Indian/Alaska Native | 361 | 715.52 | 35.54 | 650 | 850 | 0.88 |
| Asian | 1,700 | 759.54 | 44.61 | 650 | 850 | 0.92 |
| Black | 2,285 | 715.64 | 35.57 | 650 | 850 | 0.89 |
| Hispanic | 19,525 | 714.06 | 34.32 | 650 | 850 | 0.87 |
| White | 25,671 | 744.55 | 39.66 | 650 | 850 | 0.91 |
| Hawaiian/Pacific Islander | 155 | 718.35 | 37.05 | 650 | 847 | 0.90 |
| Two or More Races | 2,333 | 738.13 | 42.00 | 650 | 850 | 0.91 |
| Missing | * | * | * | * | * | * |
| No Economic Disadvantage | 32,081 | 743.66 | 40.51 | 650 | 850 | 0.91 |
| Economic Disadvantage | 19,955 | 712.62 | 33.48 | 650 | 850 | 0.87 |
| Female | 24,738 | 731.30 | 40.18 | 650 | 850 | 0.91 |
| Male | 27,298 | 732.17 | 41.46 | 650 | 850 | 0.91 |
| Language Proficiency NA | 42,810 | 737.24 | 40.72 | 650 | 850 | 0.91 |
| Language Proficiency NEP | 1,433 | 690.72 | 23.24 | 650 | 799 | 0.66 |
| Language Proficiency LEP | 3,637 | 698.97 | 25.30 | 650 | 832 | 0.72 |
| Language Proficiency FEP | 4,156 | 718.09 | 32.59 | 650 | 850 | 0.86 |
| Not Migrant | 51,865 | 731.86 | 40.85 | 650 | 850 | 0.91 |
| Migrant | 171 | 701.06 | 31.00 | 650 | 842 | 0.86 |

*n-count less than 16

**Table H.7. Performance by Subgroup—ELA Grade 3**

| Subgroup | N | Mean | SD | Min. | Max. | Alpha |
|---|---|---|---|---|---|---|
| No IEP | 48,525 | 742.90 | 41.68 | 650 | 850 | 0.90 |
| IEP | 7,212 | 699.16 | 36.89 | 650 | 850 | 0.91 |
| No Accommodation | 51,771 | 740.06 | 42.80 | 650 | 850 | 0.91 |
| Accommodation | 3,966 | 700.44 | 37.30 | 650 | 850 | 0.90 |
| Am. Indian/Alaska Native | 352 | 715.99 | 41.05 | 650 | 850 | 0.91 |
| Asian | 1,945 | 749.64 | 44.45 | 650 | 850 | 0.91 |
| Black | 2,644 | 719.27 | 40.65 | 650 | 850 | 0.91 |
| Hispanic | 17,620 | 719.42 | 40.03 | 650 | 850 | 0.91 |
| White | 29,752 | 748.14 | 41.85 | 650 | 850 | 0.90 |
| Hawaiian/Pacific Islander | 184 | 717.64 | 37.17 | 650 | 840 | 0.89 |
| Two or More Races | 3,237 | 744.72 | 43.25 | 650 | 850 | 0.91 |
| Missing | * | * | * | * | * | * |
| No Economic Disadvantage | 34,560 | 749.60 | 41.65 | 650 | 850 | 0.90 |
| Economic Disadvantage | 21,177 | 717.08 | 39.06 | 650 | 850 | 0.90 |
| Female | 27,479 | 740.31 | 44.40 | 650 | 850 | 0.91 |
| Male | 28,258 | 734.25 | 42.67 | 650 | 850 | 0.91 |
| Language Proficiency NA | 47,322 | 741.55 | 42.92 | 650 | 850 | 0.91 |
| Language Proficiency NEP | 2,050 | 683.23 | 24.68 | 650 | 850 | 0.82 |
| Language Proficiency LEP | 5,293 | 714.68 | 34.57 | 650 | 850 | 0.88 |
| Language Proficiency FEP | 1,072 | 761.68 | 33.27 | 656 | 850 | 0.84 |
| Not Migrant | 55,564 | 737.33 | 43.62 | 650 | 850 | 0.91 |
| Migrant | 173 | 706.67 | 38.55 | 650 | 800 | 0.90 |

*n-count less than 16

**Table H.8. Performance by Subgroup—ELA Grade 4**

| Subgroup | N | Mean | SD | Min. | Max. | Alpha |
|---|---|---|---|---|---|---|
| No IEP | 48,349 | 747.08 | 34.02 | 650 | 850 | 0.89 |
| IEP | 7,170 | 704.08 | 33.50 | 650 | 850 | 0.90 |
| No Accommodation | 50,988 | 744.43 | 35.71 | 650 | 850 | 0.90 |
| Accommodation | 4,531 | 708.79 | 34.03 | 650 | 850 | 0.90 |
| Am. Indian/Alaska Native | 361 | 723.35 | 33.95 | 650 | 812 | 0.90 |
| Asian | 2,033 | 752.83 | 36.03 | 650 | 850 | 0.89 |
| Black | 2,621 | 725.48 | 34.91 | 650 | 850 | 0.90 |
| Hispanic | 18,202 | 726.27 | 34.54 | 650 | 850 | 0.89 |
| White | 29,056 | 751.45 | 34.70 | 650 | 850 | 0.89 |
| Hawaiian/Pacific Islander | 193 | 724.24 | 34.64 | 650 | 813 | 0.87 |
| Two or More Races | 3,050 | 747.55 | 36.32 | 650 | 850 | 0.89 |
| Missing | * | * | * | * | * | * |
| No Economic Disadvantage | 34,522 | 752.21 | 34.54 | 650 | 850 | 0.89 |
| Economic Disadvantage | 20,997 | 723.96 | 33.77 | 650 | 850 | 0.89 |
| Female | 27,290 | 745.24 | 36.61 | 650 | 850 | 0.90 |
| Male | 28,229 | 737.93 | 36.80 | 650 | 850 | 0.90 |

| Subgroup | N | Mean | SD | Min. | Max. | Alpha |
|---|---|---|---|---|---|---|
| Language Proficiency NA | 46,561 | 745.67 | 36.08 | 650 | 850 | 0.90 |
| Language Proficiency NEP | 1,647 | 689.26 | 23.09 | 650 | 799 | 0.78 |
| Language Proficiency LEP | 5,101 | 715.41 | 26.33 | 650 | 807 | 0.84 |
| Language Proficiency FEP | 2,210 | 753.42 | 25.44 | 650 | 842 | 0.83 |
| Not Migrant | 55,337 | 741.62 | 36.86 | 650 | 850 | 0.90 |
| Migrant | 182 | 711.40 | 32.69 | 650 | 806 | 0.77 |

*n-count less than 16

### Table H.9. Performance by Subgroup—ELA Grade 5

| Subgroup | N | Mean | SD | Min. | Max. | Alpha |
|---|---|---|---|---|---|---|
| No IEP | 49,580 | 751.91 | 32.08 | 650 | 850 | 0.88 |
| IEP | 7,077 | 715.86 | 28.33 | 650 | 847 | 0.88 |
| No Accommodation | 51,842 | 749.85 | 33.10 | 650 | 850 | 0.89 |
| Accommodation | 4,815 | 721.05 | 29.85 | 650 | 849 | 0.89 |
| Am. Indian/Alaska Native | 362 | 732.29 | 31.28 | 653 | 847 | 0.90 |
| Asian | 1,954 | 757.76 | 33.27 | 650 | 850 | 0.88 |
| Black | 2,504 | 733.90 | 30.98 | 650 | 843 | 0.88 |
| Hispanic | 19,484 | 732.90 | 30.93 | 650 | 850 | 0.88 |
| White | 29,208 | 757.31 | 32.00 | 650 | 850 | 0.88 |
| Hawaiian/Pacific Islander | 201 | 732.91 | 30.71 | 662 | 821 | 0.88 |
| Two or More Races | 2,941 | 752.62 | 33.30 | 650 | 850 | 0.89 |
| Missing | * | * | * | * | * | * |
| No Economic Disadvantage | 34,895 | 757.40 | 32.24 | 650 | 850 | 0.88 |
| Economic Disadvantage | 21,762 | 731.38 | 29.86 | 650 | 850 | 0.88 |
| Female | 27,614 | 751.19 | 34.21 | 650 | 850 | 0.89 |
| Male | 29,043 | 743.81 | 33.02 | 650 | 850 | 0.89 |
| Language Proficiency NA | 46,414 | 751.94 | 33.05 | 650 | 850 | 0.89 |
| Language Proficiency NEP | 1,159 | 699.71 | 20.15 | 650 | 789 | 0.78 |
| Language Proficiency LEP | 5,185 | 717.15 | 22.64 | 650 | 835 | 0.82 |
| Language Proficiency FEP | 3,899 | 747.88 | 25.84 | 659 | 850 | 0.84 |
| Not Migrant | 56,468 | 747.50 | 33.79 | 650 | 850 | 0.89 |
| Migrant | 189 | 717.99 | 24.29 | 658 | 793 | 0.81 |

*n-count less than 16

### Table H.10. Performance by Subgroup—ELA Grade 6

| Subgroup | N | Mean | SD | Min. | Max. | Alpha |
|---|---|---|---|---|---|---|
| No IEP | 48,929 | 747.07 | 31.43 | 650 | 850 | 0.90 |
| IEP | 6,673 | 711.20 | 26.72 | 650 | 850 | 0.89 |
| No Accommodation | 50,912 | 745.25 | 32.25 | 650 | 850 | 0.90 |
| Accommodation | 4,690 | 715.83 | 29.13 | 650 | 850 | 0.90 |
| Am. Indian/Alaska Native | 345 | 729.36 | 31.32 | 656 | 817 | 0.91 |
| Asian | 1,937 | 756.54 | 33.15 | 650 | 850 | 0.90 |
| Black | 2,397 | 730.09 | 31.07 | 650 | 831 | 0.90 |

| Subgroup | N | Mean | SD | Min. | Max. | Alpha |
|---|---|---|---|---|---|---|
| Hispanic | 19,559 | 728.98 | 30.07 | 650 | 850 | 0.89 |
| White | 28,323 | 752.05 | 31.35 | 650 | 850 | 0.90 |
| Hawaiian/Pacific Islander | 191 | 728.38 | 31.43 | 650 | 850 | 0.90 |
| Two or More Races | 2,846 | 749.07 | 32.62 | 650 | 850 | 0.90 |
| Missing | * | * | * | * | * | * |
| No Economic Disadvantage | 34,649 | 752.09 | 31.50 | 650 | 850 | 0.90 |
| Economic Disadvantage | 20,953 | 727.35 | 29.53 | 650 | 850 | 0.89 |
| Female | 27,126 | 746.52 | 33.41 | 650 | 850 | 0.90 |
| Male | 28,476 | 739.19 | 32.25 | 650 | 850 | 0.91 |
| Language Proficiency NA | 45,433 | 747.08 | 32.44 | 650 | 850 | 0.90 |
| Language Proficiency NEP | 1,067 | 697.17 | 18.48 | 650 | 770 | 0.78 |
| Language Proficiency LEP | 4,060 | 711.62 | 21.74 | 650 | 800 | 0.83 |
| Language Proficiency FEP | 5,042 | 738.69 | 26.21 | 650 | 834 | 0.87 |
| Not Migrant | 55,431 | 742.85 | 33.01 | 650 | 850 | 0.90 |
| Migrant | 171 | 715.44 | 26.80 | 650 | 784 | 0.89 |

*n-count less than 16

**Table H.11. Performance by Subgroup—ELA Grade 7**

| Subgroup | N | Mean | SD | Min. | Max. | Alpha |
|---|---|---|---|---|---|---|
| No IEP | 47,822 | 748.68 | 36.34 | 650 | 850 | 0.90 |
| IEP | 6,073 | 707.11 | 30.00 | 650 | 850 | 0.87 |
| No Accommodation | 49,420 | 746.78 | 37.16 | 650 | 850 | 0.90 |
| Accommodation | 4,475 | 713.27 | 33.64 | 650 | 850 | 0.89 |
| Am. Indian/Alaska Native | 349 | 726.72 | 35.65 | 650 | 847 | 0.89 |
| Asian | 1,721 | 762.69 | 39.70 | 650 | 850 | 0.90 |
| Black | 2,349 | 729.86 | 35.23 | 650 | 850 | 0.89 |
| Hispanic | 19,487 | 727.96 | 34.53 | 650 | 850 | 0.89 |
| White | 27,185 | 755.14 | 35.80 | 650 | 850 | 0.89 |
| Hawaiian/Pacific Islander | 158 | 722.27 | 33.11 | 650 | 793 | 0.87 |
| Two or More Races | 2,637 | 751.74 | 37.90 | 650 | 850 | 0.90 |
| Missing | * | * | * | * | * | * |
| No Economic Disadvantage | 33,423 | 754.68 | 36.45 | 650 | 850 | 0.90 |
| Economic Disadvantage | 20,472 | 726.55 | 33.86 | 650 | 850 | 0.89 |
| Female | 25,982 | 749.49 | 37.67 | 650 | 850 | 0.90 |
| Male | 27,913 | 738.88 | 37.63 | 650 | 850 | 0.90 |
| Language Proficiency NA | 44,086 | 749.34 | 37.04 | 650 | 850 | 0.90 |
| Language Proficiency NEP | 1,167 | 690.47 | 21.72 | 650 | 795 | 0.80 |
| Language Proficiency LEP | 3,992 | 708.57 | 25.75 | 650 | 812 | 0.83 |
| Language Proficiency FEP | 4,650 | 737.20 | 30.81 | 650 | 850 | 0.87 |
| Not Migrant | 53,731 | 744.08 | 38.00 | 650 | 850 | 0.90 |
| Migrant | 164 | 715.00 | 32.39 | 650 | 803 | 0.88 |

*n-count less than 16

**Table H.12. Performance by Subgroup—ELA Grade 8**

| Subgroup | N | Mean | SD | Min. | Max. | Alpha |
|---|---|---|---|---|---|---|
| No IEP | 46,148 | 746.20 | 39.11 | 650 | 850 | 0.90 |
| IEP | 5,612 | 701.80 | 30.65 | 650 | 850 | 0.88 |
| No Accommodation | 47,482 | 744.23 | 39.90 | 650 | 850 | 0.90 |
| Accommodation | 4,278 | 709.76 | 35.75 | 650 | 850 | 0.90 |
| Am. Indian/Alaska Native | 358 | 727.82 | 37.13 | 650 | 842 | 0.90 |
| Asian | 1,672 | 760.84 | 41.43 | 650 | 850 | 0.90 |
| Black | 2,268 | 728.63 | 38.45 | 650 | 850 | 0.90 |
| Hispanic | 19,315 | 725.30 | 37.17 | 650 | 850 | 0.89 |
| White | 25,646 | 752.97 | 38.83 | 650 | 850 | 0.90 |
| Hawaiian/Pacific Islander | 155 | 728.97 | 40.93 | 650 | 829 | 0.90 |
| Two or More Races | 2,340 | 748.61 | 39.88 | 650 | 850 | 0.90 |
| Missing | * | * | * | * | * | * |
| No Economic Disadvantage | 32,002 | 752.40 | 39.20 | 650 | 850 | 0.90 |
| Economic Disadvantage | 19,758 | 723.55 | 36.55 | 650 | 850 | 0.89 |
| Female | 24,638 | 748.30 | 40.63 | 650 | 850 | 0.90 |
| Male | 27,122 | 735.10 | 39.73 | 650 | 850 | 0.90 |
| Language Proficiency NA | 42,820 | 747.13 | 39.73 | 650 | 850 | 0.90 |
| Language Proficiency NEP | 1,168 | 681.88 | 21.96 | 650 | 785 | 0.81 |
| Language Proficiency LEP | 3,632 | 704.83 | 26.56 | 650 | 803 | 0.84 |
| Language Proficiency FEP | 4,140 | 730.83 | 31.66 | 650 | 850 | 0.88 |
| Not Migrant | 51,594 | 741.50 | 40.66 | 650 | 850 | 0.90 |
| Migrant | 166 | 706.48 | 35.63 | 650 | 850 | 0.89 |

*n-count less than 16

**Table H.13. Performance by Subgroup—CSLA Grade 3**

| Subgroup | N | Mean | SD | Min. | Max. | Alpha |
|---|---|---|---|---|---|---|
| No IEP | 1,298 | 726.57 | 26.81 | 650 | 815 | 0.87 |
| IEP | 142 | 702.92 | 22.67 | 650 | 768 | 0.83 |
| No Accommodation | 1,239 | 726.31 | 26.94 | 650 | 815 | 0.87 |
| Accommodation | 201 | 711.43 | 26.40 | 650 | 804 | 0.86 |
| Am. Indian/Alaska Native | * | * | * | * | * | * |
| Asian | * | * | * | * | * | * |
| Black | * | * | * | * | * | * |
| Hispanic | 1,430 | 724.27 | 27.40 | 650 | 815 | 0.87 |
| White | * | * | * | * | * | * |
| Hawaiian/Pacific Islander | * | * | * | * | * | * |
| Two or More Races | * | * | * | * | * | * |
| Missing | * | * | * | * | * | * |
| No Economic Disadvantage | 241 | 723.17 | 28.72 | 650 | 809 | 0.87 |
| Economic Disadvantage | 1,199 | 724.45 | 27.07 | 650 | 815 | 0.87 |
| Female | 758 | 728.42 | 27.15 | 650 | 815 | 0.87 |
| Male | 682 | 719.58 | 26.83 | 650 | 789 | 0.87 |

| Subgroup | N | Mean | SD | Min. | Max. | Alpha |
|---|---|---|---|---|---|---|
| Language Proficiency NA | * | * | * | * | * | * |
| Language Proficiency NEP | 747 | 716.48 | 26.41 | 650 | 815 | 0.86 |
| Language Proficiency LEP | 693 | 732.59 | 25.86 | 650 | 809 | 0.87 |
| Language Proficiency FEP | * | * | * | * | * | * |
| Not Migrant | 1,426 | 724.30 | 27.33 | 650 | 815 | 0.87 |
| Migrant | * | * | * | * | * | * |

*n-count less than 16

**Table H.14. Performance by Subgroup—CSLA Grade 4**

| Subgroup | N | Mean | SD | Min. | Max. | Alpha |
|---|---|---|---|---|---|---|
| No IEP | 1,070 | 727.02 | 22.61 | 650 | 819 | 0.83 |
| IEP | 110 | 701.26 | 22.20 | 650 | 763 | 0.85 |
| No Accommodation | 976 | 727.18 | 23.10 | 656 | 819 | 0.84 |
| Accommodation | 204 | 712.36 | 23.21 | 650 | 766 | 0.84 |
| Am. Indian/Alaska Native | * | * | * | * | * | * |
| Asian | * | * | * | * | * | * |
| Black | * | * | * | * | * | * |
| Hispanic | 1,170 | 724.65 | 23.82 | 650 | 819 | 0.84 |
| White | * | * | * | * | * | * |
| Hawaiian/Pacific Islander | * | * | * | * | * | * |
| Two or More Races | * | * | * | * | * | * |
| Missing | * | * | * | * | * | * |
| No Economic Disadvantage | 191 | 724.99 | 22.15 | 667 | 780 | 0.83 |
| Economic Disadvantage | 989 | 724.54 | 24.09 | 650 | 819 | 0.84 |
| Female | 604 | 729.55 | 23.42 | 656 | 819 | 0.83 |
| Male | 576 | 719.44 | 23.05 | 650 | 782 | 0.84 |
| Language Proficiency NA | * | * | * | * | * | * |
| Language Proficiency NEP | 604 | 719.00 | 23.65 | 650 | 819 | 0.84 |
| Language Proficiency LEP | 576 | 730.50 | 22.47 | 656 | 791 | 0.83 |
| Language Proficiency FEP | * | * | * | * | * | * |
| Not Migrant | 1,163 | 724.64 | 23.81 | 650 | 819 | 0.84 |
| Migrant | 17 | 722.82 | 21.94 | 675 | 766 | 0.83 |

*n-count less than 16

**Table H.15. Performance by Subgroup—Science Grade 5**

| Subgroup | N | Mean | SD | Min. | Max. | Alpha |
|---|---|---|---|---|---|---|
| No IEP | 49,442 | 737.36 | 31.44 | 650 | 850 | 0.89 |
| IEP | 6,986 | 702.63 | 35.36 | 650 | 828 | 0.90 |
| No Accommodation | 52,265 | 734.95 | 33.08 | 650 | 850 | 0.89 |
| Accommodation | 4,163 | 709.33 | 35.54 | 650 | 808 | 0.90 |
| Am. Indian/Alaska Native | 359 | 718.09 | 34.55 | 650 | 809 | 0.89 |
| Asian | 1,967 | 743.48 | 31.65 | 650 | 828 | 0.89 |
| Black | 2,481 | 716.45 | 33.46 | 650 | 799 | 0.85 |
| Hispanic | 19,509 | 717.78 | 33.01 | 650 | 850 | 0.87 |
| White | 29,002 | 743.83 | 30.04 | 650 | 850 | 0.88 |
| Hawaiian/Pacific Islander | 201 | 713.37 | 33.88 | 650 | 787 | 0.87 |
| Two or More Races | 2,906 | 738.46 | 32.61 | 650 | 850 | 0.89 |
| Missing | * | * | * | * | * | * |
| No Economic Disadvantage | 34,695 | 743.48 | 30.24 | 650 | 850 | 0.88 |
| Economic Disadvantage | 21,733 | 716.43 | 32.88 | 650 | 830 | 0.86 |
| Female | 27,472 | 732.43 | 32.52 | 650 | 850 | 0.88 |
| Male | 28,956 | 733.66 | 35.22 | 650 | 850 | 0.90 |
| Language Proficiency NA | 45,968 | 737.92 | 32.25 | 650 | 850 | 0.89 |
| Language Proficiency NEP | 1,433 | 683.42 | 29.54 | 650 | 824 | 0.77 |
| Language Proficiency LEP | 5,151 | 703.01 | 28.49 | 650 | 802 | 0.78 |
| Language Proficiency FEP | 3,876 | 733.66 | 25.30 | 650 | 823 | 0.84 |
| Not Migrant | 56,232 | 733.17 | 33.90 | 650 | 850 | 0.89 |
| Migrant | 196 | 702.77 | 32.18 | 650 | 779 | 0.82 |

*n-count less than 16

**Table H.16. Performance by Subgroup—Science Grade 8**

| Subgroup | N | Mean | SD | Min. | Max. | Alpha |
|---|---|---|---|---|---|---|
| No IEP | 45,490 | 734.22 | 31.32 | 650 | 831 | 0.92 |
| IEP | 5,457 | 700.59 | 31.12 | 650 | 806 | 0.90 |
| No Accommodation | 47,278 | 732.45 | 32.23 | 650 | 831 | 0.92 |
| Accommodation | 3,669 | 707.03 | 33.43 | 650 | 811 | 0.92 |
| Am. Indian/Alaska Native | 352 | 722.27 | 30.33 | 650 | 797 | 0.90 |
| Asian | 1,671 | 744.97 | 31.80 | 650 | 826 | 0.92 |
| Black | 2,199 | 716.73 | 32.35 | 650 | 795 | 0.90 |
| Hispanic | 19,164 | 716.28 | 31.85 | 650 | 821 | 0.90 |
| White | 25,117 | 741.48 | 29.19 | 650 | 831 | 0.91 |
| Hawaiian/Pacific Islander | 153 | 719.93 | 33.50 | 650 | 783 | 0.92 |
| Two or More Races | 2,286 | 736.36 | 31.63 | 650 | 818 | 0.92 |
| Missing | * | * | * | * | * | * |
| No Economic Disadvantage | 31,412 | 739.88 | 30.23 | 650 | 831 | 0.92 |
| Economic Disadvantage | 19,535 | 715.72 | 31.72 | 650 | 818 | 0.90 |
| Female | 24,168 | 731.51 | 31.69 | 650 | 827 | 0.92 |
| Male | 26,779 | 729.81 | 34.08 | 650 | 831 | 0.92 |

| Subgroup | N | Mean | SD | Min. | Max. | Alpha |
|---|---|---|---|---|---|---|
| Language Proficiency NA | 41,893 | 735.73 | 31.24 | 650 | 831 | 0.92 |
| Language Proficiency NEP | 1,397 | 682.70 | 26.90 | 650 | 776 | 0.77 |
| Language Proficiency LEP | 3,568 | 700.53 | 26.29 | 650 | 775 | 0.79 |
| Language Proficiency FEP | 4,089 | 720.82 | 27.65 | 650 | 802 | 0.87 |
| Not Migrant | 50,777 | 730.71 | 32.95 | 650 | 831 | 0.92 |
| Migrant | 170 | 702.89 | 30.93 | 650 | 787 | 0.90 |

*n-count less than 16

**Table H.17. Performance by Subgroup—Science Grade 11**

| Subgroup | N | Mean | SD | Min. | Max. | Alpha |
|---|---|---|---|---|---|---|
| No IEP | 28,972 | 731.31 | 28.38 | 650 | 842 | 0.89 |
| IEP | 2,795 | 704.99 | 29.74 | 650 | 796 | 0.85 |
| No Accommodation | 29,510 | 730.20 | 28.88 | 650 | 842 | 0.90 |
| Accommodation | 2,257 | 713.27 | 32.38 | 650 | 800 | 0.90 |
| Am. Indian/Alaska Native | 223 | 721.12 | 26.21 | 650 | 774 | 0.85 |
| Asian | 969 | 736.31 | 30.08 | 650 | 800 | 0.90 |
| Black | 1,399 | 715.67 | 29.72 | 650 | 795 | 0.87 |
| Hispanic | 13,088 | 718.12 | 28.11 | 650 | 807 | 0.86 |
| White | 14,679 | 739.17 | 26.47 | 650 | 842 | 0.89 |
| Hawaiian/Pacific Islander | 93 | 717.69 | 32.73 | 650 | 781 | 0.90 |
| Two or More Races | 1,309 | 734.57 | 29.59 | 650 | 836 | 0.90 |
| Missing | * | * | * | * | * | * |
| No Economic Disadvantage | 20,014 | 735.32 | 28.25 | 650 | 842 | 0.90 |
| Economic Disadvantage | 11,753 | 718.22 | 28.33 | 650 | 808 | 0.86 |
| Female | 14,935 | 728.68 | 27.15 | 650 | 824 | 0.88 |
| Male | 16,832 | 729.27 | 31.36 | 650 | 842 | 0.91 |
| Language Proficiency NA | 27,032 | 733.32 | 27.61 | 650 | 842 | 0.89 |
| Language Proficiency NEP | 814 | 683.63 | 26.65 | 650 | 752 | 0.47 |
| Language Proficiency LEP | 1,985 | 699.42 | 25.31 | 650 | 775 | 0.67 |
| Language Proficiency FEP | 1,936 | 718.05 | 22.37 | 650 | 783 | 0.78 |
| Not Migrant | 31,674 | 729.04 | 29.45 | 650 | 842 | 0.90 |
| Migrant | 93 | 712.71 | 29.12 | 650 | 765 | 0.85 |

*n-count less than 16

## Appendix I: Summary Statistics for Points Earned by Subclaim

**Table I.1. Points Earned Summary by Subclaim—Mathematics**

| Subclaim | Grade | Mean | SD | Min. | Max. | Average % Correct |
|---|---|---|---|---|---|---|
| Subclaim A | 3 | 11.4 | 5.3 | 0 | 22 | 51.91 |
|  | 4 | 10.9 | 6.2 | 0 | 24 | 45.45 |
|  | 5 | 11.5 | 6.0 | 0 | 23 | 49.85 |
|  | 6 | 6.8 | 4.8 | 0 | 20 | 33.79 |
|  | 7 | 6.9 | 4.7 | 0 | 23 | 29.86 |
|  | 8 | 9.0 | 5.2 | 0 | 24 | 37.62 |
| Subclaim B | 3 | 5.0 | 2.5 | 0 | 9 | 55.70 |
|  | 4 | 2.7 | 1.8 | 0 | 7 | 38.32 |
|  | 5 | 3.5 | 2.3 | 0 | 8 | 43.73 |
|  | 6 | 4.7 | 2.4 | 0 | 11 | 42.26 |
|  | 7 | 2.8 | 1.9 | 0 | 8 | 35.70 |
|  | 8 | 2.8 | 1.9 | 0 | 7 | 40.17 |
| Subclaim C | 3 | 3.6 | 2.7 | 0 | 11 | 32.65 |
|  | 4 | 3.5 | 3.3 | 0 | 11 | 31.44 |
|  | 5 | 2.5 | 2.7 | 0 | 11 | 22.75 |
|  | 6 | 3.4 | 3.1 | 0 | 11 | 30.99 |
|  | 7 | 2.5 | 2.8 | 0 | 11 | 22.97 |
|  | 8 | 1.9 | 2.4 | 0 | 11 | 16.84 |
| Subclaim D | 3 | 3.1 | 2.3 | 0 | 9 | 33.99 |
|  | 4 | 2.3 | 2.6 | 0 | 9 | 25.56 |
|  | 5 | 2.3 | 2.5 | 0 | 9 | 25.43 |
|  | 6 | 2.0 | 2.4 | 0 | 9 | 22.33 |
|  | 7 | 2.1 | 2.2 | 0 | 9 | 23.21 |
|  | 8 | 1.8 | 2.4 | 0 | 9 | 19.69 |

**Table I.2. Points Earned Summary by Subclaim—ELA**

| Subclaim | Grade | Mean | SD | Min. | Max. | Average % Correct |
|---|---|---|---|---|---|---|
| RL | 3 | 6.6 | 4.2 | 0 | 17 | 38.85 |
| | 4 | 8.5 | 4.0 | 0 | 18 | 47.04 |
| | 5 | 8.4 | 4.5 | 0 | 18 | 46.86 |
| | 6 | 8.5 | 4.7 | 0 | 18 | 47.45 |
| | 7 | 7.0 | 4.0 | 0 | 18 | 39.08 |
| | 8 | 8.2 | 4.4 | 0 | 18 | 45.46 |
| RI | 3 | 7.7 | 3.7 | 0 | 14 | 54.98 |
| | 4 | 6.8 | 4.3 | 0 | 18 | 37.63 |
| | 5 | 6.3 | 3.3 | 0 | 18 | 35.14 |
| | 6 | 8.5 | 4.5 | 0 | 22 | 38.68 |
| | 7 | 7.5 | 4.6 | 0 | 22 | 33.94 |
| | 8 | 9.1 | 5.0 | 0 | 22 | 41.26 |
| RV | 3 | 6.2 | 2.8 | 0 | 10 | 61.63 |
| | 4 | 5.7 | 2.6 | 0 | 10 | 57.13 |
| | 5 | 4.5 | 2.0 | 0 | 8 | 56.46 |
| | 6 | 4.5 | 2.3 | 0 | 8 | 56.44 |
| | 7 | 4.8 | 2.8 | 0 | 10 | 48.31 |
| | 8 | 5.4 | 2.7 | 0 | 10 | 54.21 |
| WE (unweighted) | 3 | 1.1 | 1.1 | 0 | 6 | 18.39 |
| | 4 | 1.9 | 1.3 | 0 | 7 | 27.00 |
| | 5 | 1.9 | 1.4 | 0 | 7 | 27.09 |
| | 6 | 1.8 | 1.6 | 0 | 8 | 22.26 |
| | 7 | 2.4 | 1.9 | 0 | 8 | 30.02 |
| | 8 | 2.5 | 2.0 | 0 | 8 | 31.28 |
| WKL | 3 | 1.1 | 1.1 | 0 | 6 | 18.53 |
| | 4 | 1.5 | 1.4 | 0 | 6 | 24.34 |
| | 5 | 1.5 | 1.4 | 0 | 6 | 25.54 |
| | 6 | 1.7 | 1.6 | 0 | 6 | 28.13 |
| | 7 | 2.1 | 1.8 | 0 | 6 | 34.45 |
| | 8 | 2.4 | 2.0 | 0 | 6 | 39.53 |

*Note*. RL = Reading: Literary Text, RI = Reading: Informational Text, RV = Reading: Vocabulary, WE = Writing: Written Expression, WKL = Writing: Knowledge and Use of Language Conventions. Results for WE are unweighted.

**Table I.3. Points Earned Summary by Subclaim—CSLA**

| Subclaim | Grade | Mean | SD | Min. | Max. | Average % Correct |
|---|---|---|---|---|---|---|
| RL | 3 | 6.1 | 4.0 | 0 | 17 | 35.71 |
| | 4 | 8.3 | 4.4 | 0 | 20 | 41.25 |
| RI | 3 | 3.4 | 2.8 | 0 | 14 | 24.44 |
| | 4 | 4.3 | 3.1 | 0 | 17 | 23.76 |
| RV | 3 | 4.3 | 2.9 | 0 | 10 | 42.56 |
| | 4 | 4.0 | 2.3 | 0 | 8 | 50.64 |
| WE (unweighted) | 3 | 1.4 | 1.6 | 0 | 6 | 23.92 |
| | 4 | 1.9 | 1.8 | 0 | 7 | 26.86 |
| WKL | 3 | 1.6 | 1.6 | 0 | 6 | 26.97 |
| | 4 | 2.2 | 1.8 | 0 | 6 | 36.34 |

*Note*. RL = Reading: Literary Text, RI = Reading: Informational Text, RV = Reading: Vocabulary, WE = Writing: Written Expression, WKL = Writing: Knowledge and Use of Language Conventions. Results for WE are unweighted.

**Table I.4. Points Earned Summary by Subclaim—Science**

| Subclaim | Grade | Mean | SD | Min. | Max. | Average % Correct |
|---|---|---|---|---|---|---|
| Physical Science | 5 | 6.5 | 4.3 | 0 | 18 | 36.36 |
| | 8 | 7.3 | 4.4 | 0 | 21 | 35.04 |
| | 11 | 7.2 | 4.0 | 0 | 18 | 39.91 |
| Life Science | 5 | 5.2 | 2.7 | 0 | 12 | 42.92 |
| | 8 | 7.9 | 4.8 | 0 | 22 | 36.00 |
| | 11 | 5.7 | 3.3 | 0 | 16 | 35.73 |
| Earth and Space Science | 5 | 8.7 | 4.4 | 0 | 21 | 41.52 |
| | 8 | 5.7 | 3.7 | 0 | 18 | 31.71 |
| | 11 | 5.0 | 3.2 | 0 | 16 | 31.55 |

# Appendix J: Classical Item-Level Statistics

**Table J.1. SR Item Classical Statistics—Mathematics Grade 3**

| Item | Omit % | *P*-value | Item–Total Correlation |
|------|--------|-----------|------------------------|
| 1 | 0.85 | 0.73 | 0.50 |
| 2 | 0.28 | 0.69 | 0.59 |
| 3 | 0.28 | 0.45 | 0.60 |
| 4 | 3.63 | 0.37 | 0.65 |
| 5 | 1.02 | 0.42 | 0.56 |
| 6 | 2.50 | 0.47 | 0.42 |
| 7 | 0.41 | 0.58 | 0.56 |
| 8 | 0.46 | 0.28 | 0.45 |
| 9 | 0.46 | 0.79 | 0.35 |
| 10 | 3.51 | 0.39 | 0.61 |
| 11 | 1.03 | 0.22 | 0.40 |
| 12 | 0.32 | 0.62 | 0.51 |
| 13 | 0.41 | 0.52 | 0.67 |
| 14 | 0.39 | 0.45 | 0.67 |
| 15 | 1.04 | 0.58 | 0.64 |
| 16 | 0.18 | 0.81 | 0.45 |
| 17 | 0.08 | 0.77 | 0.50 |
| 18 | 3.22 | 0.54 | 0.43 |
| 19 | 0.70 | 0.77 | 0.51 |
| 20 | 1.30 | 0.52 | 0.48 |
| 21 | 0.05 | 0.83 | 0.46 |
| 22 | 0.14 | 0.49 | 0.44 |
| 23 | 0.67 | 0.60 | 0.59 |
| 24 | 0.25 | 0.80 | 0.39 |
| 25 | 0.27 | 0.58 | 0.59 |
| 26 | 0.10 | 0.35 | 0.59 |
| 27 | 2.53 | 0.34 | 0.70 |
| 28 | 2.14 | 0.46 | 0.46 |
| 29 | 0.77 | 0.38 | 0.74 |
| 30 | 0.43 | 0.35 | 0.73 |
| 31 | 0.68 | 0.32 | 0.78 |

**Table J.2. CR Item Classical Statistics—Mathematics Grade 3**

| Item | Max. Points | Omit % | 0% | 1% | 2% | 3% | 4% | P-value | Item-Total Correlation |
|------|-------------|--------|------|------|------|------|------|---------|------------------------|
| 1 | 3 | 2.70 | 35.79 | 17.25 | 32.43 | 11.82 | – | 0.39 | 0.61 |
| 2 | 4 | 1.13 | 32.79 | 39.66 | 17.39 | 7.52 | 1.51 | 0.26 | 0.65 |

**Table J.3. SR Item Classical Statistics—Mathematics Grade 4**

| Item | Omit % | P-value | Item–Total Correlation |
|------|--------|---------|------------------------|
| 1 | 1.25 | 0.21 | 0.53 |
| 2 | 0.06 | 0.53 | 0.53 |
| 3 | 0.98 | 0.40 | 0.60 |
| 4 | 0.38 | 0.18 | 0.56 |
| 5 | 1.05 | 0.18 | 0.59 |
| 6 | 0.52 | 0.62 | 0.40 |
| 7 | 0.95 | 0.40 | 0.49 |
| 8 | 3.17 | 0.28 | 0.65 |
| 9 | 1.77 | 0.41 | 0.42 |
| 10 | 0.21 | 0.62 | 0.53 |
| 11 | 3.81 | 0.30 | 0.58 |
| 12 | 0.10 | 0.42 | 0.46 |
| 13 | 0.09 | 0.64 | 0.52 |
| 14 | 0.43 | 0.62 | 0.45 |
| 15 | 0.05 | 0.72 | 0.56 |
| 16 | 0.51 | 0.45 | 0.53 |
| 17 | 0.10 | 0.43 | 0.39 |
| 18 | 3.57 | 0.45 | 0.54 |
| 19 | 1.23 | 0.27 | 0.40 |
| 20 | 1.56 | 0.31 | 0.71 |
| 21 | 1.40 | 0.53 | 0.50 |
| 22 | 0.27 | 0.54 | 0.67 |
| 23 | 1.03 | 0.37 | 0.68 |
| 24 | 0.61 | 0.36 | 0.54 |
| 25 | 0.13 | 0.67 | 0.61 |
| 26 | 0.35 | 0.41 | 0.75 |
| 27 | 6.77 | 0.26 | 0.74 |

**Table J.4. CR Item Classical Statistics—Mathematics Grade 4**

| Item | Max. Points | Omit % | 0% | 1% | 2% | 3% | 4% | 5% | 6% | P-value | Item-Total Correlation |
|------|-------------|--------|------|------|------|------|------|------|------|---------|------------------------|
| 1 | 3 | 2.33 | 60.04 | 11.86 | 10.47 | 15.31 | – | – | – | 0.26 | 0.69 |
| 2 | 3 | 3.57 | 74.06 | 7.36 | 5.18 | 9.83 | – | – | – | 0.16 | 0.63 |
| 3 | 6 | 1.02 | 41.51 | 10.15 | 15.19 | 6.21 | 9.34 | 7.56 | 9.02 | 0.31 | 0.78 |

**Table J.5. SR Item Classical Statistics—Mathematics Grade 5**

| Item | Omit % | *P*-value | Item–Total Correlation |
|------|--------|-----------|------------------------|
| 1 | 0.08 | 0.61 | 0.54 |
| 2 | 1.27 | 0.35 | 0.47 |
| 3 | 0.65 | 0.64 | 0.51 |
| 4 | 2.23 | 0.37 | 0.60 |
| 5 | 0.24 | 0.35 | 0.63 |
| 6 | 0.08 | 0.84 | 0.30 |
| 7 | 0.96 | 0.48 | 0.63 |
| 8 | 0.68 | 0.37 | 0.57 |
| 9 | 0.73 | 0.43 | 0.57 |
| 10 | 0.25 | 0.33 | 0.50 |
| 11 | 0.25 | 0.67 | 0.58 |
| 12 | 0.41 | 0.73 | 0.33 |
| 13 | 1.79 | 0.63 | 0.54 |
| 14 | 0.11 | 0.63 | 0.42 |
| 15 | 0.13 | 0.28 | 0.41 |
| 16 | 0.07 | 0.73 | 0.54 |
| 17 | 0.57 | 0.53 | 0.49 |
| 18 | 3.10 | 0.45 | 0.37 |
| 19 | 0.14 | 0.43 | 0.51 |
| 20 | 0.07 | 0.58 | 0.70 |
| 21 | 2.32 | 0.39 | 0.61 |
| 22 | 0.49 | 0.53 | 0.61 |
| 23 | 1.29 | 0.37 | 0.76 |
| 24 | 0.07 | 0.44 | 0.72 |
| 25 | 0.62 | 0.29 | 0.61 |
| 26 | 1.72 | 0.28 | 0.76 |
| 27 | 0.16 | 0.23 | 0.77 |
| 28 | 1.85 | 0.25 | 0.79 |

**Table J.6. CR Item Classical Statistics—Mathematics Grade 5**

| Item | Max. Points | Omit % | 0% | 1% | 2% | 3% | 4% | P-value | Item-Total Correlation |
|------|-------------|--------|------|-------|-------|------|------|---------|------------------------|
| 1 | 3 | 5.03 | 54.18 | 25.89 | 10.79 | 4.10 | . | 0.20 | 0.68 |
| 2 | 4 | 2.18 | 53.17 | 14.45 | 15.12 | 6.05 | 9.04 | 0.25 | 0.72 |

**Table J.7. SR Item Classical Statistics—Mathematics Grade 6**

| Item | Omit % | P-value | Item–Total Correlation |
|------|--------|---------|------------------------|
| 1  | 0.19 | 0.58 | 0.53 |
| 2  | 0.24 | 0.22 | 0.47 |
| 3  | 0.38 | 0.59 | 0.43 |
| 4  | 0.67 | 0.10 | 0.39 |
| 5  | 1.67 | 0.32 | 0.63 |
| 6  | 0.28 | 0.24 | 0.54 |
| 7  | 0.33 | 0.27 | 0.38 |
| 8  | 0.79 | 0.24 | 0.56 |
| 9  | 3.24 | 0.28 | 0.56 |
| 10 | 3.12 | 0.30 | 0.66 |
| 11 | 2.22 | 0.24 | 0.61 |
| 12 | 0.87 | 0.51 | 0.49 |
| 13 | 0.64 | 0.40 | 0.16 |
| 14 | 0.68 | 0.31 | 0.53 |
| 15 | 0.18 | 0.50 | 0.40 |
| 16 | 0.36 | 0.28 | 0.23 |
| 17 | 0.88 | 0.27 | 0.29 |
| 18 | 0.44 | 0.61 | 0.49 |
| 19 | 0.17 | 0.32 | 0.55 |
| 20 | 0.80 | 0.40 | 0.72 |
| 21 | 1.32 | 0.21 | 0.67 |
| 22 | 0.03 | 0.58 | 0.56 |
| 23 | 0.02 | 0.44 | 0.38 |
| 24 | 0.34 | 0.38 | 0.68 |
| 25 | 2.92 | 0.18 | 0.79 |

**Table J.8. CR Item Classical Statistics—Mathematics Grade 6**

| Item | Max. Points | Omit % | 0% | 1% | 2% | 3% | 4% | P-value | Item-Total Correlation |
|------|-------------|--------|-------|-------|-------|-------|------|---------|------------------------|
| 1 | 3 | 0.76 | 37.04 | 11.92 | 29.19 | 21.09 | –    | 0.45 | 0.73 |
| 2 | 3 | 0.82 | 47.98 | 18.76 | 23.83 | 8.61  | –    | 0.31 | 0.70 |
| 3 | 4 | 2.48 | 67.61 | 12.60 | 6.55  | 7.34  | 3.42 | 0.15 | 0.71 |
| 4 | 4 | 1.62 | 40.78 | 11.53 | 15.90 | 20.23 | 9.95 | 0.36 | 0.75 |

**Table J.9. SR Item Classical Statistics—Mathematics Grade 7**

| Item | Omit % | P-value | Item–Total Correlation |
|------|--------|---------|------------------------|
| 1 | 0.74 | 0.44 | 0.58 |
| 2 | 0.21 | 0.21 | 0.50 |
| 3 | 0.08 | 0.49 | 0.55 |
| 4 | 0.34 | 0.19 | 0.56 |
| 5 | 1.14 | 0.14 | 0.57 |
| 6 | 0.80 | 0.31 | 0.39 |
| 7 | 0.39 | 0.26 | 0.67 |
| 8 | 0.40 | 0.49 | 0.31 |
| 9 | 0.15 | 0.67 | 0.50 |
| 10 | 0.46 | 0.45 | 0.44 |
| 11 | 0.12 | 0.21 | 0.38 |
| 12 | 2.79 | 0.57 | 0.37 |
| 13 | 0.45 | 0.31 | 0.27 |
| 14 | 0.35 | 0.22 | 0.45 |
| 15 | 0.43 | 0.23 | 0.47 |
| 16 | 0.17 | 0.41 | 0.21 |
| 17 | 0.21 | 0.54 | 0.44 |
| 18 | 0.15 | 0.21 | 0.25 |
| 19 | 0.66 | 0.55 | 0.46 |
| 20 | 1.09 | 0.13 | 0.41 |
| 21 | 0.88 | 0.16 | 0.68 |
| 22 | 0.21 | 0.38 | 0.47 |
| 23 | 2.14 | 0.13 | 0.60 |
| 24 | 0.61 | 0.22 | 0.69 |
| 25 | 0.27 | 0.30 | 0.71 |
| 26 | 2.00 | 0.26 | 0.82 |

**Table J.10. CR Item Classical Statistics—Mathematics Grade 7**

| Item | Max. Points | Omit % | 0% | 1% | 2% | 3% | 4% | P-value | Item-Total Correlation |
|------|-------------|--------|-------|-------|-------|------|------|---------|------------------------|
| 1 | 3 | 4.13 | 56.03 | 14.53 | 15.65 | 9.66 | – | 0.25 | 0.77 |
| 2 | 3 | 2.80 | 56.76 | 29.01 | 9.56 | 1.88 | – | 0.18 | 0.65 |
| 3 | 4 | 2.65 | 56.62 | 18.62 | 6.02 | 7.33 | 8.76 | 0.22 | 0.77 |

**Table J.11. SR Item Classical Statistics—Mathematics Grade 8**

| Item | Omit % | *P*-value | Item–Total Correlation |
|------|--------|-----------|------------------------|
| 1 | 1.50% | 0.15 | 0.65 |
| 2 | 0.72% | 0.39 | 0.61 |
| 3 | 1.28% | 0.26 | 0.60 |
| 4 | 2.15% | 0.13 | 0.61 |
| 5 | 1.23% | 0.33 | 0.52 |
| 6 | 0.17% | 0.31 | 0.51 |
| 7 | 0.63% | 0.26 | 0.59 |
| 8 | 0.09% | 0.43 | 0.34 |
| 9 | 0.10% | 0.41 | 0.33 |
| 10 | 0.17% | 0.34 | 0.44 |
| 11 | 0.14% | 0.29 | 0.44 |
| 12 | 0.13% | 0.84 | 0.32 |
| 13 | 0.14% | 0.73 | 0.38 |
| 14 | 0.47% | 0.27 | 0.45 |
| 15 | 0.37% | 0.66 | 0.45 |
| 16 | 0.07% | 0.54 | 0.36 |
| 17 | 0.23% | 0.48 | 0.29 |
| 18 | 0.24% | 0.51 | 0.50 |
| 19 | 1.45% | 0.26 | 0.71 |
| 20 | 0.11% | 0.24 | 0.50 |
| 21 | 1.07% | 0.38 | 0.66 |
| 22 | 0.08% | 0.46 | 0.53 |
| 23 | 0.48% | 0.33 | 0.73 |
| 24 | 0.68% | 0.23 | 0.76 |
| 25 | 3.74% | 0.18 | 0.83 |

**Table J.12. CR Item Classical Statistics—Mathematics Grade 8**

| Item | Max. Points | Omit % | 0% | 1% | 2% | 3% | 4% | P-value | Item-Total Correlation |
|------|-------------|--------|-------|-------|-------|-------|------|---------|------------------------|
| 1 | 3 | 3.44 | 67.66 | 7.93 | 12.81 | 8.16 | – | 0.19 | 0.76 |
| 2 | 3 | 1.87 | 62.94 | 14.93 | 7.28 | 12.99 | – | 0.23 | 0.70 |
| 3 | 4 | 5.14 | 76.59 | 8.74 | 4.14 | 3.82 | 1.58 | 0.09 | 0.69 |

**Table J.13. SR Item Classical Statistics—ELA Grade 3**

| Item | Omit % | *P*-value | Item–Total Correlation |
|------|--------|-----------|------------------------|
| 1 | 0.59 | 0.52 | 0.50 |
| 2 | 0.89 | 0.37 | 0.57 |
| 3 | 0.76 | 0.47 | 0.59 |
| 4 | 0.69 | 0.45 | 0.68 |
| 5 | 1.59 | 0.77 | 0.61 |
| 6 | 2.42 | 0.78 | 0.52 |
| 7 | 2.22 | 0.54 | 0.60 |
| 8 | 2.70 | 0.57 | 0.59 |
| 9 | 1.97 | 0.57 | 0.52 |
| 10 | 0.03 | 0.59 | 0.54 |
| 11 | 0.14 | 0.45 | 0.56 |
| 12 | 0.10 | 0.48 | 0.54 |
| 13 | 0.24 | 0.50 | 0.60 |
| 14 | 1.46 | 0.29 | 0.52 |
| 15 | 0.13 | 0.57 | 0.58 |
| 16 | 0.18 | 0.61 | 0.53 |
| 17 | 0.23 | 0.55 | 0.67 |
| 18 | 0.45 | 0.54 | 0.60 |
| 19 | 0.51 | 0.28 | 0.43 |

**Table J.14. CR Item Classical Statistics—ELA Grade 3**

| Item | Max. Points | Omit % | 0% | 1% | 2% | 3% | 4% | P-value | Item-Total Correlation |
|------|-------------|--------|------|------|-------|------|-----|---------|------------------------|
| PCR_1_WE | 3 | 1.58 | 52.05 | 40.50 | 5.67 | 0.20 | – | 0.17 | 0.70 |
| PCR_1_WKL | 3 | 1.58 | 48.96 | 43.56 | 5.66 | 0.24 | – | 0.19 | 0.61 |
| PCR_2_WE | 3 | 2.38 | 49.89 | 37.28 | 10.37 | 0.08 | – | 0.19 | 0.70 |
| PCR_2_WKL | 3 | 2.38 | 48.94 | 43.81 | 4.75 | 0.13 | – | 0.18 | 0.59 |

**Table J.15. SR Item Classical Statistics—ELA Grade 4**

| Item | Omit % | *P*-value | Item–Total Correlation |
|------|--------|-----------|------------------------|
| 1 | 0.09 | 0.37 | 0.36 |
| 2 | 0.06 | 0.50 | 0.56 |
| 3 | 0.05 | 0.41 | 0.41 |
| 4 | 0.07 | 0.64 | 0.64 |
| 5 | 0.46 | 0.40 | 0.52 |
| 6 | 1.44 | 0.39 | 0.43 |
| 7 | 0.62 | 0.27 | 0.48 |
| 8 | 0.72 | 0.30 | 0.52 |
| 9 | 1.10 | 0.39 | 0.35 |
| 10 | 0.85 | 0.44 | 0.36 |
| 11 | 1.30 | 0.39 | 0.47 |
| 12 | 0.34 | 0.46 | 0.47 |
| 13 | 0.23 | 0.75 | 0.54 |
| 14 | 0.35 | 0.44 | 0.61 |
| 15 | 0.43 | 0.30 | 0.39 |
| 16 | 0.40 | 0.47 | 0.61 |
| 17 | 0.16 | 0.61 | 0.59 |
| 18 | 0.15 | 0.63 | 0.44 |
| 19 | 0.16 | 0.74 | 0.47 |
| 20 | 0.19 | 0.50 | 0.69 |
| 21 | 0.17 | 0.68 | 0.65 |

**Table J.16. CR Item Classical Statistics—ELA Grade 4**

| Item | Max. Points | Omit % | 0% | 1% | 2% | 3% | 4% | P-value | Item-Total Correlation |
|------|-------------|--------|------|------|------|------|------|---------|------------------------|
| PCR_1_WE | 3 | 0.82 | 24.91 | 44.32 | 24.74 | 5.21 | – | 0.36 | 0.75 |
| PCR_1_WKL | 3 | 0.82 | 42.36 | 38.80 | 14.45 | 3.57 | – | 0.26 | 0.70 |
| PCR_2_WE | 4 | 0.78 | 35.02 | 53.11 | 9.59 | 1.27 | 0.23 | 0.19 | 0.72 |
| PCR_2_WKL | 3 | 0.78 | 46.09 | 43.21 | 8.52 | 1.41 | – | 0.21 | 0.68 |

**Table J.17. SR Item Classical Statistics—ELA Grade 5**

| Item | Omit % | *P*-value | Item–Total Correlation |
|---|---|---|---|
| 1 | 0.25 | 0.78 | 0.52 |
| 2 | 0.24 | 0.59 | 0.57 |
| 3 | 0.41 | 0.48 | 0.54 |
| 4 | 0.48 | 0.49 | 0.52 |
| 5 | 0.36 | 0.27 | 0.44 |
| 6 | 0.33 | 0.63 | 0.66 |
| 7 | 0.41 | 0.58 | 0.64 |
| 8 | 0.19 | 0.53 | 0.50 |
| 9 | 0.18 | 0.44 | 0.50 |
| 10 | 0.17 | 0.32 | 0.36 |
| 11 | 0.19 | 0.49 | 0.49 |
| 12 | 0.18 | 0.32 | 0.44 |
| 13 | 0.05 | 0.35 | 0.31 |
| 14 | 0.18 | 0.53 | 0.32 |
| 15 | 0.08 | 0.50 | 0.41 |
| 16 | 0.09 | 0.22 | 0.34 |
| 17 | 0.39 | 0.50 | 0.57 |
| 18 | 0.05 | 0.48 | 0.44 |
| 19 | 0.34 | 0.37 | 0.45 |
| 20 | 0.61 | 0.44 | 0.49 |

**Table J.18. CR Item Classical Statistics—ELA Grade 5**

| Item | Max. Points | Omit % | 0% | 1% | 2% | 3% | 4% | P-value | Item-Total Correlation |
|---|---|---|---|---|---|---|---|---|---|
| PCR_1_WE | 3 | 0.65 | 23.45 | 34.76 | 34.23 | 6.92 | – | 0.41 | 0.79 |
| PCR_1_WKL | 3 | 0.65 | 38.76 | 36.66 | 19.62 | 4.32 | – | 0.30 | 0.75 |
| PCR_2_WE | 4 | 1.41 | 48.27 | 38.28 | 9.96 | 1.72 | 0.37 | 0.16 | 0.75 |
| PCR_2_WKL | 3 | 1.41 | 48.11 | 39.63 | 9.04 | 1.81 | - | 0.21 | 0.70 |

**Table J.19. SR Item Classical Statistics—ELA Grade 6**

| Item | Omit % | *P*-value | Item–Total Correlation |
|------|--------|-----------|------------------------|
| 1 | 0.14 | 0.60 | 0.44 |
| 2 | 0.19 | 0.41 | 0.63 |
| 3 | 0.17 | 0.36 | 0.42 |
| 4 | 0.17 | 0.39 | 0.51 |
| 5 | 0.21 | 0.67 | 0.53 |
| 6 | 0.16 | 0.57 | 0.45 |
| 7 | 0.15 | 0.41 | 0.55 |
| 8 | 0.15 | 0.48 | 0.62 |
| 9 | 0.12 | 0.47 | 0.55 |
| 10 | 0.14 | 0.48 | 0.63 |
| 11 | 0.44 | 0.39 | 0.46 |
| 12 | 0.54 | 0.34 | 0.38 |
| 13 | 0.33 | 0.42 | 0.38 |
| 14 | 0.40 | 0.42 | 0.36 |
| 15 | 0.05 | 0.55 | 0.55 |
| 16 | 0.13 | 0.41 | 0.54 |
| 17 | 0.05 | 0.51 | 0.57 |
| 18 | 0.04 | 0.57 | 0.55 |
| 19 | 0.15 | 0.36 | 0.48 |
| 20 | 0.10 | 0.32 | 0.37 |
| 21 | 0.03 | 0.52 | 0.49 |
| 22 | 0.06 | 0.64 | 0.53 |

**Table J.20. CR Item Classical Statistics—ELA Grade 6**

| Item | Max. Points | Omit % | 0% | 1% | 2% | 3% | 4% | P-value | Item-Total Correlation |
|------|-------------|--------|------|------|------|------|------|---------|------------------------|
| PCR_1_WE | 4 | 0.95 | 42.46 | 35.13 | 16.61 | 3.95 | 0.92 | 0.21 | 0.78 |
| PCR_1_WKL | 3 | 0.95 | 46.89 | 31.08 | 15.95 | 5.14 | – | 0.26 | 0.77 |
| PCR_2_WE | 4 | 1.10 | 35.58 | 41.64 | 17.70 | 3.78 | 0.20 | 0.22 | 0.79 |
| PCR_2_WKL | 3 | 1.10 | 38.22 | 39.47 | 16.98 | 4.24 | – | 0.29 | 0.77 |

**Table J.21. SR Item Classical Statistics—ELA Grade 7**

| Item | Omit % | *P*-value | Item–Total Correlation |
|------|--------|-----------|------------------------|
| 1 | 0.46 | 0.39 | 0.43 |
| 2 | 0.34 | 0.36 | 0.56 |
| 3 | 0.48 | 0.22 | 0.46 |
| 4 | 0.39 | 0.49 | 0.57 |
| 5 | 0.45 | 0.29 | 0.35 |
| 6 | 0.50 | 0.16 | 0.37 |
| 7 | 1.04 | 0.38 | 0.47 |
| 8 | 1.81 | 0.34 | 0.51 |
| 9 | 1.80 | 0.25 | 0.53 |
| 10 | 1.30 | 0.42 | 0.55 |
| 11 | 0.16 | 0.25 | 0.42 |
| 12 | 0.10 | 0.54 | 0.41 |
| 13 | 0.22 | 0.42 | 0.45 |
| 14 | 0.18 | 0.58 | 0.58 |
| 15 | 0.25 | 0.34 | 0.48 |
| 16 | 0.24 | 0.29 | 0.33 |
| 17 | 0.30 | 0.35 | 0.52 |
| 18 | 0.24 | 0.50 | 0.52 |
| 19 | 0.26 | 0.50 | 0.59 |
| 20 | 0.25 | 0.44 | 0.39 |
| 21 | 0.25 | 0.55 | 0.61 |
| 22 | 0.26 | 0.58 | 0.60 |
| 23 | 0.28 | 0.41 | 0.51 |

**Table J.22. CR Item Classical Statistics—ELA Grade 7**

| Item | Max. Points | Omit % | 0% | 1% | 2% | 3% | 4% | P-value | Item-Total Correlation |
|------|-------------|--------|------|------|------|------|------|---------|------------------------|
| PCR_1_WE | 4 | 1.57 | 31.01 | 28.69 | 24.40 | 11.46 | 2.87 | 0.31 | 0.82 |
| PCR_1_WKL | 3 | 1.57 | 36.91 | 25.80 | 22.59 | 13.12 | – | 0.37 | 0.81 |
| PCR_2_WE | 4 | 1.55 | 26.68 | 38.63 | 25.62 | 6.30 | 1.21 | 0.28 | 0.83 |
| PCR_2_WKL | 3 | 1.55 | 37.66 | 34.45 | 20.12 | 6.22 | – | 0.31 | 0.80 |

**Table J.23. SR Item Classical Statistics—ELA Grade 8**

| Item | Omit % | *P*-value | Item–Total Correlation |
|------|--------|-----------|------------------------|
| 1 | 0.23 | 0.64 | 0.59 |
| 2 | 0.31 | 0.50 | 0.54 |
| 3 | 0.17 | 0.25 | 0.26 |
| 4 | 0.14 | 0.60 | 0.60 |
| 5 | 0.03 | 0.72 | 0.43 |
| 6 | 0.13 | 0.56 | 0.51 |
| 7 | 0.28 | 0.27 | 0.37 |
| 8 | 0.66 | 0.63 | 0.43 |
| 9 | 1.00 | 0.46 | 0.58 |
| 10 | 0.86 | 0.31 | 0.50 |
| 11 | 1.25 | 0.34 | 0.45 |
| 12 | 0.36 | 0.54 | 0.66 |
| 13 | 0.28 | 0.50 | 0.56 |
| 14 | 0.34 | 0.44 | 0.50 |
| 15 | 0.37 | 0.43 | 0.47 |
| 16 | 0.30 | 0.35 | 0.49 |
| 17 | 0.32 | 0.43 | 0.49 |
| 18 | 0.19 | 0.56 | 0.58 |
| 19 | 0.32 | 0.48 | 0.57 |
| 20 | 0.32 | 0.39 | 0.48 |
| 21 | 0.37 | 0.58 | 0.54 |
| 22 | 0.45 | 0.46 | 0.45 |
| 23 | 0.46 | 0.25 | 0.44 |

**Table J.24. CR Item Classical Statistics—ELA Grade 8**

| Item | Max. Points | Omit % | 0% | 1% | 2% | 3% | 4% | P-value | Item-Total Correlation |
|------|-------------|--------|------|------|------|------|------|---------|------------------------|
| PCR_1_WE | 4 | 1.85 | 33.09 | 26.86 | 25.42 | 10.81 | 1.97 | 0.30 | 0.85 |
| PCR_1_WKL | 3 | 1.85 | 34.41 | 26.31 | 24.63 | 12.80 | – | 0.38 | 0.83 |
| PCR_2_WE | 4 | 2.04 | 29.53 | 24.59 | 29.05 | 12.26 | 2.54 | 0.32 | 0.85 |
| PCR_2_WKL | 3 | 2.04 | 31.85 | 24.41 | 28.51 | 13.19 | – | 0.40 | 0.82 |

**Table J.25. SR Item Classical Statistics—CSLA Grade 3**

| Item | Omit % | *P*-value | Item–Total Correlation |
|------|--------|-----------|------------------------|
| 1 | 1.39 | 0.39 | 0.57 |
| 2 | 1.94 | 0.38 | 0.48 |
| 3 | 1.39 | 0.50 | 0.47 |
| 4 | 1.32 | 0.47 | 0.56 |
| 5 | 2.29 | 0.37 | 0.53 |
| 6 | 11.67 | 0.38 | 0.58 |
| 7 | 14.72 | 0.29 | 0.44 |
| 8 | 13.68 | 0.32 | 0.48 |
| 9 | 13.61 | 0.27 | 0.52 |
| 10 | 15.35 | 0.16 | 0.18 |
| 11 | 2.78 | 0.48 | 0.61 |
| 12 | 3.54 | 0.33 | 0.57 |
| 13 | 3.89 | 0.23 | 0.24 |
| 14 | 3.26 | 0.38 | 0.60 |
| 15 | 2.64 | 0.48 | 0.57 |
| 16 | 2.15 | 0.28 | 0.40 |
| 17 | 3.33 | 0.31 | 0.34 |
| 18 | 2.78 | 0.39 | 0.54 |
| 19 | 6.74 | 0.08 | 0.39 |

**Table J.26. CR Item Classical Statistics—CSLA Grade 3**

| Item | Max. Points | Omit % | 0% | 1% | 2% | 3% | 4% | P-value | Item-Total Correlation |
|------|-------------|--------|-----|-----|-----|-----|-----|---------|------------------------|
| PCR_1_WE | 3 | 6.74 | 40.49 | 33.33 | 14.38 | 5.07 | – | 0.26 | 0.81 |
| PCR_1_WKL | 3 | 6.74 | 37.29 | 36.81 | 13.19 | 5.97 | – | 0.27 | 0.61 |
| PCR_2_WE | 3 | 8.47 | 50.21 | 22.08 | 13.82 | 5.42 | – | 0.22 | 0.70 |
| PCR_2_WKL | 3 | 8.47 | 37.15 | 36.04 | 10.28 | 8.06 | – | 0.27 | 0.60 |

**Table J.27. SR Item Classical Statistics—CSLA Grade 4**

| Item | Omit % | *P*-value | Item–Total Correlation |
|------|--------|-----------|------------------------|
| 1 | 1.02 | 0.61 | 0.52 |
| 2 | 1.19 | 0.45 | 0.34 |
| 3 | 1.36 | 0.31 | 0.42 |
| 4 | 1.27 | 0.61 | 0.42 |
| 5 | 1.10 | 0.66 | 0.53 |
| 6 | 1.19 | 0.20 | 0.47 |
| 7 | 1.19 | 0.55 | 0.55 |
| 8 | 1.02 | 0.30 | 0.52 |
| 9 | 1.78 | 0.62 | 0.57 |
| 10 | 1.19 | 0.53 | 0.59 |
| 11 | 2.63 | 0.46 | 0.45 |
| 12 | 2.88 | 0.22 | 0.32 |
| 13 | 3.05 | 0.19 | 0.23 |
| 14 | 2.63 | 0.24 | 0.22 |
| 15 | 2.80 | 0.37 | 0.44 |
| 16 | 3.98 | 0.21 | 0.33 |
| 17 | 6.10 | 0.34 | 0.52 |
| 18 | 3.14 | 0.25 | 0.42 |
| 19 | 3.81 | 0.36 | 0.50 |
| 20 | 3.31 | 0.18 | 0.16 |
| 21 | 4.07 | 0.14 | 0.12 |

**Table J.28. CR Item Classical Statistics—CSLA Grade 4**

| Item | Max. Points | Omit % | 0% | 1% | 2% | 3% | 4% | P-value | Item-Total Correlation |
|------|-------------|--------|------|------|------|------|------|---------|------------------------|
| PCR_1_WE | 3 | 1.95 | 45.93 | 19.58 | 23.90 | 8.64 | – | 0.31 | 0.68 |
| PCR_1_WKL | 3 | 1.95 | 28.81 | 36.69 | 15.76 | 16.78 | – | 0.40 | 0.55 |
| PCR_2_WE | 4 | 2.71 | 43.73 | 26.53 | 15.51 | 8.98 | 2.54 | 0.24 | 0.79 |
| PCR_2_WKL | 3 | 2.71 | 35.17 | 36.61 | 13.64 | 11.86 | – | 0.33 | 0.57 |

**Table J.29. SR Item Classical Statistics—Science Grade 5**

| Item | Omit % | P-value | Item–Total Correlation |
|------|--------|---------|------------------------|
| 1 | 0.64 | 0.60 | 0.59 |
| 2 | 0.04 | 0.41 | 0.38 |
| 3 | 0.26 | 0.45 | 0.59 |
| 4 | 0.38 | 0.22 | 0.33 |
| 5 | 1.07 | 0.23 | 0.32 |
| 6 | 1.06 | 0.51 | 0.32 |
| 7 | 0.10 | 0.54 | 0.46 |
| 8 | 1.45 | 0.15 | 0.35 |
| 9 | 1.00 | 0.41 | 0.45 |
| 10 | 1.30 | 0.26 | 0.53 |
| 11 | 0.08 | 0.41 | 0.28 |
| 12 | 0.05 | 0.34 | 0.59 |
| 13 | 0.08 | 0.38 | 0.53 |
| 14 | 0.07 | 0.31 | 0.45 |
| 15 | 0.01 | 0.78 | 0.46 |
| 16 | 0.29 | 0.36 | 0.20 |
| 17 | 0.45 | 0.49 | 0.24 |
| 18 | 0.28 | 0.32 | 0.22 |
| 19 | 0.21 | 0.61 | 0.34 |
| 20 | 0.23 | 0.32 | 0.28 |
| 21 | 0.25 | 0.28 | 0.25 |
| 22 | 0.67 | 0.55 | 0.33 |
| 23 | 0.12 | 0.42 | 0.27 |
| 24 | 0.01 | 0.56 | 0.32 |
| 25 | 0.41 | 0.58 | 0.46 |
| 26 | 0.01 | 0.70 | 0.41 |
| 27 | 0.08 | 0.46 | 0.45 |

**Table J.30. CR Item Classical Statistics—Science Grade 5**

| Item | Max. Points | Omit % | 0% | 1% | 2% | P-value | Item-Total Correlation |
|------|-------------|--------|------|------|------|---------|------------------------|
| 1 | 2 | 4.78 | 80.48 | 13.75 | 1.00 | 0.08 | 0.38 |
| 2 | 2 | 2.19 | 74.50 | 18.53 | 4.78 | 0.14 | 0.35 |
| 3 | 2 | 3.98 | 91.04 | 4.18 | 0.80 | 0.03 | 0.16 |
| 4 | 2 | 3.59 | 63.55 | 27.89 | 4.98 | 0.19 | 0.42 |
| 5 | 2 | 2.79 | 65.94 | 12.55 | 18.73 | 0.25 | 0.58 |
| 6 | 2 | 2.19 | 65.94 | 28.29 | 3.59 | 0.18 | 0.51 |
| 7 | 2 | 6.37 | 78.69 | 12.95 | 1.99 | 0.08 | 0.50 |
| 8 | 2 | 5.58 | 68.53 | 16.14 | 9.76 | 0.18 | 0.54 |
| 9 | 2 | 2.79 | 70.72 | 17.13 | 9.36 | 0.18 | 0.57 |
| 10 | 2 | 2.39 | 84.66 | 8.96 | 3.98 | 0.08 | 0.46 |
| 11 | 2 | 2.19 | 77.09 | 15.94 | 4.78 | 0.13 | 0.47 |
| 12 | 2 | 2.19 | 42.23 | 48.21 | 7.37 | 0.31 | 0.52 |
| 13 | 2 | 2.97 | 54.42 | 23.91 | 18.70 | 0.31 | 0.64 |
| 14 | 2 | 2.12 | 56.17 | 22.19 | 19.52 | 0.31 | 0.50 |
| 15 | 2 | 4.34 | 74.22 | 16.80 | 4.64 | 0.13 | 0.39 |

| Item | Max. Points | Omit % | 0% | 1% | 2% | P-value | Item-Total Correlation |
|------|-------------|--------|-------|-------|-------|---------|------------------------|
| 16 | 2 | 1.79 | 52.86 | 31.09 | 14.26 | 0.30 | 0.50 |
| 17 | 2 | 1.07 | 33.52 | 14.78 | 50.62 | 0.58 | 0.58 |
| 18 | 2 | 1.51 | 44.54 | 41.07 | 12.87 | 0.33 | 0.56 |
| 19 | 2 | 5.07 | 65.56 | 19.80 | 9.58 | 0.19 | 0.52 |
| 20 | 2 | 3.02 | 37.82 | 31.84 | 27.32 | 0.43 | 0.68 |
| 21 | 2 | 1.57 | 36.72 | 20.40 | 41.31 | 0.52 | 0.65 |
| 22 | 2 | 1.72 | 59.03 | 19.07 | 20.18 | 0.30 | 0.61 |
| 23 | 2 | 1.49 | 47.18 | 18.62 | 32.72 | 0.42 | 0.62 |
| 24 | 2 | 0.97 | 19.20 | 40.02 | 39.81 | 0.60 | 0.64 |

**Table J.31. SR Item Classical Statistics—Science Grade 8**

| Item | Omit % | $P$-value | Item–Total Correlation |
|------|--------|-----------|------------------------|
| 1 | 0.01 | 0.52 | 0.38 |
| 2 | 0.03 | 0.68 | 0.46 |
| 3 | 0.11 | 0.31 | 0.61 |
| 4 | 0.14 | 0.45 | 0.41 |
| 5 | 0.42 | 0.16 | 0.48 |
| 6 | 0.06 | 0.13 | 0.29 |
| 7 | 0.46 | 0.10 | 0.32 |
| 8 | 1.03 | 0.29 | 0.38 |
| 9 | 0.19 | 0.15 | 0.15 |
| 10 | 0.06 | 0.61 | 0.40 |
| 11 | 0.20 | 0.31 | 0.49 |
| 12 | 0.31 | 0.60 | 0.46 |
| 13 | 0.33 | 0.26 | 0.57 |
| 14 | 0.38 | 0.33 | 0.40 |
| 15 | 0.40 | 0.13 | 0.10 |
| 16 | 0.53 | 0.40 | 0.44 |
| 17 | 0.34 | 0.62 | 0.47 |
| 18 | 0.06 | 0.07 | 0.26 |
| 19 | 0.14 | 0.16 | 0.29 |
| 20 | 0.08 | 0.40 | 0.45 |
| 21 | 1.09 | 0.60 | 0.55 |
| 22 | 0.13 | 0.38 | 0.49 |
| 23 | 0.22 | 0.28 | 0.37 |
| 24 | 0.09 | 0.54 | 0.40 |
| 25 | 0.19 | 0.21 | 0.36 |
| 26 | 0.27 | 0.54 | 0.20 |
| 27 | 0.05 | 0.58 | 0.44 |
| 28 | 0.35 | 0.49 | 0.56 |
| 29 | 0.09 | 0.46 | 0.54 |
| 30 | 0.07 | 0.62 | 0.41 |
| 31 | 0.06 | 0.71 | 0.31 |
| 32 | 0.08 | 0.46 | 0.38 |
| 33 | 0.16 | 0.75 | 0.48 |

**Table J.32. CR Item Classical Statistics—Science Grade 8**

| Item | Max. Points | Omit % | 0% | 1% | 2% | P-value | Item-Total Correlation |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 12.18 | 81.73 | 5.45 | 0.64 | 0.03 | 0.48 |
| 2 | 2 | 7.37 | 77.24 | 12.18 | 3.21 | 0.09 | 0.51 |
| 3 | 2 | 11.22 | 83.97 | 4.17 | 0.64 | 0.03 | 0.36 |
| 4 | 2 | 11.86 | 73.08 | 13.46 | 1.60 | 0.08 | 0.53 |
| 5 | 2 | 10.58 | 58.01 | 20.83 | 10.58 | 0.21 | 0.52 |
| 6 | 2 | 10.58 | 82.05 | 5.45 | 1.92 | 0.05 | 0.56 |
| 7 | 2 | 12.50 | 81.41 | 5.13 | 0.96 | 0.04 | 0.48 |
| 8 | 2 | 8.33 | 77.56 | 8.33 | 5.77 | 0.10 | 0.48 |
| 9 | 2 | 8.01 | 65.71 | 19.23 | 7.05 | 0.17 | 0.59 |
| 10 | 2 | 8.65 | 86.86 | 4.49 | 0.00 | 0.02 | 0.21 |
| 11 | 2 | 6.73 | 85.90 | 6.73 | 0.64 | 0.04 | 0.42 |
| 12 | 2 | 9.94 | 88.14 | 1.60 | 0.32 | 0.01 | 0.24 |
| 13 | 2 | 6.09 | 60.26 | 28.85 | 4.81 | 0.19 | 0.53 |
| 14 | 2 | 10.26 | 82.05 | 7.37 | 0.32 | 0.04 | 0.42 |
| 15 | 2 | 3.77 | 59.25 | 27.96 | 9.02 | 0.23 | 0.65 |
| 16 | 2 | 2.31 | 56.21 | 21.79 | 19.69 | 0.31 | 0.61 |
| 17 | 2 | 2.87 | 79.37 | 14.23 | 3.54 | 0.11 | 0.56 |
| 18 | 2 | 3.81 | 54.34 | 27.33 | 14.52 | 0.28 | 0.68 |
| 19 | 2 | 2.85 | 45.70 | 25.36 | 26.09 | 0.39 | 0.57 |
| 20 | 2 | 2.60 | 66.47 | 20.18 | 10.74 | 0.21 | 0.60 |
| 21 | 2 | 3.63 | 63.08 | 23.76 | 9.53 | 0.21 | 0.66 |
| 22 | 2 | 0.89 | 57.14 | 18.89 | 23.08 | 0.33 | 0.45 |
| 23 | 2 | 2.53 | 36.19 | 20.40 | 40.87 | 0.51 | 0.68 |
| 24 | 2 | 2.18 | 63.59 | 26.51 | 7.72 | 0.21 | 0.55 |
| 25 | 2 | 2.19 | 74.25 | 18.92 | 4.65 | 0.14 | 0.55 |
| 26 | 2 | 3.63 | 72.64 | 10.37 | 13.35 | 0.19 | 0.53 |
| 27 | 2 | 1.79 | 34.16 | 36.16 | 27.89 | 0.46 | 0.63 |
| 28 | 2 | 3.88 | 52.38 | 33.31 | 10.43 | 0.27 | 0.59 |

**Table J.33. SR Item Classical Statistics—Science Grade 11**

| Item | Omit % | P-value | Item–Total Correlation |
|---|---|---|---|
| 1 | 0.79 | 0.18 | 0.46 |
| 2 | 4.38 | 0.27 | 0.46 |
| 3 | 0.15 | 0.46 | 0.47 |
| 4 | 1.41 | 0.46 | 0.54 |
| 5 | 0.37 | 0.41 | 0.27 |
| 6 | 0.29 | 0.59 | 0.55 |
| 7 | 0.20 | 0.07 | 0.25 |
| 8 | 0.04 | 0.66 | 0.58 |
| 9 | 0.07 | 0.43 | 0.42 |
| 10 | 0.13 | 0.19 | 0.41 |
| 11 | 0.06 | 0.21 | 0.37 |
| 12 | 0.07 | 0.45 | 0.50 |
| 13 | 0.19 | 0.50 | 0.53 |

| Item | Omit % | *P*-value | Item–Total Correlation |
|------|--------|-----------|------------------------|
| 14 | 0.02 | 0.40 | 0.48 |
| 15 | 0.40 | 0.34 | 0.17 |
| 16 | 0.72 | 0.51 | 0.46 |
| 17 | 0.26 | 0.36 | 0.37 |
| 18 | 0.29 | 0.81 | 0.36 |
| 19 | 0.21 | 0.43 | 0.26 |
| 20 | 0.22 | 0.51 | 0.38 |
| 21 | 0.06 | 0.27 | 0.23 |
| 22 | 0.03 | 0.57 | 0.34 |
| 23 | 0.06 | 0.46 | 0.42 |
| 24 | 0.06 | 0.40 | 0.34 |
| 25 | 2.68 | 0.39 | 0.12 |
| 26 | 0.01 | 0.57 | 0.34 |

**Table J.34. CR Item Classical Statistics—Science Grade 11**

| Item | Max. Points | Omit % | 0% | 1% | 2% | P-value | Item-Total Correlation |
|------|-------------|--------|-------|-------|-------|---------|------------------------|
| 1 | 2 | 18.66 | 77.03 | 3.83 | 0.48 | 0.02 | 0.14 |
| 2 | 2 | 20.10 | 66.99 | 12.44 | 0.48 | 0.07 | 0.26 |
| 3 | 2 | 15.31 | 65.55 | 12.44 | 6.70 | 0.13 | 0.53 |
| 4 | 2 | 10.53 | 50.72 | 37.80 | 0.96 | 0.20 | 0.49 |
| 5 | 2 | 18.18 | 48.80 | 27.75 | 5.26 | 0.19 | 0.50 |
| 6 | 2 | 10.05 | 78.95 | 10.05 | 0.96 | 0.06 | 0.33 |
| 7 | 2 | 16.75 | 53.11 | 25.36 | 4.78 | 0.17 | 0.44 |
| 8 | 2 | 15.31 | 55.50 | 25.84 | 3.35 | 0.16 | 0.46 |
| 9 | 2 | 11.48 | 52.15 | 33.49 | 2.87 | 0.20 | 0.46 |
| 10 | 2 | 13.40 | 63.16 | 22.49 | 0.96 | 0.12 | 0.47 |
| 11 | 2 | 13.88 | 76.56 | 9.09 | 0.48 | 0.05 | 0.23 |
| 12 | 2 | 29.19 | 68.42 | 2.39 | 0.00 | 0.01 | 0.04 |
| 13 | 2 | 8.29 | 81.60 | 8.68 | 1.44 | 0.06 | 0.31 |
| 14 | 2 | 8.61 | 46.25 | 20.74 | 24.39 | 0.35 | 0.67 |
| 15 | 2 | 4.39 | 37.96 | 21.69 | 35.97 | 0.47 | 0.69 |
| 16 | 2 | 3.85 | 39.19 | 43.41 | 13.56 | 0.35 | 0.61 |
| 17 | 2 | 6.14 | 37.89 | 33.92 | 22.05 | 0.39 | 0.61 |
| 18 | 2 | 6.40 | 52.94 | 26.70 | 13.96 | 0.27 | 0.67 |
| 19 | 2 | 6.90 | 39.79 | 34.64 | 18.67 | 0.36 | 0.61 |
| 20 | 2 | 6.12 | 34.94 | 27.46 | 31.48 | 0.45 | 0.68 |
| 21 | 2 | 3.61 | 44.42 | 46.88 | 5.09 | 0.29 | 0.54 |
| 22 | 2 | 5.81 | 43.42 | 36.20 | 14.56 | 0.33 | 0.60 |
| 23 | 2 | 3.78 | 81.32 | 12.05 | 2.85 | 0.09 | 0.41 |
| 24 | 2 | 12.92 | 74.33 | 10.85 | 1.90 | 0.07 | 0.42 |

# Appendix K: Scree Plots

**Figure K.1. Scree Plot—Mathematics Grade 3**
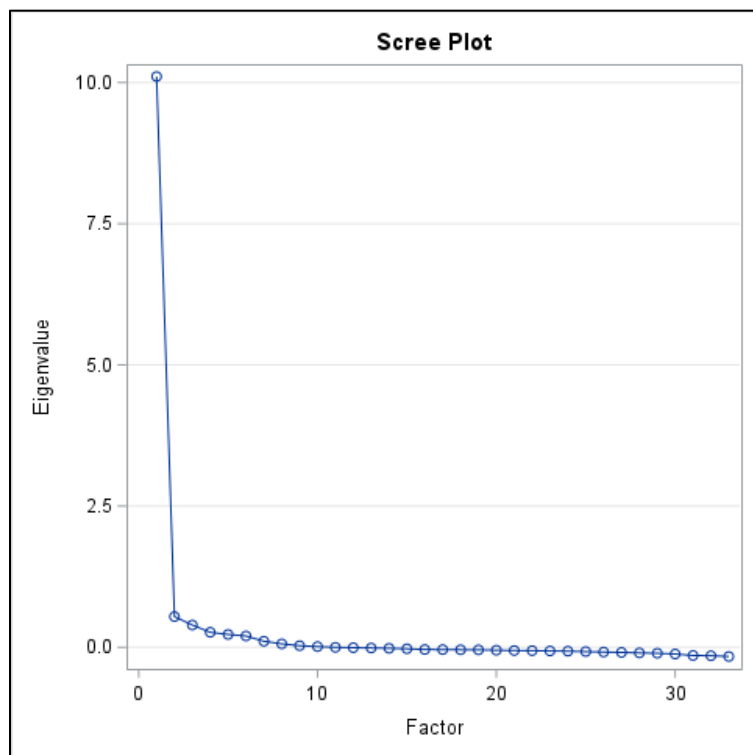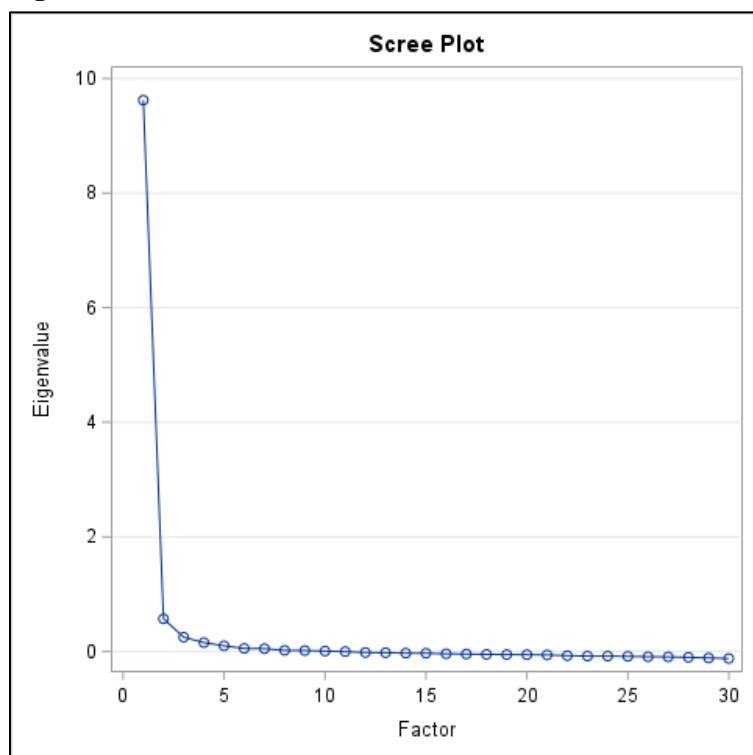


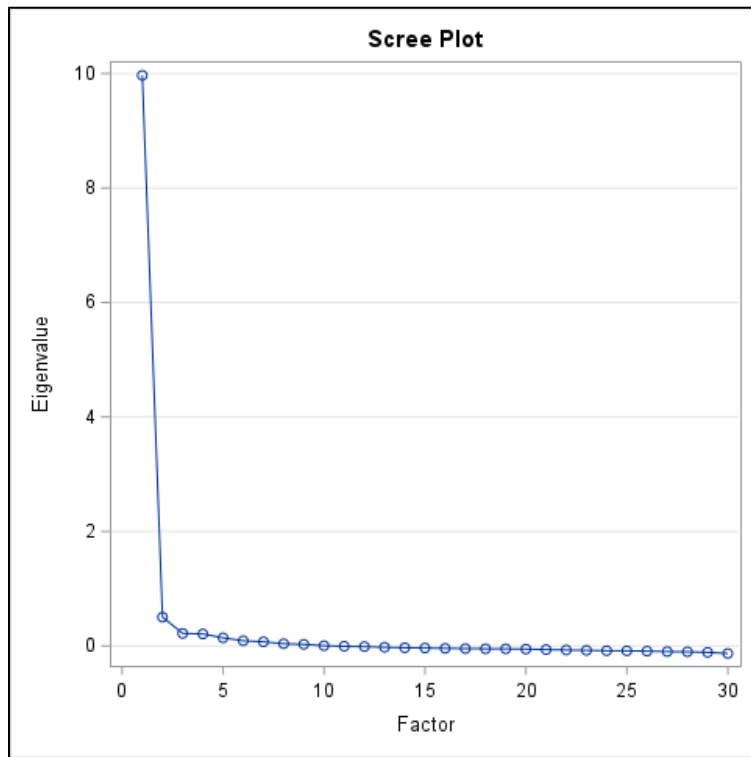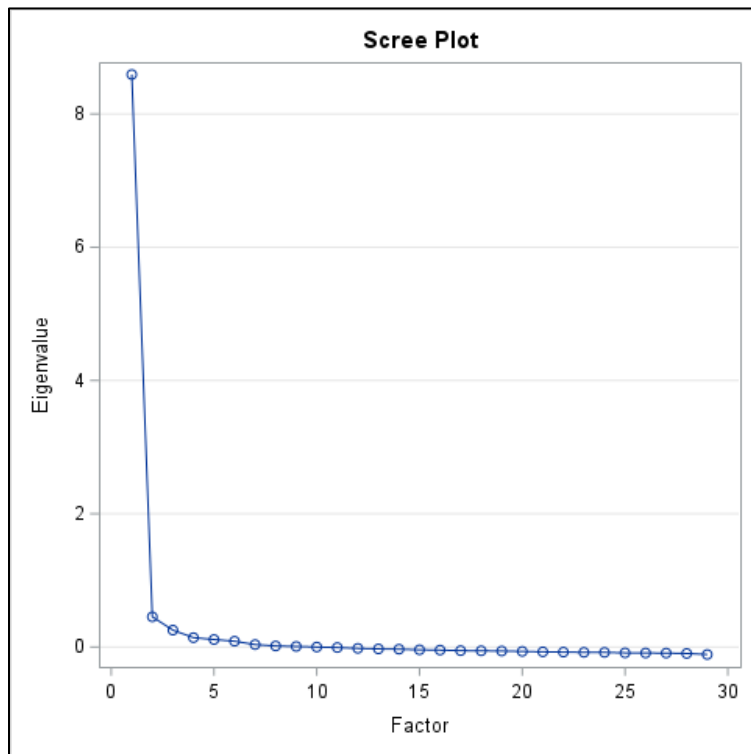**Figure K.2. Scree Plot—Mathematics Grade 4**

**Figure K.3. Scree Plot—Mathematics Grade 5**



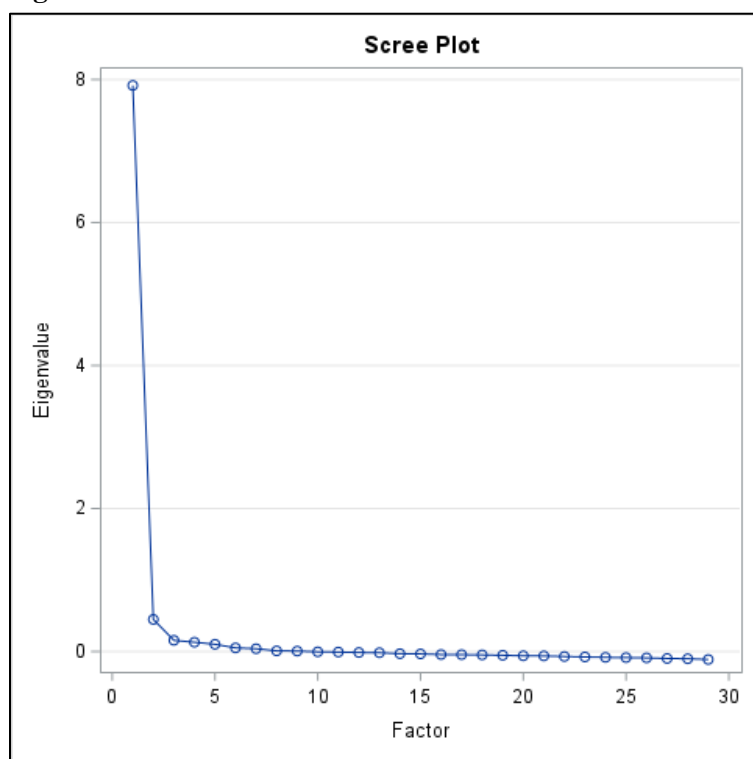**Figure K.4. Scree Plot—Mathematics Grade 6**
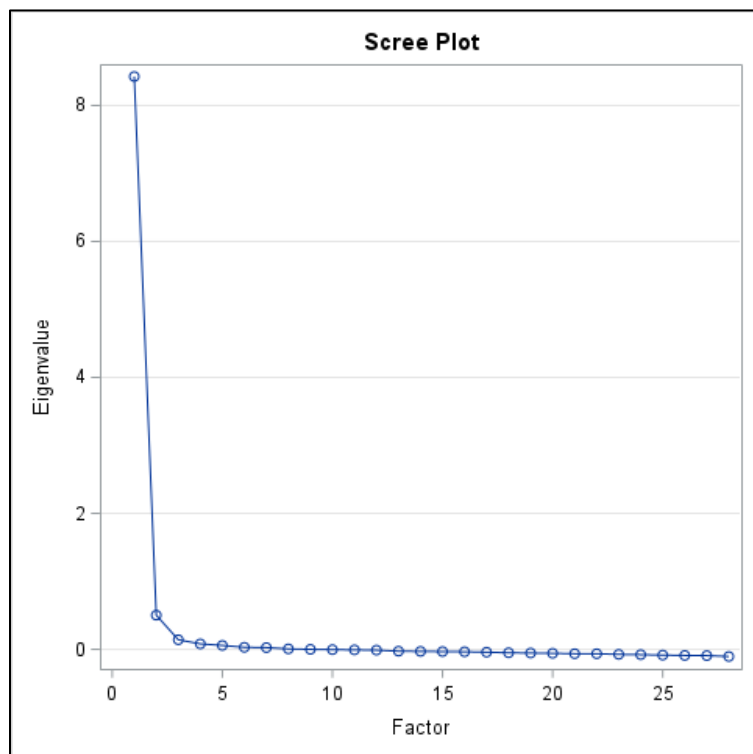
**Figure K.5. Scree Plot—Mathematics Grade 7**



**Figure K.6. Scree Plot—Mathematics Grade 8**

**Figure K.7. Scree Plot—ELA Grade 3**



**Figure K.8. Scree Plot—ELA Grade 4**
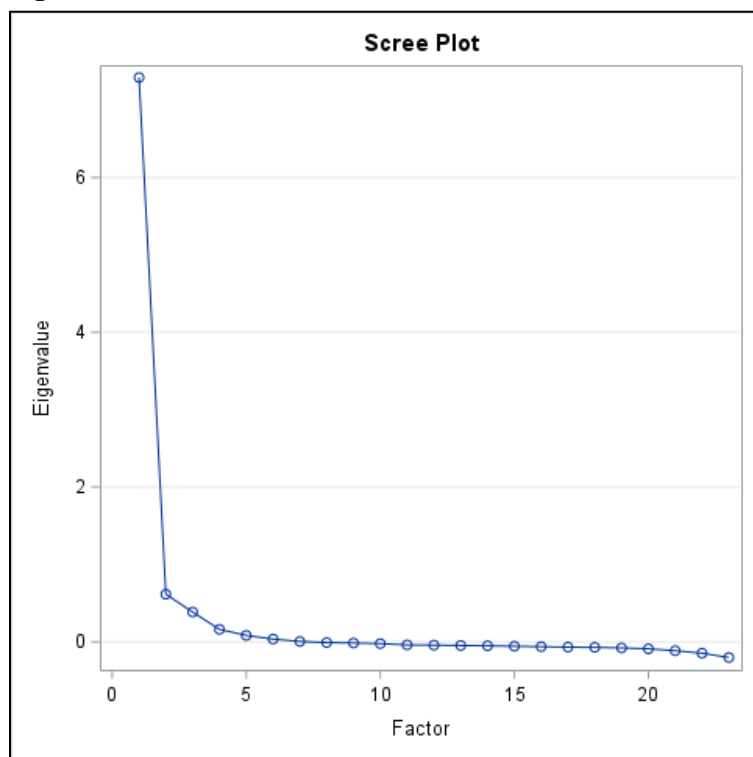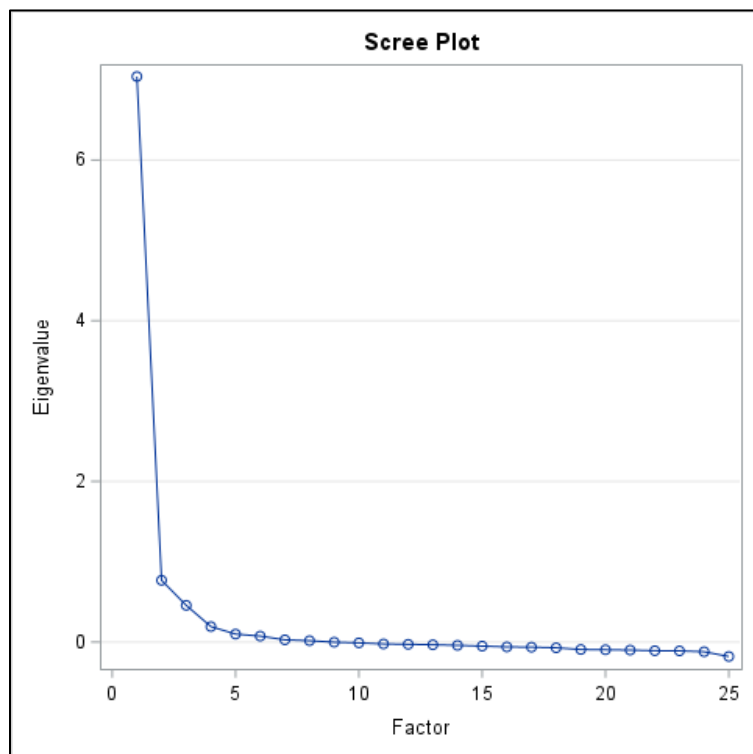
**Figure K.9. Scree Plot—ELA Grade 5**
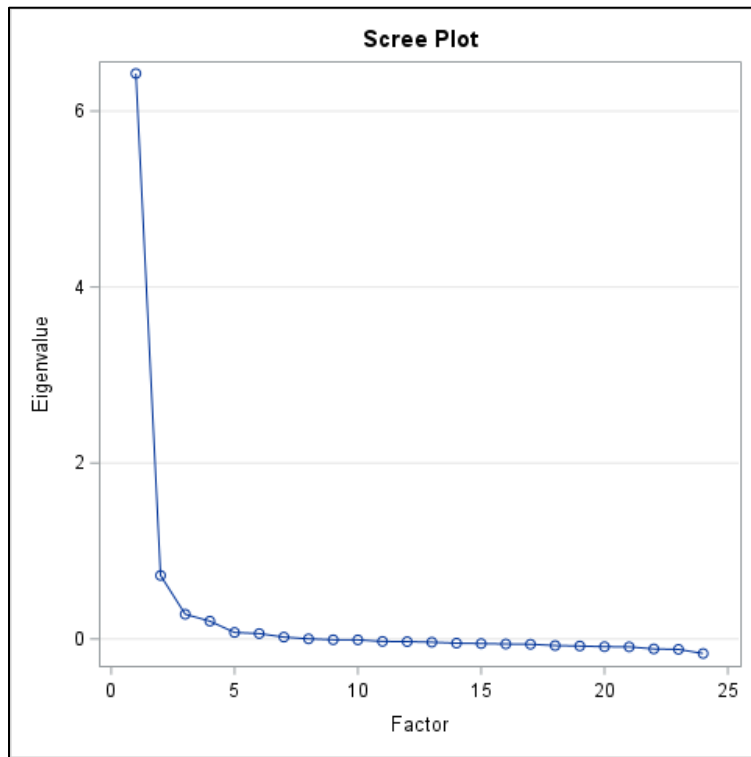


**Figure K.10. Scree Plot—ELA Grade 6**
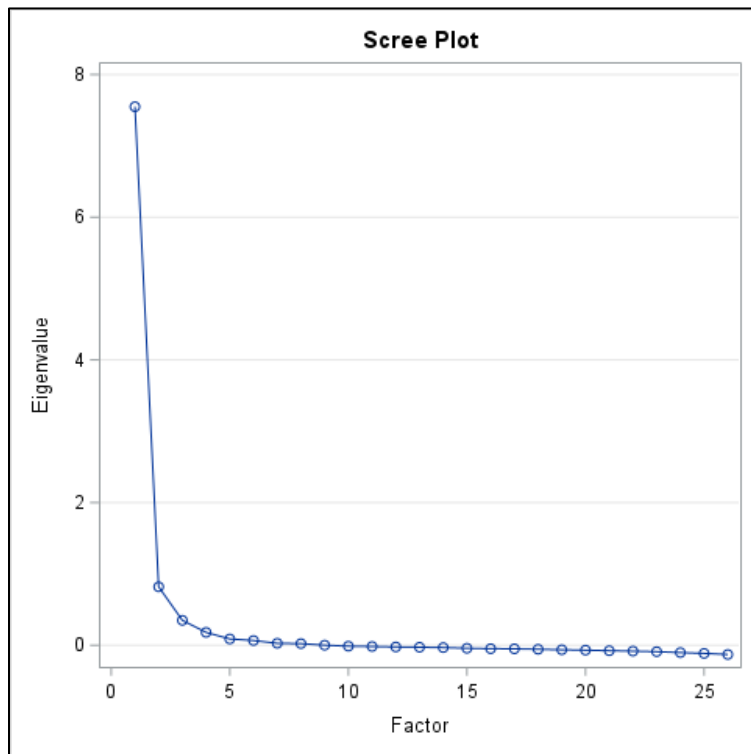
**Figure K.11. Scree Plot—ELA Grade 7**
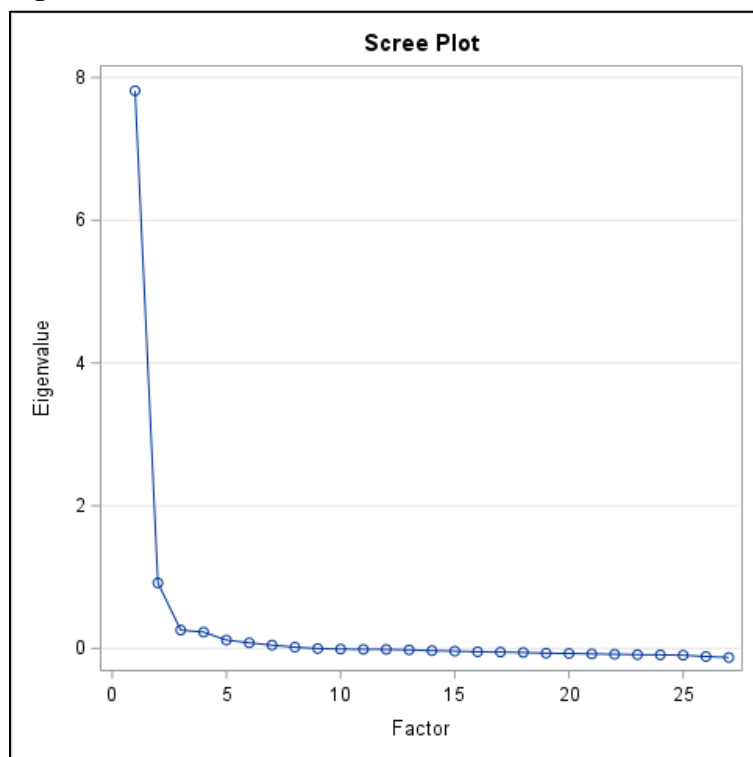


**Figure K.12. Scree Plot—ELA Grade 8**
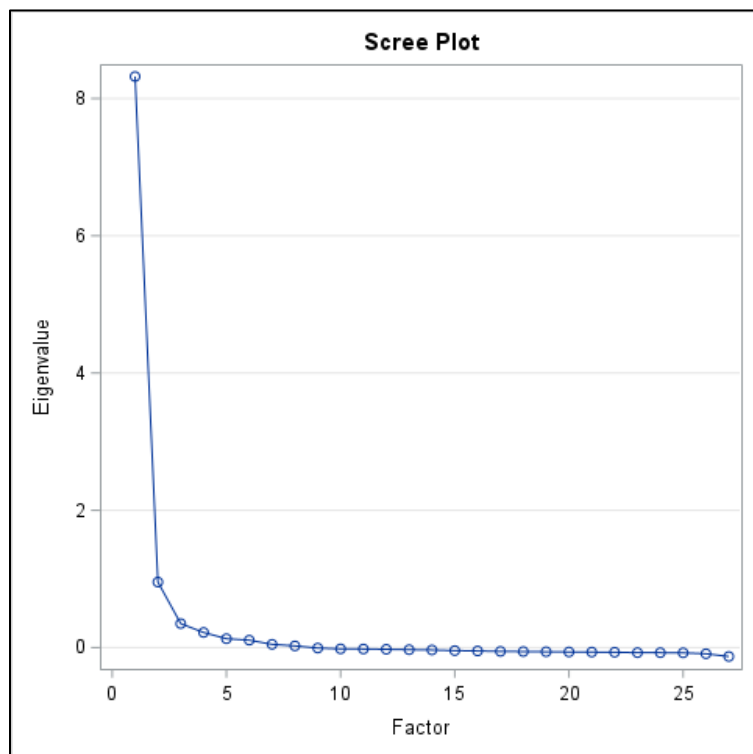
**Figure K.13. Scree Plot—CSLA Grade 3**
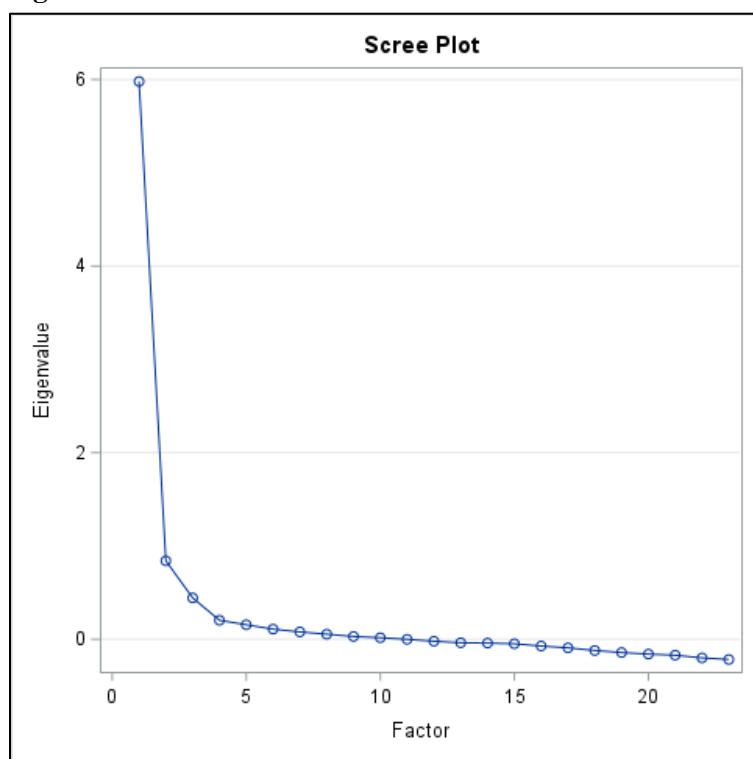


**Figure K.14. Scree Plot—CSLA Grade 4**
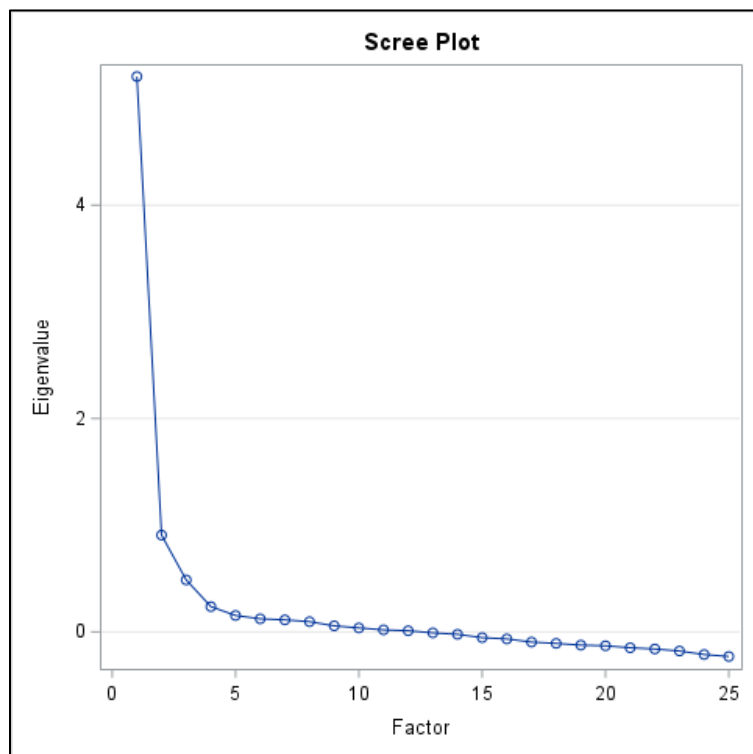
**Figure K.15. Scree Plot—Science Grade 5**
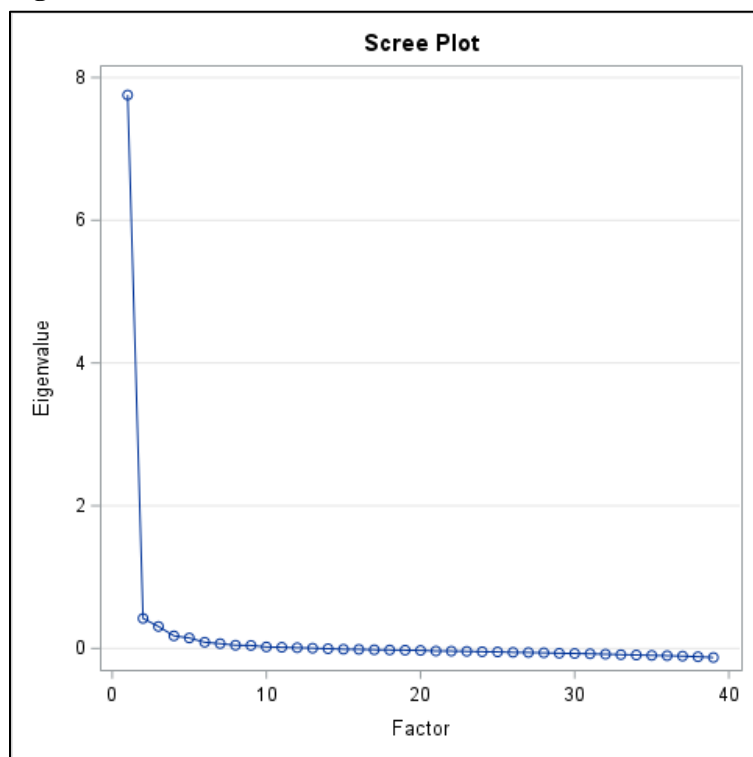


**Figure K.16. Scree Plot—Science Grade 8**
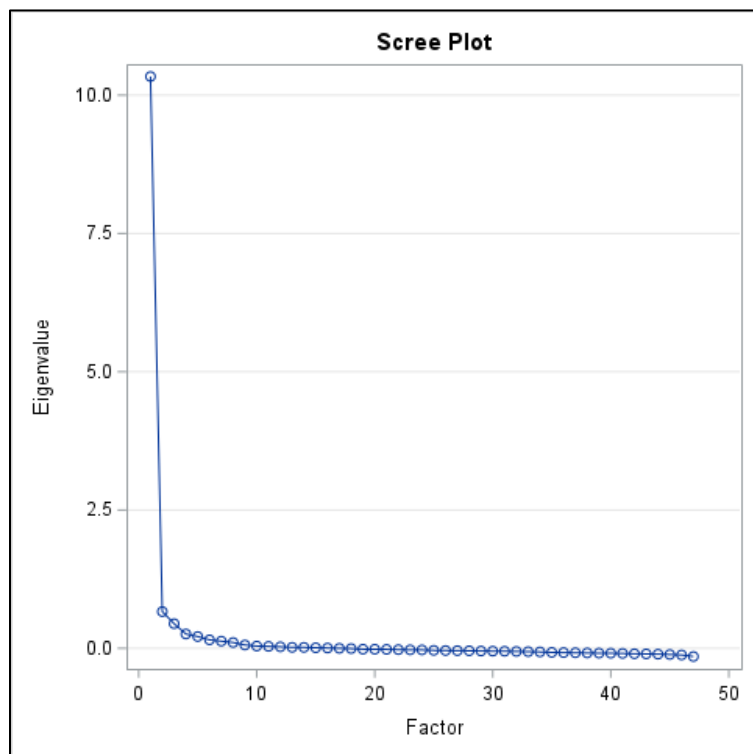
**Figure K.17. Scree Plot—Science Grade 11**
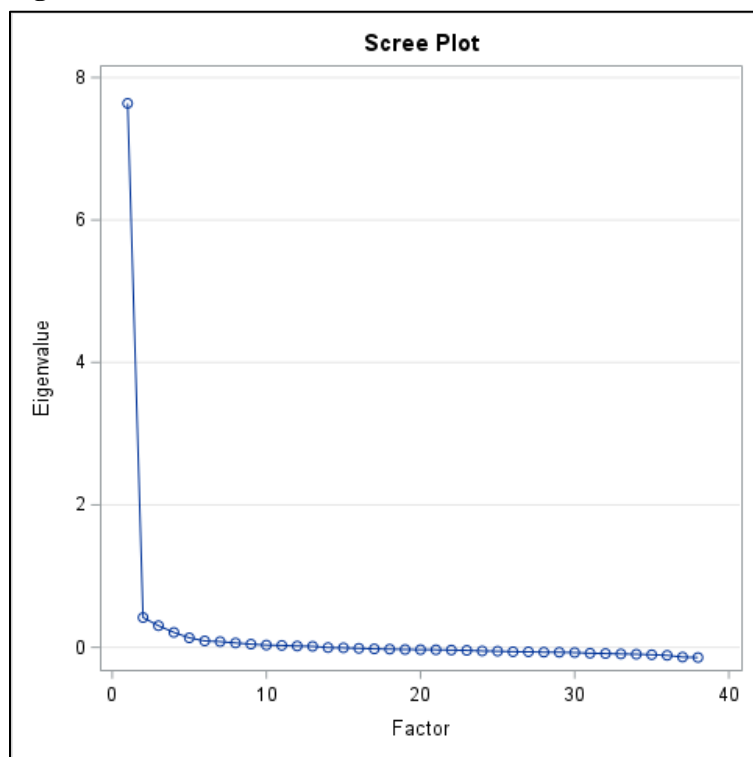
# Appendix L: Mathematics 2022 Post-Equating Check TCCs

**Figure L.1. 2022 Post-Equating Check TCCs—Mathematics Grade 3**
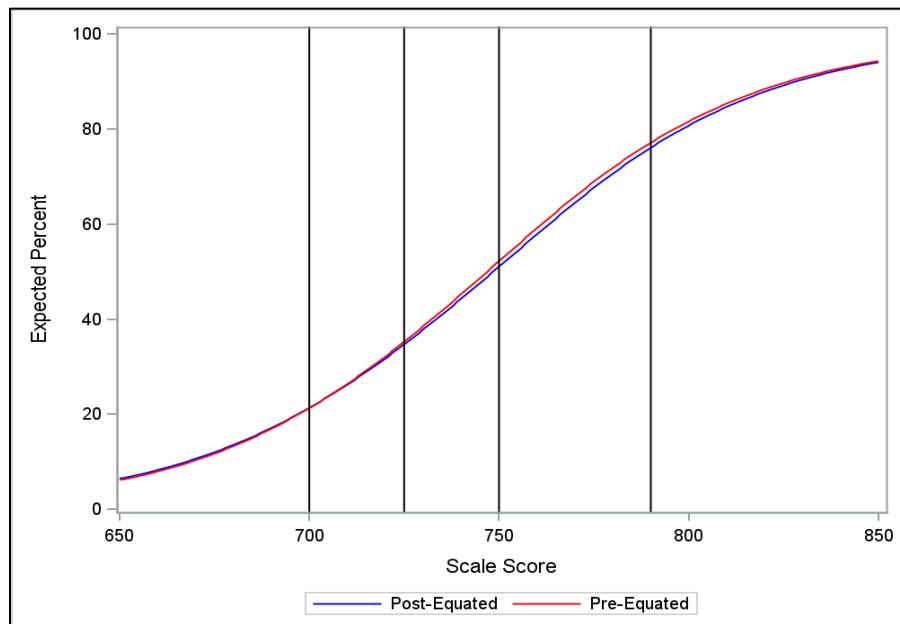


**Figure L.2. 2022 Post-Equating Check TCCs—Mathematics Grade 4**
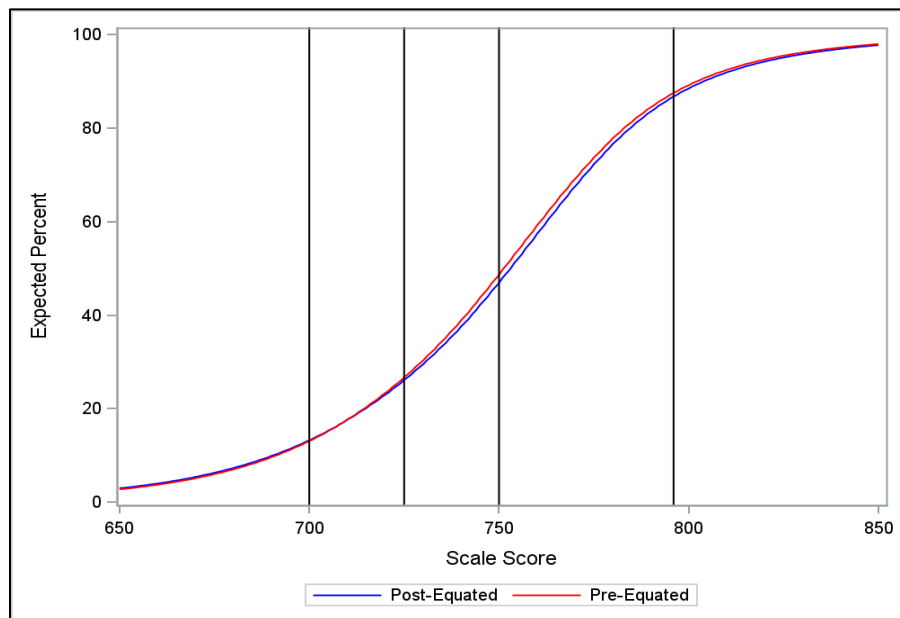
**Figure L.3. 2022 Post-Equating Check TCCs—Mathematics Grade 5**
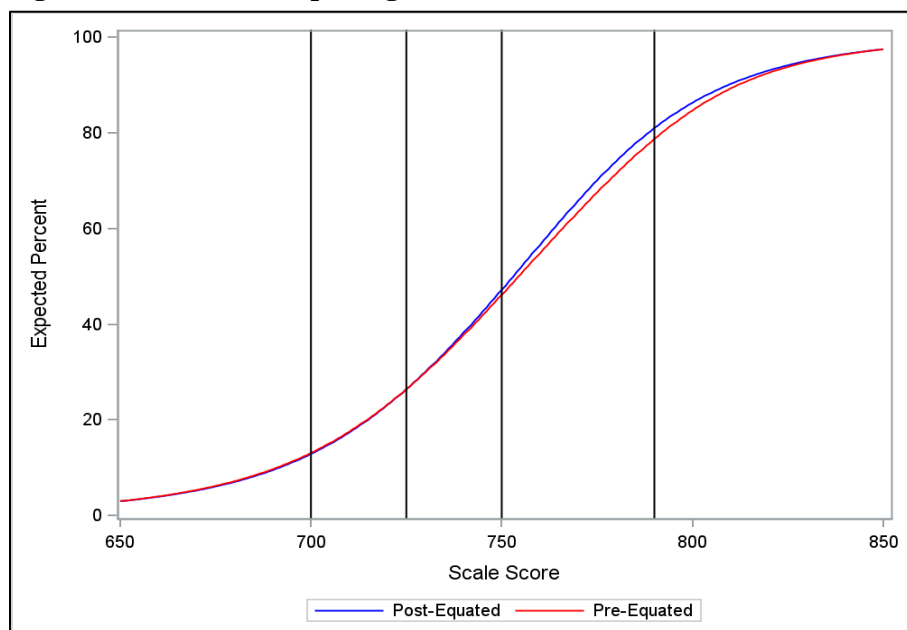


**Figure L.4. 2022 Post-Equating Check TCCs—Mathematics Grade 6**
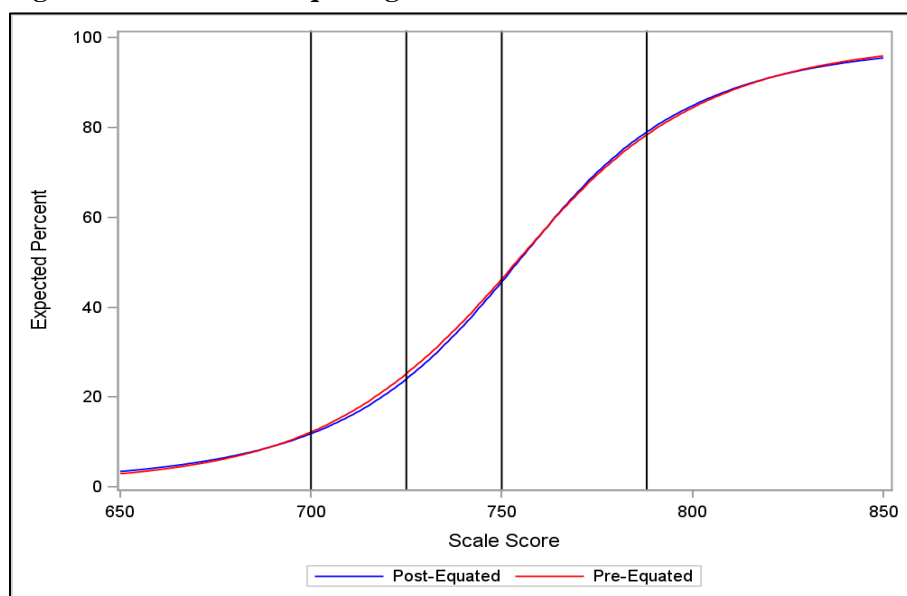
**Figure L.5. 2022 Post-Equating Check TCCs—Mathematics Grade 7**
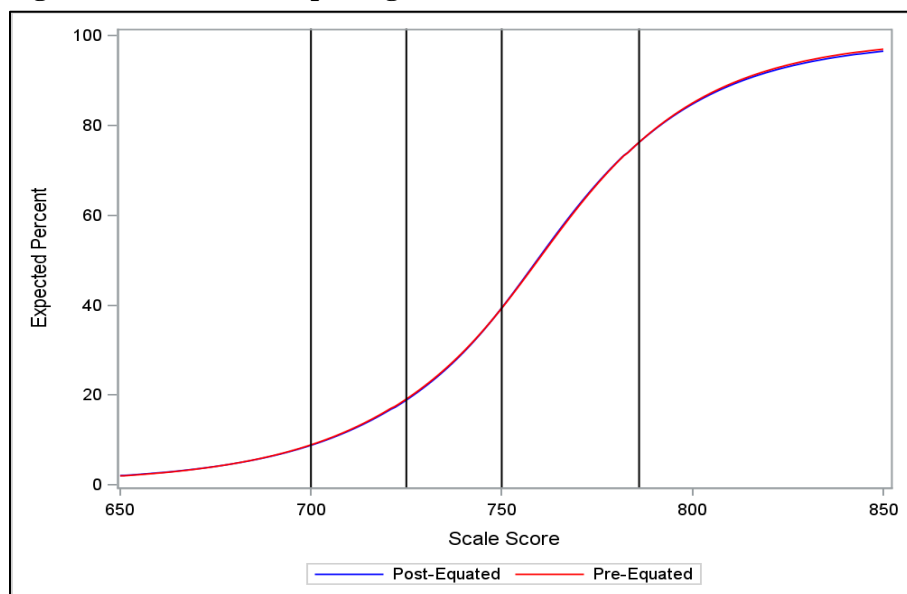


**Figure L.6. 2022 Post-Equating Check TCCs—Mathematics Grade 8**
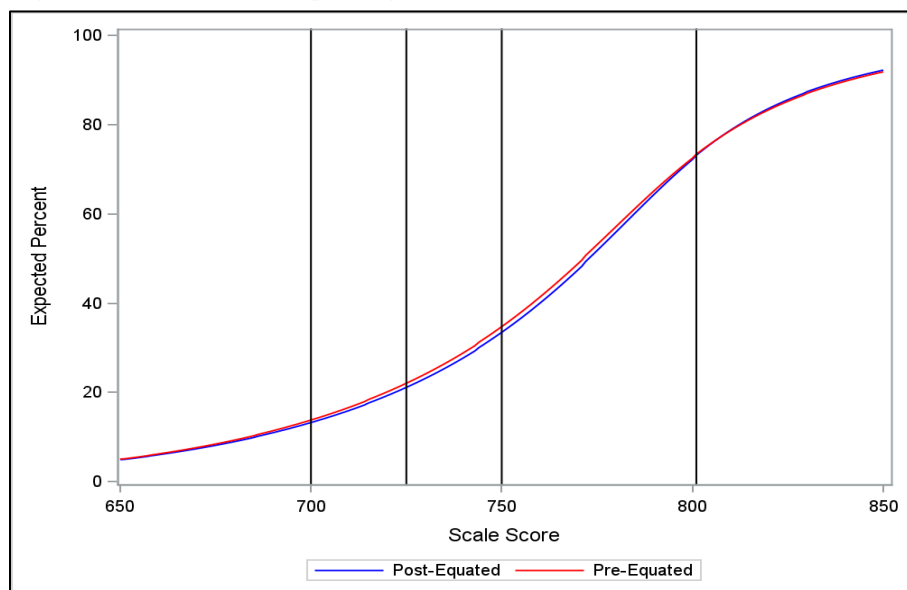
# Appendix M: IRT Item-Level Statistics

**Table M.1. Operational Item Parameter Estimates—ELA Grade 3**

| Item | Item Type | Model | A | B | D1 | D2 | D3 | D4 | D5 | Misfit Flag |
|------|-----------|-------|-------|--------|----|--------|--------|--------|----|-------------|
| 1 | CR | GPC | 0.695 | 2.497 | 0 | 2.378 | -0.248 | -2.130 | – | No |
| 2 | CR | GPC | 0.783 | 2.430 | 0 | 2.190 | -0.173 | -2.017 | – | No |
| 3 | CR | GPC | 0.674 | 2.748 | 0 | 2.618 | -0.259 | -2.360 | – | No |
| 4 | CR | GPC | 0.739 | 2.601 | 0 | 2.360 | 0.620 | -2.980 | – | No |
| 5 | XI | GPC | 0.379 | -0.062 | 0 | -0.136 | 0.136 | – | – | Yes |
| 6 | XI | GPC | 0.439 | 0.601 | 0 | -2.121 | 2.121 | – | – | Yes |
| 7 | XI | GPC | 0.479 | 0.184 | 0 | -0.978 | 0.978 | – | – | Yes |
| 8 | XI | GPC | 0.722 | 0.258 | 0 | -0.080 | 0.080 | – | – | Yes |
| 9 | XI | GPC | 0.893 | -1.172 | 0 | 0.317 | -0.317 | – | – | Yes |
| 10 | XI | GPC | 0.639 | -1.478 | 0 | 0.413 | -0.413 | – | – | Yes |
| 11 | XI | GPC | 0.497 | -0.173 | 0 | -0.558 | 0.558 | – | – | No |
| 12 | XI | GPC | 0.469 | -0.307 | 0 | -0.887 | 0.887 | – | – | No |
| 13 | XI | GPC | 0.355 | -0.369 | 0 | -1.668 | 1.668 | – | – | Yes |
| 14 | XI | GPC | 0.393 | -0.389 | 0 | -1.634 | 1.634 | – | – | Yes |
| 15 | XI | GPC | 0.403 | 0.294 | 0 | -1.554 | 1.554 | – | – | Yes |
| 16 | XI | GPC | 0.513 | 0.201 | 0 | 0.952 | -0.952 | – | – | Yes |
| 17 | XI | GPC | 0.715 | 0.061 | 0 | 1.264 | -1.264 | – | – | No |
| 18 | XI | GPC | 0.526 | 1.345 | 0 | 0.998 | -0.998 | – | – | No |
| 19 | XI | GPC | 0.453 | -0.281 | 0 | -0.913 | 0.913 | – | – | Yes |
| 20 | XI | GPC | 0.384 | -0.468 | 0 | -1.203 | 1.203 | – | – | Yes |
| 21 | XI | GPC | 0.712 | -0.135 | 0 | 0.051 | -0.051 | – | – | No |
| 22 | XI | GPC | 0.573 | -0.144 | 0 | 0.407 | -0.407 | – | – | No |
| 23 | XI | GPC | 0.368 | 1.714 | 0 | 1.034 | -1.034 | – | – | Yes |

**Table M.2. Operational Item Parameter Estimates—ELA Grade 4**

| Item | Item Type | Model | A | B | D1 | D2 | D3 | D4 | D5 | Misfit Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | CR | GPC | 0.748 | 1.272 | 0 | 1.393 | -0.187 | -1.207 | – | No |
| 2 | CR | GPC | 0.752 | 0.767 | 0 | 1.704 | -0.095 | -1.609 | – | Yes |
| 3 | CR | GPC | 0.757 | 1.669 | 0 | 1.692 | -0.419 | -1.273 | – | No |
| 4 | CR | GPC | 0.806 | 2.004 | 0 | 2.531 | 0.013 | -1.058 | -1.486 | Yes |
| 5 | XI | GPC | 0.216 | 0.989 | 0 | -3.277 | 3.277 | – | – | Yes |
| 6 | XI | GPC | 0.431 | 0.030 | 0 | -1.595 | 1.595 | – | – | Yes |
| 7 | XI | GPC | 0.313 | 0.631 | 0 | 0.456 | -0.456 | – | – | No |
| 8 | XI | GPC | 0.768 | -0.561 | 0 | 0.295 | -0.295 | – | – | No |
| 9 | XI | GPC | 0.396 | 0.488 | 0 | -1.779 | 1.779 | – | – | Yes |
| 10 | XI | GPC | 0.290 | 0.657 | 0 | -1.815 | 1.815 | – | – | Yes |
| 11 | XI | GPC | 0.451 | 1.298 | 0 | 0.064 | -0.064 | – | – | No |
| 12 | XI | GPC | 0.513 | 1.007 | 0 | 0.103 | -0.103 | – | – | Yes |
| 13 | XI | GPC | 0.209 | 0.820 | 0 | -2.357 | 2.357 | – | – | Yes |
| 14 | XI | GPC | 0.232 | 0.485 | 0 | -0.262 | 0.262 | – | – | Yes |
| 15 | XI | GPC | 0.341 | 0.623 | 0 | -1.253 | 1.253 | – | – | Yes |
| 16 | XI | GPC | 0.381 | 0.248 | 0 | 0.441 | -0.441 | – | – | No |
| 17 | XI | GPC | 0.605 | -1.183 | 0 | 0.355 | -0.355 | – | – | Yes |
| 18 | XI | GPC | 0.534 | 0.270 | 0 | -2.752 | 2.752 | – | – | Yes |
| 19 | XI | GPC | 0.297 | 1.390 | 0 | -0.315 | 0.315 | – | – | Yes |
| 20 | XI | GPC | 0.534 | 0.146 | 0 | -1.522 | 1.522 | – | – | Yes |
| 21 | XI | GPC | 0.580 | -0.491 | 0 | 0.200 | -0.200 | – | – | No |
| 22 | XI | GPC | 0.332 | -0.752 | 0 | -0.310 | 0.310 | – | – | Yes |
| 23 | XI | GPC | 0.355 | -1.194 | 0 | -3.161 | 3.161 | – | – | Yes |
| 24 | XI | GPC | 0.802 | 0.024 | 0 | 0.043 | -0.043 | – | – | Yes |
| 25 | XI | GPC | 0.905 | -0.752 | 0 | 0.711 | -0.711 | – | – | No |

**Table M.3. Operational Item Parameter Estimates—ELA Grade 5**

| Item | Item Type | Model | A | B | D1 | D2 | D3 | D4 | D5 | Misfit Flag |
|------|-----------|-------|------|------|-----|--------|--------|--------|--------|-------------|
| 1 | CR | GPC | 0.814 | 1.297 | 0 | 1.316 | 0.033 | -1.348 | – | Yes |
| 2 | CR | GPC | 0.792 | 0.785 | 0 | 1.429 | 0.289 | -1.718 | – | Yes |
| 3 | CR | GPC | 0.745 | 1.871 | 0 | 1.553 | -0.340 | -1.213 | – | Yes |
| 4 | CR | GPC | 0.775 | 2.276 | 0 | 1.942 | 0.198 | -0.821 | -1.319 | Yes |
| 5 | XI | GPC | 0.576 | -0.873 | 0 | -1.434 | 1.434 | – | – | Yes |
| 6 | XI | GPC | 0.531 | -0.130 | 0 | -0.454 | 0.454 | – | – | Yes |
| 7 | XI | GPC | 0.438 | 0.352 | 0 | -0.854 | 0.854 | – | – | Yes |
| 8 | XI | GPC | 0.436 | 0.335 | 0 | -0.053 | 0.053 | – | – | No |
| 9 | XI | GPC | 0.350 | 1.545 | 0 | -1.421 | 1.421 | – | – | Yes |
| 10 | XI | GPC | 0.890 | -0.227 | 0 | 0.013 | -0.013 | – | – | Yes |
| 11 | XI | GPC | 0.707 | -0.018 | 0 | -0.528 | 0.528 | – | – | Yes |
| 12 | XI | GPC | 0.388 | 0.111 | 0 | -0.738 | 0.738 | – | – | Yes |
| 13 | XI | GPC | 0.519 | 0.607 | 0 | 1.130 | -1.130 | – | – | No |
| 14 | XI | GPC | 0.274 | 1.653 | 0 | 0.287 | -0.287 | – | – | Yes |
| 15 | XI | GPC | 0.384 | 0.333 | 0 | -0.197 | 0.197 | – | – | Yes |
| 16 | XI | GPC | 0.330 | 1.324 | 0 | -0.947 | 0.947 | – | – | Yes |
| 17 | XI | GPC | 0.237 | 1.774 | 0 | 1.358 | -1.358 | – | – | Yes |
| 18 | XI | GPC | 0.181 | 0.040 | 0 | -2.715 | 2.715 | – | – | No |
| 19 | XI | GPC | 0.429 | 0.239 | 0 | 2.077 | -2.077 | – | – | Yes |
| 20 | XI | GPC | 0.256 | 2.306 | 0 | -1.771 | 1.771 | – | – | No |
| 21 | XI | GPC | 0.630 | 0.253 | 0 | 1.003 | -1.003 | – | – | Yes |
| 22 | XI | GPC | 0.378 | 0.404 | 0 | 0.844 | -0.844 | – | – | No |
| 23 | XI | GPC | 0.349 | 1.037 | 0 | -0.168 | 0.168 | – | – | Yes |
| 24 | XI | GPC | 0.471 | 0.628 | 0 | 1.094 | -1.094 | – | – | No |

**Table M.4. Operational Item Parameter Estimates—ELA Grade 6**

| Item | Item Type | Model | A | B | D1 | D2 | D3 | D4 | D5 | Misfit Flag |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | CR | GPC | 0.833 | 1.274 | 0 | 1.010 | 0.015 | -1.025 | – | Yes |
| 2 | CR | GPC | 0.829 | 1.709 | 0 | 1.689 | 0.409 | -0.788 | -1.310 | Yes |
| 3 | CR | GPC | 0.825 | 1.230 | 0 | 1.406 | -0.119 | -1.288 | – | Yes |
| 4 | CR | GPC | 0.817 | 1.967 | 0 | 2.274 | 0.627 | -0.602 | -2.299 | Yes |
| 5 | XI | GPC | 0.303 | -0.408 | 0 | -2.483 | 2.483 | – | – | Yes |
| 6 | XI | GPC | 0.642 | 0.516 | 0 | 0.117 | -0.117 | – | – | No |
| 7 | XI | GPC | 0.283 | 1.000 | 0 | -1.840 | 1.840 | – | – | Yes |
| 8 | XI | GPC | 0.391 | 0.697 | 0 | -0.907 | 0.907 | – | – | Yes |
| 9 | XI | GPC | 0.553 | -0.716 | 0 | 0.495 | -0.495 | – | – | Yes |
| 10 | XI | GPC | 0.390 | -0.331 | 0 | 1.127 | -1.127 | – | – | Yes |
| 11 | XI | GPC | 0.449 | 0.565 | 0 | -1.128 | 1.128 | – | – | No |
| 12 | XI | GPC | 0.631 | 0.236 | 0 | 0.196 | -0.196 | – | – | Yes |
| 13 | XI | GPC | 0.433 | 0.307 | 0 | -1.274 | 1.274 | – | – | No |
| 14 | XI | GPC | 0.594 | 0.226 | 0 | -0.754 | 0.754 | – | – | Yes |
| 15 | XI | GPC | 0.404 | 0.825 | 0 | 0.660 | -0.660 | – | – | No |
| 16 | XI | GPC | 0.257 | 1.241 | 0 | -1.306 | 1.306 | – | – | Yes |
| 17 | XI | GPC | 0.262 | 0.681 | 0 | -0.728 | 0.728 | – | – | Yes |
| 18 | XI | GPC | 0.283 | 0.883 | 0 | 1.309 | -1.309 | – | – | Yes |
| 19 | XI | GPC | 0.439 | -0.052 | 0 | -1.130 | 1.130 | – | – | Yes |
| 20 | XI | GPC | 0.493 | 0.637 | 0 | 0.323 | -0.323 | – | – | No |
| 21 | XI | GPC | 0.479 | 0.120 | 0 | -0.956 | 0.956 | – | – | No |
| 22 | XI | GPC | 0.446 | -0.136 | 0 | -1.137 | 1.137 | – | – | Yes |
| 23 | XI | GPC | 0.375 | 0.969 | 0 | -0.277 | 0.277 | – | – | Yes |
| 24 | XI | GPC | 0.344 | 1.717 | 0 | 1.549 | -1.549 | – | – | No |
| 25 | XI | GPC | 0.480 | 0.031 | 0 | 1.226 | -1.226 | – | – | No |
| 26 | XI | GPC | 0.450 | -0.491 | 0 | -1.161 | 1.161 | – | – | No |

**Table M.5. Operational Item Parameter Estimates—ELA Grade 7**

| Item | Item Type | Model | A | B | D1 | D2 | D3 | D4 | D5 | Misfit Flag |
|------|-----------|-------|-------|--------|----|--------|--------|--------|--------|-------------|
| 1 | CR | GPC | 0.752 | 0.615 | 0 | 0.674 | 0.146 | -0.820 | – | Yes |
| 2 | CR | GPC | 0.704 | 1.055 | 0 | 1.406 | 0.657 | -0.492 | -1.571 | Yes |
| 3 | CR | GPC | 0.878 | 0.924 | 0 | 1.139 | 0.012 | -1.151 | – | Yes |
| 4 | CR | GPC | 0.885 | 1.236 | 0 | 1.934 | 0.582 | -0.808 | -1.708 | Yes |
| 5 | XI | GPC | 0.303 | 0.678 | 0 | -1.923 | 1.923 | – | – | Yes |
| 6 | XI | GPC | 0.612 | 0.765 | 0 | 0.621 | -0.621 | – | – | Yes |
| 7 | XI | GPC | 0.413 | 1.393 | 0 | -1.971 | 1.971 | – | – | Yes |
| 8 | XI | GPC | 0.502 | 0.091 | 0 | -0.875 | 0.875 | – | – | Yes |
| 9 | XI | GPC | 0.255 | 1.548 | 0 | -1.398 | 1.398 | – | – | Yes |
| 10 | XI | GPC | 0.468 | 2.620 | 0 | 1.173 | -1.173 | – | – | No |
| 11 | XI | GPC | 0.425 | 0.698 | 0 | 0.249 | -0.249 | – | – | Yes |
| 12 | XI | GPC | 0.431 | 0.764 | 0 | -1.296 | 1.296 | – | – | Yes |
| 13 | XI | GPC | 0.626 | 1.284 | 0 | 0.590 | -0.590 | – | – | No |
| 14 | XI | GPC | 0.560 | 0.438 | 0 | 0.351 | -0.351 | – | – | No |
| 15 | XI | GPC | 0.370 | 1.535 | 0 | -0.334 | 0.334 | – | – | No |
| 16 | XI | GPC | 0.291 | -0.151 | 0 | -1.953 | 1.953 | – | – | No |
| 17 | XI | GPC | 0.383 | 0.594 | 0 | 0.614 | -0.614 | – | – | No |
| 18 | XI | GPC | 0.573 | -0.274 | 0 | -0.464 | 0.464 | – | – | Yes |
| 19 | XI | GPC | 0.351 | 0.805 | 0 | -3.614 | 3.614 | – | – | Yes |
| 20 | XI | GPC | 0.220 | 1.608 | 0 | -2.742 | 2.742 | – | – | Yes |
| 21 | XI | GPC | 0.519 | 0.843 | 0 | 0.625 | -0.625 | – | – | No |
| 22 | XI | GPC | 0.438 | 0.061 | 0 | -0.744 | 0.744 | – | – | Yes |
| 23 | XI | GPC | 0.561 | 0.066 | 0 | -0.441 | 0.441 | – | – | Yes |
| 24 | XI | GPC | 0.451 | 0.611 | 0 | 2.100 | -2.100 | – | – | Yes |
| 25 | XI | GPC | 0.708 | -0.147 | 0 | 0.402 | -0.402 | – | – | Yes |
| 26 | XI | GPC | 0.758 | -0.301 | 0 | 0.683 | -0.683 | – | – | Yes |
| 27 | XI | GPC | 0.446 | 0.508 | 0 | -0.086 | 0.086 | – | – | Yes |

**Table M.6. Operational Item Parameter Estimates—ELA Grade 8**

| Item | Item Type | Model | A | B | D1 | D2 | D3 | D4 | D5 | Misfit Flag |
|------|-----------|-------|------|------|----|------|------|------|------|-------------|
| 1 | CR | GPC | 0.756 | 0.467 | 0 | 0.811 | 0.201 | -1.012 | – | No |
| 2 | CR | GPC | 0.741 | 1.101 | 0 | 1.495 | 0.822 | -0.498 | -1.819 | Yes |
| 3 | CR | GPC | 0.765 | 0.383 | 0 | 0.784 | 0.337 | -1.121 | – | No |
| 4 | CR | GPC | 0.802 | 0.901 | 0 | 1.434 | 0.916 | -0.597 | -1.753 | Yes |
| 5 | XI | GPC | 0.542 | -0.619 | 0 | -1.311 | 1.311 | – | – | Yes |
| 6 | XI | GPC | 0.442 | -0.057 | 0 | -0.333 | 0.333 | – | – | No |
| 7 | XI | GPC | 0.208 | 2.859 | 0 | 1.320 | -1.320 | – | – | Yes |
| 8 | XI | GPC | 0.583 | -0.488 | 0 | -0.561 | 0.561 | – | – | No |
| 9 | XI | GPC | 0.368 | -1.329 | 0 | -0.593 | 0.593 | – | – | No |
| 10 | XI | GPC | 0.499 | -0.383 | 0 | 0.941 | -0.941 | – | – | Yes |
| 11 | XI | GPC | 0.284 | 1.612 | 0 | -0.605 | 0.605 | – | – | Yes |
| 12 | XI | GPC | 0.395 | -0.954 | 0 | 0.929 | -0.929 | – | – | Yes |
| 13 | XI | GPC | 0.558 | 0.091 | 0 | 0.077 | -0.077 | – | – | Yes |
| 14 | XI | GPC | 0.395 | 0.857 | 0 | -1.831 | 1.831 | – | – | Yes |
| 15 | XI | GPC | 0.391 | 0.885 | 0 | 0.467 | -0.467 | – | – | No |
| 16 | XI | GPC | 0.897 | -0.239 | 0 | 0.818 | -0.818 | – | – | No |
| 17 | XI | GPC | 0.487 | -0.056 | 0 | -0.288 | 0.288 | – | – | No |
| 18 | XI | GPC | 0.415 | 0.263 | 0 | 0.446 | -0.446 | – | – | Yes |
| 19 | XI | GPC | 0.444 | 0.461 | 0 | 1.424 | -1.424 | – | – | No |
| 20 | XI | GPC | 0.364 | 0.683 | 0 | -2.005 | 2.005 | – | – | Yes |
| 21 | XI | GPC | 0.325 | 0.288 | 0 | -3.241 | 3.241 | – | – | No |
| 22 | XI | GPC | 0.509 | -0.322 | 0 | -1.068 | 1.068 | – | – | Yes |
| 23 | XI | GPC | 0.469 | 0.034 | 0 | -1.023 | 1.023 | – | – | No |
| 24 | XI | GPC | 0.443 | 0.643 | 0 | 0.852 | -0.852 | – | – | No |
| 25 | XI | GPC | 0.427 | -0.414 | 0 | -1.826 | 1.826 | – | – | Yes |
| 26 | XI | GPC | 0.370 | 0.182 | 0 | 0.838 | -0.838 | – | – | Yes |
| 27 | XI | GPC | 0.369 | 1.420 | 0 | -0.545 | 0.545 | – | – | No |

**Table M.7. Operational Item Parameter Estimates—CSLA Grade 3**

| Item | Item Type | Model | B | D1 | D2 | D3 | D4 | Infit | Outfit |
|------|-----------|-------|------|----|------|------|------|-------|--------|
| 1 | CR | Rasch | 0.054 | 0 | -0.904 | 0.694 | 0.210 | 0.88 | 0.85 |
| 2 | CR | Rasch | 0.377 | 0 | -0.937 | 0.115 | 0.821 | 0.76 | 0.71 |
| 3 | CR | Rasch | 0.182 | 0 | -0.880 | 0.688 | 0.192 | 1.02 | 0.97 |
| 4 | CR | Rasch | 0.480 | 0 | -0.345 | -0.300 | 0.645 | 0.93 | 0.87 |
| 5 | XI | Rasch | -0.192 | 0 | -1.290 | 1.290 | – | 0.80 | 0.80 |
| 6 | XI | Rasch | -0.290 | 0 | 0.577 | -0.577 | – | 1.07 | 1.23 |
| 7 | XI | Rasch | -0.755 | 0 | -0.773 | 0.773 | – | 1.04 | 1.06 |
| 8 | XI | Rasch | -0.653 | 0 | 0.156 | -0.156 | – | 0.96 | 0.95 |
| 9 | XI | Rasch | -0.287 | 0 | 0.339 | -0.339 | – | 1.03 | 1.07 |
| 10 | XI | Rasch | -0.295 | 0 | 0.767 | -0.767 | – | 0.92 | 0.92 |
| 11 | XI | Rasch | 0.119 | 0 | 0.204 | -0.204 | – | 1.14 | 1.22 |
| 12 | XI | Rasch | -0.081 | 0 | 1.273 | -1.273 | – | 1.09 | 1.17 |
| 13 | XI | Rasch | 0.272 | 0 | 0.121 | -0.121 | – | 0.99 | 1.01 |
| 14 | XI | Rasch | 0.891 | 0 | -0.171 | 0.171 | – | 1.26 | 1.64 |
| 15 | XI | Rasch | -0.706 | 0 | 0.436 | -0.436 | – | 0.85 | 0.81 |
| 16 | XI | Rasch | -0.105 | 0 | 0.276 | -0.276 | – | 0.92 | 0.89 |
| 17 | XI | Rasch | 0.450 | 0 | -0.180 | 0.180 | – | 1.30 | 1.53 |
| 18 | XI | Rasch | -0.329 | 0 | 0.788 | -0.788 | – | 0.90 | 0.93 |
| 19 | XI | Rasch | -0.712 | 0 | -0.090 | 0.090 | – | 0.90 | 0.88 |
| 20 | XI | Rasch | 0.157 | 0 | -0.022 | 0.022 | – | 1.13 | 1.18 |
| 21 | XI | Rasch | -0.062 | 0 | 0.539 | -0.539 | – | 1.30 | 1.48 |

**Table M.8. Operational Item Parameter Estimates—CSLA Grade 4**

| Item | Item Type | Model | B | D1 | D2 | D3 | D4 | D5 | Infit | Outfit |
|------|-----------|-------|------|----|------|------|------|------|-------|--------|
| 1 | CR | Rasch | -0.605 | 0 | -0.812 | 0.608 | 0.204 | – | 1.03 | 1.01 |
| 2 | CR | Rasch | 0.069 | 0 | 0.133 | -0.881 | 0.748 | – | 0.94 | 0.94 |
| 3 | CR | Rasch | -0.227 | 0 | -0.754 | 0.613 | 0.142 | – | 1.01 | 1.00 |
| 4 | CR | Rasch | 0.302 | 0 | -0.722 | -0.349 | 0.012 | 1.059 | 0.83 | 0.77 |
| 5 | XI | Rasch | -1.251 | 0 | -0.197 | 0.197 | – | – | 0.89 | 0.86 |
| 6 | XI | Rasch | -0.496 | 0 | -0.650 | 0.650 | – | – | 1.12 | 1.13 |
| 7 | XI | Rasch | -0.162 | 0 | 0.908 | -0.908 | – | – | 1.05 | 1.07 |
| 8 | XI | Rasch | -1.167 | 0 | 0.668 | -0.668 | – | – | 1.07 | 1.10 |
| 9 | XI | Rasch | -1.463 | 0 | -0.205 | 0.205 | – | – | 0.86 | 0.85 |
| 10 | XI | Rasch | 0.792 | 0 | -0.786 | 0.786 | – | – | 0.89 | 0.87 |
| 11 | XI | Rasch | -0.991 | 0 | 0.699 | -0.699 | – | – | 0.88 | 0.89 |
| 12 | XI | Rasch | -0.149 | 0 | 0.836 | -0.836 | – | – | 0.91 | 0.84 |
| 13 | XI | Rasch | -1.225 | 0 | 0.582 | -0.582 | – | – | 0.83 | 0.78 |
| 14 | XI | Rasch | -0.906 | 0 | 0.911 | -0.911 | – | – | 0.84 | 0.82 |
| 15 | XI | Rasch | -0.626 | 0 | 0.399 | -0.399 | – | – | 1.01 | 1.05 |
| 16 | XI | Rasch | 0.090 | 0 | 0.704 | -0.704 | – | – | 1.02 | 1.15 |
| 17 | XI | Rasch | 1.102 | 0 | -0.997 | 0.997 | – | – | 1.08 | 1.19 |
| 18 | XI | Rasch | 0.261 | 0 | -0.260 | 0.260 | – | – | 1.16 | 1.30 |
| 19 | XI | Rasch | -0.250 | 0 | -0.523 | 0.523 | – | – | 0.97 | 0.96 |
| 20 | XI | Rasch | 0.248 | 0 | 0.811 | -0.811 | – | – | 1.08 | 1.51 |
| 21 | XI | Rasch | -0.006 | 0 | 1.434 | -1.434 | – | – | 0.99 | 1.07 |
| 22 | XI | Rasch | -0.320 | 0 | 0.227 | -0.227 | – | – | 0.95 | 0.95 |
| 23 | XI | Rasch | 0.446 | 0 | 0.435 | -0.435 | – | – | 1.24 | 1.83 |
| 24 | XI | Rasch | 0.807 | 0 | 0.011 | -0.011 | – | – | 1.19 | 1.80 |
| 25 | SR | Rasch | -0.197 | 0 | -0.162 | 0.162 | – | – | 0.90 | 0.86 |

**Table M.9. Operational Item Parameter Estimates—Science Grade 5**

| Item | Item Type | Model | A | B | C | D1 | D2 | D3 | Misfit Flag |
|------|-----------|-------|------|------|------|-----|--------|--------|-------------|
| 1 | CR | GPC | 0.789 | 0.752 | – | 0 | 0.127 | -0.127 | Yes |
| 2 | CR | GPC | 0.443 | 0.964 | – | 0 | -0.279 | 0.279 | Yes |
| 3 | CR | GPC | 0.494 | 2.175 | – | 0 | 0.153 | -0.153 | No |
| 4 | CR | GPC | 0.504 | 1.055 | – | 0 | 0.432 | -0.432 | Yes |
| 5 | CR | GPC | 0.533 | -0.291 | – | 0 | -0.837 | 0.837 | Yes |
| 6 | CR | GPC | 0.674 | 0.827 | – | 0 | 0.826 | -0.826 | No |
| 7 | CR | GPC | 0.649 | 1.378 | – | 0 | 0.094 | -0.094 | No |
| 8 | CR | GPC | 0.919 | 0.273 | – | 0 | 0.365 | -0.365 | Yes |
| 9 | CR | GPC | 0.715 | -0.025 | – | 0 | -0.197 | 0.197 | Yes |
| 10 | CR | GPC | 0.678 | 0.800 | – | 0 | -0.191 | 0.191 | Yes |
| 11 | CR | GPC | 0.606 | 0.328 | – | 0 | -0.417 | 0.417 | Yes |
| 12 | CR | GPC | 0.850 | -0.391 | – | 0 | 0.672 | -0.672 | Yes |
| 13 | XI | 3PL | 1.306 | -0.169 | 0.088 | – | – | – | Yes |
| 14 | XI | 3PL | 0.694 | 0.845 | 0.144 | – | – | – | No |
| 15 | XI | 3PL | 1.137 | 0.267 | 0.028 | – | – | – | No |
| 16 | XI | 3PL | 0.505 | 1.733 | 0.009 | – | – | – | No |
| 17 | XI | 3PL | 1.301 | 1.489 | 0.128 | – | – | – | No |
| 18 | XI | 3PL | 0.508 | 0.577 | 0.182 | – | – | – | No |
| 19 | XI | 3PL | 0.768 | 0.104 | 0.118 | – | – | – | Yes |
| 20 | XI | 3PL | 1.969 | 1.511 | 0.076 | – | – | – | Yes |
| 21 | XI | 3PL | 0.662 | 0.443 | 0.013 | – | – | – | Yes |
| 22 | XI | 3PL | 1.049 | 0.914 | 0.006 | – | – | – | Yes |
| 23 | XI | 3PL | 0.420 | 1.134 | 0.119 | – | – | – | Yes |
| 24 | XI | 3PL | 1.239 | 0.615 | 0.023 | – | – | – | No |
| 25 | XI | 3PL | 0.942 | 0.536 | 0.022 | – | – | – | No |
| 26 | XI | 3PL | 1.092 | 1.003 | 0.098 | – | – | – | Yes |
| 27 | SR | 3PL | 1.101 | -0.708 | 0.264 | – | – | – | Yes |
| 28 | SR | 3PL | 0.746 | 2.025 | 0.273 | – | – | – | No |
| 29 | SR | 3PL | 0.702 | 1.479 | 0.360 | – | – | – | No |
| 30 | SR | 3PL | 0.991 | 1.840 | 0.248 | – | – | – | No |
| 31 | SR | 3PL | 1.137 | 0.694 | 0.437 | – | – | – | No |
| 32 | SR | 3PL | 0.730 | 1.648 | 0.179 | – | – | – | Yes |
| 33 | SR | 3PL | 0.553 | 1.964 | 0.132 | – | – | – | No |
| 34 | SR | 3PL | 1.210 | 0.860 | 0.394 | – | – | – | No |
| 35 | SR | 3PL | 1.156 | 1.389 | 0.324 | – | – | – | Yes |
| 36 | SR | 3PL | 0.420 | -0.124 | 0.082 | – | – | – | No |
| 37 | SR | 3PL | 1.029 | 0.233 | 0.242 | – | – | – | Yes |
| 38 | SR | 3PL | 0.720 | -0.564 | 0.170 | – | – | – | Yes |
| 39 | SR | 3PL | 0.753 | 0.393 | 0.081 | – | – | – | No |

**Table M.10. Operational Item Parameter Estimates—Science Grade 8**

| Item | Item Type | Model | A | B | C | D1 | D2 | D3 | Misfit Flag |
|------|-----------|-------|-------|-------|-------|----|--------|--------|-------------|
| 1 | CR | GPC | 1.056 | 1.077 | – | 0 | 0.495 | -0.495 | Yes |
| 2 | CR | GPC | 0.655 | 0.801 | – | 0 | -0.063 | 0.063 | Yes |
| 3 | CR | GPC | 1.176 | 1.619 | – | 0 | 0.314 | -0.314 | Yes |
| 4 | CR | GPC | 1.007 | 0.831 | – | 0 | 0.359 | -0.359 | Yes |
| 5 | CR | GPC | 0.575 | 0.496 | – | 0 | -0.025 | 0.025 | Yes |
| 6 | CR | GPC | 0.851 | 1.166 | – | 0 | 0.161 | -0.161 | Yes |
| 7 | CR | GPC | 1.123 | 1.087 | – | 0 | 0.369 | -0.369 | Yes |
| 8 | CR | GPC | 0.344 | 0.971 | – | 0 | -0.896 | 0.896 | Yes |
| 9 | CR | GPC | 0.843 | 0.001 | – | 0 | -0.089 | 0.089 | Yes |
| 10 | CR | GPC | 0.730 | 1.348 | – | 0 | 0.493 | -0.493 | Yes |
| 11 | CR | GPC | 0.928 | 1.567 | – | 0 | 0.390 | -0.390 | Yes |
| 12 | CR | GPC | 0.610 | 1.309 | – | 0 | -0.769 | 0.769 | Yes |
| 13 | CR | GPC | 0.737 | 0.190 | – | 0 | 0.489 | -0.489 | Yes |
| 14 | CR | GPC | 0.761 | 1.046 | – | 0 | 0.622 | -0.622 | Yes |
| 15 | XI | 2PL | 0.497 | -0.098 | – | – | – | – | Yes |
| 16 | XI | 2PL | 0.733 | -0.776 | – | – | – | – | Yes |
| 17 | XI | 2PL | 1.221 | 0.697 | – | – | – | – | Yes |
| 18 | XI | 2PL | 0.548 | 0.257 | – | – | – | – | Yes |
| 19 | XI | 2PL | 1.086 | 1.390 | – | – | – | – | Yes |
| 20 | XI | 2PL | 0.485 | 2.531 | – | – | – | – | Yes |
| 21 | XI | 2PL | 0.732 | 2.218 | – | – | – | – | Yes |
| 22 | XI | 3PL | 0.608 | 1.203 | 0.040 | – | – | – | No |
| 23 | XI | 3PL | 0.314 | 4.146 | 0.042 | – | – | – | No |
| 24 | XI | 3PL | 0.605 | -0.318 | 0.098 | – | – | – | Yes |
| 25 | XI | 3PL | 0.937 | 0.904 | 0.044 | – | – | – | Yes |
| 26 | XI | 3PL | 0.743 | -0.316 | 0.058 | – | – | – | Yes |
| 27 | XI | 3PL | 1.162 | 0.889 | 0.001 | – | – | – | Yes |
| 28 | XI | 3PL | 0.775 | 1.069 | 0.094 | – | – | – | Yes |
| 29 | XI | 3PL | 0.199 | 7.158 | 0.045 | – | – | – | No |
| 30 | XI | 3PL | 0.830 | 0.731 | 0.105 | – | – | – | Yes |
| 31 | XI | 3PL | 0.869 | -0.146 | 0.164 | – | – | – | No |
| 32 | XI | 3PL | 1.420 | 2.085 | 0.030 | – | – | – | Yes |
| 33 | XI | 3PL | 1.710 | 1.667 | 0.100 | – | – | – | Yes |
| 34 | XI | 3PL | 1.253 | 0.860 | 0.194 | – | – | – | Yes |
| 35 | XI | 3PL | 1.014 | -0.273 | 0.031 | – | – | – | Yes |
| 36 | XI | 3PL | 0.774 | 0.550 | 0.006 | – | – | – | Yes |
| 37 | XI | 3PL | 0.555 | 1.261 | 0.016 | – | – | – | Yes |
| 38 | SR | 3PL | 1.277 | 0.669 | 0.329 | – | – | – | Yes |
| 39 | SR | 3PL | 0.943 | 1.530 | 0.077 | – | – | – | Yes |
| 40 | SR | 3PL | 0.672 | 1.577 | 0.428 | – | – | – | Yes |
| 41 | SR | 3PL | 1.061 | 0.309 | 0.278 | – | – | – | Yes |
| 42 | SR | 3PL | 1.246 | 0.289 | 0.115 | – | – | – | Yes |
| 43 | SR | 3PL | 1.074 | 0.373 | 0.099 | – | – | – | Yes |
| 44 | SR | 3PL | 1.347 | 0.462 | 0.400 | – | – | – | Yes |
| 45 | SR | 3PL | 0.463 | -1.247 | 0.019 | – | – | – | Yes |
| 46 | SR | 3PL | 1.178 | 0.898 | 0.281 | – | – | – | Yes |
| 47 | SR | 3PL | 0.981 | -0.945 | 0.019 | – | – | – | Yes |

**Table M.11. Operational Item Parameter Estimates—Science Grade 11**

| Item | Item Type | Model | A | B | C | D1 | D2 | D3 | Misfit Flag |
|------|-----------|-------|-------|--------|-------|-----|--------|--------|-------------|
| 1 | CR | GPC | 0.559 | 2.854 | – | 0 | 0.066 | -0.066 | No |
| 2 | CR | GPC | 0.765 | 0.571 | – | 0 | -0.076 | 0.076 | Yes |
| 3 | CR | GPC | 0.835 | 0.129 | – | 0 | -0.042 | 0.042 | Yes |
| 4 | CR | GPC | 0.792 | 0.691 | – | 0 | 0.847 | -0.847 | Yes |
| 5 | CR | GPC | 0.680 | 0.481 | – | 0 | 0.438 | -0.438 | Yes |
| 6 | CR | GPC | 0.963 | 0.870 | – | 0 | 0.360 | -0.360 | Yes |
| 7 | CR | GPC | 0.711 | 0.613 | – | 0 | 0.506 | -0.506 | Yes |
| 8 | CR | GPC | 0.824 | 0.191 | – | 0 | 0.189 | -0.189 | Yes |
| 9 | CR | GPC | 0.715 | 1.290 | – | 0 | 1.313 | -1.313 | No |
| 10 | CR | GPC | 0.714 | 0.790 | – | 0 | 0.628 | -0.628 | Yes |
| 11 | CR | GPC | 0.645 | 2.226 | – | 0 | 0.135 | -0.135 | No |
| 12 | CR | GPC | 0.785 | 2.234 | – | 0 | 0.281 | -0.281 | Yes |
| 13 | XI | 2PL | 0.857 | 1.395 | – | – | – | – | No |
| 14 | XI | 2PL | 0.699 | 1.054 | – | – | – | – | Yes |
| 15 | XI | 3PL | 0.835 | 0.476 | 0.119 | – | – | – | Yes |
| 16 | XI | 3PL | 0.880 | 0.223 | 0.019 | – | – | – | Yes |
| 17 | XI | 3PL | 0.315 | 0.846 | 0.020 | – | – | – | No |
| 18 | XI | 3PL | 1.202 | -0.062 | 0.140 | – | – | – | Yes |
| 19 | XI | 3PL | 1.389 | 2.187 | 0.033 | – | – | – | No |
| 20 | XI | 3PL | 1.436 | -0.294 | 0.145 | – | – | – | No |
| 21 | XI | 3PL | 0.743 | 0.666 | 0.127 | – | – | – | No |
| 22 | XI | 3PL | 1.006 | 1.484 | 0.044 | – | – | – | No |
| 23 | XI | 3PL | 1.027 | 1.534 | 0.081 | – | – | – | Yes |
| 24 | XI | 3PL | 0.828 | 0.327 | 0.058 | – | – | – | No |
| 25 | SR | 3PL | 1.220 | 0.336 | 0.165 | – | – | – | Yes |
| 26 | SR | 3PL | 0.728 | 0.515 | 0.023 | – | – | – | Yes |
| 27 | SR | 3PL | 1.806 | 1.741 | 0.293 | – | – | – | No |
| 28 | SR | 3PL | 0.911 | 0.383 | 0.184 | – | – | – | Yes |
| 29 | SR | 3PL | 0.535 | 0.940 | 0.055 | – | – | – | Yes |
| 30 | SR | 3PL | 0.845 | -0.719 | 0.390 | – | – | – | Yes |
| 31 | SR | 3PL | 1.065 | 1.449 | 0.329 | – | – | – | No |
| 32 | SR | 3PL | 0.660 | 0.449 | 0.183 | – | – | – | Yes |
| 33 | SR | 3PL | 0.756 | 2.055 | 0.180 | – | – | – | Yes |
| 34 | SR | 3PL | 0.496 | 0.069 | 0.164 | – | – | – | Yes |
| 35 | SR | 3PL | 0.984 | 0.723 | 0.221 | – | – | – | Yes |
| 36 | SR | 3PL | 0.901 | 1.188 | 0.236 | – | – | – | No |
| 37 | SR | 3PL | 1.234 | 2.206 | 0.363 | – | – | – | Yes |
| 38 | SR | 3PL | 0.483 | 0.00 | 0.132 | – | – | – | Yes |

# Appendix N: TCC, TIC, and CSEM Curves

**Figure N.1. Mathematics Grade 3 TCC**
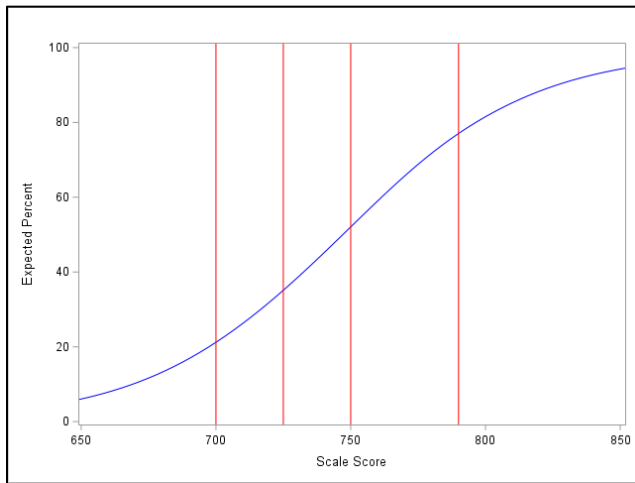


**Figure N.2. Mathematics Grade 3 TIC**
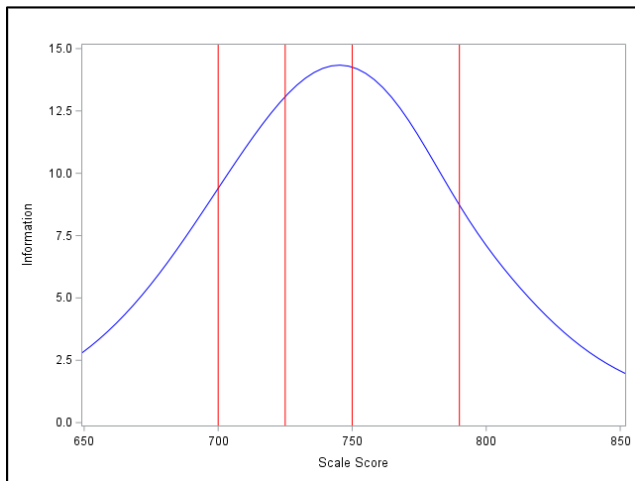


**Figure N.3. Mathematics Grade 3 CSEM Curve**
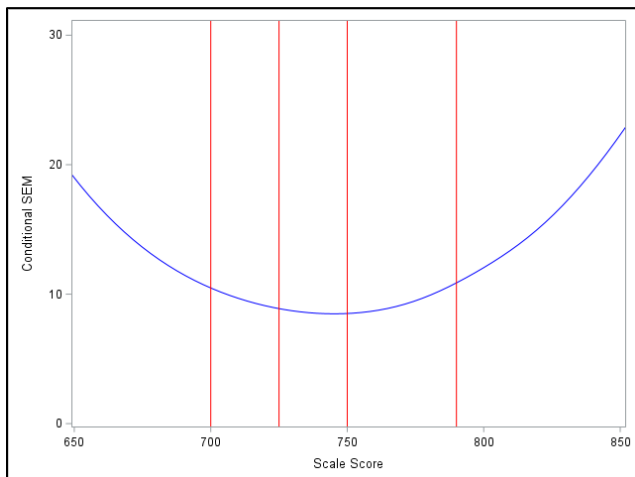
**Figure N.4. Mathematics Grade 4 TCC**
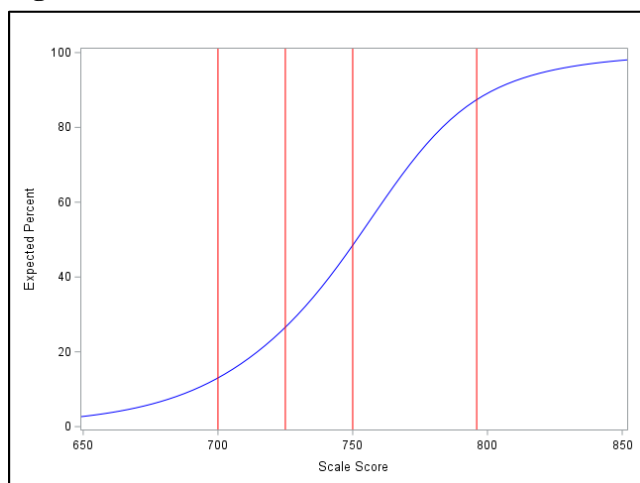


**Figure N.5. Mathematics Grade 4 TIC**
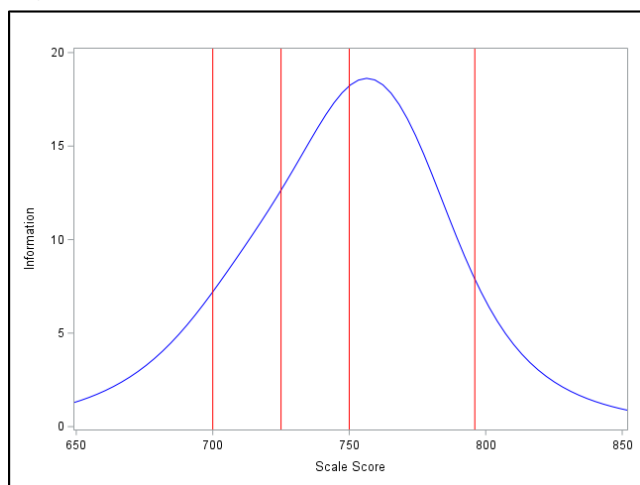


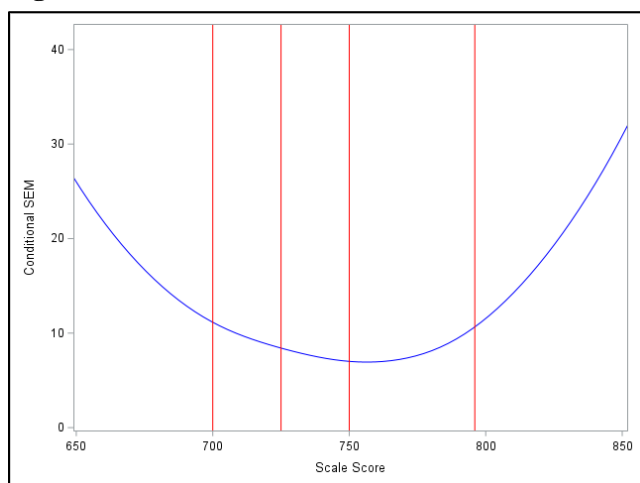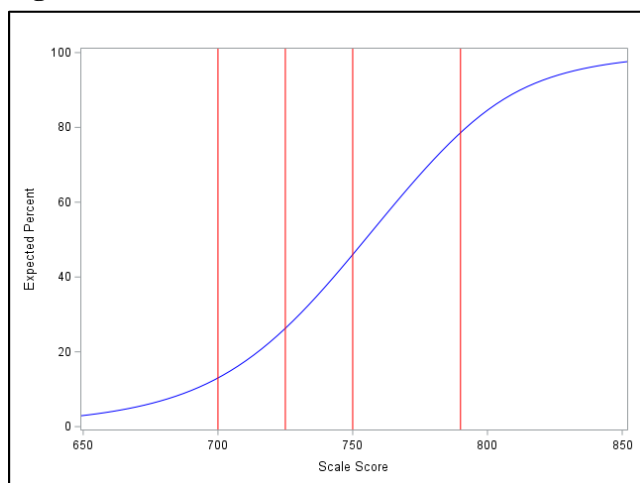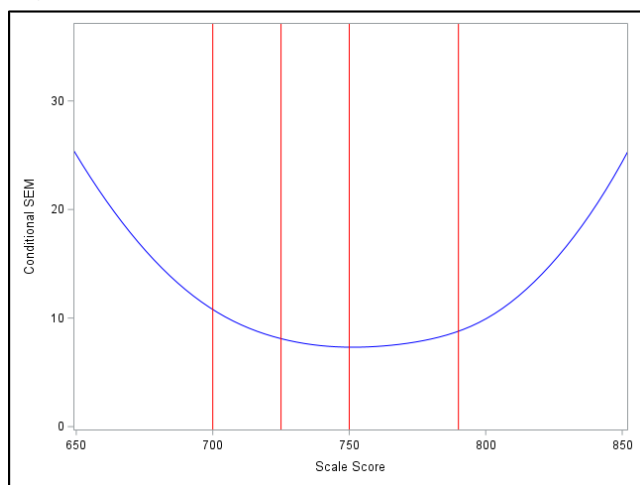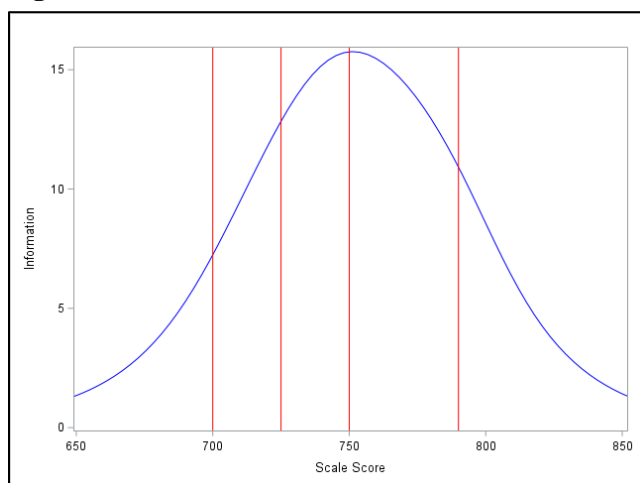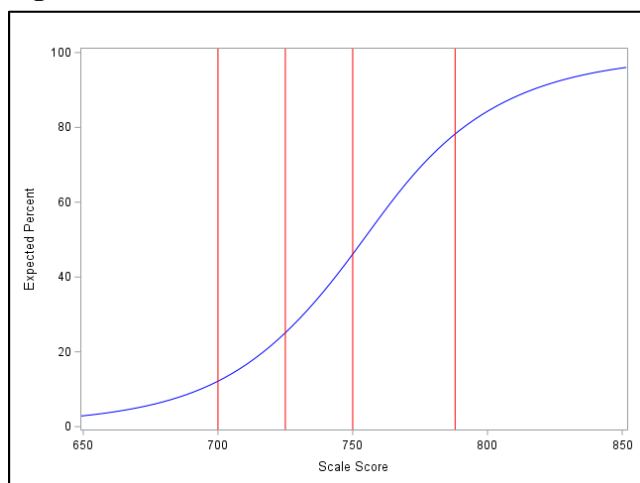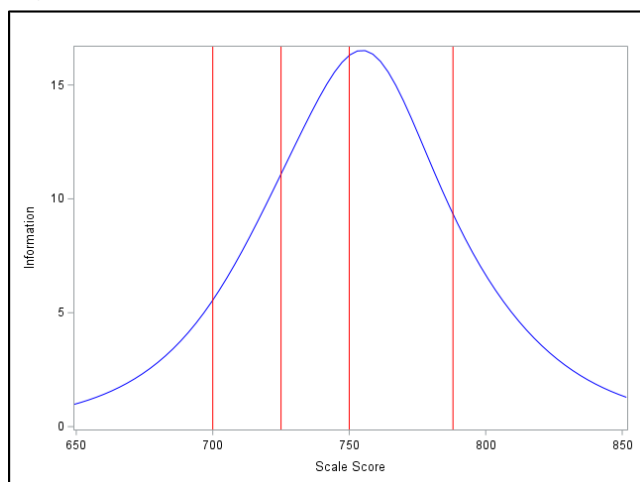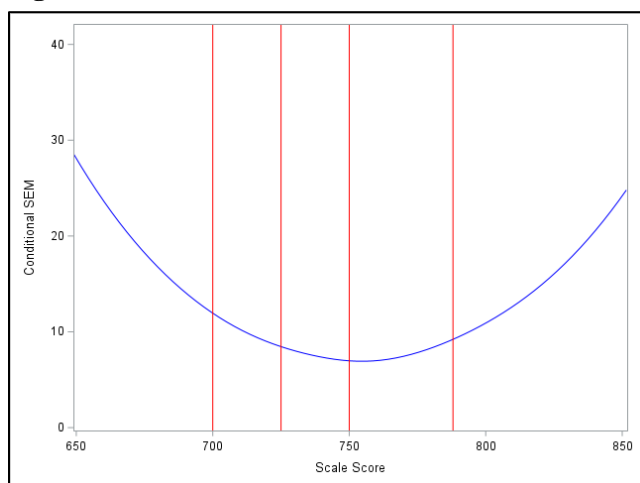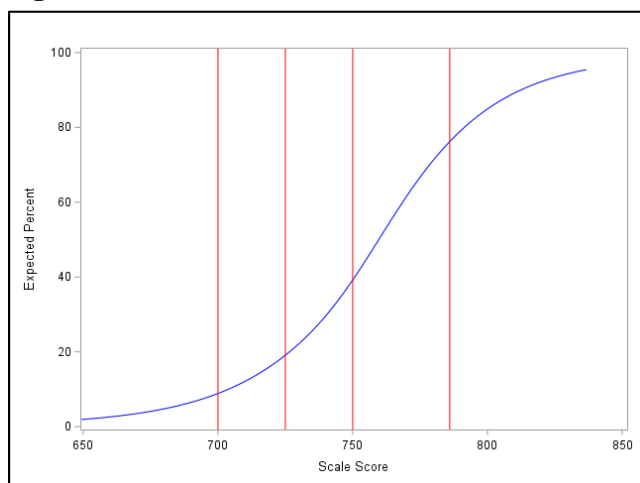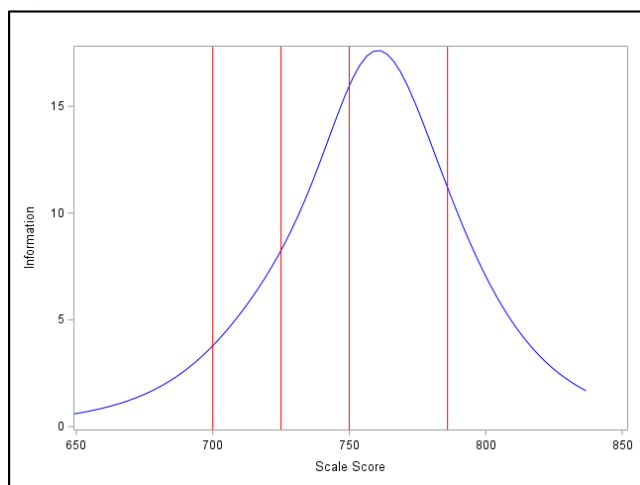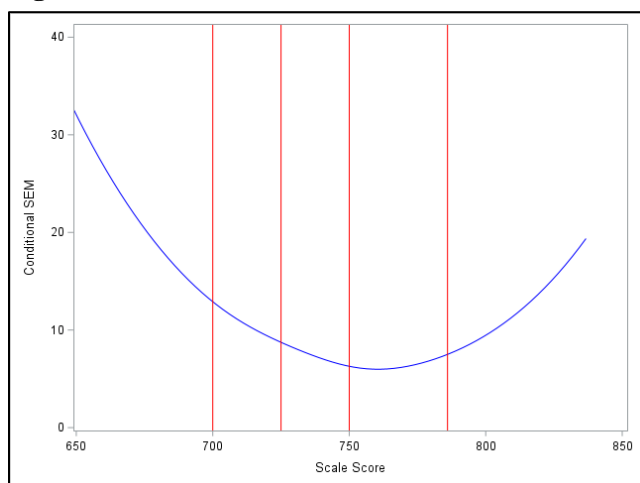**Figure N.6. Mathematics Grade 4 CSEM Curve**

**Figure N.7. Mathematics Grade 5 TCC**



**Figure N.8. Mathematics Grade 5 TIC**



**Figure N.9. Mathematics Grade 5 CSEM Curve**

**Figure N.10. Mathematics Grade 6 TCC**



**Figure N.11. Mathematics Grade 6 TIC**



**Figure N.12. Mathematics Grade 6 CSEM Curve**

**Figure N.13. Mathematics Grade 7 TCC**



**Figure N.14. Mathematics Grade 7 TIC**



**Figure N.15. Mathematics Grade 7 CSEM Curve**

**Figure N.16. Mathematics Grade 8 TCC**
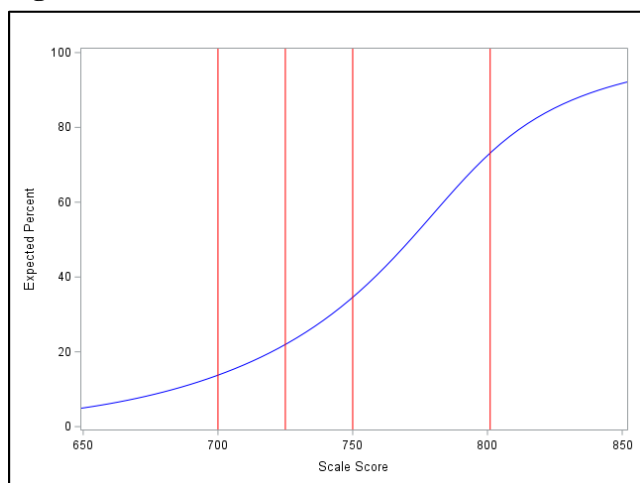


**Figure N.17. Mathematics Grade 8 TIC**
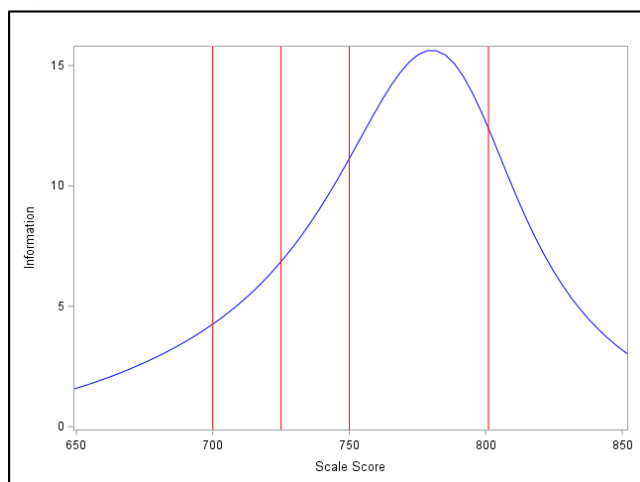


**Figure N.18. Mathematics Grade 8 CSEM Curve**
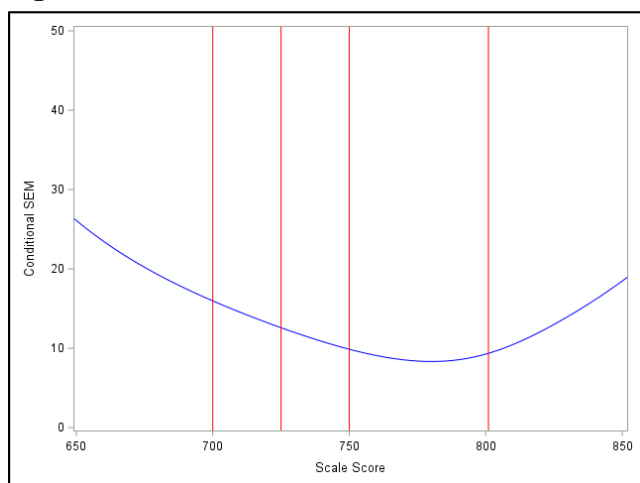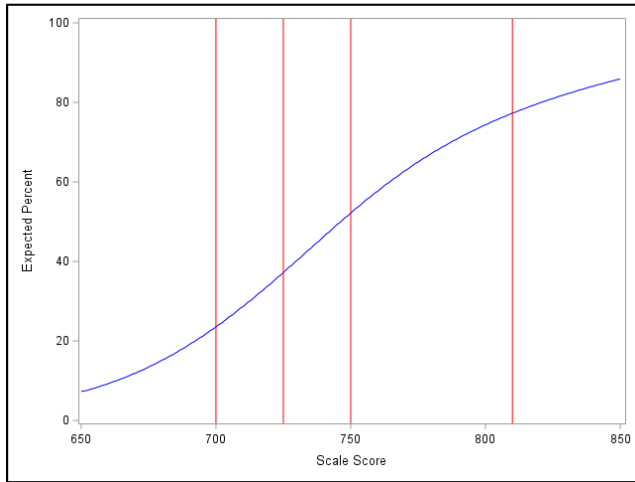
**Figure N.19. ELA Grade 3 TCC**
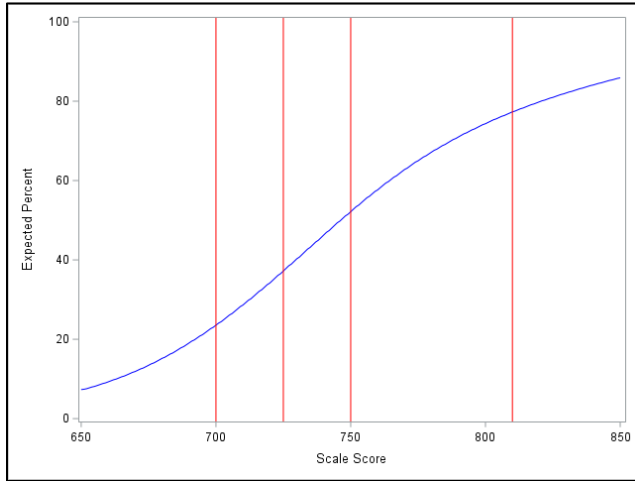


**Figure N.20. ELA Grade 3 TIC**



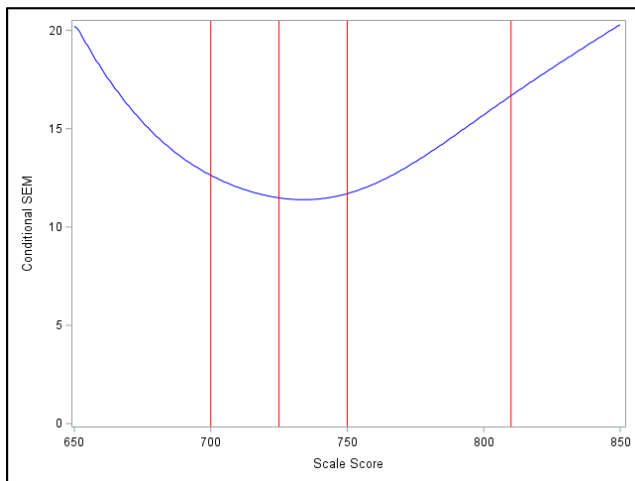**Figure N.21. ELA Grade 3 CSEM Curve**

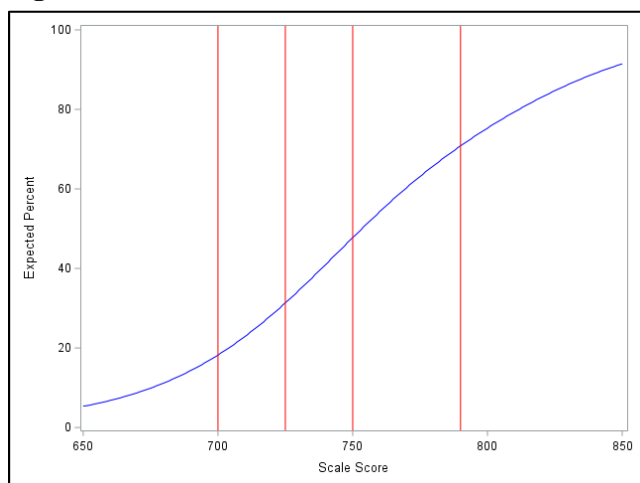**Figure N.22. ELA Grade 4 TCC**



**Figure N.23. ELA Grade 4 TIC**
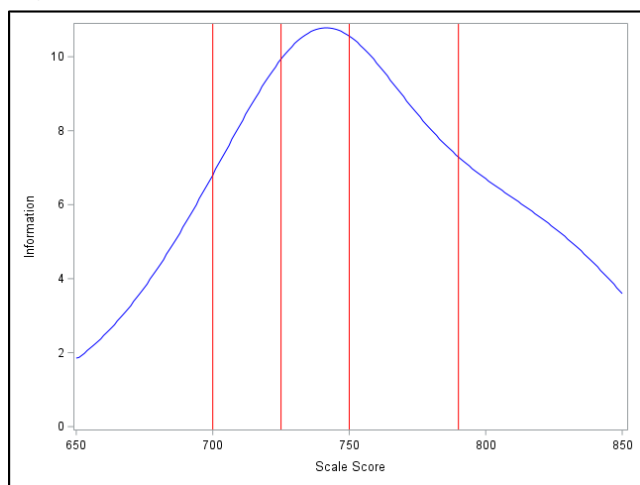


**Figure N.24. ELA Grade 4 CSEM Curve**
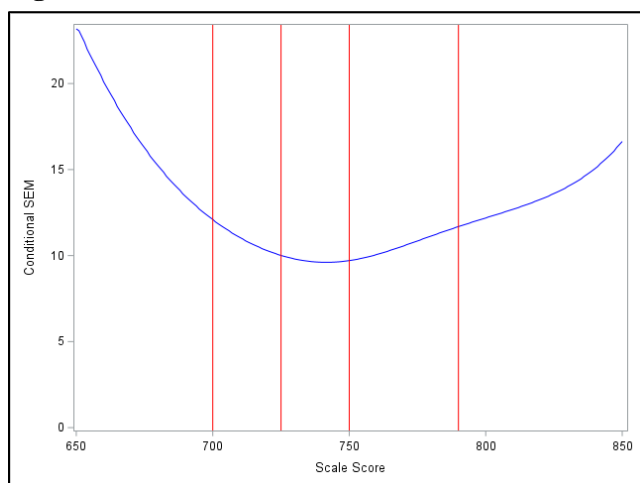
**Figure N.25. ELA Grade 5 TCC**
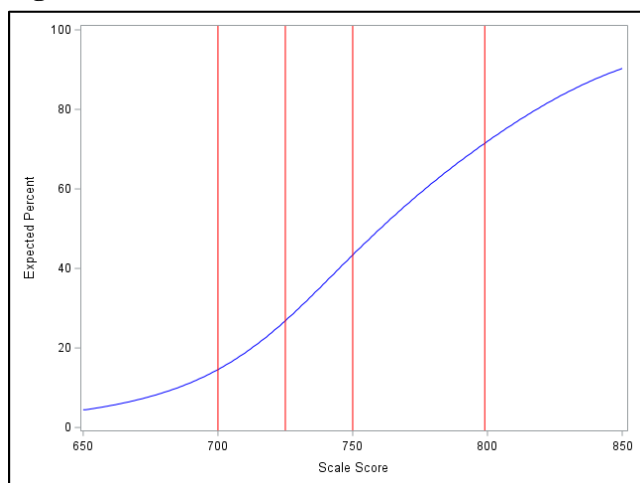


**Figure N.26. ELA Grade 5 TIC**
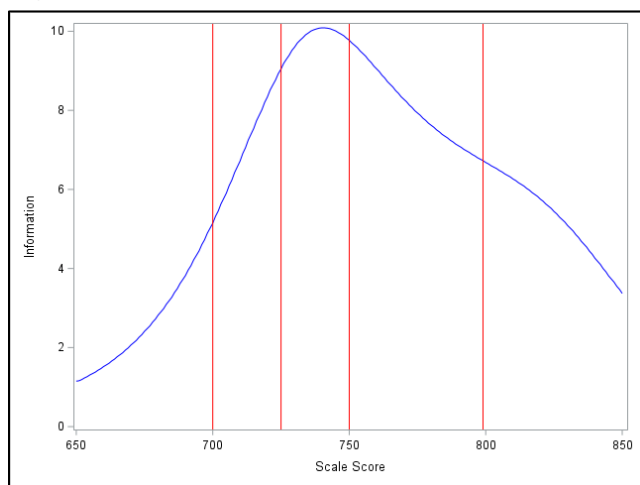


**Figure N.27. ELA Grade 5 CSEM Curve**
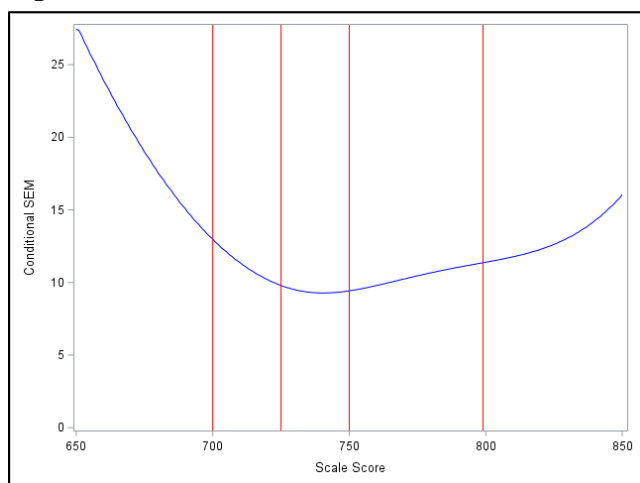
**Figure N.28. ELA Grade 6 TCC**
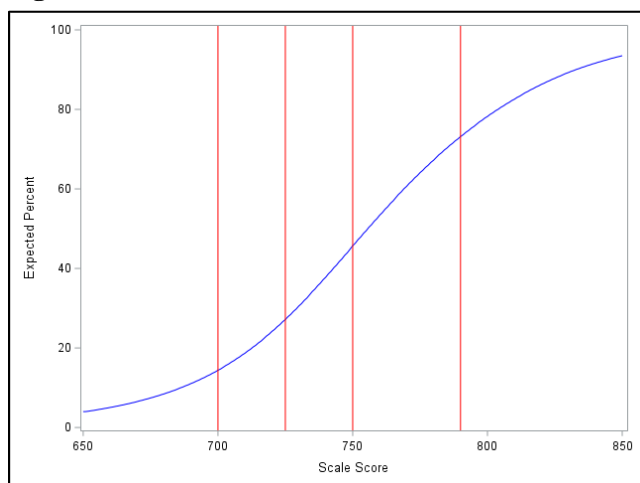


**Figure N.29. ELA Grade 6 TIC**
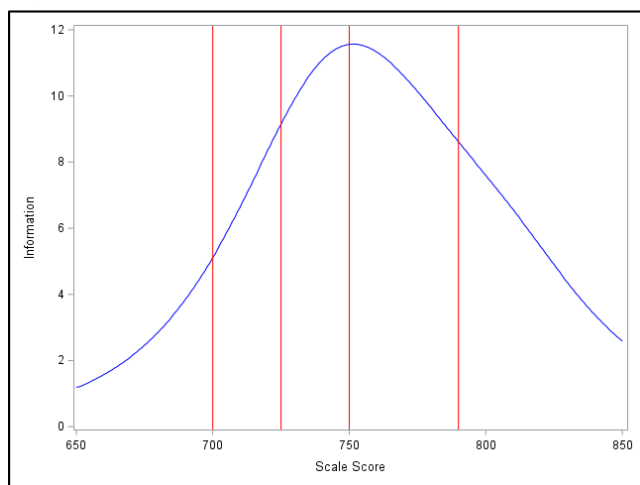


**Figure N.30. ELA Grade 6 CSEM Curve**
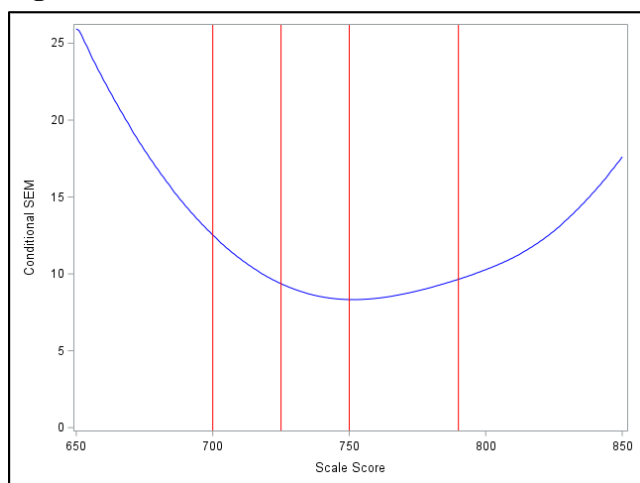
**Figure N.31. ELA Grade 7 TCC**
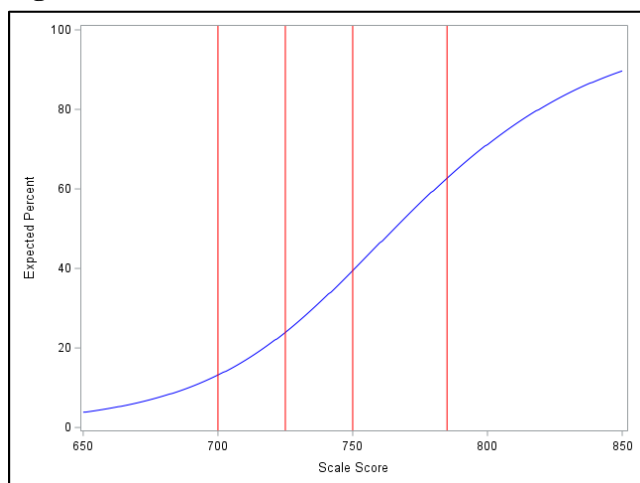


**Figure N.32. ELA Grade 7 TIC**
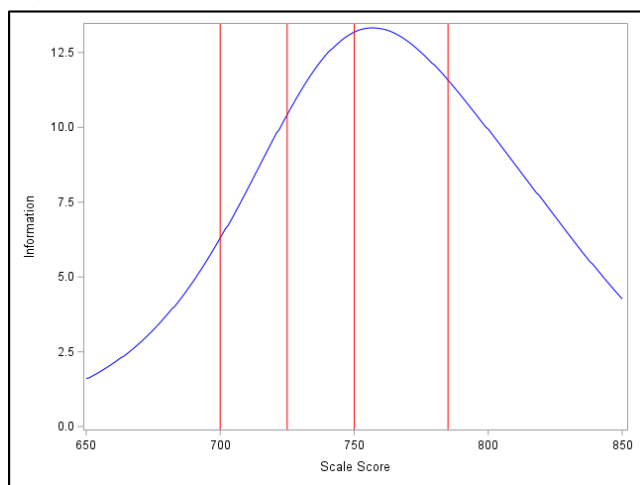


**Figure N.33. ELA Grade 7 CSEM Curve**
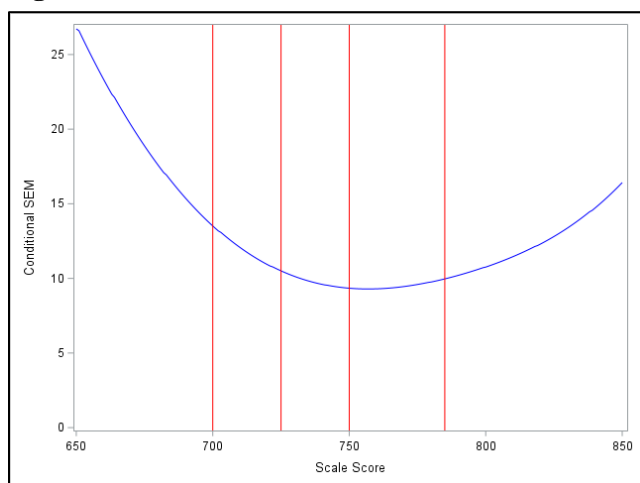
**Figure N.34. ELA Grade 8 TCC**
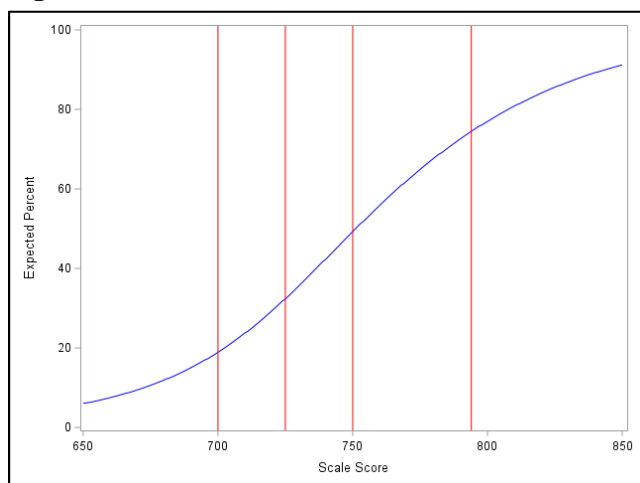


**Figure N.35. ELA Grade 8 TIC**
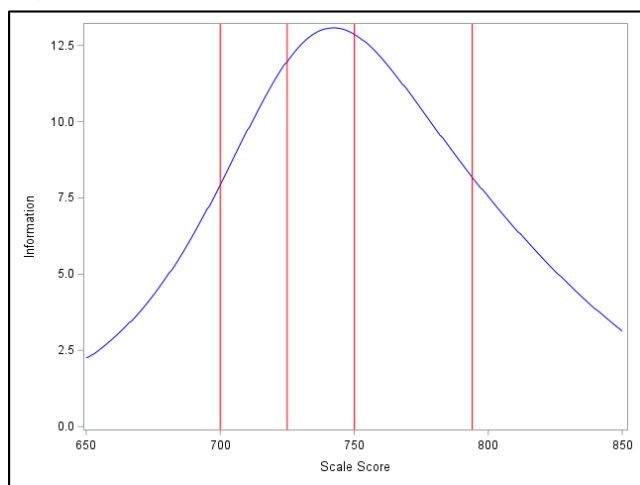


**Figure N.36. ELA Grade 8 CSEM Curve**
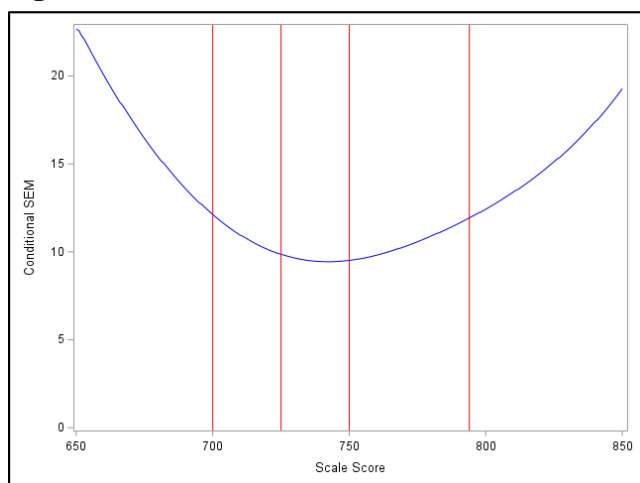
**Figure N.37. CSLA Grade 3 TCC**
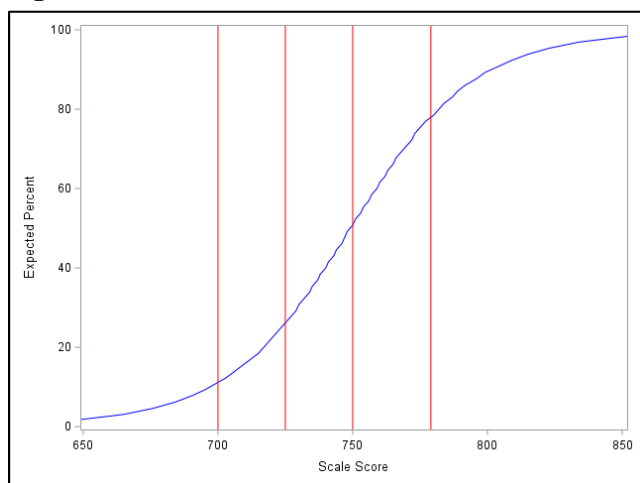


**Figure N.38. CSLA Grade 3 TIC**
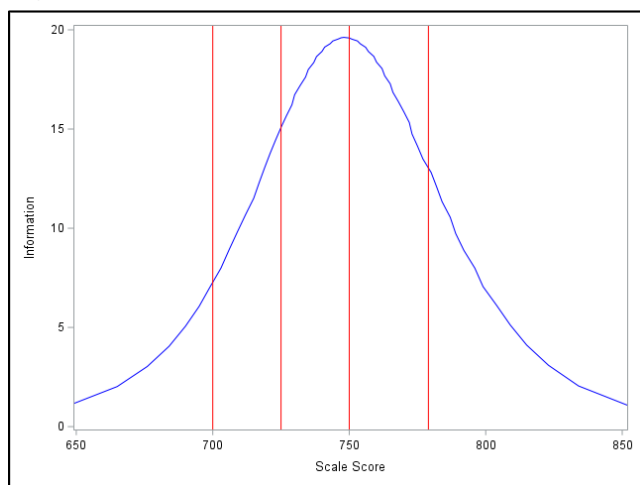


**Figure N.39. CSLA Grade 3 CSEM Curve**
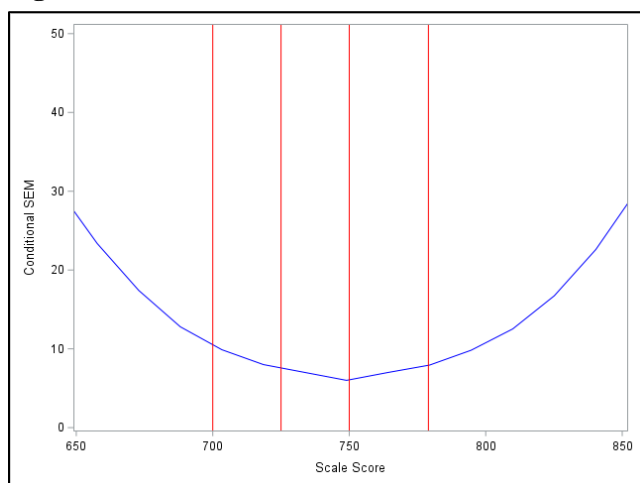
**Figure N.40. CSLA Grade 4 TCC**
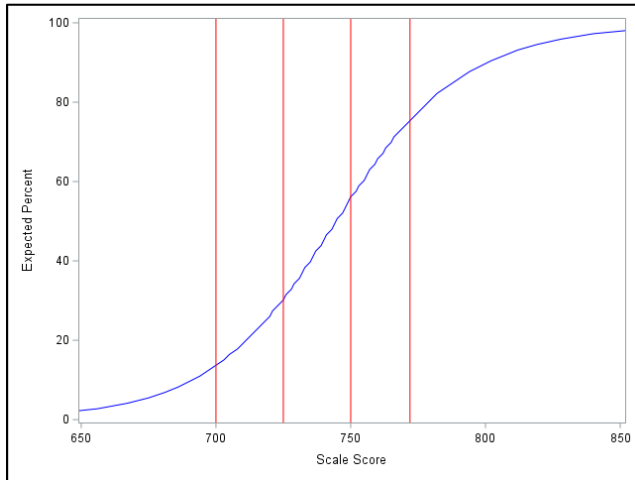


**Figure N.41. CSLA Grade 4 TIC**
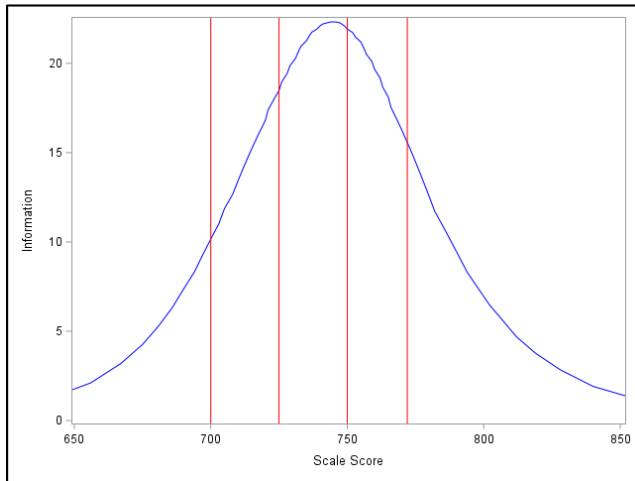


**Figure N.42. CSLA Grade 4 CSEM Curve**
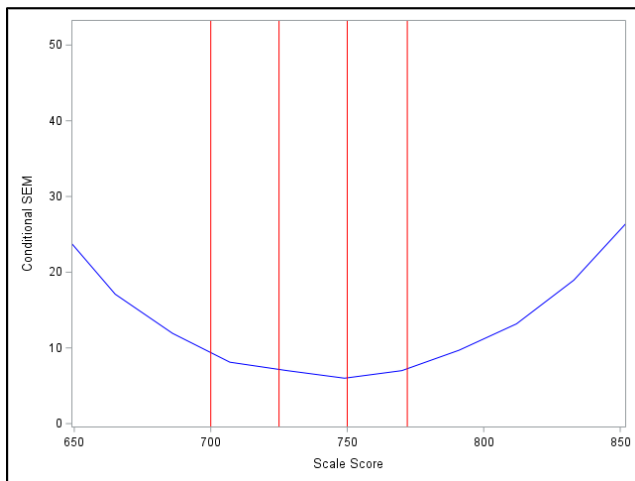
**Figure N.43. ELA Reading Grade 3 TCC**
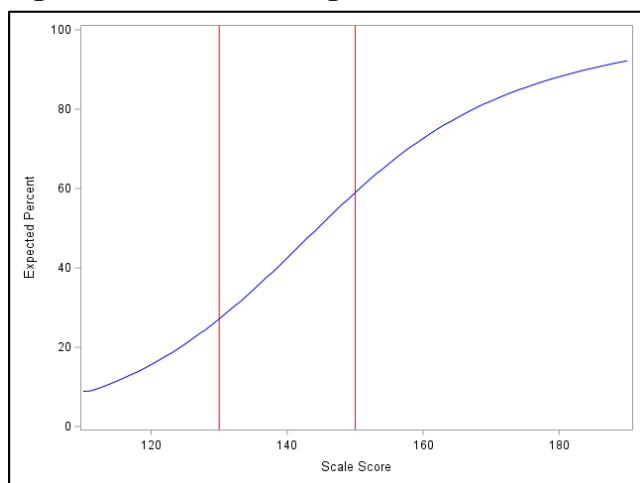


**Figure N.44. ELA Reading Grade 3 TIC**
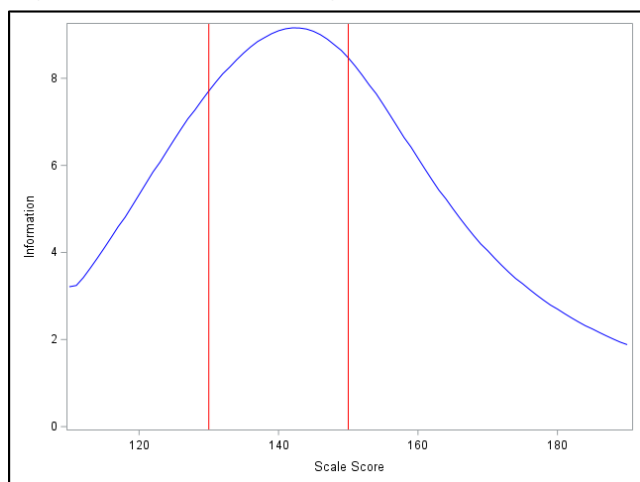


**Figure N.45. ELA Reading Grade 3 CSEM Curve**
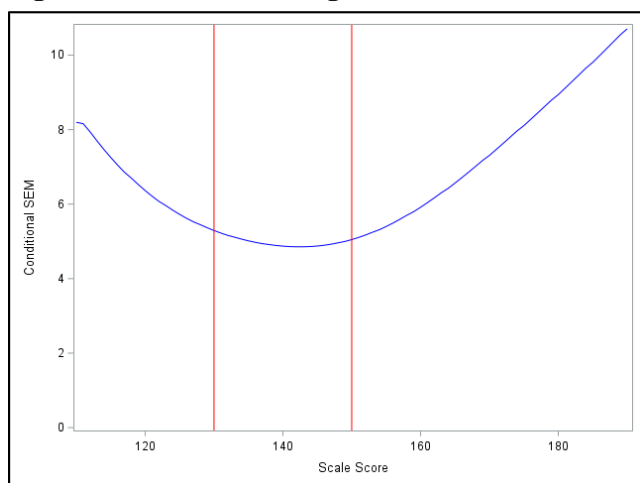
**Figure N.46. ELA Reading Grade 4 TCC**
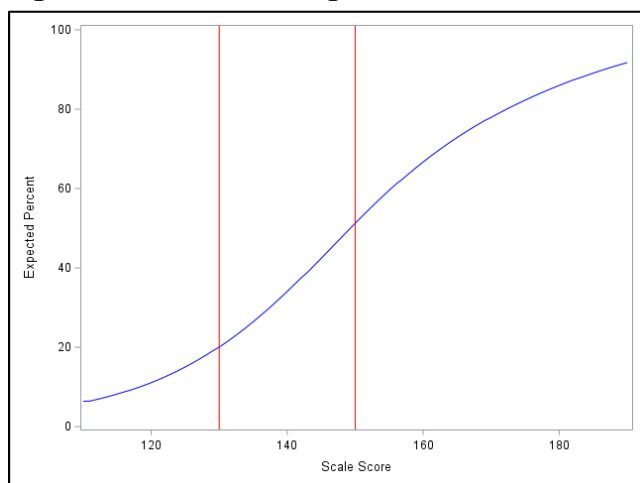


**Figure N.47. ELA Reading Grade 4 TIC**
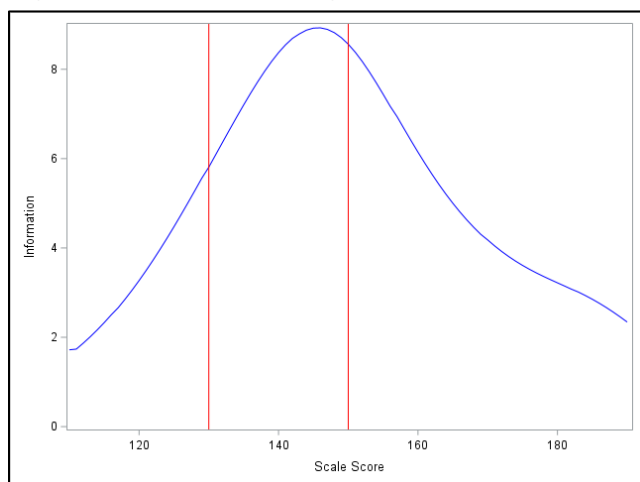


**Figure N.48. ELA Reading Grade 4 CSEM Curve**
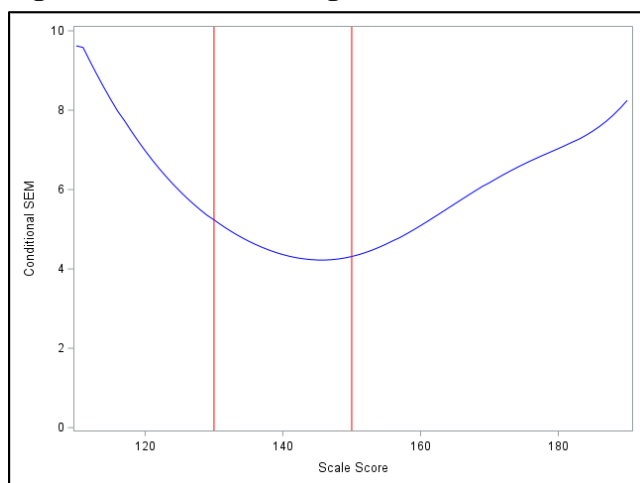
**Figure N.49. ELA Reading Grade 5 TCC**
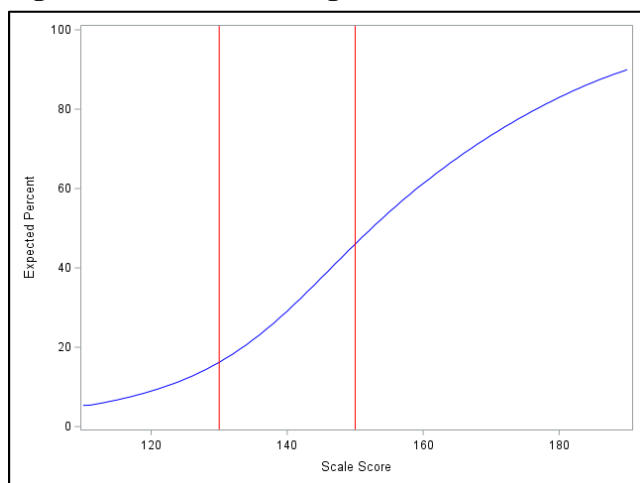


**Figure N.50. ELA Reading Grade 5 TIC**
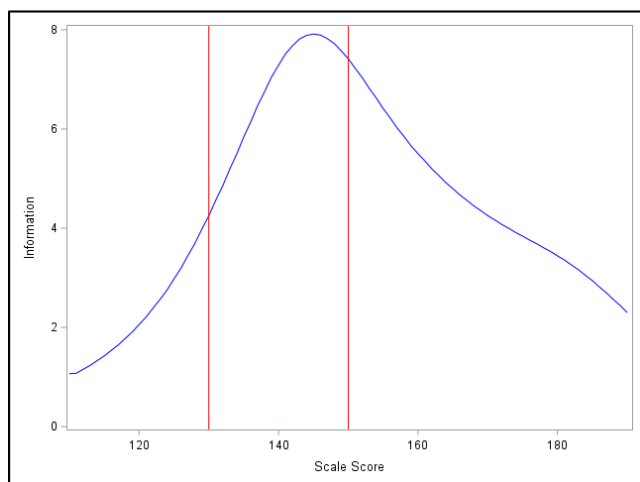


**Figure N.51. ELA Reading Grade 5 CSEM Curve**
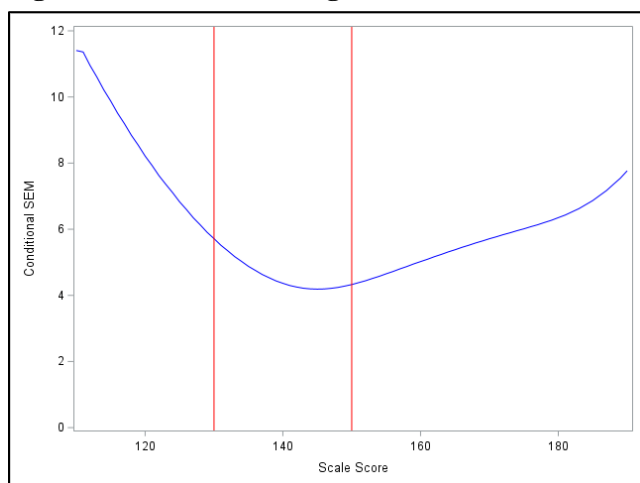
**Figure N.52. ELA Reading Grade 6 TCC**
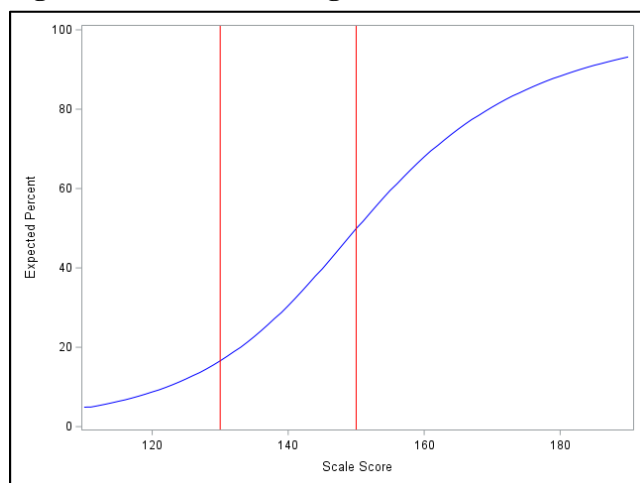


**Figure N.53. ELA Reading Grade 6 TIC**
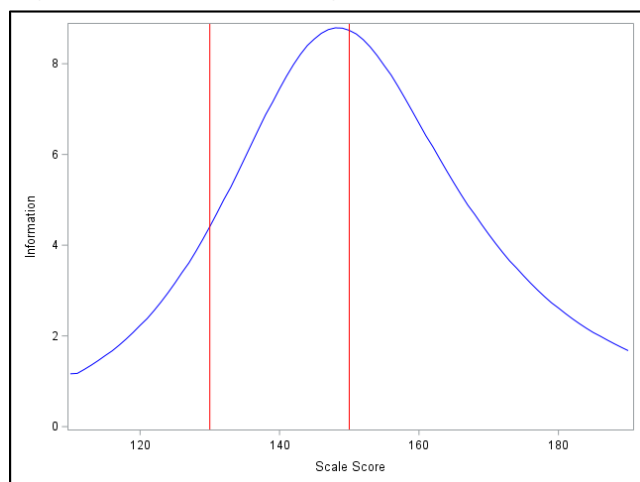


**Figure N.54. ELA Reading Grade 6 CSEM Curve**
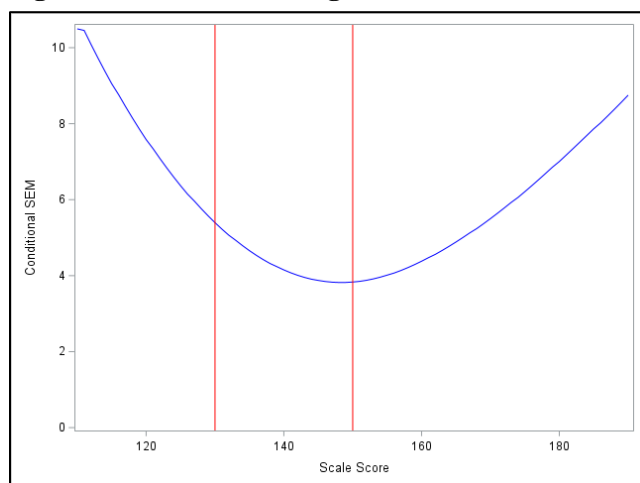
**Figure N.55. ELA Reading Grade 7 TCC**
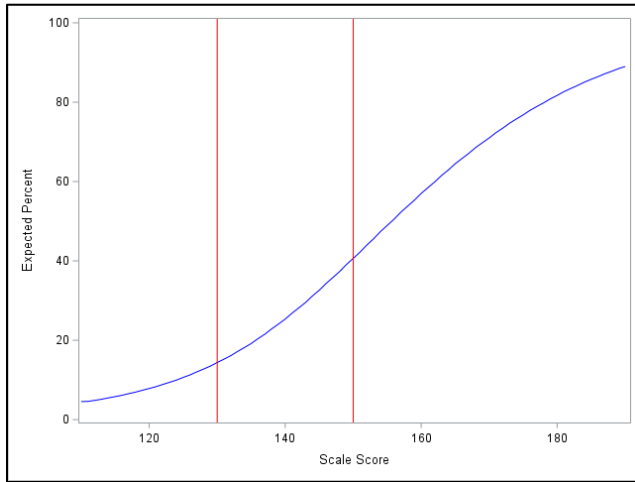


**Figure N.56. ELA Reading Grade 7 TIC**
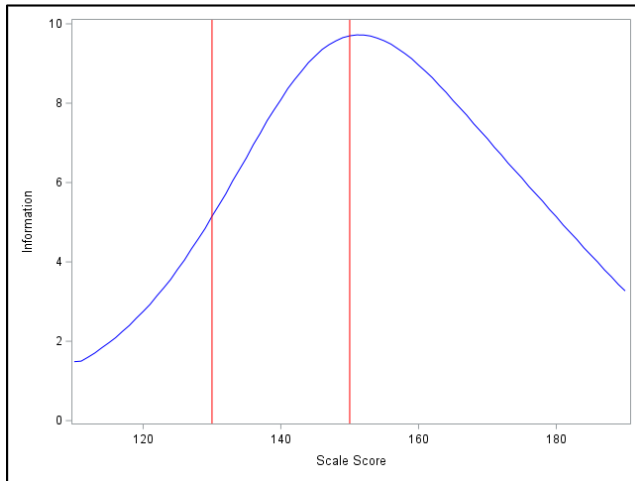


**Figure N.57. ELA Reading Grade 7 CSEM Curve**
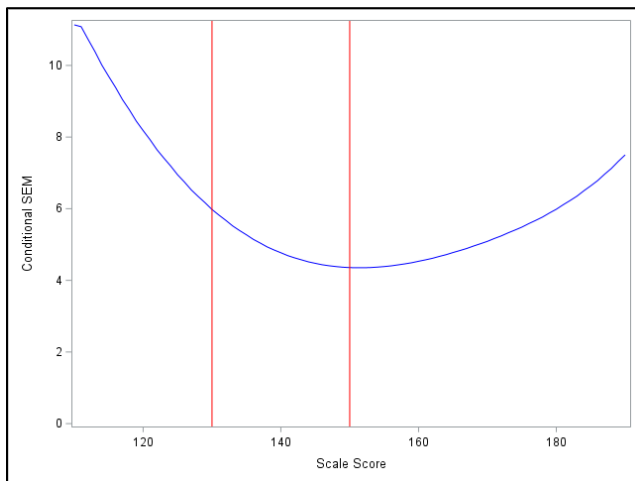
**Figure N.58. ELA Reading Grade 8 TCC**
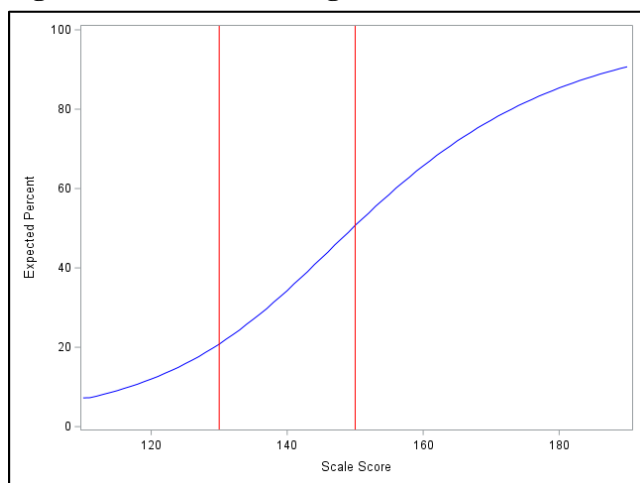


**Figure N.59. ELA Reading Grade 8 TIC**
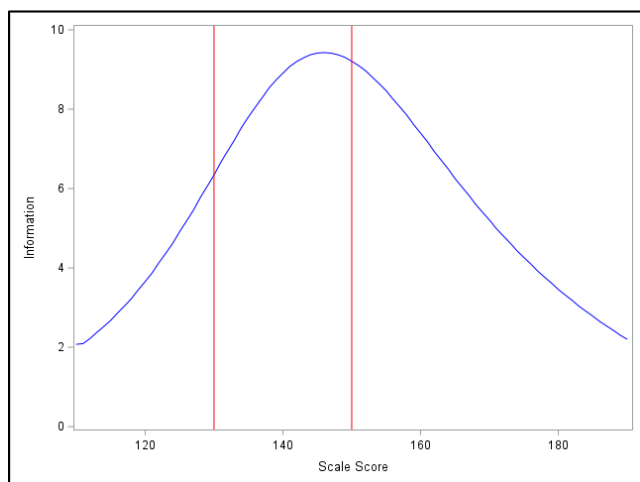


**Figure N.60. ELA Reading Grade 8 CSEM Curve**
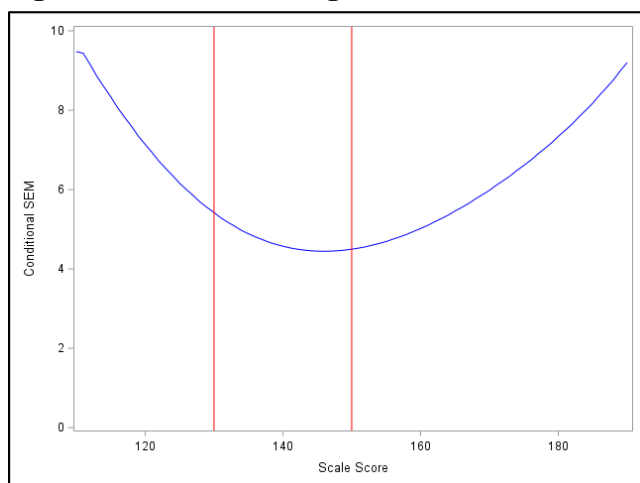
**Figure N.61. CSLA Reading Grade 3 TCC**
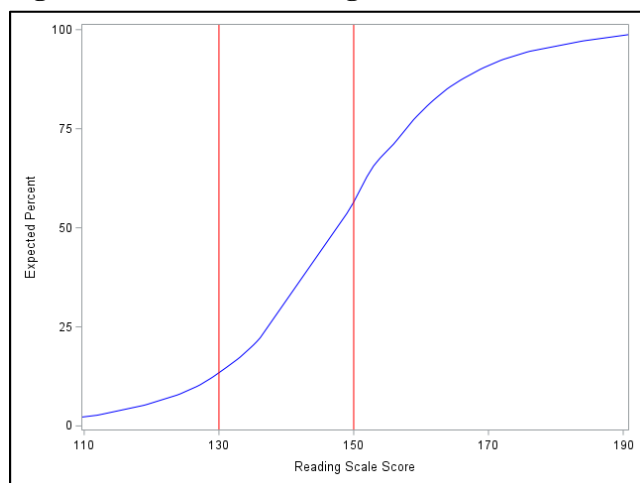


**Figure N.62. CSLA Reading Grade 3 TIC**
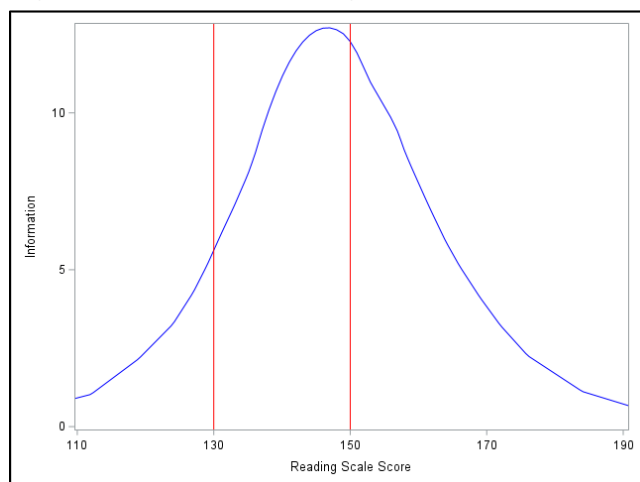


**Figure N.63. CSLA Reading Grade 3 CSEM Curve**
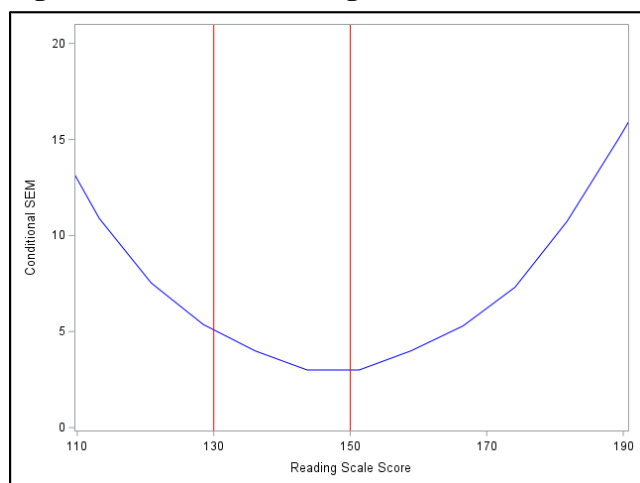
**Figure N.64. CSLA Reading Grade 4 TCC**
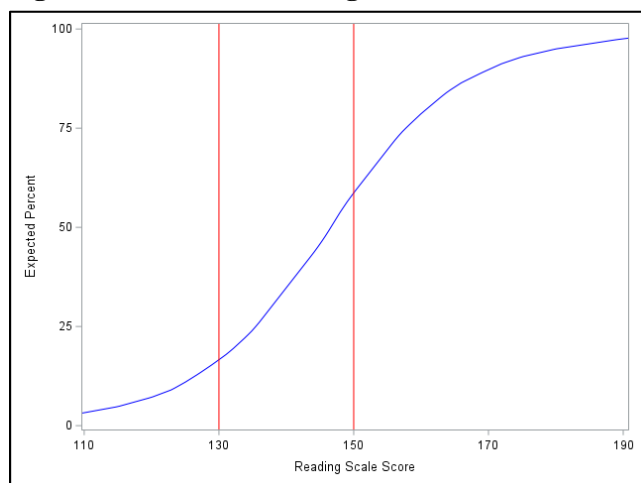


**Figure N.65. CSLA Reading Grade 4 TIC**
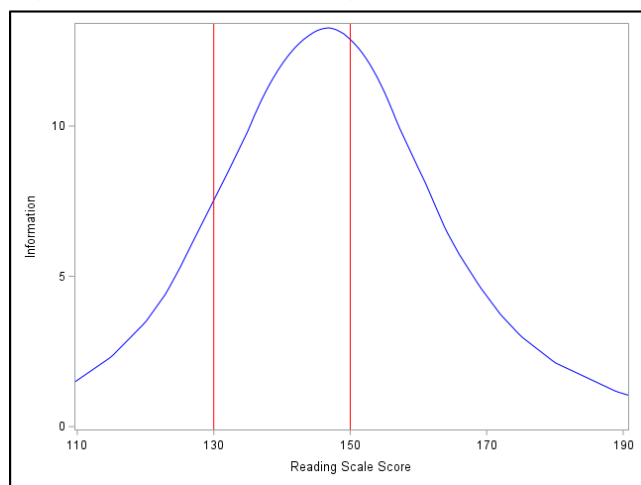


**Figure N.66. CSLA Reading Grade 4 CSEM Curve**
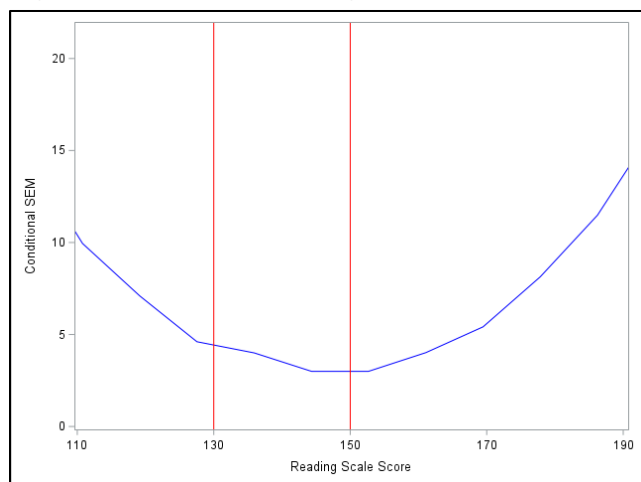
**Figure N.67. Science Grade 5 TCC**
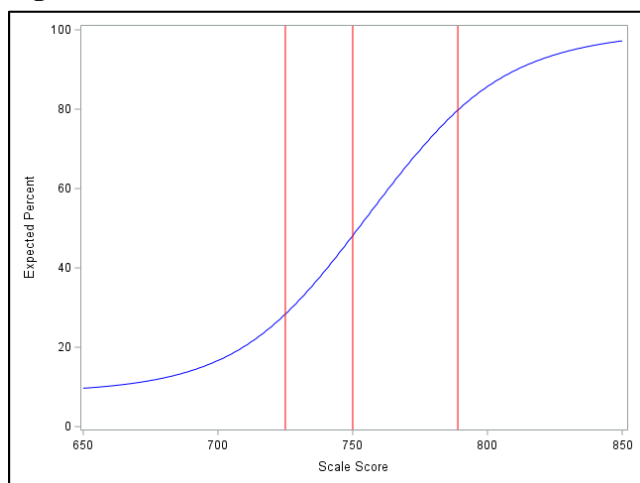


**Figure N.68. Science Grade 5 TIC**
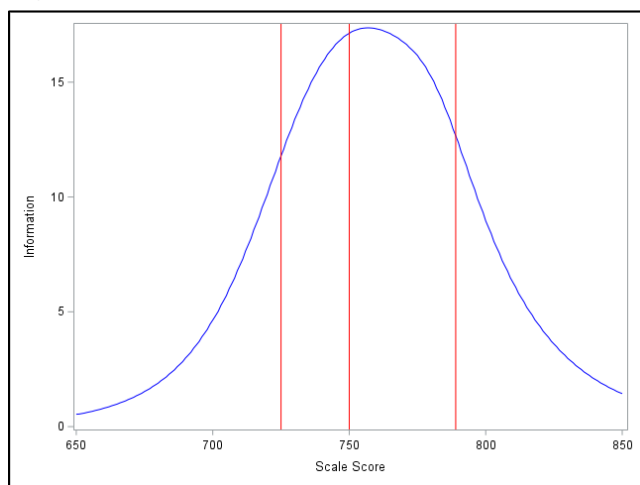


**Figure N.69. Science Grade 5 CSEM**
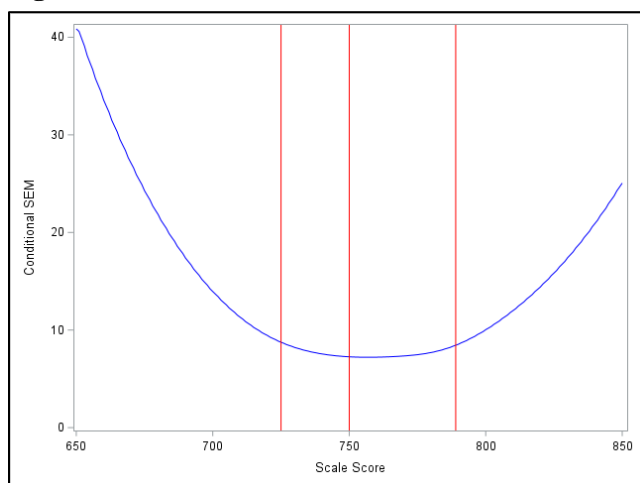
**Figure N.70. Science Grade 8 TCC**
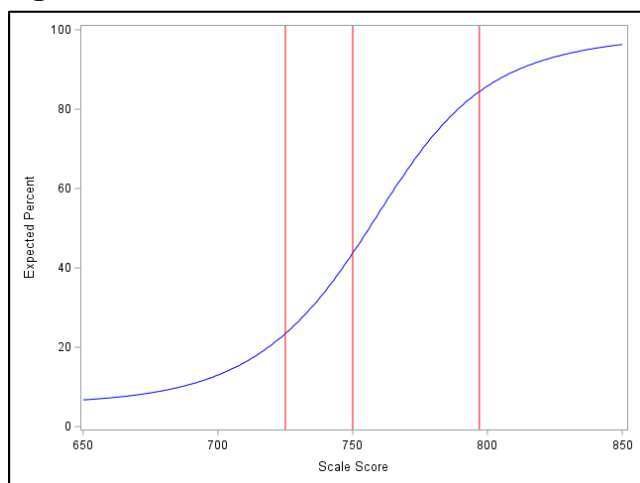


**Figure N.71. Science Grade 8 TIC**
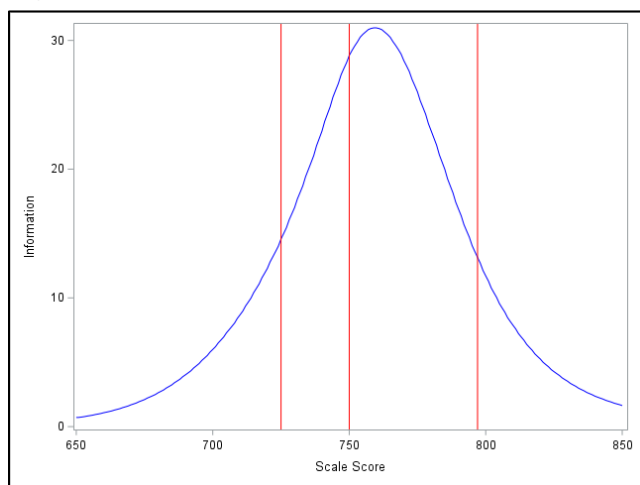


**Figure N.72. Science Grade 8 CSEM**
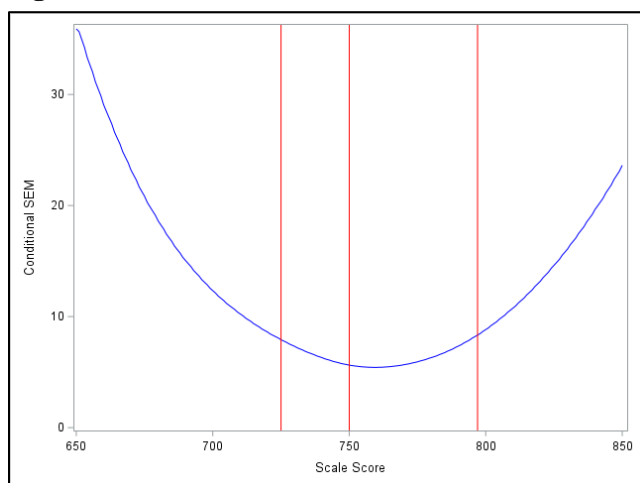
**Figure N.73. Science Grade 11 TCC**
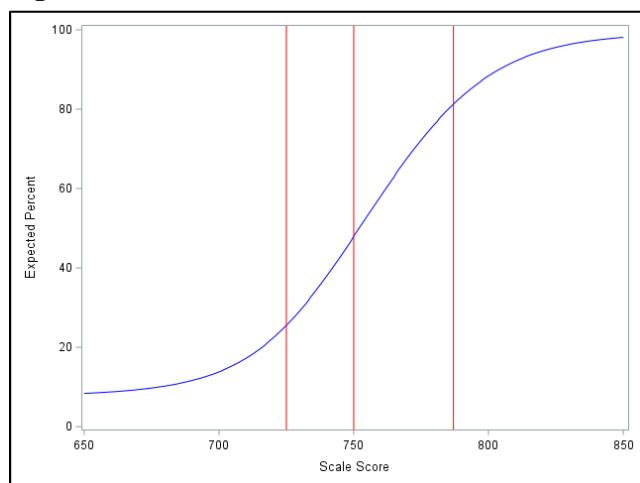


**Figure N.74. Science Grade 11 TIC**
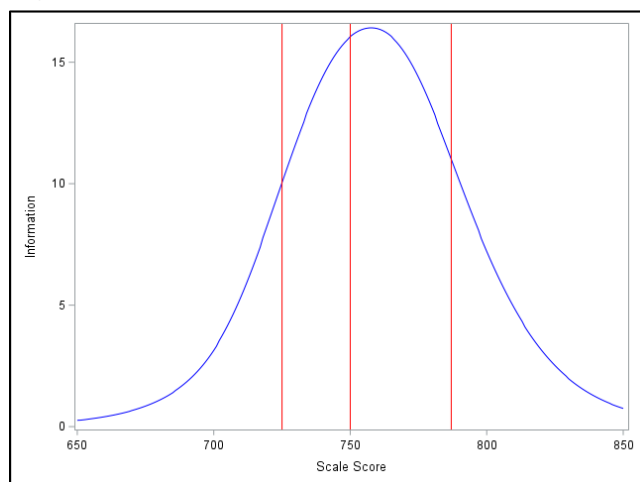


**Figure N.75. Science Grade 11 CSEM**
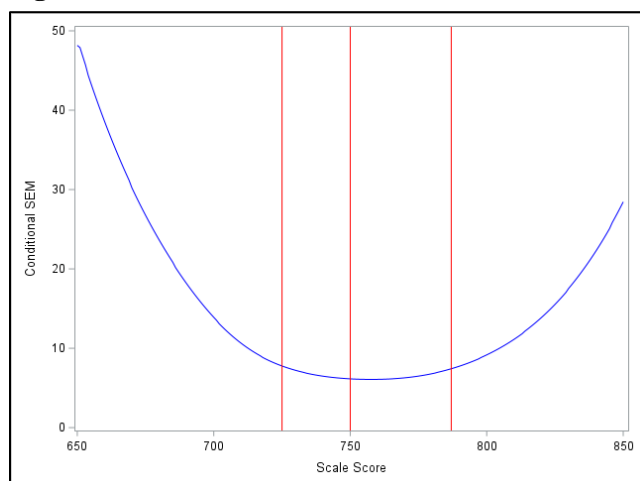
# Appendix O: Inter-Rater Agreement

**Table O.1. Operational Rater Agreement Statistics—Mathematics Grade 3**

| Item | Max. Points | N | %Exact | %Adjacent | %Non-Adjacent | Kappa | MD | Corr. |
|---|---|---|---|---|---|---|---|---|
| Item 1 | 3 | 5,428 | 88.0 | 11.6 | 0.4 | 0.94 | 0.00 | 0.94 |
| Item 2 | 4 | 5,510 | 83.4 | 15.7 | 1.0 | 0.90 | 0.01 | 0.90 |
| Item 3_PartB | 2 | 5,059 | 91.4 | 8.3 | 0.2 | 0.92 | 0.02 | 0.92 |
| Item 4_PartB | 3 | 5,056 | 85.8 | 13.6 | 0.6 | 0.93 | 0.00 | 0.93 |
| Item 4_PartC | 4 | 4,997 | 92.0 | 6.9 | 1.1 | 0.95 | 0.00 | 0.95 |

**Table O.2. Operational Rater Agreement Statistics—Mathematics Grade 4**

| Item | Max. Points | N | %Exact | %Adjacent | %Non-Adjacent | Kappa | MD | Corr. |
|---|---|---|---|---|---|---|---|---|
| Item 1 | 3 | 5,430 | 89.3 | 9.8 | 0.9 | 0.95 | 0.00 | 0.95 |
| Item 2_PartB | 3 | 5,044 | 93.4 | 5.7 | 0.9 | 0.97 | 0.00 | 0.97 |
| Item 3 | 3 | 5,326 | 95.2 | 3.2 | 1.5 | 0.95 | 0.00 | 0.95 |
| Item 4_PartA | 2 | 5,118 | 89.5 | 10.2 | 0.2 | 0.90 | 0.01 | 0.90 |
| Item 4_PartB | 2 | 4,946 | 94.0 | 5.8 | 0.2 | 0.94 | 0.01 | 0.94 |
| Item 5 | 6 | 5,493 | 89.6 | 9.1 | 1.3 | 0.98 | 0.00 | 0.98 |

**Table O.3. Operational Rater Agreement Statistics—Mathematics Grade 5**

| Item | Max. Points | N | %Exact | %Adjacent | %Non-Adjacent | Kappa | MD | Corr. |
|---|---|---|---|---|---|---|---|---|
| Item 1_PartA | 3 | 5,494 | 92.0 | 7.4 | 0.7 | 0.96 | 0.00 | 0.96 |
| Item 1_PartB | 3 | 5,263 | 93.9 | 5.0 | 1.1 | 0.95 | 0.00 | 0.95 |
| Item 2 | 3 | 5,335 | 90.9 | 8.6 | 0.5 | 0.93 | 0.01 | 0.93 |
| Item 3_PartB | 3 | 5,169 | 87.5 | 11.7 | 0.8 | 0.89 | 0.01 | 0.89 |
| Item 4 | 4 | 5,449 | 80.9 | 17.1 | 2.1 | 0.92 | 0.00 | 0.92 |
| Item 5_PartB | 2 | 5,392 | 94.1 | 5.7 | 0.1 | 0.94 | 0.00 | 0.94 |

**Table O.4. Operational Rater Agreement Statistics—Mathematics Grade 6**

| Item | Max. Points | N | %Exact | %Adjacent | %Non-Adjacent | Kappa | MD | Corr. |
|---|---|---|---|---|---|---|---|---|
| Item 1_PartA | 4 | 5,371 | 91.0 | 7.0 | 2.0 | 0.95 | 0.00 | 0.95 |
| Item 1_PartB | 2 | 5,244 | 97.3 | 2.6 | 0.1 | 0.96 | 0.01 | 0.96 |
| Item 2 | 3 | 5,507 | 88.5 | 11.1 | 0.4 | 0.95 | 0.00 | 0.95 |
| Item 3 | 4 | 5,389 | 85.1 | 12.7 | 2.2 | 0.91 | 0.00 | 0.91 |
| Item 4 | 4 | 5,439 | 75.0 | 22.1 | 2.9 | 0.92 | 0.01 | 0.92 |
| Item 5 | 3 | 5,478 | 80.7 | 17.4 | 1.9 | 0.88 | 0.01 | 0.88 |

**Table O.5. Operational Rater Agreement Statistics—Mathematics Grade 7**

| Item | Max. Points | N | %Exact | %Adjacent | %Non-Adjacent | Kappa | MD | Corr. |
|---|---|---|---|---|---|---|---|---|
| Item 1_PartA | 3 | 5,215 | 87.0 | 10.0 | 3.0 | 0.85 | 0.00 | 0.85 |
| Item 1_PartB | 3 | 5,063 | 91.7 | 6.6 | 1.7 | 0.94 | 0.00 | 0.94 |
| Item 2 | 3 | 5,147 | 88.9 | 10.8 | 0.3 | 0.95 | 0.00 | 0.95 |
| Item 3 | 4 | 5,190 | 82.8 | 15.5 | 1.7 | 0.93 | 0.01 | 0.93 |
| Item 4_PartB | 3 | 5,128 | 88.9 | 10.9 | 0.2 | 0.91 | 0.01 | 0.91 |
| Item 5 | 3 | 5,184 | 84.3 | 14.8 | 0.9 | 0.83 | 0.02 | 0.83 |

**Table O.6. Operational Rater Agreement Statistics—Mathematics Grade 8**

| Item | Max. Points | N | %Exact | %Adjacent | %Non-Adjacent | Kappa | MD | Corr. |
|---|---|---|---|---|---|---|---|---|
| Item 1 | 3 | 4,942 | 92.1 | 7.6 | 0.3 | 0.96 | 0.01 | 0.96 |
| Item 2_PartB | 3 | 4,677 | 88.0 | 11.2 | 0.8 | 0.88 | 0.01 | 0.88 |
| Item 3 | 4 | 4,838 | 89.4 | 9.6 | 1.0 | 0.91 | 0.00 | 0.91 |
| Item 4 | 3 | 5,033 | 87.9 | 10.7 | 1.4 | 0.93 | 0.00 | 0.93 |
| Item 5_PartA | 4 | 4,914 | 93.4 | 6.0 | 0.6 | 0.96 | 0.00 | 0.96 |
| Item 5_PartB | 2 | 4,809 | 90.2 | 9.5 | 0.3 | 0.92 | 0.00 | 0.92 |

**Table O.7. Field Test Rater Agreement Statistics—Mathematics Grade 3**

| Item | Max. Points | N | %Exact | %Adjacent | %Non-Adjacent | Kappa | MD | Corr. |
|---|---|---|---|---|---|---|---|---|
| Item 1 | 3 | 2,945 | 94.8 | 3.8 | 1.4 | 0.97 | 0.01 | 0.97 |
| Item 2 | 3 | 2,929 | 92.8 | 6.7 | 0.5 | 0.97 | 0.00 | 0.97 |
| Item 3 | 3 | 2,899 | 87.4 | 11.8 | 0.8 | 0.94 | 0.01 | 0.94 |
| Item 4_PartA | 2 | 2,762 | 92.0 | 7.7 | 0.2 | 0.93 | 0.00 | 0.93 |
| Item 5 | 3 | 2,865 | 92.3 | 6.8 | 0.9 | 0.92 | 0.00 | 0.92 |
| Item 6_PartB | 3 | 2,997 | 87.5 | 12.3 | 0.3 | 0.94 | 0.01 | 0.94 |
| Item 7_PartA | 2 | 2,957 | 92.7 | 7.2 | 0.1 | 0.95 | 0.00 | 0.95 |
| Item 7_PartB | 2 | 2,956 | 91.0 | 8.9 | 0.1 | 0.92 | 0.02 | 0.92 |
| Item 8_PartC | 2 | 2,997 | 90.8 | 9.1 | 0.0 | 0.91 | 0.00 | 0.91 |
| Item 9_PartB | 2 | 2,831 | 95.3 | 4.6 | 0.1 | 0.97 | 0.00 | 0.97 |
| Item 10_PartC | 2 | 2,899 | 97.2 | 2.7 | 0.1 | 0.97 | 0.00 | 0.97 |
| Item 10_PartD | 2 | 2,899 | 95.4 | 4.5 | 0.1 | 0.96 | 0.00 | 0.96 |
| Item 11 | 3 | 2,993 | 90.4 | 9.1 | 0.5 | 0.96 | 0.00 | 0.96 |
| Item 12 | 3 | 2,996 | 81.1 | 17.6 | 1.3 | 0.91 | 0.00 | 0.91 |
| Item 13_PartB | 2 | 2,881 | 92.4 | 7.4 | 0.2 | 0.94 | 0.00 | 0.94 |
| Item 14 | 3 | 2,875 | 85.1 | 13.8 | 1.1 | 0.89 | 0.01 | 0.89 |
| Item 15_PartA | 2 | 2,911 | 90.3 | 9.4 | 0.3 | 0.93 | 0.00 | 0.93 |
| Item 15_PartB | 2 | 2,908 | 92.2 | 7.6 | 0.2 | 0.92 | 0.02 | 0.92 |
| Item 16_PartB | 3 | 2,963 | 85.2 | 13.8 | 1.0 | 0.91 | 0.02 | 0.91 |
| Item 17_PartA | 2 | 2,995 | 94.3 | 5.6 | 0.1 | 0.94 | 0.01 | 0.95 |
| Item 17_PartB | 2 | 2,995 | 90.9 | 9.1 | 0.0 | 0.92 | 0.02 | 0.92 |
| Item 18 | 3 | 2,996 | 86.7 | 12.5 | 0.8 | 0.94 | 0.01 | 0.94 |
| Item 19_PartA | 2 | 2,908 | 90.3 | 9.6 | 0.1 | 0.90 | 0.01 | 0.90 |
| Item 19_PartB | 2 | 2,908 | 91.8 | 8.0 | 0.1 | 0.93 | 0.01 | 0.93 |
| Item 20_PartA | 2 | 2,873 | 97.0 | 2.9 | 0.2 | 0.98 | 0.00 | 0.98 |
| Item 20_PartB | 2 | 2,873 | 97.3 | 2.6 | 0.1 | 0.97 | 0.01 | 0.97 |
| Item 21_PartA | 2 | 2,901 | 91.2 | 8.7 | 0.1 | 0.93 | 0.00 | 0.93 |
| Item 21_PartB | 2 | 2,900 | 93.1 | 6.9 | 0.0 | 0.94 | 0.01 | 0.94 |
| Item 23_PartB | 2 | 2,852 | 97.3 | 2.7 | 0.0 | 0.98 | 0.00 | 0.98 |
| Item 24_PartA | 4 | 2,985 | 93.5 | 5.7 | 0.8 | 0.98 | 0.01 | 0.98 |
| Item 24_PartB | 2 | 2,983 | 94.8 | 5.0 | 0.2 | 0.97 | 0.00 | 0.97 |
| Item 25_PartB | 2 | 2,984 | 93.9 | 5.5 | 0.5 | 0.95 | 0.00 | 0.95 |
| Item 25_PartC | 3 | 2,983 | 90.3 | 9.3 | 0.4 | 0.95 | 0.00 | 0.95 |

**Table O.8. Field Test Rater Agreement Statistics—Mathematics Grade 4**

| Item | Max. Points | N | %Exact | %Adjacent | %Non-Adjacent | Kappa | MD | Corr. |
|---|---|---|---|---|---|---|---|---|
| Item 1_PartB | 2 | 2,998 | 90.2 | 9.7 | 0.1 | 0.88 | 0.00 | 0.88 |
| Item 2 | 3 | 2,997 | 80.7 | 18.1 | 1.1 | 0.89 | 0.01 | 0.89 |
| Item 3 | 3 | 2,988 | 89.4 | 9.9 | 0.8 | 0.90 | 0.01 | 0.90 |
| Item 4_PartA | 2 | 2,838 | 94.9 | 4.7 | 0.4 | 0.95 | 0.01 | 0.95 |
| Item 4_PartB | 2 | 2,832 | 94.1 | 5.8 | 0.2 | 0.90 | 0.00 | 0.90 |
| Item 5_PartA | 2 | 2,992 | 92.1 | 7.7 | 0.2 | 0.95 | 0.00 | 0.95 |
| Item 5_PartB | 2 | 2,985 | 90.5 | 9.0 | 0.5 | 0.89 | 0.01 | 0.89 |
| Item 6 | 3 | 2,990 | 92.5 | 6.1 | 1.3 | 0.89 | 0.01 | 0.89 |
| Item 7 | 3 | 2,973 | 86.2 | 13.0 | 0.8 | 0.94 | 0.01 | 0.94 |
| Item 8_PartB | 2 | 2,969 | 94.1 | 5.6 | 0.4 | 0.95 | 0.01 | 0.95 |
| Item 9 | 3 | 2,994 | 81.9 | 16.7 | 1.4 | 0.87 | 0.01 | 0.87 |
| Item 10_PartB | 3 | 2,992 | 82.6 | 16.2 | 1.2 | 0.91 | 0.01 | 0.91 |
| Item 11_PartA | 2 | 2,994 | 93.6 | 6.2 | 0.2 | 0.96 | 0.00 | 0.96 |
| Item 11_PartB | 2 | 2,990 | 90.0 | 9.7 | 0.3 | 0.93 | 0.00 | 0.93 |
| Item 12_PartA | 2 | 2,828 | 92.6 | 7.2 | 0.2 | 0.95 | 0.01 | 0.95 |
| Item 12_PartB | 2 | 2,823 | 93.2 | 6.7 | 0.1 | 0.95 | 0.00 | 0.95 |
| Item 13_PartA | 2 | 2,878 | 90.6 | 9.1 | 0.3 | 0.89 | 0.01 | 0.89 |
| Item 13_PartB | 2 | 2,870 | 92.0 | 7.8 | 0.2 | 0.84 | 0.00 | 0.84 |
| Item 14 | 3 | 2,992 | 80.7 | 17.9 | 1.4 | 0.90 | 0.00 | 0.90 |
| Item 15 | 3 | 2,944 | 79.8 | 19.4 | 0.8 | 0.87 | 0.00 | 0.87 |
| Item 16_PartA | 2 | 2,866 | 92.6 | 7.2 | 0.1 | 0.91 | 0.01 | 0.91 |
| Item 17_PartA | 2 | 2,888 | 89.6 | 10.0 | 0.3 | 0.93 | 0.00 | 0.93 |
| Item 17_PartB | 2 | 2,886 | 91.0 | 8.9 | 0.1 | 0.93 | 0.01 | 0.93 |
| Item 18 | 4 | 2,896 | 84.2 | 13.0 | 2.8 | 0.91 | 0.01 | 0.91 |
| Item 19_PartA | 2 | 2,818 | 90.2 | 9.6 | 0.2 | 0.92 | 0.01 | 0.92 |
| Item 19_PartB | 2 | 2,814 | 94.7 | 5.2 | 0.1 | 0.96 | 0.01 | 0.96 |
| Item 20_PartB | 3 | 2,975 | 91.7 | 7.7 | 0.7 | 0.95 | 0.00 | 0.95 |
| Item 20_PartC | 2 | 2,972 | 90.6 | 6.8 | 2.6 | 0.89 | 0.00 | 0.89 |
| Item 21_PartB | 3 | 2,888 | 87.4 | 11.3 | 1.4 | 0.89 | 0.01 | 0.89 |
| Item 21_PartC | 2 | 2,884 | 96.7 | 2.6 | 0.7 | 0.97 | 0.01 | 0.97 |
| Item 22 | 3 | 2,994 | 91.1 | 8.2 | 0.7 | 0.94 | 0.00 | 0.94 |

**Table O.9. Field Test Rater Agreement Statistics—Mathematics Grade 5**

| Item | Max. Points | N | %Exact | %Adjacent | %Non-Adjacent | Kappa | MD | Corr. |
|---|---|---|---|---|---|---|---|---|
| Item 1_PartC | 4 | 2,986 | 85.0 | 14.0 | 1.0 | 0.95 | 0.01 | 0.95 |
| Item 2 | 3 | 2,989 | 82.3 | 16.4 | 1.3 | 0.89 | 0.01 | 0.89 |
| Item 3_PartA | 2 | 2,995 | 90.2 | 9.7 | 0.1 | 0.89 | 0.03 | 0.89 |
| Item 3_PartB | 2 | 2,993 | 96.4 | 3.1 | 0.5 | 0.97 | 0.00 | 0.97 |
| Item 4_PartB | 3 | 2,983 | 94.7 | 5.0 | 0.3 | 0.94 | 0.00 | 0.94 |
| Item 5_PartB | 3 | 2,992 | 94.2 | 5.7 | 0.0 | 0.95 | 0.01 | 0.95 |
| Item- 6 | 4 | 2,990 | 84.5 | 15.5 | 0.0 | 0.92 | 0.01 | 0.92 |
| Item 7_PartB | 3 | 2,994 | 96.5 | 3.1 | 0.4 | 0.99 | 0.01 | 0.99 |
| Item 8_PartA | 3 | 2,983 | 88.4 | 10.9 | 0.7 | 0.93 | 0.00 | 0.93 |
| Item 8_PartB | 3 | 2,986 | 91.6 | 7.4 | 1.0 | 0.96 | 0.01 | 0.96 |
| Item 9 | 3 | 2,988 | 93.0 | 6.4 | 0.6 | 0.97 | 0.01 | 0.97 |
| Item 10 | 3 | 2,992 | 90.9 | 8.9 | 0.2 | 0.97 | 0.00 | 0.97 |
| Item 11 | 3 | 2,994 | 89.1 | 10.4 | 0.6 | 0.93 | 0.02 | 0.93 |
| Item 12 | 3 | 2,991 | 83.7 | 14.4 | 1.9 | 0.90 | 0.01 | 0.90 |
| Item 13_PartA | 2 | 2,989 | 94.4 | 4.3 | 1.3 | 0.93 | 0.01 | 0.93 |
| Item 13_PartB | 2 | 2,990 | 92.5 | 7.4 | 0.1 | 0.93 | 0.01 | 0.93 |
| Item 14 | 3 | 2,992 | 86.0 | 13.5 | 0.5 | 0.94 | 0.01 | 0.95 |
| Item 15 | 3 | 2,987 | 90.9 | 8.1 | 0.9 | 0.94 | 0.01 | 0.94 |
| Item 16 | 3 | 2,996 | 91.7 | 8.0 | 0.3 | 0.97 | 0.01 | 0.97 |
| Item 17 | 3 | 2,990 | 86.9 | 13.1 | 0.0 | 0.95 | 0.00 | 0.95 |
| Item 18 | 4 | 2,997 | 87.7 | 10.9 | 1.4 | 0.92 | 0.00 | 0.92 |
| Item 19 | 4 | 2,993 | 77.7 | 19.3 | 3.0 | 0.92 | 0.00 | 0.92 |
| Item 19 | 3 | 2,990 | 84.7 | 14.7 | 0.6 | 0.90 | 0.01 | 0.90 |
| Item 20_PartA | 2 | 2,997 | 94.3 | 5.4 | 0.3 | 0.96 | 0.00 | 0.96 |
| Item 20_PartB | 4 | 2,996 | 87.0 | 12.1 | 0.9 | 0.96 | 0.00 | 0.96 |
| Item 21_PartB | 3 | 2,992 | 88.3 | 10.6 | 1.1 | 0.93 | 0.00 | 0.93 |
| Item 21_PartC | 2 | 2,991 | 93.5 | 6.1 | 0.4 | 0.95 | 0.00 | 0.95 |

**Table O.10. Field Test Rater Agreement Statistics—Mathematics Grade 6**

| Item | Max. Points | N | %Exact | %Adjacent | %Non-Adjacent | Kappa | MD | Corr. |
|---|---|---|---|---|---|---|---|---|
| Item 1 | 3 | 2,982 | 81.4 | 16.1 | 2.5 | 0.84 | 0.02 | 0.84 |
| Item 2 | 3 | 2,991 | 92.2 | 7.3 | 0.5 | 0.95 | 0.00 | 0.95 |
| Item 3 | 3 | 2,985 | 86.2 | 13.2 | 0.6 | 0.92 | 0.01 | 0.92 |
| Item 4_PartB | 2 | 2,988 | 90.3 | 9.3 | 0.4 | 0.88 | 0.01 | 0.88 |
| Item 5 | 3 | 2,974 | 92.7 | 7.1 | 0.2 | 0.91 | 0.01 | 0.91 |
| Item 6 | 3 | 2,994 | 88.6 | 10.5 | 0.9 | 0.94 | 0.01 | 0.94 |
| Item 7 | 4 | 2,983 | 83.5 | 15.1 | 1.4 | 0.93 | 0.01 | 0.93 |
| Item 8 | 3 | 2,995 | 94.4 | 5.6 | 0.0 | 0.97 | 0.00 | 0.97 |
| Item 9 | 3 | 2,989 | 92.3 | 7.3 | 0.4 | 0.96 | 0.00 | 0.96 |
| Item 10 | 3 | 2,987 | 89.3 | 9.7 | 1.0 | 0.93 | 0.00 | 0.93 |
| Item 11 | 3 | 2,987 | 85.4 | 13.6 | 1.0 | 0.85 | 0.02 | 0.85 |
| Item 12_PartA | 2 | 2,985 | 90.8 | 9.1 | 0.2 | 0.91 | 0.00 | 0.91 |
| Item 12_PartB | 2 | 2,987 | 92.6 | 7.3 | 0.1 | 0.89 | 0.00 | 0.89 |
| Item 13_PartA | 2 | 2,989 | 89.8 | 10.1 | 0.1 | 0.90 | 0.00 | 0.90 |
| Item 13_PartB | 2 | 2,985 | 93.0 | 6.9 | 0.1 | 0.93 | 0.01 | 0.93 |
| Item 14_PartA | 2 | 2,993 | 95.6 | 4.0 | 0.3 | 0.97 | 0.00 | 0.97 |
| Item 14_PartB | 2 | 2,989 | 90.2 | 9.6 | 0.2 | 0.91 | 0.00 | 0.91 |
| Item 15 | 3 | 2,997 | 85.8 | 13.9 | 0.3 | 0.84 | 0.01 | 0.84 |
| Item 16 | 3 | 2,993 | 89.0 | 9.8 | 1.2 | 0.89 | 0.00 | 0.89 |
| Item 17 | 4 | 2,990 | 91.5 | 8.2 | 0.2 | 0.97 | 0.00 | 0.97 |
| Item 18 | 4 | 2,989 | 88.8 | 10.4 | 0.8 | 0.97 | 0.00 | 0.97 |
| Item 19_PartA | 2 | 2,989 | 91.6 | 8.2 | 0.2 | 0.90 | 0.01 | 0.90 |
| Item 19_PartB | 2 | 2,982 | 96.8 | 3.0 | 0.3 | 0.89 | 0.01 | 0.89 |
| Item 20 | 3 | 2,984 | 86.4 | 11.8 | 1.8 | 0.91 | 0.00 | 0.91 |
| Item 21 | 3 | 2,992 | 90.7 | 9.1 | 0.2 | 0.96 | 0.01 | 0.96 |
| Item 22_PartA | 3 | 2,994 | 91.0 | 7.4 | 1.6 | 0.95 | 0.00 | 0.95 |
| Item 22_PartB | 3 | 2,991 | 87.5 | 12.0 | 0.5 | 0.92 | 0.01 | 0.92 |

**Table O.11. Field Test Rater Agreement Statistics—Mathematics Grade 7**

| Item | Max. Points | N | %Exact | %Adjacent | %Non-Adjacent | Kappa | MD | Corr. |
|---|---|---|---|---|---|---|---|---|
| Item 1 | 3 | 2,968 | 94.2 | 5.1 | 0.7 | 0.86 | 0.00 | 0.86 |
| Item 2_PartA | 2 | 2,988 | 94.1 | 5.4 | 0.5 | 0.95 | 0.00 | 0.95 |
| Item 2_PartB | 2 | 2,987 | 95.8 | 4.1 | 0.1 | 0.97 | 0.00 | 0.97 |
| Item 3 | 3 | 2,978 | 91.9 | 7.2 | 0.9 | 0.95 | 0.00 | 0.95 |
| Item 4 | 3 | 2,985 | 92.2 | 7.4 | 0.4 | 0.95 | 0.00 | 0.95 |
| Item 5 | 3 | 2,985 | 91.6 | 7.2 | 1.2 | 0.92 | 0.00 | 0.92 |
| Item 6 | 3 | 2,969 | 96.2 | 3.3 | 0.5 | 0.95 | 0.00 | 0.95 |
| Item 7_PartB | 3 | 2,986 | 92.7 | 7.0 | 0.2 | 0.97 | 0.01 | 0.97 |
| Item 8 | 4 | 2,979 | 82.8 | 15.4 | 1.7 | 0.94 | 0.00 | 0.94 |
| Item 9 | 4 | 2,986 | 83.1 | 15.8 | 1.1 | 0.93 | 0.01 | 0.93 |
| Item 10 | 4 | 2,983 | 92.3 | 7.2 | 0.6 | 0.92 | 0.00 | 0.92 |
| Item 11 | 4 | 2,980 | 87.6 | 11.7 | 0.7 | 0.96 | 0.00 | 0.96 |
| Item 12_PartB | 3 | 2,980 | 92.7 | 6.9 | 0.4 | 0.96 | 0.00 | 0.96 |
| Item 13 | 3 | 2,983 | 88.9 | 10.5 | 0.6 | 0.94 | 0.01 | 0.94 |
| Item 14 | 3 | 2,974 | 84.4 | 14.1 | 1.4 | 0.90 | 0.00 | 0.90 |
| Item 15 | 3 | 2,989 | 94.3 | 5.2 | 0.5 | 0.97 | 0.01 | 0.97 |
| Item 16 | 3 | 2,986 | 91.3 | 8.4 | 0.3 | 0.96 | 0.00 | 0.96 |
| Item 17 | 4 | 2,991 | 93.2 | 5.8 | 1.0 | 0.98 | 0.00 | 0.98 |
| Item 18 | 4 | 2,984 | 84.6 | 13.3 | 2.1 | 0.95 | 0.01 | 0.95 |
| Item 19 | 4 | 2,979 | 92.6 | 6.5 | 0.9 | 0.98 | 0.00 | 0.98 |
| Item 20 | 3 | 2,992 | 93.8 | 5.7 | 0.5 | 0.96 | 0.00 | 0.96 |
| Item 21 | 6 | 2,984 | 84.9 | 13.7 | 1.4 | 0.97 | 0.00 | 0.97 |
| Item 22_PartA | 4 | 2,991 | 90.8 | 7.3 | 1.9 | 0.96 | 0.00 | 0.96 |
| Item 22_PartB | 2 | 2,980 | 97.1 | 2.7 | 0.2 | 0.93 | 0.00 | 0.93 |

**Table O.12. Field Test Rater Agreement Statistics—Mathematics Grade 8**

| Item | Max. Points | N | %Exact | %Adjacent | %Non-Adjacent | Kappa | MD | Corr. |
|------|-------------|---|--------|-----------|---------------|-------|-----|-------|
| Item 1 | 3 | 2,977 | 93.1 | 6.6 | 0.3 | 0.96 | 0.00 | 0.96 |
| Item 2_PartA | 2 | 2,982 | 92.7 | 6.9 | 0.4 | 0.95 | 0.01 | 0.95 |
| Item 2_PartB | 2 | 2,967 | 97.0 | 3.0 | 0.1 | 0.96 | 0.00 | 0.96 |
| Item 3 | 6 | 2,964 | 90.1 | 7.8 | 2.1 | 0.93 | 0.00 | 0.93 |
| Item 4 | 3 | 2,972 | 88.9 | 10.1 | 1.0 | 0.93 | 0.00 | 0.93 |
| Item 5 | 3 | 2,968 | 86.6 | 12.4 | 1.0 | 0.95 | 0.01 | 0.95 |
| Item 6_PartA | 4 | 2,980 | 92.9 | 6.6 | 0.4 | 0.97 | 0.01 | 0.97 |
| Item 6_PartB | 2 | 2,975 | 97.9 | 1.9 | 0.2 | 0.95 | 0.00 | 0.95 |
| Item 7 | 3 | 2,988 | 92.2 | 7.7 | 0.1 | 0.96 | 0.01 | 0.96 |
| Item 8_PartA | 2 | 2,975 | 94.1 | 5.8 | 0.1 | 0.95 | 0.00 | 0.95 |
| Item 8_PartB | 2 | 2,967 | 97.8 | 2.2 | 0.0 | 0.99 | 0.00 | 0.99 |
| Item 9 | 3 | 2,980 | 87.3 | 12.0 | 0.6 | 0.93 | 0.00 | 0.93 |
| Item 10 | 4 | 2,988 | 93.2 | 6.2 | 0.6 | 0.98 | 0.00 | 0.98 |
| Item 11 | 3 | 2,976 | 95.6 | 4.0 | 0.4 | 0.97 | 0.00 | 0.97 |
| Item 12_PartB | 2 | 2,964 | 97.9 | 2.0 | 0.1 | 0.96 | 0.01 | 0.96 |
| Item 13 | 3 | 2,979 | 83.8 | 15.6 | 0.6 | 0.91 | 0.00 | 0.91 |
| Item 14 | 4 | 2,990 | 98.2 | 1.5 | 0.3 | 0.96 | 0.00 | 0.96 |
| Item 15 | 6 | 2,979 | 86.7 | 12.5 | 0.8 | 0.98 | 0.00 | 0.98 |

**Table O.13. Operational Rater Agreement Statistics—ELA Grade 3**

| Item | Max. Points | N | %Exact | %Adjacent | %Non-Adjacent | Kappa | MD | Corr. |
|------|-------------|---|--------|-----------|---------------|-------|-----|-------|
| PCR 1 WKL | 3 | 5,578 | 85.7 | 14.3 | 0.0 | 0.81 | 0.01 | 0.81 |
| PCR 1 WE | 3 | 5,578 | 82.8 | 17.1 | 0.1 | 0.77 | 0.01 | 0.77 |
| PCR 2 WKL | 3 | 5,580 | 86.1 | 13.9 | 0.0 | 0.80 | 0.01 | 0.80 |
| PCR 2 WE | 3 | 5,580 | 81.9 | 17.9 | 0.1 | 0.79 | 0.01 | 0.79 |

**Table O.14. Operational Rater Agreement Statistics—ELA Grade 4**

| Item | Max. Points | N | %Exact | %Adjacent | %Non-Adjacent | Kappa | MD | Corr. |
|------|-------------|---|--------|-----------|---------------|-------|-----|-------|
| PCR 1 WKL | 3 | 5,545 | 80.9 | 18.8 | 0.2 | 0.85 | 0.02 | 0.85 |
| PCR 1 WE | 3 | 5,545 | 80.9 | 19.0 | 0.2 | 0.86 | 0.01 | 0.86 |
| PCR 2 WKL | 3 | 5,557 | 80.3 | 19.6 | 0.1 | 0.77 | 0.03 | 0.77 |
| PCR 2 WE | 4 | 5,557 | 74.9 | 24.9 | 0.2 | 0.71 | 0.01 | 0.71 |

**Table O.15. Operational Rater Agreement Statistics—ELA Grade 5**

| Item | Max. Points | N | %Exact | %Adjacent | %Non-Adjacent | Kappa | MD | Corr. |
|------|-------------|---|--------|-----------|---------------|-------|-----|-------|
| PCR 1 WKL | 3 | 5,678 | 80.8 | 19.1 | 0.1 | 0.87 | 0.01 | 0.87 |
| PCR 1 WE | 3 | 5,678 | 80.9 | 19.1 | 0.1 | 0.88 | 0.01 | 0.88 |
| PCR 2 WKL | 3 | 5,662 | 80.8 | 18.6 | 0.6 | 0.78 | 0.01 | 0.78 |
| PCR 2 WE | 4 | 5,662 | 74.8 | 24.1 | 1.1 | 0.74 | 0.00 | 0.74 |

**Table O.16. Operational Rater Agreement Statistics—ELA Grade 6**

| Item | Max. Points | N | %Exact | %Adjacent | %Non-Adjacent | Kappa | MD | Corr. |
|------|-------------|---|--------|-----------|---------------|-------|----|----|
| PCR 1 WKL | 3 | 5,569 | 80.7 | 19.3 | 0.0 | 0.88 | 0.00 | 0.88 |
| PCR 1 WE | 4 | 5,569 | 79.6 | 20.4 | 0.0 | 0.88 | 0.01 | 0.88 |
| PCR 2 WKL | 3 | 5,561 | 79.6 | 19.8 | 0.6 | 0.84 | 0.01 | 0.84 |
| PCR 2 WE | 4 | 5,561 | 77.6 | 22.0 | 0.4 | 0.83 | 0.01 | 0.83 |

**Table O.17. Operational Rater Agreement Statistics—ELA Grade 7**

| Item | Max. Points | N | %Exact | %Adjacent | %Non-Adjacent | Kappa | MD | Corr. |
|------|-------------|---|--------|-----------|---------------|-------|----|----|
| PCR 1 WKL | 3 | 5,393 | 79.9 | 19.6 | 0.5 | 0.90 | 0.01 | 0.90 |
| PCR 1 WE | 4 | 5,393 | 77.4 | 22.1 | 0.5 | 0.90 | 0.01 | 0.90 |
| PCR 2 WKL | 3 | 5,387 | 79.7 | 19.8 | 0.5 | 0.87 | 0.01 | 0.87 |
| PCR 2 WE | 4 | 5,387 | 74.7 | 24.8 | 0.5 | 0.84 | 0.01 | 0.84 |

**Table O.18. Operational Rater Agreement Statistics—ELA Grade 8**

| Item | Max. Points | N | %Exact | %Adjacent | %Non-Adjacent | Kappa | MD | Corr. |
|------|-------------|---|--------|-----------|---------------|-------|----|----|
| PCR 1 WKL | 3 | 5,200 | 79.3 | 19.9 | 0.8 | 0.89 | 0.00 | 0.89 |
| PCR 1 WE | 4 | 5,200 | 77.5 | 21.7 | 0.8 | 0.89 | 0.00 | 0.89 |
| PCR 2 WKL | 3 | 5,205 | 79.5 | 20.4 | 0.1 | 0.91 | 0.04 | 0.91 |
| PCR 2 WE | 4 | 5,205 | 80.0 | 20.0 | 0.0 | 0.92 | 0.01 | 0.92 |

**Table O.19. Field Test Rater Agreement Statistics—ELA Grade 3**

| Item | Max. Points | N | %Exact | %Adjacent | %Non-Adjacent | Kappa | MD | Corr. |
|------|-------------|---|--------|-----------|---------------|-------|----|----|
| PCR 1 WKL | 3 | 3,082 | 88.1 | 11.9 | 0.0 | 0.81 | 0.02 | 0.81 |
| PCR 1 WE | 3 | 3,082 | 83.6 | 16.4 | 0.0 | 0.69 | 0.03 | 0.69 |
| PCR 2 WKL | 3 | 3,066 | 91.3 | 8.7 | 0.0 | 0.87 | 0.00 | 0.87 |
| PCR 2 WE | 3 | 3,066 | 80.6 | 19.3 | 0.0 | 0.71 | 0.01 | 0.71 |
| PCR 3 WKL | 3 | 3,062 | 85.2 | 14.5 | 0.3 | 0.82 | 0.01 | 0.82 |
| PCR 3 WE | 3 | 3,062 | 79.9 | 19.9 | 0.2 | 0.73 | 0.02 | 0.73 |
| PCR 4 WKL | 3 | 3,059 | 84.3 | 15.7 | 0.0 | 0.78 | 0.00 | 0.78 |
| PCR 4 WE | 3 | 3,059 | 83.8 | 16.2 | 0.0 | 0.66 | 0.02 | 0.66 |
| PCR 5 WKL | 3 | 3,073 | 84.8 | 15.2 | 0.0 | 0.79 | 0.02 | 0.79 |
| PCR 5 WE | 3 | 3,073 | 82.5 | 17.5 | 0.0 | 0.65 | 0.02 | 0.65 |
| PCR 6 WKL | 3 | 3,061 | 85.2 | 14.8 | 0.0 | 0.79 | 0.02 | 0.79 |
| PCR 6 WE | 3 | 3,061 | 79.6 | 20.4 | 0.0 | 0.63 | 0.02 | 0.63 |
| PCR 7 WKL | 3 | 3,000 | 85.7 | 14.3 | 0.0 | 0.78 | 0.01 | 0.78 |
| PCR 7 WE | 3 | 3,000 | 80.7 | 19.2 | 0.0 | 0.66 | 0.02 | 0.66 |
| PCR 8 WKL | 3 | 3,099 | 85.8 | 14.2 | 0.0 | 0.80 | 0.02 | 0.80 |
| PCR 8 WE | 3 | 3,099 | 80.3 | 19.6 | 0.1 | 0.65 | 0.01 | 0.65 |
| PCR 9 WKL | 3 | 3,075 | 83.4 | 16.6 | 0.0 | 0.76 | 0.00 | 0.76 |
| PCR 9 WE | 3 | 3,075 | 80.8 | 19.1 | 0.0 | 0.59 | 0.06 | 0.59 |

**Table O.20. Field Test Rater Agreement Statistics—ELA Grade 4**

| Item | Max. Points | N | %Exact | %Adjacent | %Non-Adjacent | Kappa | MD | Corr. |
|---|---|---|---|---|---|---|---|---|
| PCR 1 WKL | 3 | 3,101 | 79.7 | 20.3 | 0.0 | 0.80 | 0.01 | 0.80 |
| PCR 1 WE | 4 | 3,101 | 78.9 | 21.0 | 0.1 | 0.78 | 0.03 | 0.78 |
| PCR 2 WKL | 3 | 3,085 | 80.2 | 19.5 | 0.3 | 0.76 | 0.01 | 0.76 |
| PCR 2 WE | 4 | 3,085 | 76.9 | 22.6 | 0.4 | 0.75 | 0.02 | 0.75 |
| PCR 3 WKL | 3 | 3,072 | 86.5 | 13.5 | 0.0 | 0.91 | 0.00 | 0.91 |
| PCR 3 WE | 3 | 3,072 | 87.4 | 12.6 | 0.0 | 0.91 | 0.01 | 0.91 |
| PCR 4 WKL | 3 | 2,999 | 85.8 | 14.2 | 0.0 | 0.88 | 0.01 | 0.89 |
| PCR 4 WE | 3 | 2,999 | 84.8 | 15.2 | 0.0 | 0.87 | 0.00 | 0.87 |
| PCR 5 WKL | 3 | 3,047 | 81.1 | 18.7 | 0.1 | 0.78 | 0.02 | 0.78 |
| PCR 5 WE | 4 | 3,047 | 73.3 | 26.7 | 0.0 | 0.73 | 0.04 | 0.73 |
| PCR 6 WKL | 3 | 3,040 | 83.0 | 17.0 | 0.0 | 0.80 | 0.02 | 0.80 |
| PCR 6 WE | 4 | 3,040 | 75.3 | 24.7 | 0.0 | 0.71 | 0.01 | 0.71 |
| PCR 7 WKL | 3 | 3,080 | 80.6 | 19.2 | 0.2 | 0.77 | 0.00 | 0.78 |
| PCR 7 WE | 4 | 3,080 | 73.2 | 26.8 | 0.0 | 0.72 | 0.01 | 0.72 |
| PCR 8 WKL | 3 | 3,060 | 80.3 | 19.7 | 0.0 | 0.78 | 0.01 | 0.78 |
| PCR 8 WE | 4 | 3,060 | 74.0 | 26.0 | 0.0 | 0.72 | 0.02 | 0.72 |
| PCR 9 WKL | 3 | 3,081 | 81.3 | 18.2 | 0.4 | 0.75 | 0.01 | 0.75 |
| PCR 9 WE | 4 | 3,081 | 75.0 | 23.7 | 1.3 | 0.64 | 0.02 | 0.64 |
| PCR 10 WKL | 3 | 3,042 | 82.6 | 17.4 | 0.0 | 0.77 | 0.03 | 0.77 |
| PCR 10 WE | 4 | 3,042 | 76.2 | 23.8 | 0.0 | 0.67 | 0.02 | 0.67 |

**Table O.21. Field Test Rater Agreement Statistics—ELA Grade 5**

| Item | Max. Points | N | %Exact | %Adjacent | %Non-Adjacent | Kappa | MD | Corr. |
|---|---|---|---|---|---|---|---|---|
| PCR 1 WKL | 3 | 3,064 | 81.1 | 18.3 | 0.6 | 0.83 | 0.01 | 0.83 |
| PCR 1 WE | 4 | 3,064 | 78.4 | 20.8 | 0.8 | 0.82 | 0.02 | 0.82 |
| PCR 2 WKL | 3 | 2,993 | 80.0 | 19.7 | 0.4 | 0.82 | 0.07 | 0.82 |
| PCR 2 WE | 4 | 2,993 | 72.9 | 26.6 | 0.5 | 0.79 | 0.01 | 0.79 |
| PCR 3 WKL | 3 | 2,997 | 80.2 | 19.7 | 0.1 | 0.85 | 0.10 | 0.85 |
| PCR 3 WE | 4 | 2,997 | 70.2 | 29.7 | 0.1 | 0.79 | 0.05 | 0.79 |
| PCR 4 WKL | 3 | 2,996 | 80.9 | 19.0 | 0.1 | 0.83 | 0.01 | 0.83 |
| PCR 4 WE | 4 | 2,996 | 79.7 | 20.3 | 0.0 | 0.82 | 0.00 | 0.82 |
| PCR 5 WKL | 3 | 2,996 | 80.4 | 19.6 | 0.0 | 0.81 | 0.01 | 0.81 |
| PCR 5 WE | 4 | 2,996 | 74.3 | 25.7 | 0.0 | 0.78 | 0.01 | 0.78 |
| PCR 6 WKL | 3 | 3,108 | 79.4 | 20.5 | 0.1 | 0.84 | 0.02 | 0.84 |
| PCR 6 WE | 4 | 3,108 | 78.1 | 21.7 | 0.2 | 0.82 | 0.00 | 0.82 |

**Table O.22. Field Test Rater Agreement Statistics—ELA Grade 6**

| Item | Max. Points | N | %Exact | %Adjacent | %Non-Adjacent | Kappa | MD | Corr. |
|------|------------|---|--------|-----------|---------------|-------|----|----|
| PCR 1 WKL | 3 | 2,985 | 80.0 | 19.3 | 0.7 | 0.85 | 0.00 | 0.85 |
| PCR 1 WE | 4 | 2,985 | 79.6 | 19.7 | 0.8 | 0.85 | 0.00 | 0.85 |
| PCR 2 WKL | 3 | 3,033 | 79.9 | 19.9 | 0.2 | 0.85 | 0.02 | 0.85 |
| PCR 2 WE | 4 | 3,033 | 79.8 | 19.8 | 0.4 | 0.85 | 0.01 | 0.85 |
| PCR 3 WKL | 3 | 2,978 | 81.3 | 18.4 | 0.2 | 0.84 | 0.03 | 0.84 |
| PCR 3 WE | 4 | 2,978 | 80.4 | 19.5 | 0.2 | 0.83 | 0.02 | 0.84 |
| PCR 4 WKL | 3 | 2,982 | 83.2 | 16.6 | 0.3 | 0.85 | 0.04 | 0.85 |
| PCR 4 WE | 4 | 2,982 | 79.9 | 19.8 | 0.2 | 0.83 | 0.01 | 0.83 |
| PCR 5 WKL | 3 | 2,980 | 80.0 | 19.9 | 0.2 | 0.80 | 0.03 | 0.80 |
| PCR 5 WE | 4 | 2,980 | 78.1 | 21.9 | 0.0 | 0.79 | 0.01 | 0.79 |
| PCR 6 WKL | 3 | 3,054 | 79.9 | 19.9 | 0.2 | 0.84 | 0.02 | 0.84 |
| PCR 6 WE | 4 | 3,054 | 82.8 | 17.1 | 0.1 | 0.87 | 0.02 | 0.87 |
| PCR 7 WKL | 3 | 3,021 | 80.2 | 19.7 | 0.1 | 0.88 | 0.00 | 0.88 |
| PCR 7 WE | 4 | 3,021 | 74.7 | 25.3 | 0.1 | 0.88 | 0.03 | 0.88 |
| PCR 8 WKL | 3 | 2,983 | 80.2 | 19.8 | 0.0 | 0.89 | 0.01 | 0.89 |
| PCR 8 WE | 4 | 2,983 | 78.0 | 21.9 | 0.0 | 0.89 | 0.03 | 0.89 |
| PCR 9 WKL | 3 | 2,992 | 80.1 | 19.9 | 0.0 | 0.88 | 0.01 | 0.88 |
| PCR 9 WE | 4 | 2,992 | 71.4 | 28.6 | 0.0 | 0.89 | 0.01 | 0.89 |
| PCR 10 WKL | 3 | 2,982 | 80.9 | 19.0 | 0.0 | 0.89 | 0.01 | 0.89 |
| PCR 10 WE | 4 | 2,982 | 76.1 | 23.9 | 0.0 | 0.90 | 0.00 | 0.90 |

**Table O.23. Field Test Rater Agreement Statistics—ELA Grade 7**

| Item | Max. Points | N | %Exact | %Adjacent | %Non-Adjacent | Kappa | MD | Corr. |
|------|------------|---|--------|-----------|---------------|-------|----|----|
| PCR 1 WKL | 3 | 3,000 | 80.1 | 19.9 | 0.0 | 0.88 | 0.00 | 0.88 |
| PCR 1 WE | 4 | 3,000 | 76.9 | 23.1 | 0.0 | 0.87 | 0.00 | 0.87 |
| PCR 2 WKL | 3 | 3,000 | 79.9 | 19.3 | 0.8 | 0.88 | 0.01 | 0.88 |
| PCR 2 WE | 4 | 3,000 | 74.7 | 24.6 | 0.7 | 0.88 | 0.01 | 0.88 |
| PCR 3 WKL | 3 | 2,981 | 80.1 | 19.8 | 0.2 | 0.87 | 0.02 | 0.88 |
| PCR 3 WE | 4 | 2,981 | 74.3 | 25.4 | 0.3 | 0.87 | 0.01 | 0.87 |
| PCR 4 WKL | 3 | 3,081 | 81.3 | 18.3 | 0.4 | 0.89 | 0.01 | 0.89 |
| PCR 4 WE | 4 | 3,081 | 79.8 | 20.0 | 0.2 | 0.90 | 0.01 | 0.90 |
| PCR 5 WKL | 3 | 2,998 | 79.9 | 19.4 | 0.8 | 0.89 | 0.00 | 0.89 |
| PCR 5 WE | 4 | 2,998 | 80.4 | 19.3 | 0.3 | 0.91 | 0.00 | 0.91 |
| PCR 6 WKL | 3 | 2,994 | 79.9 | 18.9 | 1.1 | 0.89 | 0.01 | 0.89 |
| PCR 6 WE | 4 | 2,994 | 77.5 | 21.7 | 0.9 | 0.89 | 0.02 | 0.89 |
| PCR 7 WKL | 3 | 2,997 | 81.3 | 18.6 | 0.1 | 0.88 | 0.01 | 0.88 |
| PCR 7 WE | 4 | 2,997 | 81.8 | 18.1 | 0.1 | 0.90 | 0.01 | 0.90 |
| PCR 8 WKL | 3 | 2,996 | 80.0 | 19.9 | 0.1 | 0.89 | 0.09 | 0.89 |
| PCR 8 WE | 4 | 2,996 | 73.7 | 26.1 | 0.1 | 0.87 | 0.04 | 0.87 |
| PCR 9 WKL | 3 | 3,076 | 79.2 | 19.7 | 1.1 | 0.86 | 0.02 | 0.86 |
| PCR 9 WE | 4 | 3,076 | 81.4 | 17.9 | 0.7 | 0.89 | 0.02 | 0.89 |
| PCR 10 WKL | 3 | 2,999 | 79.9 | 19.8 | 0.3 | 0.86 | 0.01 | 0.86 |
| PCR 10 WE | 4 | 2,999 | 77.9 | 21.7 | 0.4 | 0.87 | 0.01 | 0.87 |
| PCR 11 WKL | 3 | 2,998 | 80.9 | 18.1 | 1.0 | 0.90 | 0.02 | 0.90 |

| Item | Max. Points | N | %Exact | %Adjacent | %Non-Adjacent | Kappa | MD | Corr. |
|---|---|---|---|---|---|---|---|---|
| PCR 11 WE | 4 | 2,998 | 79.4 | 19.7 | 1.0 | 0.91 | 0.00 | 0.91 |
| PCR 12 WKL | 3 | 2,993 | 80.5 | 19.3 | 0.3 | 0.89 | 0.06 | 0.89 |
| PCR 12 WE | 4 | 2,993 | 73.1 | 26.5 | 0.4 | 0.87 | 0.01 | 0.87 |

**Table O.24. Field Test Rater Agreement Statistics—ELA Grade 8**

| Item | Max. Points | N | %Exact | %Adjacent | %Non-Adjacent | Kappa | MD | Corr. |
|---|---|---|---|---|---|---|---|---|
| PCR 1 WKL | 3 | 3,077 | 81.1 | 18.5 | 0.4 | 0.91 | 0.00 | 0.91 |
| PCR 1 WE | 4 | 3,077 | 84.0 | 15.9 | 0.1 | 0.93 | 0.01 | 0.93 |
| PCR 2 WKL | 3 | 2,995 | 80.2 | 19.8 | 0.1 | 0.91 | 0.01 | 0.91 |
| PCR 2 WE | 4 | 2,995 | 83.5 | 16.5 | 0.0 | 0.93 | 0.01 | 0.93 |
| PCR 3 WKL | 3 | 3,123 | 83.1 | 16.2 | 0.7 | 0.91 | 0.01 | 0.91 |
| PCR 3 WE | 4 | 3,123 | 79.9 | 19.4 | 0.8 | 0.91 | 0.00 | 0.91 |
| PCR 4 WKL | 3 | 2,986 | 79.8 | 19.2 | 1.0 | 0.90 | 0.01 | 0.90 |
| PCR 4 WE | 4 | 2,986 | 77.0 | 22.1 | 0.9 | 0.91 | 0.00 | 0.91 |
| PCR 5 WKL | 3 | 2,986 | 81.7 | 18.0 | 0.3 | 0.91 | 0.02 | 0.91 |
| PCR 5 WE | 4 | 2,986 | 73.7 | 25.7 | 0.6 | 0.89 | 0.02 | 0.89 |
| PCR 6 WKL | 3 | 2,989 | 83.8 | 15.4 | 0.7 | 0.92 | 0.00 | 0.92 |
| PCR 6 WE | 4 | 2,989 | 79.6 | 19.5 | 0.9 | 0.91 | 0.00 | 0.91 |
| PCR 7 WKL | 3 | 3,035 | 80.0 | 19.5 | 0.5 | 0.90 | 0.02 | 0.90 |
| PCR 7 WE | 4 | 3,035 | 78.6 | 21.0 | 0.3 | 0.91 | 0.01 | 0.91 |
| PCR 8 WKL | 3 | 2,994 | 82.0 | 17.6 | 0.4 | 0.91 | 0.04 | 0.91 |
| PCR 8 WE | 4 | 2,994 | 74.9 | 25.0 | 0.1 | 0.90 | 0.01 | 0.90 |
| PCR 9 WKL | 3 | 2,987 | 81.0 | 18.9 | 0.0 | 0.92 | 0.08 | 0.92 |
| PCR 9 WE | 4 | 2,987 | 73.6 | 26.4 | 0.0 | 0.90 | 0.01 | 0.90 |
| PCR 1 WKL | 3 | 2,990 | 81.0 | 19.0 | 0.0 | 0.92 | 0.01 | 0.92 |
| PCR 1 WE | 4 | 2,990 | 80.4 | 19.5 | 0.1 | 0.92 | 0.01 | 0.92 |
| PCR 2 WKL | 3 | 2,980 | 81.9 | 18.1 | 0.0 | 0.91 | 0.01 | 0.91 |
| PCR 2 WE | 4 | 2,980 | 83.5 | 16.4 | 0.1 | 0.93 | 0.01 | 0.93 |
| PCR 3 WKL | 3 | 2,982 | 80.5 | 19.5 | 0.0 | 0.91 | 0.01 | 0.91 |
| PCR 3 WE | 4 | 2,982 | 85.6 | 14.3 | 0.1 | 0.94 | 0.00 | 0.94 |

**Table O.25. Operational Rater Agreement Statistics—CSLA Grade 3**

| Item | Max. Points | N | %Exact | %Adjacent | %Non-Adjacent | Kappa | MD | Corr. |
|---|---|---|---|---|---|---|---|---|
| PCR 1 WE | 3 | 147 | 86.8 | 13.2 | 0.0 | 0.90 | 0.02 | 0.90 |
| PCR 1 WKL | 3 | 147 | 89.7 | 10.3 | 0.0 | 0.92 | 0.02 | 0.92 |
| PCR 2 WE | 3 | 147 | 98.5 | 1.5 | 0.0 | 0.99 | 0.00 | 0.99 |
| PCR 2 WKL | 3 | 147 | 93.9 | 6.1 | 0.0 | 0.96 | 0.00 | 0.96 |

**Table O.26. Operational Rater Agreement Statistics—CSLA Grade 4**

| Item | Max. Points | N | %Exact | %Adjacent | %Non-Adjacent | Kappa | MD | Corr. |
|---|---|---|---|---|---|---|---|---|
| PCR 1 WE | 3 | 118 | 88.0 | 12.0 | 0.0 | 0.95 | 0.00 | 0.95 |
| PCR 1 WKL | 3 | 118 | 89.7 | 10.3 | 0.0 | 0.95 | 0.00 | 0.95 |
| PCR 2 WE | 4 | 119 | 84.7 | 15.3 | 0.0 | 0.94 | 0.07 | 0.94 |
| PCR 2 WKL | 3 | 119 | 91.9 | 8.1 | 0.0 | 0.96 | 0.04 | 0.96 |

**Table O.27. Field Test Rater Agreement Statistics—CSLA Grade 3**

| Item | Max. Points | N | %Exact | %Adjacent | %Non-Adjacent | Kappa | MD | Corr. |
|------|-------------|---|--------|-----------|---------------|-------|-----|-------|
| PCR 1 WE | 3 | 360 | 96.4 | 3.6 | 0.0 | 0.97 | 0.02 | 0.97 |
| PCR 1 WKL | 3 | 360 | 90.8 | 9.2 | 0.0 | 0.94 | 0.06 | 0.95 |
| PCR 2 WE | 3 | 369 | 98.2 | 1.8 | 0.0 | 0.99 | 0.00 | 0.99 |
| PCR 2 WKL | 3 | 369 | 92.4 | 7.6 | 0.0 | 0.95 | 0.04 | 0.95 |
| PCR 3 WE | 3 | 364 | 94.7 | 5.3 | 0.0 | 0.97 | 0.01 | 0.97 |
| PCR 3 WKL | 3 | 364 | 94.4 | 5.6 | 0.0 | 0.96 | 0.00 | 0.96 |
| PCR 4 WE | 3 | 365 | 91.5 | 8.5 | 0.0 | 0.94 | 0.01 | 0.94 |
| PCR 4 WKL | 3 | 365 | 91.2 | 8.8 | 0.0 | 0.95 | 0.04 | 0.95 |

**Table O.28. Field Test Rater Agreement Statistics—CSLA Grade 4**

| Item | Max. Points | N | %Exact | %Adjacent | %Non-Adjacent | Kappa | MD | Corr. |
|------|-------------|---|--------|-----------|---------------|-------|-----|-------|
| PCR 1 WE | 4 | 588 | 91.1 | 8.9 | 0.0 | 0.96 | 0.01 | 0.96 |
| PCR 1 WKL | 3 | 588 | 94.8 | 5.2 | 0.0 | 0.97 | 0.01 | 0.97 |
| PCR 2 WE | 4 | 595 | 89.3 | 10.7 | 0.0 | 0.89 | 0.01 | 0.90 |
| PCR 2 WKL | 3 | 595 | 91.4 | 8.6 | 0.0 | 0.95 | 0.00 | 0.95 |

**Table O.29. Operational Rater Agreement Statistics—Science Grade 5**

| Item | Max. Points | N | %Exact | %Adjacent | %Non-Adjacent | Kappa | MD | Corr. |
|------|-------------|---|--------|-----------|---------------|-------|-----|-------|
| Item 1 | 2 | 5,622 | 90.0 | 8.8 | 1.2 | 0.89 | 0.00 | 0.89 |
| Item 2 | 2 | 5,623 | 89.9 | 9.7 | 0.3 | 0.91 | 0.00 | 0.91 |
| Item 3 | 2 | 5,623 | 91.0 | 8.7 | 0.3 | 0.84 | 0.01 | 0.84 |
| Item 4 | 2 | 5,363 | 90.0 | 8.3 | 1.7 | 0.85 | 0.01 | 0.85 |
| Item 5 | 2 | 5,364 | 90.1 | 8.6 | 1.3 | 0.92 | 0.00 | 0.92 |
| Item 6 | 2 | 5,361 | 90.1 | 9.0 | 0.9 | 0.87 | 0.00 | 0.87 |
| Item 7 | 2 | 5,363 | 89.6 | 9.5 | 0.9 | 0.85 | 0.01 | 0.85 |
| Item 8 | 2 | 5,363 | 89.9 | 9.0 | 1.1 | 0.90 | 0.01 | 0.90 |
| Item 9 | 2 | 5,364 | 89.7 | 9.3 | 1.0 | 0.92 | 0.01 | 0.92 |
| Item 10 | 2 | 5,623 | 90.2 | 9.3 | 0.5 | 0.91 | 0.00 | 0.91 |
| Item 11 | 2 | 5,623 | 90.1 | 9.6 | 0.4 | 0.93 | 0.02 | 0.93 |
| Item 12 | 2 | 5,623 | 89.9 | 9.8 | 0.3 | 0.90 | 0.00 | 0.90 |

**Table O.30. Operational Rater Agreement Statistics—Science Grade 8**

| Item | Max. Points | N | %Exact | %Adjacent | %Non-Adjacent | Kappa | MD | Corr. |
|------|-------------|---|--------|-----------|---------------|-------|-----|-------|
| Item 1 | 2 | 5,122 | 90.1 | 9.9 | 0.0 | 0.88 | 0.03 | 0.88 |
| Item 2 | 2 | 5,121 | 90.0 | 9.4 | 0.7 | 0.91 | 0.01 | 0.91 |
| Item 3 | 2 | 5,122 | 90.3 | 9.1 | 0.7 | 0.77 | 0.02 | 0.77 |
| Item 4 | 2 | 4,918 | 90.7 | 9.2 | 0.2 | 0.91 | 0.00 | 0.91 |
| Item 5 | 2 | 4,918 | 90.2 | 8.5 | 1.3 | 0.90 | 0.00 | 0.90 |
| Item 6 | 2 | 4,916 | 89.7 | 8.7 | 1.6 | 0.84 | 0.00 | 0.84 |
| Item 7 | 2 | 4,915 | 87.1 | 12.4 | 0.6 | 0.83 | 0.01 | 0.83 |
| Item 8 | 2 | 5,122 | 90.3 | 9.6 | 0.0 | 0.93 | 0.01 | 0.93 |
| Item 9 | 2 | 5,122 | 89.9 | 9.9 | 0.2 | 0.93 | 0.01 | 0.93 |
| Item 10 | 2 | 5,122 | 90.5 | 9.5 | 0.0 | 0.88 | 0.01 | 0.88 |
| Item 11 | 2 | 5,122 | 90.2 | 9.4 | 0.4 | 0.82 | 0.00 | 0.82 |

| Item | Max. Points | N | %Exact | %Adjacent | %Non-Adjacent | Kappa | MD | Corr. |
|------|-------------|---|--------|-----------|---------------|-------|-----|-------|
| Item 12 | 2 | 4,916 | 96.2 | 2.9 | 0.9 | 0.94 | 0.01 | 0.94 |
| Item 13 | 2 | 4,916 | 89.9 | 10.0 | 0.0 | 0.92 | 0.00 | 0.92 |
| Item 14 | 2 | 4,916 | 90.0 | 10.0 | 0.0 | 0.89 | 0.00 | 0.89 |

**Table O.31. Operational Rater Agreement Statistics—Science Grade 11**

| Item | Max. Points | N | %Exact | %Adjacent | %Non-Adjacent | Kappa | MD | Corr. |
|------|-------------|---|--------|-----------|---------------|-------|-----|-------|
| Item 1 | 2 | 3,215 | 93.7 | 6.3 | 0.0 | 0.77 | 0.01 | 0.77 |
| Item 2 | 2 | 3,215 | 89.2 | 10.3 | 0.5 | 0.91 | 0.00 | 0.91 |
| Item 3 | 2 | 3,134 | 90.7 | 9.3 | 0.0 | 0.94 | 0.00 | 0.94 |
| Item 4 | 2 | 3,133 | 89.9 | 9.8 | 0.3 | 0.89 | 0.01 | 0.89 |
| Item 5 | 2 | 3,133 | 89.1 | 9.7 | 1.2 | 0.88 | 0.01 | 0.88 |
| Item 6 | 2 | 3,215 | 89.7 | 9.9 | 0.4 | 0.90 | 0.01 | 0.90 |
| Item 7 | 2 | 3,134 | 90.3 | 9.7 | 0.0 | 0.91 | 0.00 | 0.91 |
| Item 8 | 2 | 3,133 | 89.4 | 9.6 | 0.9 | 0.91 | 0.00 | 0.91 |
| Item 9 | 2 | 3,215 | 90.5 | 9.3 | 0.2 | 0.85 | 0.01 | 0.85 |
| Item 10 | 2 | 3,215 | 89.9 | 9.1 | 0.9 | 0.88 | 0.01 | 0.88 |
| Item 11 | 2 | 3,215 | 93.2 | 6.8 | 0.0 | 0.84 | 0.01 | 0.84 |
| Item 12 | 2 | 3,215 | 89.6 | 9.5 | 0.9 | 0.66 | 0.04 | 0.67 |

**Table O.32. Field Test Rater Agreement Statistics—Science Grade 5**

| Item | Max. Points | N | %Exact | %Adjacent | %Non-Adjacent | Kappa | MD | Corr. |
|------|-------------|---|--------|-----------|---------------|-------|-----|-------|
| Item 1 | 2 | 3,244 | 91.1 | 8.2 | 0.8 | 0.87 | 0.01 | 0.87 |
| Item 2 | 2 | 3,226 | 91.2 | 8.6 | 0.2 | 0.93 | 0.00 | 0.93 |
| Item 3 | 2 | 3,519 | 92.0 | 8.0 | 0.0 | 0.85 | 0.01 | 0.85 |
| Item 4 | 2 | 3,122 | 90.5 | 8.5 | 1.0 | 0.81 | 0.01 | 0.81 |
| Item 5 | 2 | 3,469 | 89.8 | 10.0 | 0.1 | 0.88 | 0.01 | 0.88 |
| Item 6 | 2 | 3,159 | 89.7 | 10.0 | 0.3 | 0.87 | 0.02 | 0.87 |
| Item 7 | 2 | 3,338 | 93.2 | 6.6 | 0.2 | 0.95 | 0.01 | 0.95 |
| Item 8 | 2 | 3,698 | 94.3 | 5.5 | 0.2 | 0.81 | 0.02 | 0.81 |
| Item 9 | 2 | 3,391 | 88.9 | 10.0 | 1.1 | 0.79 | 0.01 | 0.79 |
| Item 10 | 2 | 3,311 | 85.1 | 12.8 | 2.2 | 0.82 | 0.01 | 0.82 |
| Item 11 | 2 | 3,089 | 90.2 | 9.7 | 0.1 | 0.92 | 0.01 | 0.92 |
| Item 12 | 2 | 3,230 | 89.8 | 10.0 | 0.2 | 0.90 | 0.01 | 0.90 |
| Item 13 | 2 | 3,048 | 90.0 | 9.8 | 0.2 | 0.92 | 0.01 | 0.92 |
| Item 14 | 2 | 3,099 | 91.7 | 8.1 | 0.1 | 0.90 | 0.00 | 0.90 |
| Item 15 | 2 | 3,113 | 89.9 | 10.0 | 0.1 | 0.82 | 0.00 | 0.82 |
| Item 16 | 2 | 3,124 | 89.6 | 9.9 | 0.5 | 0.85 | 0.01 | 0.85 |
| Item 17 | 2 | 3,081 | 90.2 | 9.1 | 0.7 | 0.90 | 0.00 | 0.90 |
| Item 18 | 2 | 3,108 | 96.0 | 3.4 | 0.6 | 0.97 | 0.00 | 0.97 |
| Item 19 | 2 | 3,085 | 90.1 | 9.4 | 0.5 | 0.92 | 0.01 | 0.92 |
| Item 20 | 2 | 3,092 | 89.7 | 9.4 | 0.9 | 0.87 | 0.01 | 0.87 |
| Item 21 | 2 | 3,059 | 89.9 | 6.8 | 3.3 | 0.83 | 0.03 | 0.84 |
| Item 22 | 2 | 3,045 | 90.0 | 9.9 | 0.1 | 0.89 | 0.02 | 0.89 |
| Item 23 | 2 | 3,043 | 90.2 | 9.6 | 0.2 | 0.87 | 0.02 | 0.87 |

**Table O.33. Field Test Rater Agreement Statistics—Science Grade 8**

| Item | Max. Points | N | %Exact | %Adjacent | %Non-Adjacent | Kappa | MD | Corr. |
|------|-------------|-----|--------|-----------|---------------|-------|------|-------|
| Item 1 | 2 | 3,149 | 96.0 | 4.0 | 0.0 | 0.96 | 0.00 | 0.96 |
| Item 2 | 2 | 3,222 | 89.6 | 10.1 | 0.3 | 0.91 | 0.01 | 0.91 |
| Item 3 | 2 | 3,195 | 89.7 | 8.3 | 2.0 | 0.89 | 0.02 | 0.89 |
| Item 4 | 2 | 3,493 | 88.7 | 11.3 | 0.0 | 0.88 | 0.00 | 0.88 |
| Item 5 | 2 | 3,660 | 90.6 | 9.3 | 0.1 | 0.91 | 0.00 | 0.91 |
| Item 6 | 2 | 3,212 | 90.2 | 9.7 | 0.1 | 0.87 | 0.01 | 0.87 |
| Item 7 | 2 | 3,435 | 89.8 | 9.6 | 0.6 | 0.89 | 0.00 | 0.89 |
| Item 8 | 2 | 3,306 | 89.8 | 9.7 | 0.5 | 0.86 | 0.01 | 0.86 |
| Item 9 | 2 | 3,307 | 89.2 | 10.6 | 0.2 | 0.86 | 0.03 | 0.86 |
| Item 10 | 2 | 3,239 | 89.6 | 9.6 | 0.8 | 0.90 | 0.00 | 0.90 |
| Item 11 | 2 | 3,233 | 89.5 | 7.4 | 3.1 | 0.76 | 0.01 | 0.76 |
| Item 12 | 2 | 3,339 | 89.3 | 10.3 | 0.5 | 0.92 | 0.01 | 0.92 |
| Item 13 | 2 | 3,226 | 89.3 | 10.7 | 0.0 | 0.91 | 0.05 | 0.91 |
| Item 14 | 2 | 3,191 | 89.4 | 10.6 | 0.0 | 0.92 | 0.00 | 0.92 |
| Item 15 | 2 | 3,444 | 92.2 | 6.9 | 0.9 | 0.90 | 0.00 | 0.90 |
| Item 16 | 2 | 3,283 | 93.5 | 6.1 | 0.4 | 0.81 | 0.01 | 0.81 |
| Item 17 | 2 | 3,207 | 89.5 | 9.8 | 0.8 | 0.86 | 0.01 | 0.86 |
| Item 18 | 2 | 3,211 | 91.3 | 6.9 | 1.8 | 0.90 | 0.00 | 0.90 |
| Item 19 | 2 | 3,193 | 89.6 | 9.9 | 0.5 | 0.86 | 0.01 | 0.86 |
| Item 20 | 2 | 3,225 | 94.6 | 4.9 | 0.5 | 0.95 | 0.00 | 0.95 |
| Item 21 | 2 | 3,148 | 90.0 | 9.1 | 0.9 | 0.91 | 0.01 | 0.91 |
| Item 22 | 2 | 3,206 | 89.2 | 10.8 | 0.0 | 0.86 | 0.00 | 0.86 |
| Item 23 | 2 | 3,187 | 89.3 | 10.7 | 0.0 | 0.88 | 0.01 | 0.88 |
| Item 24 | 2 | 3,182 | 90.7 | 9.3 | 0.0 | 0.84 | 0.00 | 0.84 |
| Item 25 | 2 | 3,204 | 90.0 | 9.5 | 0.6 | 0.90 | 0.00 | 0.90 |
| Item 26 | 2 | 3,145 | 89.5 | 10.5 | 0.0 | 0.91 | 0.00 | 0.91 |
| Item 27 | 2 | 3,176 | 89.4 | 10.5 | 0.1 | 0.90 | 0.01 | 0.90 |

**Table O.34. Field Test Rater Agreement Statistics—Science Grade 11**

| Item | Max. Points | N | %Exact | %Adjacent | %Non-Adjacent | Kappa | MD | Corr. |
|------|-------------|-----|--------|-----------|---------------|-------|------|-------|
| Item 1 | 2 | 3,083 | 92.4 | 7.6 | 0.0 | 0.88 | 0.01 | 0.88 |
| Item 2 | 2 | 2,937 | 88.9 | 11.1 | 0.0 | 0.91 | 0.02 | 0.91 |
| Item 3 | 2 | 2,948 | 88.7 | 11.3 | 0.0 | 0.87 | 0.00 | 0.87 |
| Item 4 | 2 | 2,996 | 94.4 | 5.6 | 0.0 | 0.94 | 0.00 | 0.94 |
| Item 5 | 2 | 2,914 | 89.1 | 10.9 | 0.0 | 0.90 | 0.01 | 0.90 |
| Item 6 | 2 | 2,993 | 98.6 | 1.4 | 0.0 | 0.99 | 0.00 | 0.99 |
| Item 7 | 2 | 2,994 | 97.1 | 2.9 | 0.0 | 0.96 | 0.01 | 0.96 |
| Item 8 | 2 | 2,940 | 91.5 | 8.5 | 0.0 | 0.90 | 0.01 | 0.90 |
| Item 9 | 2 | 2,968 | 92.8 | 7.2 | 0.0 | 0.90 | 0.01 | 0.90 |
| Item 10 | 2 | 3,083 | 90.8 | 9.2 | 0.1 | 0.88 | 0.01 | 0.88 |
| Item 11 | 2 | 3,049 | 89.3 | 10.0 | 0.7 | 0.89 | 0.01 | 0.89 |
| Item 12 | 2 | 3,065 | 88.8 | 11.2 | 0.0 | 0.90 | 0.00 | 0.90 |
| Item 13 | 2 | 3,325 | 89.0 | 11.0 | 0.0 | 0.89 | 0.00 | 0.89 |
| Item 14 | 2 | 4,026 | 89.8 | 8.8 | 1.4 | 0.78 | 0.01 | 0.78 |

| Item | Max. Points | N | %Exact | %Adjacent | %Non-Adjacent | Kappa | MD | Corr. |
|---|---|---|---|---|---|---|---|---|
| Item 15 | 2 | 3,291 | 91.5 | 8.4 | 0.1 | 0.88 | 0.01 | 0.88 |
| Item 16 | 2 | 3,098 | 88.8 | 11.2 | 0.0 | 0.84 | 0.00 | 0.84 |
| Item 17 | 2 | 3,011 | 78.0 | 21.7 | 0.2 | 0.83 | 0.01 | 0.83 |
| Item 18 | 2 | 2,983 | 90.2 | 9.8 | 0.0 | 0.63 | 0.02 | 0.63 |
| Item 19 | 2 | 3,018 | 93.0 | 7.0 | 0.0 | 0.65 | 0.01 | 0.65 |
| Item 20 | 2 | 3,048 | 90.7 | 9.3 | 0.0 | 0.78 | 0.01 | 0.78 |
| Item 21 | 2 | 2,935 | 83.1 | 16.9 | 0.0 | 0.82 | 0.01 | 0.82 |
| Item 22 | 2 | 2,936 | 94.3 | 5.6 | 0.1 | 0.91 | 0.02 | 0.91 |
| Item 23 | 2 | 2,968 | 91.0 | 8.9 | 0.1 | 0.76 | 0.02 | 0.76 |
| Item 24 | 2 | 3,048 | 91.1 | 8.8 | 0.1 | 0.75 | 0.02 | 0.75 |
| Item 25 | 2 | 3,081 | 97.9 | 2.1 | 0.0 | 0.98 | 0.01 | 0.98 |
| Item 26 | 2 | 3,003 | 89.2 | 10.8 | 0.0 | 0.87 | 0.01 | 0.87 |
| Item 27 | 2 | 3,002 | 89.3 | 10.7 | 0.0 | 0.79 | 0.01 | 0.79 |
| Item 28 | 2 | 3,060 | 91.9 | 7.5 | 0.6 | 0.77 | 0.00 | 0.77 |