The Connecticut Mastery Test: Technical Report

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Part 1: Introduction

1.1. General Description of CMT

Connecticut General Statutes Section 10-14n mandates a statewide mastery test to be administered annually in March to all public school students enrolled in grades 3-8. In accordance with that mandate, the Connecticut Mastery Test (CMT) was designed to measure student performance in the areas of Mathematics, Reading, Writing, and Science. The assessment focuses on content that students at each grade level can reasonably be expected to have mastered. Although the legislation specifically prohibits the use of test results as the sole criterion for promotion or graduation, the CMT provides information about achievement that is used for many purposes. Some purposes of the CMT are to:

- set high expectations and standards for student achievement;
- test a comprehensive range of academic skills;
- disseminate useful test achievement information about students, schools, and districts;
- identify students in need of intervention;
- assess equitable educational opportunities; and
- continually monitor student progress in grades 3-8 over time.

The CMT has measured growth in achievement for Connecticut students since 1985, when it was first administered. A second generation of the CMT was introduced in 1993 and a third generation in fall 2000. A fourth generation, which is the version currently in use statewide, was introduced in March 2006. New generations of the test offer an opportunity to adjust content, re-establish standards, and reflect changes in philosophy and technology that have occurred since the previous generation was developed.

The CMT is one important measure for determining student achievement in all of Connecticut's public elementary and middle schools. In 1994, the Connecticut Academic Performance Test (CAPT) was instituted for all Connecticut 10th-grade students as the logical extension of the CMT in the high school. Together, the CMT and CAPT provide a comprehensive system of monitoring and reporting on the academic progress of Connecticut students.

All Connecticut public school students are required to participate in the CMT except for a small number of students with very limited English proficiency that may be exempted from the test. The CMT results provide the opportunity to publicly account for statewide student achievement on the skills and knowledge that Connecticut considers to be important.

The content of the CMT was selected to represent the most important Mathematics, Reading, Writing, and Science skills for students at each of the grades tested. The test content reflects the standards of Connecticut's Curriculum Frameworks. This document, combined with the CMT, aids educators throughout Connecticut in designing instructional programs across all grades to bring about continued improvement in student achievement.

The interpretation of CMT results does not depend on comparing students against one another in terms of performance. Instead, the best way to understand CMT scores is to compare student performance against the established achievement standards. While scores are reported for each of the five tests on the CMT, achievement standards have been established in the four broad areas of Mathematics, Reading, Writing, and Science. In 2000, three achievement standards were established by the Connecticut Board of Education (CSBE), creating four levels of achievement. In 2002, a fourth standard was added to the previous three by CSBE, creating five levels of performance: Advanced, Goal, Proficient, Basic, and Below Basic. The top two levels (Advanced and Goal) define the Goal Range, which is the same as what has historically been referred to as "at or above goal."

There are other ways in which student results are presented. The sections of the test differ in breadth and complexity for each grade and content area. For this reason, student performance is reported in various ways for

each section, most frequently in relation to content strand mastery standards. This information will be explained in more detail in later sections.

The CMT requires more from students than most traditional tests in the areas of mathematics, reading, writing, and science. While traditional assessments typically measure what students know, the CMT also employs performance tasks to measure what students can do with what they know. For example, instead of just doing mathematical calculations, students are asked to apply calculation skills to solve everyday problems. In writing, students are asked to demonstrate their communication skills by producing an essay on a grade-appropriate topic.

The CMT is intended to support high-quality classroom instruction by providing useful feedback to teachers. By administering the CMT in grades 3-8, school districts can gain a comprehensive picture of student achievement. This information can be used for such purposes as individual student diagnosis and placement, curriculum alignment, instructional programs, and communication with parents about student progress.

The CMT plays an important role in education at the school and district levels. CMT results are reported for each school, each school district, and the state as a whole. They are available to the press and to the public on the website www.cmtreports.com.

An aligned assessment program reinforces educational priorities established by Connecticut educators. The CMT provides important feedback to schools and school districts as they work to improve the effectiveness of their educational programs. Many initiatives are in place to support the use of CMT results and to guide instruction toward greater effectiveness.

1.2. 2008 CMT Test Design

The content of the 2008 CMT was selected to represent the most important Mathematics, Reading, Writing, and Science skills for students at each of the grades tested. The test content reflects the standards of Connecticut's Curriculum Frameworks. From Connecticut's Curriculum Frameworks, assessment standards were developed for the CMT.

The spring 2008 administration was the third operational (OP) administration of CMT4. Each administration comprises the following content areas:

1. Mathematics
   Mathematics (MA) consists of a single test administered in two sessions for grades 3 and 4 and three sessions for grades 5 through 8. The tests contain dichotomously scored multiple-choice (MC) items, grid-in (GR) response items, and open-ended (OE) items scored on a 0-1, 0-2, or 0-3 scale.

2. Reading
   Reading (RD) consists of two subtests:
   2.1. Degrees of Reading Power
   Degrees of Reading Power (DRP) has a single session of MC items.
   2.2. Reading Comprehension
   Reading Comprehension (RC) consists of MC items and OE items scored on a 0-2 scale. RC has two sessions.

3. Writing
   Writing (WR) consists of two subtests:
   3.1. Editing & Revising
   Editing & Revising (ER) has only MC items and one session.
   3.2. Direct Assessment of Writing
   Direct Assessment of Writing (DAW) has a single prompt test scored on a 2-12 scale.

4. Science
   Science (SC), which is administered in grades 5 and 8 only, consists of MC items and OE items scored on 0-2 scale.

Table 1 and Table 2 provide the test designs for Form S (Live – 2008 OP) and Form Q' (Breach – 2007 OP), respectively. Both tables share a similar design with a difference in the number of items of Reading Comprehension grade 7. Form S grade 7 (Table 1), Reading Comprehension has 20 MC and 10 OE items, while Form Q' grade 7 (Table 2), Reading Comprehension has 22 MC and 9 OE items. The description Form S and Form Q' will be discussed in the next section (section 1.3.).

Table 1: Form S (Live - 2008 CMT Operational) Test Design

Content	Subject	Grade	Number of Items				Total Items	Score Points
			MC	GR	OE	ER		
Mathematics	Mathematics	3	76		18		94	0 – 106
		4	80		16		96	0 – 110
		5	80	13	20		113	0 – 132
		6	71	18	27		116	0 – 140
		7	70	19	31		120	0 – 146
		8	61	20	36		117	0 – 146
Reading	Degree of Reading Power	3	42				42	0 – 42
		4	42				42	0 – 42
		5	49				49	0 – 49
		6	49				49	0 – 49
		7	49				49	0 – 49
		8	49				49	0 – 49
	Reading Comprehension	3	22		9		31	0 – 40
		4	24		8		32	0 – 40
		5	22		9		31	0 – 40
		6	22		9		31	0 – 40
		7	20		10		30	0 – 40
		8	20		10		30	0 – 40
Writing	Editing & Revising	3	32				32	0 – 32
		4	32				32	0 – 32
		5	36				36	0 – 36
		6	36				36	0 – 36
		7	40				40	0 – 40
		8	40				40	0 – 40
	Direct Assessment of Writing	3				1	1	2 - 12
		4				1	1	2 - 12
		5				1	1	2 - 12
		6				1	1	2 - 12
		7				1	1	2 - 12
		8				1	1	2 - 12
Science	Science	5	36		3		39	0 - 42
		8	45		3		48	0 - 51

Table 2: Form Q' (Breach - 2007 CMT Operational) Test Design

Content	Subject	Grade	Number of Items				Total Items	Score Points
			MC	GR	OE	ER		
Mathematics	Mathematics	3	76		18		94	0 – 106
		4	80		16		96	0 – 110
		5	80	13	20		113	0 – 132
		6	71	18	27		116	0 – 140
		7	70	19	31		120	0 – 146
		8	61	20	36		117	0 – 146
Reading	Degree of Reading Power	3	42				42	0 – 42
		4	42				42	0 – 42
		5	49				49	0 – 49
		6	49				49	0 – 49
		7	49				49	0 – 49
		8	49				49	0 – 49
	Reading Comprehension	3	22		9		31	0 – 40
		4	24		8		32	0 – 40
		5	22		9		31	0 – 40
		6	22		9		31	0 – 40
		7	22		9		31	0 – 40
		8	20		10		30	0 – 40
Writing	Editing & Revising	3	32				32	0 – 32
		4	32				32	0 – 32
		5	36				36	0 – 36
		6	36				36	0 – 36
		7	40				40	0 – 40
		8	40				40	0 – 40
	Direct Assessment of Writing	3				1	1	2 - 12
		4				1	1	2 - 12
		5				1	1	2 - 12
		6				1	1	2 - 12
		7				1	1	2 - 12
		8				1	1	2 - 12
Science	Science	5	36		3		39	0 - 42
		8	45		3		48	0 - 51

1.3. 2008 CMT Test Forms

The design of CMT forms reflects two critical goals of: 1) maintaining the horizontal link (year to year) from 2007 to the 2008 tests and 2) piloting new items for future years of CMT testing. Both of these goals are accomplished while maintaining the same high standards of CMT testing from previous years. The 2008 Form S has links to the 2007 Form P'. Form Q' is used as the breach form in 2008 CMT. The remaining forms of the 2008 CMT tests were the forms X and Y. These form were hybrid Science forms that contained mixed sessions of either Form S or Form Q'.

Part 2: Test Development

The process by which each form of the CMT is developed is extensive, spanning a two- or three-year period and going through many stages. The development process is led and overseen by staff members in the Bureau of Student Assessment at the Connecticut State Department of Education (CSDE), but it also involves many other people who represent a wide variety of perspectives and areas of expertise. CSDE curriculum specialists and content experts play a critical role and work closely with the assessment staff throughout the process. In addition, a major testing company and other organizations and individuals with experience in educational assessment are involved at appropriate points in the development process.

Advisory committees of Connecticut educators are particularly important throughout the development of the CMT. Advisory committees are composed of Connecticut educators with respected knowledge in particular content areas. A separate advisory committee is established for each part of the CMT: Mathematics, Reading, Writing and Science. Additionally, a Fairness Committee screens all test material to ensure that all groups of examinees are validly assessed. Educators are carefully selected for the advisory committees to be representative of school districts throughout Connecticut.

2.1. Content Standards

The first and most critical stage of test development is the basic conceptual design of the test, determining what the most important content to assess is and how that content can best be assessed given the present resources and constraints. These decisions have important implications for the direction of education in Connecticut and for the manner in which the progress of students, schools, and school districts will be measured for several years. These basic decisions are based on the collective expertise of both assessment specialists and curriculum specialists at CSDE, along with input from the CMT advisory committees. Current educational research in the content areas, current assessment research, and current policies and priorities for education in Connecticut form the bases for these decisions. For example, the content tested on the CMT is directly aligned with the content outlined in The Connecticut Framework: K-12 Curricular Goals and Standards.

Once content is determined, other issues must be decided. Test formats (i.e., the types of questions used) must be selected. Also, the methods of scoring the questions and performance tasks must be established. These factors are directly related to the skills and knowledge being assessed. There is, therefore, great variation between and within CMT tests, each uniquely designed to assess specific abilities.

When decisions have been made about test content and test format, they are referred to as “test specifications.” Test specifications serve as the rules for developing the actual test questions. Clear test specifications ensure that test material is not only consistent with the priorities of Connecticut educators, but also that test forms are comparable from year to year. Hundreds of Connecticut citizens and educators responded to surveys that identified the content intended to be included on each test form, validating the appropriateness of the material for students at each grade.

2.2 Item Development

Test items for the CMT4 were carefully developed in accordance with the established test specifications and test blueprint for each grade to reflect content standards in the Connecticut Curriculum Frameworks for mathematics, reading/language arts, and science. After test items were developed according to the test specifications, they underwent extensive review by the testing company, CMT content advisory committees, and the fairness committee before being piloted with Connecticut students in grades 3 through 8. The content advisory committees included content experts, regular and special education teachers, Connecticut State Department of Education curriculum and assessment content specialists, who are knowledgeable about grade appropriate educational content and processes. For the CMT4, the fairness committee was responsible for determining whether items were appropriate and fair to all examinees. Items that did not pass the scrutiny of the either committee were eliminated from the pool of pilot items.

After committee reviews, field test forms were created and piloted on a representative sample, stratified by scale score distribution, of approximately 2000 students per form. During pilot testing, representative samples of students in grades 3 through 8 try out new test questions for the purpose of identifying potential problems with the questions. Questions that are being piloted do not count toward a student's score. The utility of the potential test questions is evaluated based on the results of the pilot testing. Estimated pilot statistics such as the mean, point biserial, and Rasch difficulty, misinterpretation or confusion on the part of the test takers, and performance of various demographic groups are reviewed by CSDE assessment content staff and psychometricians. A judgment is made as to whether each test question enabled students to demonstrate the required skills and knowledge. In addition, for constructed response items that require hand-scoring, the contractor provides qualitative summaries about whether students appeared to have sufficient contextual knowledge to be able to fully respond to the item. Based on these pilot results, flawed items were removed from the item pool, including those showing test item bias or inappropriate levels of difficulty, some were revised for re-piloting, and some became candidates for inclusion on a future form of the CMT.

2.3 Forms Construction

With test specifications as a guide, test forms are carefully constructed, taking into consideration the difficulty of the items and the balance of content. Because a new form of the CMT is developed and administered every few years, it is critical that the forms are "parallel," that is, as similar as possible in terms of both content coverage and test difficulty. This parallelism allows meaningful comparisons to be made from one test form to another. Any slight differences in difficulty among test forms that remain are accounted for through the equating process.

In Connecticut, we think in terms of "generations" of our testing program to allow predictable points where the testing process can be reevaluated and revised as necessary. A "generation" of a Connecticut test spans about five to seven years. During those years, every effort is made to create test forms, score student work, and interpret results in the same way from year to year. The first generation of CMT began in 1985, the second generation began in 1993, and the third generation began in fall 2000.The current, fourth generation CMT began in March 2006. Each new generation of the CMT involves a process similar to the one described above.

Based on the CMT4 blueprints, all test forms of equivalent difficulty per grade were then simultaneously constructed from the grade level pool of items that met all the review criteria, using eMetric's proprietary software, TestBuilder. Every effort was made to ensure that strand level difficulties were comparable and that the items reflected the range of content within the strands across the generation.

Part 3: Validity

According to the 1999 AERA, APA, NCME *Standards*, "It is helpful to consider the four phases leading from the original statement of purpose(s) to the final product: (a) delineation of the purpose(s) of the test and the scope of the construct or the extent of the domain to be measured; (b) development and evaluation of the test specifications; (c) development, field testing, evaluation, and selection of the items and scoring guides and procedures; and (d) the assembly and evaluation of the test for operational use.

In the development and maintenance of CMT each of these phases is carefully planned and implemented. The following section details the critical psychometric procedures undertaken to ensure a strong validity argument for the use and interpretation of CMT (Kane, 2006; Messick, 1989).

3.1. Content Validity Survey

To examine the validity of the CMT for its intended applications, a number of studies have been conducted. The first focused on establishing content validity of each part of the CMT. In October 1984 (the year before the first administration of the grade 4 CMT), a survey of the objectives proposed for the grade 4 CMT was sent to more than 3,000 Connecticut educators. The purpose of the survey was to determine (1) the importance of the proposed mathematics and reading/writing objectives and (2) whether the objectives were taught prior to the fall administration of grade 4. Similar surveys of objectives proposed for grades 6 and 8 were sent to more than 8,000 Connecticut educators in October 1985.

For the third generation, another survey was developed and distributed in January 2000 for the same purpose. The respondents characterized the objectives as important educational outcomes to which students would be instructed prior to being tested. In addition to the test objective validation process, a two-step validation process was carried out. First, content experts reviewed all objectives and test items, examining the relationship between each item and its associated objective. Second, content experts judged how well each item and objective measured the purported content domain.

With the development of CMT4, CSDE commissioned Assessment and Evaluation Concepts, Inc. (AEC) to undertake a comprehensive survey of the Language Arts and Mathematics items to determine the match between item content and respective content strands, as well as the categorical concurrence between the test items and the broader content standards. In their summary report, AEC concluded that CSDE "has done a solid, quality job in matching the test items included on the CMT4 with the relevant content strands and standards of the Language Arts and Mathematics Curriculum Framework." Such evidence, provided by an external reviewer, enhances the validity argument that the CMT4 content is relevant and representative of the constructs being measured.

When establishing validity for a newly developed test, it is common to correlate the examinee scores of the new test with the scores of other tests intended to measure similar content. The two tests need not be parallel or interchangeable, nor do they need to be used for the same purpose. Accordingly, the seventh edition of the Metropolitan Achievement Test (MAT7) was correlated with the CMT in 1993. In 2000, the Metropolitan Achievement Test, eighth edition (MAT8) was used during the first administration of the third generation CMT. Data from each of the four sections of the MAT (Total Language, Reading Comprehension, Math Concepts and Math Procedures) were used to compute the correlations among CMT tests and MAT sections. These correlations provided additional evidence to establish concurrent validity of the CMT.

The Direct Assessment of Writing portion of the CMT was additionally analyzed in another way. This was done because the Direct Assessment of Writing is a single, extended-response measure and, therefore, considerably different from the rest of the CMT tests. Validity concerns in this measure include the relation of the writing sample with the other language arts scores. Correlations between the Direct Assessment of Writing test and the other Language Arts tests (i.e., Degrees of Reading Power, Reading Comprehension, and Editing & Revising) were calculated to establish evidence of construct and concurrent validity.

3.2. Scoring Quality Assurance Procedures Undertaken during Development

Much of the following discussion applies to procedures undertaken during field testing and test construction phases of development work. Of course quality control is applied during the operational administration, but not with the aim of selecting or removing items.

In order to ensure the validity of inferences made from the CMT tests is to make certain there are quality control procedures in place for the scoring of the test. One such quality assurance component is to check the MC answer keys for MC items several times prior to test administration and one final time during the first run of live results. Items yielding low point-biserial correlations are checked a final time for miskeying.

For constructed-response (CR) items, CMT staff and contractor staff work with Connecticut educators to establish score boundaries in a process known as "range finding". The score point examples and training sets so established are carried forward into operational scoring and elaborated with new samples of student responses. Reader training lasts up to several days, and readers must qualify by matching scores to several sets of prescored student responses. Once scoring begins, validity packets are used to maintain reader accuracy. These are packets of student responses with scores pre-assigned by CMT staff and Connecticut educators. Readers periodically receive these packets, and their responses are compared to the pre-assigned scores. If a reader assigns too many discrepant scores, that reader is retrained or removed from the project. Other QA procedures include a 100% second read for the writing prompts (DAW). There is a 20% second read for short answer and extended response items in mathematics and reading comprehension.

3.3. Item Quality Analysis Undertaken During Development

Another part of assessing the quality and validity of inferences made from an instrument is to assess the quality of the items on the test. This quality is typically assessed by examining the classical item statistics as well as the potential for item bias. Item bias could lead to less valid inferences made for certain subgroups.

Item specifications. CMT employs *Standards for Educational and Psychological Testing* (AERA, APA, NCME, 1999) as a primary source of guidance in the construction, field testing, and documentation of the tests. The introduction to the 1999 *Standards* best describes how those *Standards* are and will be used in the development and evaluation of CMT tests:

> Evaluating the acceptability of a test or test application does not rest on the literal satisfaction of every standard in this document, and acceptability cannot be determined by using a checklist. (*Standards*, p. 4)

Thus, the terms 'target' and 'goal' are used when referring to various psychometric properties of the tests. For example, while it is a goal of test development for each high school test to have a reliability coefficient of .90 or greater, it is not our intention to scrap a test with a reliability coefficient of .89. Instead, the test results would be published, along with the reliability coefficient and associated standard error of measurement.

Item statistics. Because the CMT tests are used in making individual decisions about students, they must be very reliable, particularly at cut points (the score points that separate adjacent achievement categories). Target reliability coefficients of .90 (or higher) are therefore set for the important cut points of each test.

Other psychometric properties include item difficulty, item discrimination, and differential item functioning. General statistical targets are provided below:

For Multiple-Choice (MC) Items

Percent correct: greater than or equal to .25
Point biserial correlation with total score: greater than or equal to.20
Mantel-Haenszel: No Category C items (see below)

For Constructed-Response (CR) Items

Difficulty: any level as long as all score points are well represented

Correlation with total score: greater than or equal to.20
Generalized Mantel-Haenszel: No chi-square significant at .05 level of alpha

It should be pointed out that the point biserial correlations for MC items and the correlations for CR items refer to total scores of the field test form with the influence of the item in question removed.

Differential item functioning. The Mantel_Haenszel statistic computes an odds ratio for each item that compares item performance for a reference group and a focal group (for whom bias may be an issue). Specifically, the M-H statistic is a ratio of the probability of success on an item for the reference group to the probability of success on the same item for the reference group. When the ratio is greater than one, the probability of success on the item favors the reference group over the focus group. Note that M-H and other methods for identifying statistical bias are flagging mechanisms that do not necessarily mean that the performance difference is due to unfairness in the item. Instead, the standard procedure is for the bias committee review the items to make a final judgmental determination as to whether or not the item is actually biased.

Since its introduction in the field of epidemiology in 1959, Mantel-Haenszel statistics have been employed by many test developers, and several refinements have been added. Educational Testing Service (ETS) uses the Mantel-Haenszel statistic and calculates a D statistic which permits grouping of test items into three categories (Zieky, 1993). The D statistic is a function of the case-control odds estimator of risk generated by SAS's PROC FREQ. The D statistic is calculated as follows:

1. α = case-control estimate of risk (odds ratio)
2. β = natural log of α
3. $D = -2.35*\beta$

Camilli and Shepard (1994, p. 121) describe three categories of items with respect to D:

A D does not significantly differ from zero using Mantel-Haenszel chi-square, or D's absolute value is less than 1
B D significantly differs from 0 and D has either (a) an absolute value less than 1.5 or (b) an absolute value not significantly different from 1
C D's absolute value is significantly greater than or equal to 1.5

Camilli and Shepard note that Category B items are typically investigated for potential bias, while Category C items are typically removed. Others treat Category C items only as candidates for elimination, pending a reprieve from the committee. In other words, Category C items are considered unusable unless specifically declared usable by the committee. It should be noted that an item that allowed a target group to break out of a pattern of trailing behind the reference group on all other items would tend to fall into Category C. The committee would likely want to keep such an item, in spite of its Mantel-Haenszel status.

DIF occurs when an item shows different results by group (e.g., by race or sex) that cannot be explained by known differences in the overall achievement levels of the two groups. Overall achievement level is typically taken as score on an operational test, assuming that the operational test is itself free of bias. While committee members are free to examine all field-tested items, they must review all items with a Category C rating. Unless the committee specifically calls for the inclusion of any such item, that item is removed from the pool.

Part 4: CMT4 Achievement Standards

To continue to comply with the *No Child Left Behind* (NCLB) accountability requirements, the Connecticut State Department of Education (CSDE carried over from the third generation Connecticut Mastery Test (CMT3) to the fourth generation (CMT4) the previously adopted achievement standards: Below Basic, Basic, Proficient, Goal and Advanced. The CMT3 was last administered in fall 2004 to students in Grades 4, 6 and 8 in mathematics, reading and writing. The CMT4 was first administered in Grades 3 through 8 in spring 2006 in the same three content areas.

The purpose of this section is to summarize the procedures used to accomplish the task of carrying over CMT3 standards to CMT4 and to recommend for approval the CMT4 achievement standards for each grade and content area. The recommendations take into consideration the results from a statistical intergenerational equating study, historical results from past CMT3 administrations, and input from our CMT Standards Review Panel composed of a diverse group of Connecticut educators. All procedures were discussed with and approved by our Technical Advisory Committee (TAC) prior to implementation. The TAC is composed of nationally recognized experts in the measurement field.

4.1. Standards for CMT3

In June 2002, the State Board of Education approved revisions to the standards for the CMT3 in Grades 4, 6 and 8. Standards were established based on scale scores (100-400) in three areas: mathematics, reading and writing. In all content areas, the standards define the different academic performance levels, denoted as Below Basic, Basic, Proficient, Goal and Advanced. The state goal has been an important benchmark for judging the quality of education in Connecticut for more than a decade. The proficient standard is used for accountability purposes as required by NCLB to make determinations about Adequate Yearly Progress (AYP) and schools in need of improvement.

4.2. Establishment of Standards for CMT4

When standards were being established for first and second generation CMT, a judgmental standard setting process called Modified Angoff, was employed. Through that process, groups of educators who were familiar with the performance of students at a particular grade level in a particular content area were asked to predict how students who just meet a particular standard (e.g., remedial standard) would perform on many different CMT items. Using the judgment of these groups of educators in consideration with other validity checks, appropriate state goal and remedial standards were recommended by the Department and adopted by the State Board of Education.

The third generation standards were developed through department staff working with a CMT3 Standards Advisory Panel composed of technical experts, district content experts and district research and testing specialists. The CMT3 standards were set to be as rigorous as the CMT2 standards and to be equivalent across grade levels and across content areas as much as possible.

The process of carrying over CMT3 standards to the CMT4 was based on an intergeneration linking study, consideration of historical results from the CMT3, and judgmental input from the CMT Standards Review Panel. The purpose of the linking study was to equate standards from Grades 3, 5 and 7 of CMT4 with Grades 4, 6 and 8 of CMT3 in order to maintain the same performance standards for NCLB purposes. The equating not only adjusted for differences in difficulty between CMT3 and CMT4, but also for differences due to the change in the testing window. The CMT4 standards for Grades 4, 6 and 8 were then derived through interpolation and extrapolation procedures by examining the previously established trends in standards across Grades 3, 5 and 7.

The Standards Review Panel assisted in the identification of acceptable and valid test standards for each content area of CMT4. Committee membership was broadly constituted to be representative of the state and to include a variety of stakeholders. The CMT Standards Review Panel was given an overview of the CMT3 including the content covered, score weighting, and reporting conventions. Differences between CMT3 and CMT4 were also discussed. Copies of the complete CMT4 were available for reference. In addition, the procedures for carrying

CMT3 standards over to CMT4 were presented in detail so that committee members would better understand their role in the process. They reviewed data from several related analyses and discussed implications from both an educational perspective and a technical perspective. They were asked particularly to provide input in the following three areas:

- Review results from the intergenerational linking procedure to ensure that standards are reasonable and appropriate across grades and content areas,

- Provide subjective input about the effect of changing testing from fall to spring and losing instructional time in March through June for CMT4 examinees, so that the CMT3 standards are maintained across the two generations of testing, and

- Provide subjective input about the reasonableness and consistency of the standards for all grades and content areas.

The full standard-setting report contains the projected percentages of students who will score at or above the CMT4 standards along with the comparative data from the 2004 CMT3 administration. Based on the best data that were available at the time the standards panel was convened, we were able to estimate the scale score cut points that correspond to the projected percentages. The scale score cut scores for 2008 CMT along with those used with CMT3 are presented in Tables 3 (below). The same scale score cut points established for the 2006 administration will be applied in all future CMT4 administrations.

4.3. Establishments of Science Standards for CMT4

On May 20-22, 2008, the Connecticut State Department of Education (CSDE) conducted standard setting for the Science Test component of the Connecticut Mastery Test (CMT). CSDE staff had invited 25 science educators from around the state to participate in this activity and to recommend cut scores for the tests for grades 5 and 8. Measurement Incorporated (MI), the contractor for CMT, served as facilitator for the session employing the bookmark procedure (Cizek & Bunch, 2007).

With the Bookmark procedure, panelists examine test items in an ordered-item booklet and determine whether or not a minimally Basic, Proficient, Goal, or minimally Advanced student would have a 2/3 chance of answering the item correctly (for MC items) or obtain the given score point (for CR items). The ordered-item booklet consists of the items from the actual test but arranged in order of difficulty, with the easiest item on the first page and the most difficult item on the last page. MC and SCR items appear only once in the booklet, but ECR items and writing prompts appear once for each score point. An item worth three points would appear three times, the first time with a sample response representing one point, later with a sample response representing two points, and so on.

Each page contains essential information about the item, including its position in the ordered booklet, its position in the original booklet, and the achievement level (theta) required for a student to have a 2/3 chance of answering correctly or obtaining that point. These theta values are derived from analysis of the student responses to the items through the use of item response theory (IRT) procedures. Specifically, for CMT Science, MI uses the Rasch model for item calibration and test construction. This model allows for the calibration of all items and students on a common scale. This common calibration allows for the calculation of a probability of a correct response to a given item by a given student from information about the student's achievement level (theta) and the items difficulty level (delta).

Panelists enter four bookmarks on a special form, one each for the last page they believe a threshold student would have a 2/3 chance of answering correctly. The page number is associated with a theta required for a 2/3 chance of answering correctly. These theta values are averaged across all panelists. The mean theta is then translated into a score via a table from the Rasch analysis of the live test results. The tabled raw score closest to this value becomes the cut score

After panelists entered their bookmarks (page numbers) in Round 1, MI research assistants (one for each test) entered them into spreadsheets set up to convert the page numbers to theta values for the operational test and

calculate mean theta for each cut, as well as standard deviation and range. The facilitators shared these results with the panelists as described above at the beginning of Round 2. Table 3 summarizes the results of Round 1.

Table 3: Summary of Round 1

	Grade 5	Grade 8
Range of bookmarks for Basic	3-5	4-6
Range of bookmarks for Proficient	7-10	10-21
Range of bookmarks for Goal	17-28	23-39
Range of bookmarks for Advanced	34-37	42-48
Mean theta cut for Basic (S.D.)	-0.549 (0.151)	-0.294 (0.075)
Mean theta cut for Proficient (S.D.)	0.046 (0.068)	0.143 (0.109)
Mean theta cut for Goal (S.D.)	0.923 (0.104)	0.737 (0.265)
Mean theta cut for Advanced (S.D.)	1.801 (0.131)	1.945 (0.181)
Mean cut score for Basic	15	22
Mean cut score for Proficient	20	27
Mean cut score for Goal	28	33
Mean cut score for Advanced	34	43

Panelists received the feedback from Round 1 and discussed the range of bookmarks for each proficiency level, as well as the range of cut scores. Panelists then evaluated the items in the ordered item booklets. On this occasion, they skipped over the items at the beginning of the booklet that had not been delineated by Basic bookmarks by anyone in Round 1 and stopped on the last page delineated by an advanced bookmark in Round 1. Otherwise, procedures in Round 2 were exactly as those in Round 1. Table 4 shows the results of Round 2.

Table 4: Summary of Round 2

	Grade 5	Grade 8
Range of bookmarks for Basic	3-4	4-5
Range of bookmarks for Proficient	7-10	11-17
Range of bookmarks for Goal	20-28	24-32
Range of bookmarks for Advanced	35-38	42-48
Mean theta cut for Basic (S.D.)	-0.786 (0.209)	-0.349 (0.082)
Mean theta cut for Proficient (S.D.)	-0.006 (0.048)	0.117 (0.031)
Mean theta cut for Goal (S.D.)	0.922 (0.064)	0.667 (0.137)
Mean theta cut for Advanced (S.D.)	1.855 (0.185)	2.043 (0.256)
Mean cut score for Basic	13	21
Mean cut score for Proficient	20	26
Mean cut score for Goal	28	32
Mean cut score for Advanced	34	43

Panelists returned for Round 3 and received the information in Table 4 as well as a graphic showing the percentages of students classified at each level, based on their Round 2 cut scores. Drs. Bunch and Deville led discussions of the range of cut scores as well as the impact data and answered panelists' questions. After this discussion, panelists completed their Readiness Forms, indicating that they were ready to go on to Round 3.

In Round 3, panelists entered not only the page numbers where they would place their bookmarks, but their cut scores and percentages of students scoring at or above that cut. Results are summarized in Table 5. Impact data are summarized in Table 6.

Table 5: Summary of Round 3

	Grade 5	Grade 8
Range of bookmarks for Basic	4-5	4-5
Range of bookmarks for Proficient	9-21	10-19
Range of bookmarks for Goal	26-28	24-34
Range of bookmarks for Advanced	37-39	41-50
Mean theta cut for Basic (S.D.)	-0.505 (0.058)	-0.360 (0.079)
Mean theta cut for Proficient (S.D.)	0.188 (0.275)	0.106 (0.075)
Mean theta cut for Goal (S.D.)	0.977 (0.030)	0.667 (0.142)
Mean theta cut for Advanced (S.D.)	2.137 (0.111)	2.058 (0.331)
Mean cut score for Basic	16	21
Mean cut score for Proficient	21	26
Mean cut score for Goal	28	32
Mean cut score for Advanced	36	43

Table 6: Percentages of Students at Each Level, Using Round 3 Cut Scores

	Grade 5*	Grade 8
Below Basic	7.4	14.6
Basic	11.0	10.0
Proficient	26.4	16.6
Goal	40.6	43.8
Advanced	14.7	14.9

After Round 3, MI staff shared results with panelists who then evaluated the process and outcomes. Before leaving the workshop, MI staff delivered the final cut scores and a summary of results to CSDE for final review and approval.

4.4. Levels of Achievement and Cut Scores

Table 7 shows the range of scale scores in each performance category.

Table 7: CMT4 Achievement Levels and Scale Score Ranges

Content Area	Grade	Below Basic	Basic	Proficient	Goal	Advanced
Mathematics	3	100 - 186	187 - 209	210 - 241	242 - 287	288 - 400
	4	100 - 193	194 - 214	215 - 244	245 - 289	290 - 400
	5	100 - 190	191 - 214	215 - 244	245 - 292	293 - 400
	6	100 - 189	190 - 213	214 - 243	244 - 284	285 - 400
	7	100 -190	191 - 215	216 - 245	246 - 289	290 - 400
	8	100 - 190	191 - 213	214 - 244	245 - 286	287 - 400
Reading	3	100 - 201	202 - 216	217 - 234	235 - 278	279 - 400
	4	100 - 212	213 - 226	227 - 243	244 - 294	295 - 400
	5	100 - 202	203 - 214	215 - 229	230 - 278	279 - 400
	6	100 - 206	207 - 219	220 - 235	236 - 288	289 - 400
	7	100 - 193	194 - 207	208 - 221	222 - 272	273 - 400
	8	100 - 205	206 - 218	219 - 231	232 - 281	282 - 400

Content Area	Grade	Below Basic	Basic	Proficient	Goal	Advanced
Writing	3	100 - 187	188 - 211	212 - 239	240 - 286	287 - 400
	4	100 - 184	185 - 208	209 - 236	237 - 280	281 - 400
	5	100 - 185	186 - 208	209 - 237	238 - 283	284 - 400
	6	100 - 184	185 - 210	211 - 236	237 - 283	284 - 400
	7	100 - 191	192 – 212	213 - 235	236 - 269	270 - 400
	8	100 - 188	189 - 211	212 - 235	236 - 282	283 - 400
Science	5	100 – 187	188 – 212	213 – 247	248 – 299	300 – 400
	8	100 – 201	202 – 220	221 - 243	244 - 298	299 - 400

Part 5: Scaling and Equating

5.1 Calibration Process

The 2008 CMT test forms were scaled and equated using the Rasch model. The WINSTEPS software, written by Linacre (Mesa Press, 2005) was used to estimate the latent trait difficulty of each item on the test. WINSTEPS is a WINDOWS-based program that is widely used for similar high stakes tests. WINSTEPS (the Rasch model), allows for the estimation of item difficulty for multiple-choice, open-ended, and extended response items on a single scale. Using these item difficulties, the model is able to estimate the ability (theta) of each student corresponding to each student's raw score.

All scaling and equating analyses were undertaken by three independent groups: Measurement Incorporated (MI), the contractor, the Connecticut State Department of Education (CSDE), and H. Jane Rogers and H. Swaminathan from the University of Connecticut (UCONN). Results were compared and cross-checked to the fourth decimal point to ensure accuracy.

The equating was accomplished using a common item equating design in which the linking items, were embedded in Form S. The purpose of the equating was to place the difficulty estimates of the Form S items on the same scale as Form P' (CMT 2007 Live). The equating was accomplished in the following steps:

1. For every content area, calibrate the 2008 OP with Form S (see Charts 1-4 for sample calibration data matrix). This step is a free run calibration. For DAW two points are subtracted from each score so that scores are on a scale from 0 to 10.

Chart 1: Calibration Design for 2008 CMT Operational Mathematics

Grade 3 & 4	Form S	S_MA1	S_MA2	
Grade 5 - 8	Form S	S_MA1	S_MA2	S_MA3

Note:
S_MA1 = Form S Math Session 1
S_MA2 = Form S Math Session 2
S_MA3 = Form S Math Session 3

Chart 2: Calibration Design for 2008 CMT Operational Reading

Grade 3 - 8	Form S	S_RC	S_DRP

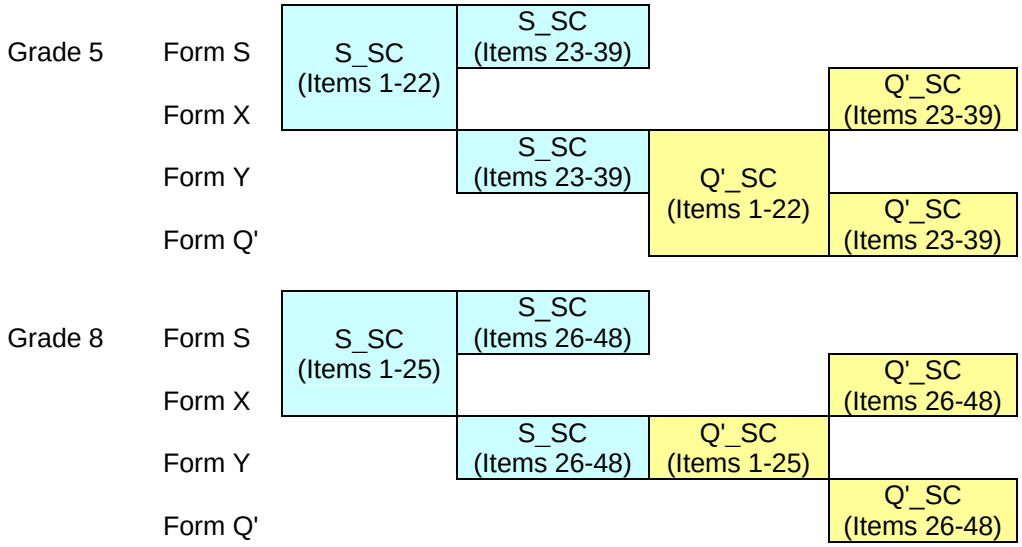
Note:
S_RC = Form S Reading Comprehension
S_DRP = Form S DRP

Chart 3: Calibration Design for 2008 CMT Operational Writing

Grade 3 - 8	Form S	S_ER	S_DAW

Note:
S_ER = Form S Editing & Revising
S_DAW = Form S DAW

Chart 4: Calibration Design for 2008 CMT Operational Science



Note:

Grade 5: S_SC (Items 1-22) = Form S Science: Items 1-22
S_SC (Items 23-39) = Form S Science: Items 23-39
Q'_SC (Items 1-22) = Form Q' Science: Items 1-22
Q'_SC (Items 23-39) = Form Q' Science: Items 23-39

Grade 8: S_SC (Items 1-25) = Form S Science: Items 1-25
S_SC (Items 26-48) = Form S Science: Items 26-48
Q'_SC (Items 1-25) = Form Q' Science: Items 1-25
Q'_SC (Items 26-48) = Form Q' Science: Items 26-48

2. Select linking items between forms S and P'. Do anchor evaluation using .3 rule between the estimates of difficulties from Step 1 and Form P' values (see Appendix A for the Rasch values of linking items). This is an iterative process in which each item, starting with the one with the greatest absolute value difference, is removed until all items fulfill the criterion for use. Using the remaining items the difference between the scale means from Form P' and Step 1 yields the equating constant. Table 8 shows the equating constants. For establishing the first year base scale, anchor evaluation is not needed for Science.

Table 8: 2008 CMT Equating Constants

Grade	Mathematics	Reading	Writing
3	-0.1055	-0.3037	-0.1728
4	-0.0373	-0.1079	-0.0452
5	0.075	-0.191	-0.1019
6	-0.0393	0.0188	-0.0334
7	-0.0732	0.1064	-0.3407
8	-0.0282	0.1037	-0.1388

3. Using the item output files from Step 1 and anchoring these b-values, perform another run for each combination of forms, i.e., employ only those items from a given form in order to obtain theta values for each group of students administered a particular form. For Reading and Writing, the appropriate weights were included (see Table 9).

Table 9: Summary of Weighting for Reading and Writing

Content/Subject	Grade	Unweighted Scale	% of Total Scale	Score Weight	Compute Formula	Weighted Scale
Degree of Reading Power	3	0 – 42	50%	1.000		0 – 42
	4	0 – 42	50%	1.000		0 – 42
	5	0 – 49	50%	1.000		0 – 49
	6	0 – 49	50%	1.000		0 – 49
	7	0 – 49	50%	1.000		0 – 49
	8	0 – 49	50%	1.000		0 – 49
Reading Comprehension	3	0 – 40	50%	1.050		0 – 42
	4	0 – 40	50%	1.050		0 – 42
	5	0 – 40	50%	1.225		0 – 49
	6	0 – 40	50%	1.225		0 – 49
	7	0 – 40	50%	1.225		0 – 49
	8	0 – 40	50%	1.225		0 – 49
Total Reading	3	0 – 82				0 – 84
	4	0 – 82				0 – 84
	5	0 – 89				0 – 98
	6	0 – 89				0 – 98
	7	0 – 89				0 – 98
	8	0 – 89				0 – 98
Editing & Revising	3	0 – 32	40%	1.00		0 – 32
	4	0 – 32	40%	1.00		0 – 32
	5	0 – 36	40%	1.00		0 – 36
	6	0 – 36	40%	1.00		0 – 36
	7	0 – 40	40%	1.00		0 – 40
	8	0 – 40	40%	1.00		0 – 40
Direct Assessment of Writing	3	2 – 12	60%	4.80	(DAW-2)*4.80	0 – 48
	4	2 – 12	60%	4.80	(DAW-2)*4.80	0 – 48
	5	2 – 12	60%	5.40	(DAW-2)*5.40	0 – 54
	6	2 – 12	60%	5.40	(DAW-2)*5.40	0 – 54
	7	2 – 12	60%	6.00	(DAW-2)*6.00	0 – 60
	8	2 – 12	60%	6.00	(DAW-2)*6.00	0 – 60
Total Writing	3	2 – 44				0 – 80
	4	2 – 44				0 – 80
	5	2 – 48				0 – 90
	6	2 – 48				0 – 90
	7	2 – 52				0 – 100
	8	2 – 52				0 – 100

4. Compute scale score (SS) and scale score standard error (SSE) for each forms

$$SS = \left(\frac{T + EQ - T_{mean}}{T_{SD}} \right) * 45 + 250 \text{ and } SSE = \frac{T_{err}}{T_{SD}} * 45$$

where

T and T_{err} are the ability score and the standard error of the ability from the score file in Step 3 (for Reading, Writing, and Science) and Step 1 (for Mathematics).

EQ is the difference between the mean of difficulties estimates of the linking items on Form P' and mean of difficulties estimates of the linking items on Form S, called the equating constant. This value was obtained in Step 2.

T_{mean} and T_{SD} are the scaling coefficients from CMT3 and 2006 CMT (see Table 10).

Table 10: Scaling Coefficients

Content	Grade	T_mean	T_SD
Mathematics	3	2.11972	1.06174
	4	1.715231	1.127543
	5	1.56796	1.08322
	6	1.206464	1.184245
	7	0.79254	1.18006
	8	0.742283	1.223549
Reading	3	0.99235	1.24795
	4	1.149643	1.173126
	5	1.19747	1.20351
	6	1.107734	1.241252
	7	1.52062	1.19801
	8	1.379708	1.271917
Writing	3	0.97123	1.24615
	4	1.405899	1.303604
	5	1.06359	1.23642
	6	1.200022	1.203568
	7	1.21748	1.36516
	8	1.123911	1.2611

Note: Scaling coefficients for grade 3, 5, and 7 came from CMT3 and for grade 4, 6, and 8 came from 2006 CMT.

The minimum SS will be 100 and the maximum SS will be 400. SS less than 100 will be reported as 100 and SS greater than 400 will be reported as 400.

Appendix C contains the results of raw scores, theta, and scale score for Form S. Please contact CSDE for other forms and combinations.

Part 6: Item and Test Statistics

Table 11 and Appendix B present a summary and detailed of item analysis (item quality) data for grades 3-8 Form S, respectively. The following information is presented in each item analysis:

Classical and IRT difficulties: Item difficulty is fundamentally a ratio of the proportion of examinees who answered the item correctly to those who did not answer the item correctly. Thus, an easy item has a high p-value and a difficult item has a low p-value. If an item has a very high p-value it may be so easy that it does not provide much information about what most examinees know or can do, while an item with a very low p-value may be so difficult that it is beyond the range of what most students know or can do. Therefore, items with very high or very low p-values may be rejected, unless content relevance overrides that concern.

Item Discriminations: The point biserial correlation or item-total correlations measure the strength of the relationship between the particular item score and the total score. Thus, item discrimination reflects how well a particular item differentiates between high and low total test performers. When the correlation is high, examinees that do well on the item also tend to do well on the entire test and correspondingly, examinees that do not do well on the item also tend not to do well on the total test.

Distractor Frequencies: The proportion of students who answered each option (A-E, 0-3, and 2-12) are presented for the multiple-choice items, open-ended and extended response, respectively. The percent of students at each score point is presented for extended response (2-12).

Table 11: Summary of Item Analysis Form S

Subject	Grade	Rasch		P-value		Point biserial	
		Mean	Std	Mean	Std	Mean	Std
Mathematics	3	-0.1055	1.033	0.93	0.28	0.40	0.10
	4	-0.0373	1.0314	0.91	0.32	0.42	0.10
	5	0.0750	1.0177	0.90	0.31	0.44	0.10
	6	-0.0393	0.979	0.89	0.29	0.45	0.11
	7	-0.0732	0.7900	0.85	0.33	0.48	0.11
	8	-0.0282	0.8683	0.82	0.31	0.48	0.12
Reading Comprehension	3	-0.7531	0.8311	0.92	0.31	0.43	0.06
	4	-0.2911	0.8840	0.90	0.29	0.41	0.10
	5	-0.5585	0.7028	0.95	0.31	0.43	0.06
	6	-0.2706	0.7550	0.95	0.34	0.42	0.10
	7	-0.1239	0.8686	0.98	0.34	0.45	0.08
	8	0.0325	0.7358	0.95	0.37	0.42	0.11
Degree of Reading Power	3	0.0280	1.2400	0.59	0.20	0.42	0.13
	4	0.0316	1.2067	0.67	0.18	0.45	0.10
	5	0.0415	1.3321	0.64	0.21	0.41	0.10
	6	0.2019	1.1819	0.67	0.18	0.46	0.08
	7	0.2474	1.2062	0.68	0.18	0.45	0.09
	8	0.1473	1.0773	0.69	0.16	0.42	0.08
Editing & Revising	3	-0.1918	0.9009	0.71	0.14	0.40	0.09
	4	-0.0587	0.7658	0.75	0.11	0.40	0.09
	5	-0.1184	0.7101	0.73	0.12	0.39	0.09
	6	-0.0556	0.7323	0.73	0.12	0.37	0.09

Subject	Grade	Rasch		P-value		Point biserial	
		Mean	Std	Mean	Std	Mean	Std
	7	-0.3577	0.8488	0.74	0.13	0.37	0.09
	8	-0.1520	0.9787	0.72	0.15	0.39	0.09
Direct Assessment of Writing	3	0.4351	.	8.11	.	0.53	.
	4	0.3858	.	8.63	.	0.55	.
	5	0.4925	.	8.05	.	0.51	.
	6	0.7653	.	7.93	.	0.51	.
	7	0.3407	.	8.17	.	0.59	.
	8	0.3899	.	8.39	.	0.63	.
Science	5	-0.0130	0.9504	0.71	0.15	0.35	0.08
	8	-0.0039	0.8832	0.67	0.16	0.39	0.10

6.1. Reliability

Reliability is a statistical index of the consistency of test performance over repeated trials. The simplest model for conveying the concept of reliability is to describe the test re-test method. If a test is administered to a group of examinees and then re-administered to the same examinees a short time later, the correlation of the scores across both test administrations estimates the reliability of the test. To measure reliability using a single administration, the test items are split using various techniques into half-length tests and those scores are then correlated. Cronbach's alpha estimates the lower-bound estimate of an infinite combination of split-halves and therefore is regarded as a very conservative method for assessing test reliability.

Table 12 summarizes reliability estimates for 2008 CMT Mathematics, Reading, Writing, and Science. The reliability coefficients are based on Cronbach's alpha measure of internal consistency. When evaluating these results it is important to remember that reliability is partially a function of test length and thus reliability is likely to be greater for clusters that have more items. Within each content area the reliability estimates across the forms were very similar. Note that there are no Hybrid forms for Mathematics, Reading and Writing. Table 13 presents the mean and standard deviation of students' scale scores.

Table 12: 2008 CMT Cronbach's Alpha

Grade	Form	Mathematics	Reading	Writing	Science
3	S	0.949	0.945	0.887	-
4	S	0.957	0.948	0.884	-
5	S	0.966	0.949	0.886	0.867
	X	-	-	-	0.899
	Y	-	-	-	0.895
6	S	0.969	0.954	0.879	-
7	S	0.973	0.955	0.889	-
8	S	0.974	0.948	0.896	0.904
	X	-	-	-	0.922
	Y	-	-	-	0.918

Table 13: 2008 CMT Scale Score Summary Statistics

Grade	MA		Reading		Writing		Science	
	Mean	Std	Mean	Std	Mean	Std	Mean	Std
3	252.29	52.66	235.93	42.74	253.25	45.58		
4	257.71	50.55	248.69	46.14	253.09	46.56		
5	264.04	52.39	239.93	44.22	254.75	44.03	250.11	45.61
6	260.67	46.28	255.41	47.23	252.18	45.60		
7	260.71	47.77	245.81	47.74	244.50	39.23		
8	255.06	44.96	247.54	42.22	252.95	46.10	249.88	45.27

6.2. Classification Consistency and Accuracy

Classification Consistency and Accuracy studies were measured using the IRT-Class program (see Lee, Hanson, and Brennan, 2002), developed by CASMA (Center for Advanced Studies in Measurement and Assessment) at the University of Iowa. The classification consistency and accuracy can be assessed based on the given ability distribution and the difficulty of the items (IRT parameters). Tables 14-17 contain the results of these analyses.

The results of decision consistency and accuracy computations show that for the most part, decisions are highly consistent (see Table 14). The consistency ratings at each cut score are generally in the upper 90s. This tends to tail off at the highest cut score (i.e., the upper end of the distributions). The cumulative effect of applying all cut scores simultaneously yields an average consistency of around low 70s to mid 90s. The classification accuracy estimates show (see Table 15), similarly, that the accuracy ratings at each cut score are generally in the upper 90s.

The program also computes the false negative rates for the test, which in effect are an estimate of those students that may have been misclassified to a performance category lower than their true performance category. The results of the false negatives, found in Table 16, indicate that a very small number of students may have been negatively misclassified in this way. Table 17 shows the false positive classification.

Table 14: Classification Consistency

Content Area	Grade	Overall Classification Consistency	Cut 1	Cut 2	Cut 3	Cut 4
Mathematics	3	0.81921	0.98086	0.97100	0.94692	0.91901
	4	0.82889	0.97995	0.96988	0.95239	0.92569
	5	0.85662	0.98145	0.97322	0.96323	0.93848
	6	0.87371	0.98470	0.97819	0.96629	0.94449
	7	0.87383	0.98360	0.97788	0.96621	0.94613
	8	0.86651	0.97864	0.97257	0.96441	0.95084
Reading	3	0.80996	0.97162	0.96298	0.95040	0.91687
	4	0.79581	0.96480	0.95760	0.94885	0.91152
	5	0.81905	0.97331	0.96705	0.95726	0.90859
	6	0.83201	0.97246	0.96681	0.95811	0.92374
	7	0.83164	0.97099	0.96563	0.95907	0.92428
	8	0.81299	0.96755	0.96025	0.95140	0.92052
Writing	3	0.96906	0.96920	0.96915	0.96915	0.96917
	4	0.97438	0.97557	0.97557	0.97557	0.97554

Content Area	Grade	Overall Classification Consistency	Cut 1	Cut 2	Cut 3	Cut 4
	5	0.96847	0.96856	0.96852	0.96852	0.96852
	6	0.96198	0.96208	0.96205	0.96205	0.96205
	7	0.97551	0.97552	0.97552	0.97552	0.97552
	8	0.97179	0.97186	0.97186	0.97186	0.97189
Science	5	0.70453	0.95620	0.93734	0.90895	0.89363
	8	0.74645	0.95380	0.94479	0.92947	0.90606

Table 15: Classification Accuracy

Content Area	Grade	Overall Classification Accuracy	Cut 1	Cut 2	Cut 3	Cut 4
Mathematics	3	0.87094	0.98647	0.97921	0.96215	0.94304
	4	0.87808	0.98579	0.97838	0.96627	0.94762
	5	0.89860	0.98694	0.98097	0.97402	0.95666
	6	0.91110	0.98931	0.98463	0.97627	0.96089
	7	0.91055	0.98841	0.98436	0.97624	0.96154
	8	0.90510	0.98492	0.98063	0.97458	0.96496
Reading	3	0.86184	0.97994	0.97403	0.96508	0.94121
	4	0.84955	0.97500	0.97005	0.96406	0.93729
	5	0.86642	0.98110	0.97665	0.96985	0.93505
	6	0.87622	0.98052	0.97654	0.97032	0.94595
	7	0.87543	0.97948	0.97573	0.97099	0.94621
	8	0.86165	0.97700	0.97187	0.96568	0.94359
Writing	3	0.95584	0.96957	0.97635	0.97807	0.97721
	4	0.95913	0.97673	0.98327	0.98327	0.97810
	5	0.95722	0.97091	0.97672	0.97827	0.97659
	6	0.93867	0.95900	0.96557	0.97291	0.97042
	7	0.96615	0.97571	0.98231	0.98261	0.98261
	8	0.94488	0.97165	0.97998	0.97998	0.96913
Science	5	0.77919	0.96889	0.95279	0.93343	0.92306
	8	0.81316	0.96641	0.96141	0.94871	0.93381

Table 16: False Negative Classification

Content	Grade	Overall False Negative	Cut 1	Cut 2	Cut 3	Cut 4
Mathematics	3	0.06384	0.00732	0.00890	0.01730	0.03035
	4	0.06743	0.00910	0.00874	0.01916	0.03044
	5	0.05358	0.00779	0.01153	0.01225	0.02202
	6	0.04762	0.00601	0.00884	0.01285	0.01993
	7	0.04792	0.00505	0.00730	0.01265	0.02292
	8	0.04130	0.00746	0.00882	0.01008	0.01495
Reading	3	0.06724	0.00930	0.01353	0.01763	0.02753
	4	0.08398	0.01406	0.01581	0.01957	0.03630

Content	Grade	Overall False Negative	Cut 1	Cut 2	Cut 3	Cut 4
	5	0.07037	0.00971	0.01199	0.01584	0.03476
	6	0.06391	0.00968	0.01203	0.01532	0.02833
	7	0.06475	0.01045	0.01220	0.01431	0.02929
	8	0.06842	0.01127	0.01407	0.01750	0.02730
Writing	3	0.02799	0.02792	0.01857	0.01271	0.00666
	4	0.02163	0.02131	0.01054	0.00904	0.00322
	5	0.02609	0.02604	0.01716	0.01239	0.00673
	6	0.03875	0.03868	0.03043	0.01826	0.00701
	7	0.02255	0.02255	0.01274	0.00610	0.00610
	8	0.02643	0.02642	0.01426	0.01426	0.00222
Science	5	0.07709	0.01410	0.01438	0.02285	0.02598
	8	0.08028	0.01237	0.02229	0.01843	0.02839

Table 17: False Positive Classification

Content	Grade	Overall False Positive	Cut 1	Cut 2	Cut 3	Cut 4
Mathematics	3	0.06523	0.00621	0.01190	0.02055	0.02661
	4	0.05449	0.00511	0.01288	0.01456	0.02194
	5	0.04783	0.00528	0.00750	0.01373	0.02132
	6	0.04127	0.00468	0.00654	0.01087	0.01918
	7	0.04152	0.00654	0.00834	0.01111	0.01554
	8	0.05360	0.00762	0.01055	0.01534	0.02009
Reading	3	0.07091	0.01076	0.01244	0.01729	0.03126
	4	0.06647	0.01095	0.01414	0.01637	0.02641
	5	0.06321	0.00919	0.01135	0.01431	0.03019
	6	0.05988	0.00979	0.01143	0.01436	0.02573
	7	0.05982	0.01007	0.01207	0.01470	0.02450
	8	0.06993	0.01173	0.01405	0.01682	0.02912
Writing	3	0.01616	0.00251	0.00508	0.00922	0.01613
	4	0.01925	0.00196	0.00619	0.00769	0.01868
	5	0.01669	0.00305	0.00612	0.00934	0.01668
	6	0.02258	0.00233	0.00400	0.00882	0.02257
	7	0.01130	0.00175	0.00494	0.01130	0.01129
	8	0.02869	0.00193	0.00576	0.00576	0.02865
Science	5	0.14373	0.01701	0.03283	0.04372	0.05097
	8	0.10657	0.02122	0.01630	0.03286	0.03780

Part 7: Vertical Scale Score Development for CMT4

7.1. Overview

Vertical scaling is used to place test scores from assessments that vary in difficulty, but measure similar constructs, on the same scale. For example, students in grades 3-8 who take their state's reading achievement assessments, whereby each grade level has its own test can be provided vertically scaled scores so that a given student's achievement can be compared to students' scores from the same grade as well as across the grades. In addition, a vertical scale allows one to track a student's growth, e.g., in reading from year to year. Vertically scaled scores can also be aggregated, so that one could also track scores at the grade, school, or district level.

This type of scale can also be used to track student growth, relate the content and skills in items across grades, and examine the relationship of performance standards from grade to grade (see hypothetical values in Tables 18 and 19). Such a scale might also afford the state of Connecticut an additional method for reporting student achievement for purposes of No Child Left Behind, or simply as another approach to investigating and interpreting test scores for purposes of tracking growth and development.

The hypothetical numbers in Table 18 illustrate growth in two directions. First within a grade, e.g., grade 3, the raw and scale scores needed to attain Basic, Proficient, and Advanced proceed from 48 to 65 to 80 (raw) and 330 to 500 to 654 (scale). Looking across grades within a level, e.g., at the Proficient level, a grade 3 student must obtain a scale score of 500, while a grade 4 students needs a score of 559, etc., up to grade 8 where a student must score 700. (Raw scores are not relevant when examining growth across grades within a proficiency level.)

Table 19 illustrates, again using hypothetical numbers, the level of growth or the amount of score change needed when moving from grade to grade. As just described, at the Proficiency level, a score change of 59 points would be required. Likewise, a 45-point score change between grades 4 and 5 is needed to maintain a performance level of Proficient.

In summary, a vertical scale can be a useful tool to examine the growth of individual students or aggregates of students (e.g., schools). The scale can provide information regarding students' progress across grades as well as within a grade across proficiency levels.

Table 18: An Example of Scale Values, Cut Scores, and Performance Levels

Grade	Basic		Proficient		Advanced	
	Raw	Scale	Raw	Scale	Raw	Scale
3	48	330	65	500	80	654
4	42	354	64	559	80	748
5	39	382	62	604	81	799
6	44	417	69	641	83	823
7	43	426	65	673	80	867
8	47	507	64	700	81	914

Table 19: An Example of Scale Score Growth Expectations at Proficient

Grade Progression	Gain
3 to 4	59 points
4 to 5	45 points
5 to 6	37 points
6 to 7	32 points
7 to 8	27 points
3 to 8	200 points

In Spring 2007, the Connecticut State Department of Education (CSDE) decided to investigate the possibility of using vertical scales in its statewide testing program. This part provides information with respect to the vertical scaling analyses undertaken by the state's contractor, Measurement Incorporated (MI).

7.2. Data Collection and Design

Data were collected as part of the regular testing administration in Spring 2007. Test scores from the regular, operational administration (Form P') were used, as well as scores from shorter, supplemental exams. Items from the operational tests were used to construct all supplemental exams. Tables 20-22 provide the numbers and types of items from the Form P' operational tests across grades 3-8. The Math tests were comprised of multiple-choice (MC), grid-in (GR), and open-ended (OE) questions. The Reading test is a combination of two separate parts, the Degree of Reading Power (DRP) and the Reading Comprehension (RC) test.

Table 20: Number and Item Types for Mathematics across Grades

Grade	Number of Items			Total Items
	MC	GR	OE	
3	76		18	94
4	80		16	96
5	80	13	20	113
6	71	18	27	116
7	70	19	31	120
8	61	20	36	117

Table 21: Number and Item Types for DRP across Grades

Grade	Number of MC Items	Total Items
3	42	42 of 73
4	42	42 of 74
5	49	49 of 80
6	49	49 of 80
7	49	49 of 79
8	49	49 of 79

Table 22: Number and Item Types for RC across Grades

Grade	Number of Items		Total Items
	MC	OE	
3	22	9	31 of 73
4	24	8	32 of 74
5	22	9	31 of 80
6	22	9	31 of 80
7	20	10	30 of 79
8	20	10	30 of 79

During the 2007 CMT administration, students in grades 3-8 were given a supplemental exam in addition to the regular, operational assessments. The supplemental exams were constructed so that the students could be tested 'off grade', meaning that, for example, grade 5 students were administered a supplemental test that contained either grade 4 or grade 6 operational items. The supplemental tests were shorter than the operational exams (students took only one section within the supplemental content area), but enough supplemental forms were created and administered to include all operational items. So for a given grade-level operational test, all items

were also administered to students in the adjacent grades via the supplemental exams. The design called for the administration of each grade-level item to approximately 1,500 students from each adjacent grade. This common item and student design permits vertical linking of performance across grades (see Table 23). The diagonal (boldface) fields represent the on-level items at a given grade level, while the off-diagonal fields represent the off-grade administration of the operational items to adjacent grades (the upper diagonal are the supplemental exams administered to adjacent lower grades, while the lower are the tests given to the adjacent higher grades).

Table 23: Common Item and Student Design

		Items					
		Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
Students	Grade 3	**OP33**					
			SU34				
	Grade 4	SU43	**OP44**				
				SU45			
	Grade 5		SU54	**OP55**			
					SU56		
	Grade 6			SU65	**OP66**		
						SU67	
	Grade 7				SU76	**OP77**	
							SU78
	Grade 8					SU87	**OP88**

Notation: OP=Operational test; SU=Supplemental test; Numerals=grade-level students and test level taken, e.g., SU56 refers to fifth-grade students who took the supplemental exam containing grade-six operational items.

7.3. Methodology

Only students who were administered Form P' (main form) during the 2007 Spring administration were included in the analyses. Equating analyses for the 2007 operational forms for the six grades and three content areas were performed and cross-validated (see 2007 CMT Technical Report).

Before beginning with the linking, we first examined the classical difficulties (p-values) from the on-grade data and values for the same items from the next higher grade. If an item had a p-value for the on-grade students that was 5%*maximum score or greater than that obtained from students in the next higher grade, we removed it from subsequent analyses. (Experience has shown that p-values from on-grade students are almost always higher than those obtained from students in the next lower grade, e.g., grade 4 students administered grade 4 test materials will, in general, perform better on every item than 3rd-grades taking those same 4th-grade items.) Because students in higher grades may have forgotten material learned the previous year, some items are likely to exhibit this 'reverse' pattern of difficulty. The item can work well when measuring on-grade performance, but may not be suitable for modeling a vertically linked continuum of learning. For this reason, we removed such items.

The linking plan follows the scheme represented in Appendix D. As explained below, there are two linking paths to follow, meaning we obtained two sets of item parameters for each grade level. The strength of this design is that we were able to determine how well the two links result in convergent values for the rescaled parameters.

Having obtained the two sets of parameters from following the upper and lower linking paths we then examined the item parameters to determine how similar they were by obtaining a correlation coefficient between the sets of parameters and used Fisher's z-test to determine if the differences were significant. An item that exhibited

very different parameter values was to be removed from further analysis. We then used the mean of the two parameter values for each item to proceed. The following steps detail the analyses.

***Step 1* (see Appendix D).** Based on advice from the Technical Advisory Committee, we set a middle grade as the base scale, namely grade 5. We first did a free run on the OP55 items and obtained item and person parameters.
There are common items linking OP55 and SU45. By anchoring the grade 5 items we obtained 'new' (i.e., different from what these grade 4 students would have from having taken OP44) thetas for the SU45 test takers. We then fixed these new theta values. Using the PAFILE command in WINSTEPS, i.e., anchoring students' thetas, we then obtained item parameter estimates by linking to OP44.
Again starting from OP55, we had theta values for the grade-5 students from their on-grade testing and the initial free run. Linking to SU54 via the common students, we anchor their grade-5 theta values and obtained parameter estimates for the grade-4 items.
At this point we have two sets of parameters for the grade-4 items, each set linked to the grade-5 scale. We compared the two sets using a Pearson correlation and the Fisher Z-test. We expected $r > 0.90$. Fisher's Z is calculated by:

$Z = .5 \log ((1+(r-0.9)) / (1-(r-0.9)))$, where
$Z \sim N (0, 1/\text{sqrt}(n-3))$, and where n is the number of observations.

Our plan was to remove 'outliers' until $Z < 1.96 / \text{sqrt}(n-3)$, then calculate the average of the remaining item parameters. These estimates were then be used to obtain thetas for the OP44 students.

Step 2. At this point we had the OP44 item parameters and thetas, linked to the grade-5 scale, and proceeded as in the first step. There are common OP44 items linked to SU34. By fixing those item values, we obtained thetas for the test takers in SU34. We then anchored their theta values and linked to OP33, obtaining a set of item parameters for the grade-3 items.
Similar to the grades 5 and 4 connection, there are common students between OP44 and SU43. We anchored the theta values in OP44 and linked to SU43, giving us a second set of item parameter estimates for grade 3. We then went through the same procedure described above to determine if the two linking paths and procedures gave us similar results. Finally, we used the average item parameter estimates to obtain thetas for the grade 3 students.

Step 3. The same procedures were used to link the higher grades. Again, we started with the free run of OP55, using those item parameter and theta estimates as the staring point. Common items link OP55 to SU65. Fixing the grade 5 item parameters, we obtained theta estimates for SU65. By fixing these theta values, we linked to OP66 to obtain grade-6 item parameters.
The link from OP55 to SU56 is the common students. We fixed the students' theta values from their on-grade testing, i.e., OP55, and obtained item parameter estimates for the grade-6 items.
The items were examined to identify problematic ones, which were to be discarded. For the remaining items we calculated the mean of the two parameters and used that to get thetas for the grade-6 students.

Steps 4 and 5. The same procedures were used as just delineated for grades 7 and 8. When finished we had items and students on the same Rasch scale using grade 5 as the base.

Using the final item parameter and theta estimates a vertical, developmental scale was created to demonstrate what growth would look like across the grades in Math and Reading. It is emphasized here that the choice of a scale was somewhat arbitrary and was undertaken without consultation with CSDE or the TAC. The scale is for illustrative purpose only.

7.4. Results

Table 24 presents the number of items that were removed because of item p-value reversals, i.e., where the p-value for the item taken by the on-grade students was 5%*maximum score or higher than the p-value for the students at the higher adjacent grade. Noteworthy is that few items were removed, especially at the lower grades 3 and 4. More Math items were removed than Reading items. With respect to Reading, no items were

removed until grade 6, where 10 of 80 had to be discarded for further analysis. Grade 6 also saw the most Math items removed. The TAC and CSDE discussed why so many items from this particular grade level showed reversals and whether the content of the items might play a role. In addition, having removed a larger number of items, especially in Reading, likely affected the subsequent vertical scaling, although to what extent would be very difficult to determine. While removing these 'misfitting' items likely results in better vertical scales, further analysis, interpretation, and justification is needed to improve our understanding of how this procedure affects vertical scaling.

Table 24: Number of Items Removed based on P-value Reversal

Grade	# Items Removed	
	Mathematics	Reading
3		
4	2 / 96	
5	4 / 113	
6	8 / 116	10 / 80
7	4 / 120	3 / 79

The WINSTEPS runs were performed in the manner described above in Section 7.2.2. The two linking paths were followed linking grade to grade. The resulting two sets of item parameters were compared using Pearson's correlation and the Fisher Z-test. No items were removed based on these analyses. The TAC suggested that the method of comparing the parameters may not have been stringent enough. An investigation into what other procedures might be more appropriate would be a worthwhile research project.

The final Rasch item parameters, using grade 5 as the base scale, can be found in Appendix E. Figure 1 is output from SAS that shows the distributions of thetas across grades in Mathematics based on the vertical scaling using the obtained Rasch values. The mean thetas increase across grades, from a mean of 0.3021 for grade 3 to a high of 2.9339 for grade 8. The variability in the distributions is quite similar, with standard deviations between 1.2 and 1.3. The range of the thetas across the six grades is approximately 10 logits, from -3.5 to 6.0.

Figure 1: Theta Distributions for Mathematics across Grades

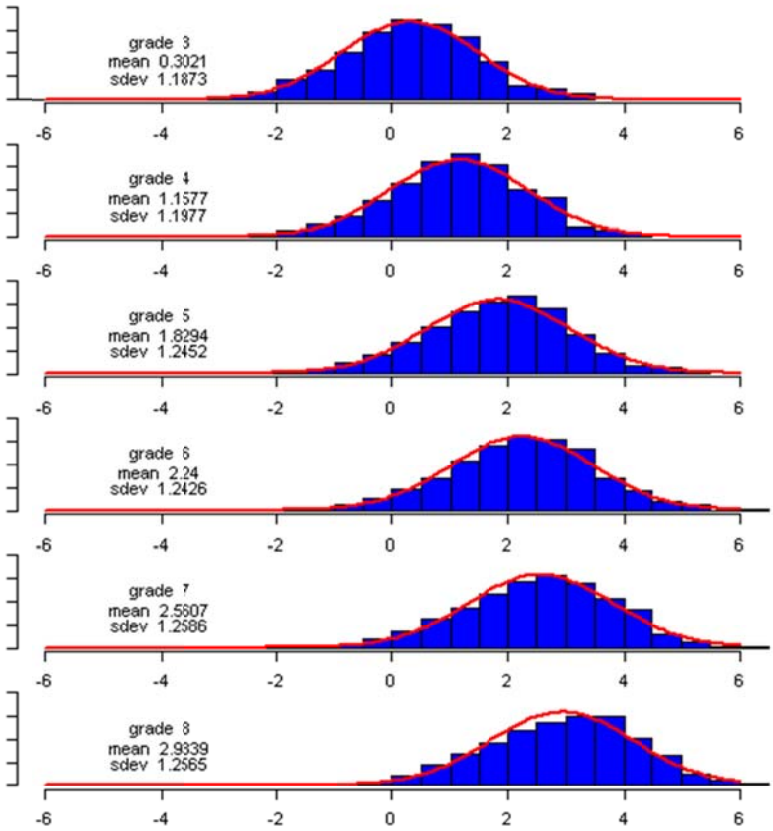
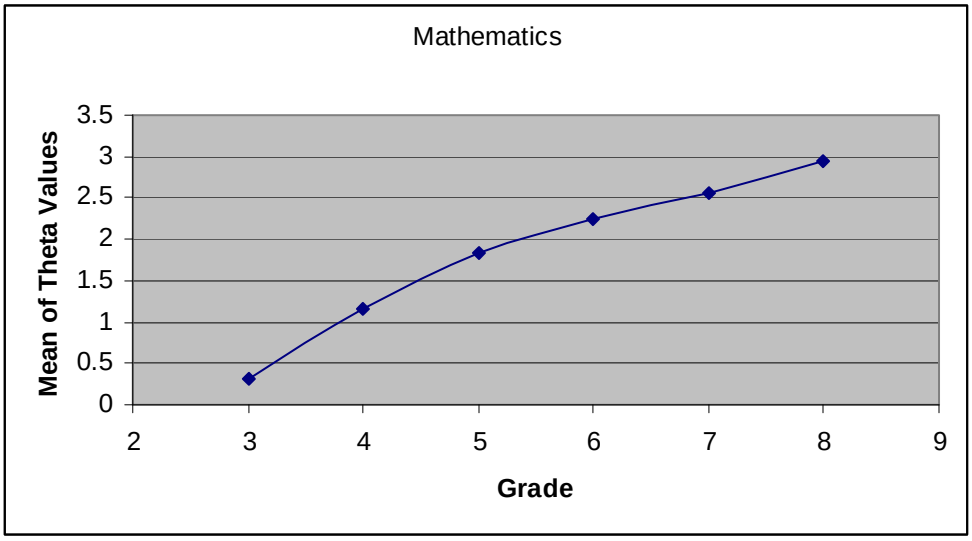


Figure 2 provides a graphic depiction of the increasing mean theta values in Mathematics across grades 3-8. Growth, as depicted here, appears to be steeper at the lower grades and becomes somewhat flatter in the upper grades. In other words, growth appears to slow as the students get older.

Figure 2: Mean of Theta Values for Mathematics across Grades



The pattern of thetas for Reading was similar to the pattern for the Mathematics (Figures 3-4). Again, the mean thetas increase across grades, from a mean of -0.0991 for grade 3 to a high of 2.0393 for grade 8 in Reading. The standard deviations were between 1.1 and 1.3 in Reading. Similar to Mathematics, the range of the thetas for Reading across the six grades is approximately 10 logits, from -3.5 to 6.0. Figure 4 show the increasing mean theta values in Reading across grades 3-8 respectively. Once again, growth appears to be steeper at the lower grades and becomes somewhat flatter in the upper grades, i.e., growth looks to slow as the students get older.

For illustrative purposes we constructed a vertical scale score in order to demonstrate what growth would look like across such a scale, and just as importantly, what the relationship would be across the grades when examining the performance levels. MI did not consult with CSDE or the TAC to generate this scale, although the results appear to be very promising.

At the outset of constructing the scale, we discovered that we could not use the score files given by WINSTEPS because some items were not included (a number of items had been removed due to p-value reversals). So we anchored the thetas and recalibrated all items. Having done that, we then recalibrated the thetas using all items with parameters obtained above.

The scale range chosen was 100-800. These somewhat arbitrary values come from simply doubling the present score scale used for all CMT tests (i.e., 100-400). At this point we have a theta for each student in grades 3-8. The student's vertical scale score (VS) is equal to:

$$VS = 100 + 700 * ((theta–min(theta))/(max(theta)-min(theta))).$$

Figure 3: Theta Distributions for Reading across Grades

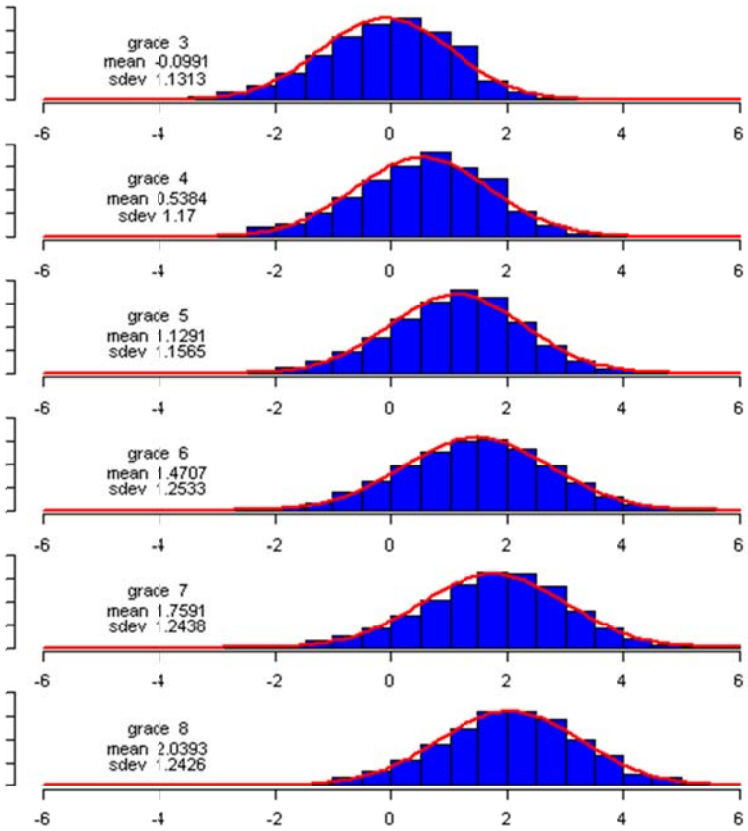
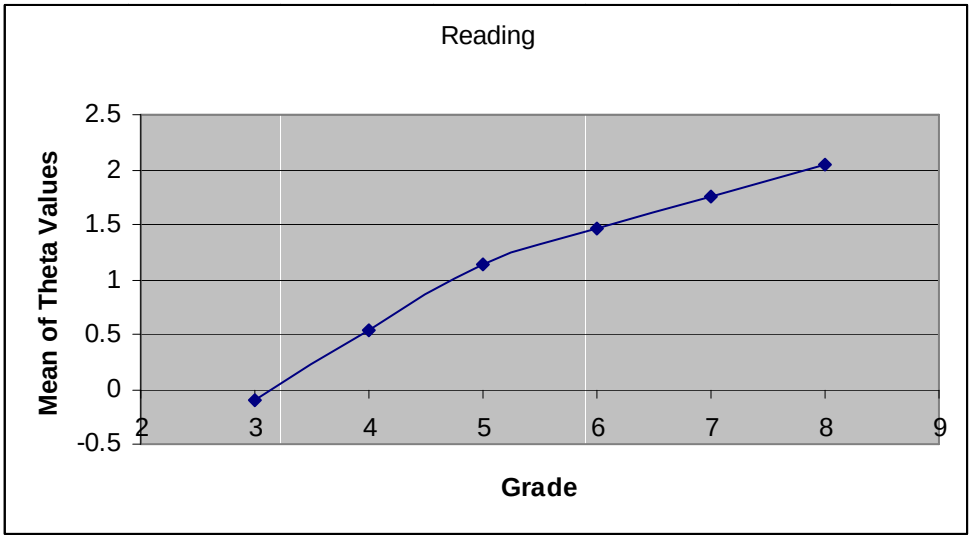


Figure 4: Mean of Theta Values for Reading across Grades



The vertical scores of the above formula have resulted in inconsistent vertical scale scores changes at the lower and upper end of the scale, which may lead to misinterpretation. University of Connecticut (H. Swaminathan and H. Jane Rogers) suggested and have implemented the necessary adjustments.

To obtain the vertically scaled cut scores, we started with the Mathematics and Reading scale score cut points for the different performance levels used operationally in CMT4 (where the scale is 100-400), and then found the corresponding raw cut scores. We then looked at the score file out of the final vertical scaling run in WINSTEPS to obtain the theta value that corresponds to the raw score. Finally, the theta values were inserted into the scale score formula above to obtain a student's VS on the vertical scale of 100-800 (Table 25).

Figures 5-6 depict the relationship between the vertically scaled cut scores across the proficiency levels for Mathematics and Reading respectively. Growth increases across the grades as do the cut scores. From the graphs it is clear that the cut scores for Advanced, especially in Reading, set this group well apart from the others.

Some degree of caution is advisable when interpreting the extent of growth, the speed of growth, and the extent of differences across grades. A vertical scale is most helpful when looking at such information across years and not simply for a single year, as presented in this report. That said, it appears these initial results indicate that a vertical scale may add another, and important, dimension for Connecticut's educators to interpret test scores.

Based on vertical scaling in CMT 2007, CSDE has decided to use the available results to generate the conversion tables for the whole generation of CMT4. In order to generate conversion tables in subsequent years, conversion tables mapping the conventional scale score to the vertical scale score will be used as lookup tables to determine the appropriate vertical scale score for a given conventional scale score.

Table 25: Vertical Scale Cut Scores in Mathematics and Reading at Each Proficiency Level for Grades 3-8 for CMT4

Content Area	Grade	Basic	Proficient	Goal	Advanced
Mathematics	3	396	418	452	499
	4	429	453	483	531
	5	450	476	506	558
	6	466	492	526	572
	7	483	509	543	593
	8	496	523	559	608
Reading	3	382	400	425	481
	4	410	427	447	507
	5	436	449	467	525
	6	439	455	475	545
	7	453	472	489	550
	8	466	483	500	564

Figure 5: Relationship of Mathematics Cut Scores for Each Proficiency Level across Grades

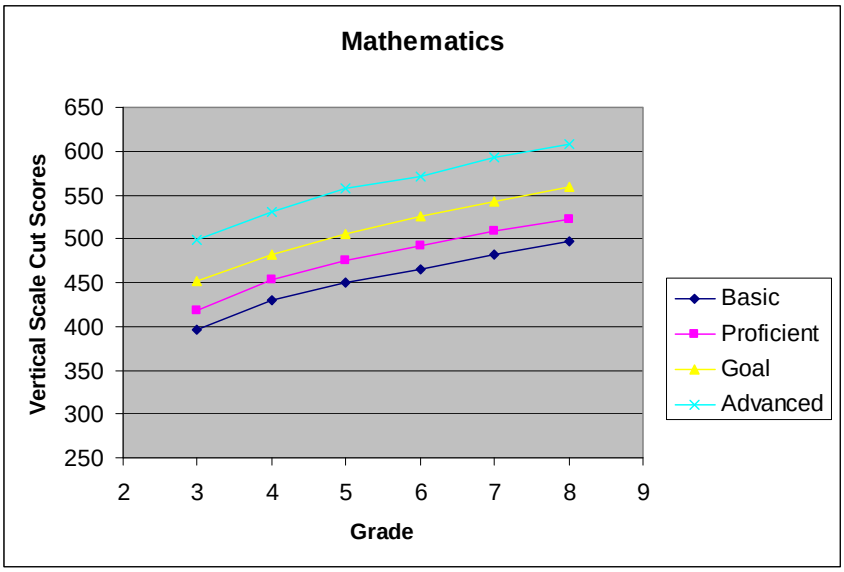
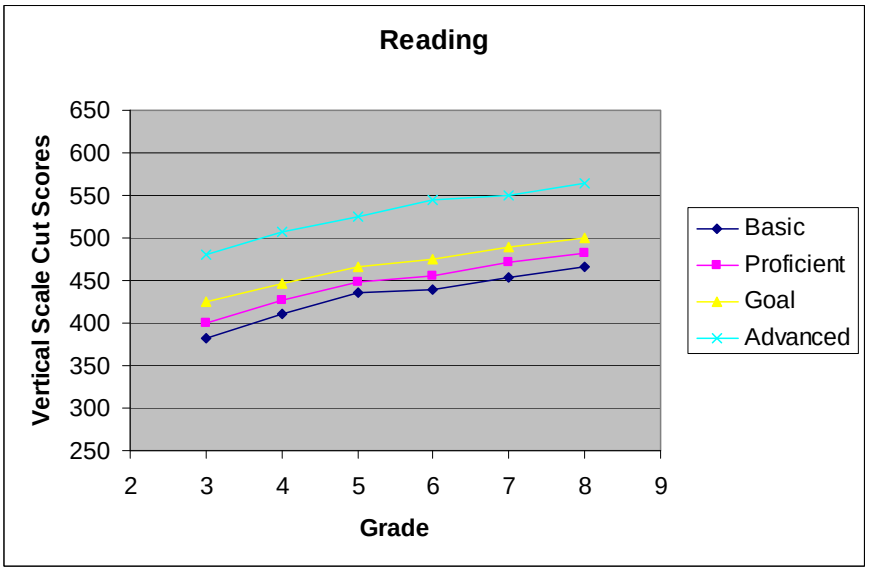


Figure 6: Relationship of Reading Cut Scores for Each Proficiency Level across Grades



REFERENCES

American Educational Research Association, American Psychological Association, & National Council on Measurement in Education. (1999*). Standards for educational and psychological testing*. Washington, DC: AERA.

Angoff, W. H. (1971). Scales, norms, and equivalent scores. In R. L. Thorndike (Ed.), *Educational measurement* (2nd ed., pp. 508-600), Washington, DC: American Council on Research.

Camilli, G., & Shepard, L. (1994). *Methods for identifying biased test items.* Thousand Oaks, CA: Sage.

Cizek, G. J., & Bunch, M. B. (2007). *Standard setting: A guide to establishing and evaluating performance standards on tests*. Thousand Oaks, CA: Sage Publications.

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika, 16,* 297-334.

Lee, W-C., Hanson, B. A., & Brennan, R. L. (2002). Estimating consistency and accuracy indices for multiple classifications. *Applied Psychological Measurement, 26,* 412-432.

Mantel, N., & Haenszel, W. (1959). Statistical aspects of the analysis of data from retrospective studies of disease. *Journal of the National Cancer Institute, 22*, 719-748.

The Connecticut Framework: K-12 Curricular Goals and Standards. (1998). Connecticut State Department of Education.

Winsteps. (1991-2006©). Linacre, John M.

Zieky, M. (1993). Practical questions in the use of DIF statistics in item development. In P. W. Holland & H. Wainer (Eds.), *Differential item functioning: Theory and practice* (pp. 337-364). Hillsdale, NJ: Lawrence Erlbaum Associates.

Appendix A: Linking Items between Form P' and Form S

Note: Items dropped after anchor evaluation are shaded

Mathematics

Grade	Form P' Item Position	Form S Item Position	Item Type	Rasch Form P'
3	4	4	MC	-0.1373
	10	10	MC	-1.7888
	15	12	MC	-0.8326
	19	18	MC	-1.3251
	24	20	MC	0.4913
	30	31	MC	0.1876
	32	35	MC	-0.2307
	39	43	MC	1.8446
	58	61	MC	-0.3886
	63	63	MC	-1.6444
	69	70	MC	-0.5218
	73	75	MC	-0.1964
	76	79	MC	0.5027
	82	80	MC	0.4097
	84	87	MC	1.0427
4	3	3	MC	-0.1300
	12	11	MC	1.6498
	17	15	MC	0.5671
	21	19	MC	-0.6151
	29	29	MC	1.5938
	34	34	MC	-0.6396
	36	36	MC	-0.3825
	39	37	MC	-0.3761
	41	43	MC	0.3932
	45	45	MC	-1.0011
	61	57	MC	-1.2353
	68	66	MC	-0.7259
	77	73	MC	-0.0612
	80	80	MC	1.2121
	84	83	MC	-0.1118
	85	87	MC	1.1437
5	4	3	MC	-0.5860
	7	8	MC	0.1252
	13	12	MC	-0.7364
	19	18	MC	0.7500
	27	28	MC	0.5806
	30	29	MC	-0.4308
	35	33	MC	1.5822
	37	38	GR	-0.5601
	43	45	GR	1.0928
	54	53	MC	-0.0835
	61	56	MC	-1.1921
	64	65	MC	0.8129
	66	67	MC	1.0894

Grade	Form P' Item Position	Form S Item Position	Item Type	Rasch Form P'
	70	70	MC	0.4595
	75	77	MC	0.3581
	96	95	MC	0.0459
	97	98	MC	-2.2387
	99	99	MC	0.1463
	101	102	MC	0.1555
6	1	2	MC	-2.6666
	9	8	MC	-1.2587
	16	16	MC	2.3823
	19	19	MC	-0.7167
	26	26	MC	-0.4609
	27	27	MC	0.2365
	29	29	MC	-0.5990
	32	32	GR	-0.8039
	37	35	GR	0.3093
	53	56	MC	0.1085
	62	63	MC	0.4818
	70	70	MC	1.1984
	73	73	MC	0.6185
	75	75	GR	0.7995
	77	78	GR	1.2016
	91	90	MC	-1.2428
	96	98	MC	-0.0233
	102	104	MC	1.3321
7	4	1	MC	-1.5944
	8	8	MC	-0.2567
	13	14	MC	-2.1772
	16	17	MC	-0.2303
	20	19	MC	-0.8972
	25	25	MC	0.0945
	28	27	MC	-0.3719
	35	35	GR	-0.5118
	55	55	MC	0.0009
	59	58	MC	-0.1496
	61	61	MC	-0.9364
	69	69	MC	-1.0538
	71	71	MC	-0.2146
	78	80	GR	1.6676
	92	91	MC	-0.9307
	98	98	MC	1.4976
	101	101	MC	-0.3626
8	3	2	MC	-0.2758
	5	5	MC	0.6219
	13	13	MC	-1.2159
	16	20	MC	1.3789
	21	22	MC	-0.3187
	29	30	GR	1.3074
	47	48	MC	-0.7233
	50	51	MC	-0.0093

Grade	Form P' Item Position	Form S Item Position	Item Type	Rasch Form P’
	54	53	MC	0.1533
	58	58	MC	-0.2045
	64	67	GR	0.6654
	84	82	MC	-1.6084
	89	90	MC	-0.8758
	94	96	MC	0.3208
	102	102	GR	1.2833

Reading

Grade	Form P' Item Position	Form S Item Position	Item Type	Rasch Form P'
3	22	22	MC	-0.1874
	23	23	MC	-1.1841
	24	24	MC	-1.5592
	25	25	MC	-0.3765
	26	26	MC	-2.3402
	27	27	MC	-0.3117
	28	28	MC	0.7670
	30	30	OE	1.2608
	31	31	OE	-0.4716
4	24	24	OE	0.8106
	25	25	MC	-0.4167
	26	26	MC	-0.4908
	27	27	MC	-0.8855
	28	28	MC	-1.4361
	29	29	MC	0.2179
	30	30	MC	0.8137
	31	31	MC	0.6308
	32	32	OE	0.7878
5	1	1	OE	0.2727
	2	2	MC	-1.4989
	3	3	MC	-0.1353
	4	4	MC	-0.8750
	5	5	MC	-0.6801
	6	6	MC	-1.2093
	7	7	MC	-1.2686
	8	8	MC	-1.2262
	9	9	OE	-0.2112
6	1	1	MC	0.2702
	3	2	MC	-0.5296
	4	3	MC	-0.5184
	5	4	MC	-1.6716
	6	5	MC	-1.0639
	7	6	OE	0.8400
	8	7	OE	0.2369
7	9	7	OE	0.7833
	10	8	MC	0.7764
	11	9	MC	0.1666
	12	10	MC	1.1477
	13	11	MC	0.2592
	14	12	MC	-0.4739
	15	13	OE	0.6456
8	16	18	OE	0.8412
	17	19	MC	0.3191
	18	20	MC	0.9237
	19	21	MC	-0.3583
	20	22	MC	1.0988
	22	24	OE	0.1906

Reading Step Difficulty Values

Grade	Form P' Item Position	Item Type	Step	Rasch Values
3	30	OE	0	0.0000
			1	-0.4074
			2	0.4074
	31	OE	0	0.0000
			1	-0.7441
			2	0.7441
4	24	OE	0	0.0000
			1	-0.6342
			2	0.6342
	32	OE	0	0.0000
			1	-1.3293
			2	1.3293
5	1	OE	0	0.0000
			1	-0.5576
			2	0.5576
	9	OE	0	0.0000
			1	-1.1317
			2	1.1317
6	7	OE	0	0.0000
			1	-1.5424
			2	1.5424
	8	OE	0	0.0000
			1	-1.2347
			2	1.2347
7	9	OE	0	0.0000
			1	-0.8610
			2	0.8610
	15	OE	0	0.0000
			1	-0.2134
			2	0.2134
8	16	OE	0	0.0000
			1	-0.9599
			2	0.9599
	22	OE	0	0.0000
			1	-1.3733
			2	1.3733

Writing

Grade	Form P' Item Position	Form S Item Position	Item Type	Rasch Form P'
3	1	1	MC	-0.5138
	2	2	MC	1.2820
	3	4	MC	-0.3990
	4	5	MC	-1.3364
	5	6	MC	-1.2499
	6	7	MC	-1.3222
	7	8	MC	0.5279
	8	9	MC	-1.9101
	9	10	MC	1.2714
4	10	10	MC	-0.0332
	11	11	MC	0.1583
	12	12	MC	-0.1372
	13	13	MC	1.0969
	14	14	MC	-0.5745
	15	15	MC	-1.1544
	16	16	MC	-0.7159
	17	17	MC	-1.1979
5	28	27	MC	-0.7759
	29	28	MC	-0.5779
	30	29	MC	-0.2511
	31	30	MC	-0.5302
	32	31	MC	1.4262
	33	33	MC	-0.4635
	34	34	MC	-1.3762
	35	35	MC	-0.6392
	36	36	MC	0.0746
6	11	10	MC	-1.6668
	12	11	MC	0.7368
	13	12	MC	-0.3949
	14	13	MC	0.5032
	15	14	MC	0.9502
	16	15	MC	-0.1692
	17	16	MC	-0.8774
	18	17	MC	-0.3426
	19	18	MC	0.8494
7	20	22	MC	0.5813
	21	23	MC	-0.6967
	22	24	MC	-0.5954
	23	25	MC	0.5091
	24	26	MC	-1.0788
	25	27	MC	0.7423
	26	28	MC	0.1955
	27	29	MC	0.6267
	28	30	MC	0.0227
	29	31	MC	1.0441
	30	32	MC	-1.2886

Grade	Form P' Item Position	Form S Item Position	Item Type	Rasch Form P’
8	30	30	MC	1.3985
	31	31	MC	-0.2281
	32	32	MC	-0.3196
	33	33	MC	0.5856
	34	34	MC	1.0421
	35	35	MC	-0.063
	36	36	MC	1.0966
	37	37	MC	-0.0351
	38	38	MC	0.2278
	39	39	MC	0.0819
	40	40	MC	1.5889

Appendix B: Item Analysis

Mathematics Form S Grade 3 Item Analysis

Multiple-choice Items
PC = Proportion Correct
RPB = Point-biserial correlation for keyed answer
A – D = Proportion answering each distractor; answer key is shaded

Open-ended Items
Mean = Mean OE score
Corr = Item-total correlation
0 – 3 = Percent of students at each score point

Item	Type	Rasch	PC/Mean	RPB/Corr
1	MC	-1.5400	0.96	0.21
2	MC	-1.4699	0.95	0.26
3	MC	-0.5605	0.90	0.27
4	MC	-0.2015	0.87	0.39
5	MC	-0.3081	0.88	0.36
6	MC	-0.3256	0.88	0.38
7	MC	-1.3432	0.95	0.38
8	MC	-2.0146	0.97	0.27
9	MC	-1.4144	0.95	0.39
10	MC	-2.2497	0.98	0.31
11	MC	-1.2769	0.94	0.42
12	MC	-0.3017	0.88	0.36
13	MC	-1.2096	0.94	0.45
14	MC	-2.1531	0.97	0.24
15	MC	0.9717	0.72	0.43
16	MC	-0.3373	0.88	0.37
17	MC	-1.1025	0.94	0.27
18	MC	-1.2759	0.94	0.22
19	MC	-2.4122	0.98	0.16
20	MC	0.4098	0.80	0.37
21	MC	0.9005	0.73	0.52
22	MC	-0.5142	0.90	0.33
23	MC	-1.2205	0.94	0.33
24	MC	-0.8585	0.92	0.41
25	MC	0.1848	0.83	0.42
26	MC	0.3304	0.81	0.49
27	MC	-0.4774	0.89	0.42

Item	Type	Rasch	PC/Mean	RPB/Corr
28	MC	0.4368	0.80	0.39
29	MC	0.7637	0.75	0.55
30	MC	0.0458	0.84	0.44
31	MC	0.0007	0.85	0.51
32	MC	0.2007	0.83	0.47
33	MC	0.1534	0.83	0.53
34	MC	-0.2998	0.88	0.44
35	MC	-0.2837	0.88	0.43
36	MC	1.1043	0.70	0.56
37	MC	-0.0736	0.86	0.51
38	MC	0.5024	0.79	0.38
39	MC	1.4570	0.64	0.40
40	MC	0.6814	0.76	0.37
41	MC	1.7613	0.58	0.43
42	MC	1.6318	0.61	0.43
43	MC	1.6578	0.60	0.29
44	MC	-0.0441	0.85	0.35
45	MC	0.0226	0.85	0.30
46	OE	-2.2825	0.98	0.24
47	OE	-2.4145	0.98	0.26
48	OE	-0.6052	0.90	0.24
49	OE	1.1432	0.69	0.33
50	OE	-0.1834	0.87	0.37
51	OE	-0.0782	1.81	0.44
52	OE	0.0625	1.77	0.47
53	OE	0.5423	1.64	0.58
54	OE	0.3056	1.56	0.50
55	OE	1.3426	1.29	0.52
56	OE	0.4329	1.68	0.45
57	MC	-0.1471	0.86	0.41
58	MC	-0.6300	0.91	0.40
59	MC	0.4498	0.80	0.54
60	MC	-0.3212	0.88	0.42
61	MC	-0.2093	0.87	0.47
62	MC	0.1818	0.83	0.47
63	MC	-1.7096	0.96	0.34

Item	Type	Rasch	PC/Mean	RPB/Corr
64	MC	-1.2745	0.94	0.37
65	MC	-0.7764	0.92	0.35
66	MC	-1.2223	0.94	0.41
67	MC	0.0632	0.84	0.45
68	MC	-0.7349	0.91	0.43
69	MC	-1.3378	0.95	0.38
70	MC	-1.2583	0.94	0.21
71	MC	-0.3676	0.88	0.38
72	MC	-0.5956	0.90	0.45
73	MC	0.0995	0.84	0.30
74	MC	-0.1723	0.87	0.33
75	MC	-0.0587	0.86	0.31
76	MC	-0.3216	0.88	0.39
77	MC	0.0698	0.84	0.32
78	MC	-0.1602	0.87	0.35
79	MC	0.6520	0.77	0.30
80	MC	0.5820	0.78	0.56
81	MC	0.2804	0.82	0.55
82	MC	0.7940	0.75	0.56
83	MC	0.8084	0.75	0.56
84	MC	1.7235	0.59	0.22
85	MC	0.8925	0.73	0.49
86	MC	1.6933	0.59	0.37
87	MC	0.9925	0.72	0.48
88	OE	0.1925	1.79	0.40
89	OE	-0.5299	1.85	0.41
90	OE	0.5693	0.78	0.41
91	OE	0.6294	0.77	0.34
92	OE	0.8944	0.73	0.34
93	OE	1.9234	1.69	0.54
94	OE	2.2053	1.52	0.57

Mathematics Form S Grade 4 Item Analysis

Multiple-choice Items
PC = Proportion Correct
RPB = Point-biserial correlation for keyed answer
A – D = Proportion answering each distractor; answer key is shaded

Open-ended Items
Mean = Mean OE score
Corr = Item-total correlation
0 – 3 = Percent of students at each score point

Item	Type	Rasch	PC/Mean	RPB/Corr
1	MC	-0.5476	0.88	0.28
2	MC	0.2910	0.78	0.45
3	MC	0.1605	0.80	0.43
4	MC	0.5544	0.74	0.37
5	MC	-0.5622	0.88	0.39
6	MC	0.1501	0.80	0.42
7	MC	-1.9903	0.96	0.22
8	MC	0.3255	0.77	0.40
9	MC	-2.4262	0.97	0.31
10	MC	-0.2787	0.85	0.34
11	MC	1.6938	0.54	0.49
12	MC	0.3410	0.77	0.55
13	MC	1.4898	0.58	0.52
14	MC	1.4150	0.60	0.55
15	MC	0.6567	0.73	0.56
16	MC	0.7674	0.71	0.50
17	MC	1.3813	0.60	0.44
18	MC	0.7539	0.71	0.59
19	MC	-0.8761	0.90	0.39
20	MC	-0.9240	0.91	0.34
21	MC	0.0087	0.82	0.44
22	MC	0.2733	0.78	0.57
23	MC	-0.4717	0.87	0.38
24	MC	-0.7235	0.89	0.23
25	MC	-0.3743	0.86	0.38
26	MC	0.7970	0.70	0.28
27	MC	1.1503	0.64	0.47
28	MC	1.2369	0.63	0.43

Item	Type	Rasch	PC/Mean	RPB/Corr
29	MC	1.6963	0.54	0.31
30	MC	2.1335	0.46	0.19
31	MC	-0.7862	0.90	0.37
32	MC	-0.4168	0.86	0.30
33	MC	-0.8741	0.90	0.39
34	MC	-0.8447	0.90	0.39
35	MC	0.5272	0.75	0.54
36	MC	-0.5653	0.88	0.43
37	MC	-0.4651	0.87	0.55
38	MC	-0.7836	0.90	0.51
39	MC	-0.4587	0.87	0.51
40	MC	-0.6251	0.88	0.49
41	MC	-0.1573	0.84	0.40
42	MC	-0.6959	0.89	0.33
43	MC	0.6787	0.72	0.25
44	MC	-0.6900	0.89	0.47
45	MC	-1.0145	0.91	0.42
46	MC	-0.6204	0.88	0.44
47	OE	-2.0320	0.96	0.28
48	OE	-1.6033	0.95	0.23
49	OE	-0.8280	1.87	0.38
50	OE	-0.8172	1.87	0.39
51	OE	0.1689	1.69	0.53
52	OE	1.2701	1.20	0.43
53	OE	-0.1861	1.78	0.53
54	OE	0.1329	1.64	0.44
55	OE	0.4599	1.55	0.45
56	OE	0.8211	1.37	0.49
57	MC	-1.5983	0.95	0.30
58	MC	1.8450	0.51	0.46
59	MC	-1.4174	0.94	0.40
60	MC	1.7300	0.54	0.45
61	MC	-1.5743	0.94	0.38
62	MC	-1.5485	0.94	0.34
63	MC	-1.1832	0.92	0.38
64	MC	-0.4806	0.87	0.44

Item	Type	Rasch	PC/Mean	RPB/Corr
65	MC	-2.4093	0.97	0.31
66	MC	-0.7439	0.89	0.45
67	MC	-1.3432	0.93	0.41
68	MC	-0.6262	0.88	0.50
69	MC	-1.1341	0.92	0.31
70	MC	0.0884	0.81	0.52
71	MC	0.7372	0.71	0.53
72	MC	0.5411	0.74	0.55
73	MC	-0.4850	0.87	0.51
74	MC	-0.5901	0.88	0.38
75	MC	0.0483	0.81	0.53
76	MC	1.3643	0.60	0.53
77	MC	-0.0723	0.83	0.35
78	MC	-0.4792	0.87	0.45
79	MC	-0.9427	0.91	0.31
80	MC	1.3648	0.60	0.34
81	MC	0.8387	0.70	0.52
82	MC	-0.8810	0.90	0.44
83	MC	-0.0269	0.82	0.59
84	MC	0.0448	0.81	0.49
85	MC	1.0223	0.67	0.49
86	MC	1.8741	0.51	0.38
87	MC	0.8638	0.69	0.35
88	MC	1.5218	0.58	0.41
89	MC	-0.9788	0.91	0.28
90	MC	-0.0583	0.82	0.37
91	OE	-0.5246	0.87	0.37
92	OE	0.0705	0.81	0.33
93	OE	0.4882	1.61	0.44
94	OE	0.8908	1.42	0.46
95	OE	1.4125	1.83	0.61
96	OE	1.0748	2.09	0.64

Mathematics Form S Grade 5 Item Analysis

Grid-in Items
PC = Proportion Correct
RPB = Point-Biserial correlation

Multiple-choice Items
PC = Proportion Correct
RPB = Point-biserial correlation for keyed answer
A – D = Proportion answering each distractor; answer key is shaded

Open-ended Items
Mean = Mean OE score
Corr = Item-total correlation
0 – 3 = Percent of students at each score point

Item	Type	Rasch	PC/Mean	RPB/Corr
1	MC	-1.4424	0.94	0.41
2	MC	-1.4923	0.94	0.33
3	MC	-0.7286	0.89	0.43
4	MC	-1.1936	0.92	0.32
5	MC	1.1177	0.65	0.50
6	MC	-1.6718	0.95	0.22
7	MC	-0.9022	0.90	0.26
8	MC	0.0813	0.81	0.61
9	MC	-1.5553	0.94	0.32
10	MC	-1.4099	0.94	0.39
11	MC	-1.1238	0.92	0.40
12	MC	-1.0116	0.91	0.41
13	MC	-1.4900	0.94	0.36
14	MC	0.1365	0.80	0.53
15	MC	-1.2377	0.93	0.39
16	MC	0.6845	0.72	0.60
17	MC	0.1642	0.80	0.59
18	MC	0.7481	0.71	0.59
19	MC	1.0133	0.67	0.51
20	MC	1.7439	0.54	0.53
21	MC	-0.3372	0.85	0.45
22	MC	1.0811	0.66	0.48
23	MC	-0.8432	0.90	0.52
24	MC	0.3713	0.77	0.41
25	MC	-1.5105	0.94	0.45

Item	Type	Rasch	PC/Mean	RPB/Corr
26	MC	0.1689	0.80	0.30
27	MC	-0.9338	0.91	0.40
28	MC	0.5513	0.74	0.44
29	MC	-0.0655	0.83	0.54
30	MC	-0.0793	0.83	0.55
31	MC	-0.1820	0.84	0.58
32	MC	-0.1697	0.84	0.52
33	MC	1.5378	0.58	0.49
34	MC	1.1253	0.65	0.48
35	MC	0.8452	0.70	0.50
36	MC	1.2663	0.62	0.46
37	GR	-0.4638	0.87	0.51
38	GR	-0.5038	0.87	0.46
39	GR	-0.8192	0.90	0.46
40	GR	-0.5581	0.88	0.53
41	GR	-0.4561	0.87	0.45
42	GR	-0.5680	0.88	0.48
43	GR	-0.0714	0.83	0.28
44	GR	0.9148	0.69	0.46
45	GR	0.9572	0.68	0.45
46	GR	1.3351	0.61	0.56
47	GR	-1.4359	0.94	0.36
48	GR	1.2242	0.63	0.51
49	OE	0.5187	1.54	0.57
50	OE	0.8462	1.46	0.54
51	MC	-0.7322	0.89	0.43
52	MC	-0.0979	0.83	0.51
53	MC	-0.1739	0.84	0.57
54	MC	-0.6081	0.88	0.33
55	MC	0.2104	0.79	0.45
56	MC	-0.9543	0.91	0.46
57	MC	0.6003	0.74	0.20
58	MC	-2.0879	0.96	0.35
59	MC	0.7487	0.71	0.43
60	MC	0.0078	0.82	0.42
61	MC	0.6449	0.73	0.52

Item	Type	Rasch	PC/Mean	RPB/Corr
62	MC	0.6044	0.74	0.55
63	MC	0.8429	0.70	0.56
64	MC	0.0052	0.82	0.37
65	MC	0.9370	0.68	0.51
66	MC	0.1248	0.80	0.29
67	MC	1.1034	0.65	0.51
68	MC	1.2828	0.62	0.37
69	MC	0.9593	0.68	0.35
70	MC	0.5962	0.74	0.36
71	MC	0.3291	0.77	0.26
72	MC	1.6282	0.56	0.34
73	MC	2.0366	0.48	0.48
74	MC	-1.8997	0.96	0.27
75	MC	-0.1077	0.83	0.49
76	MC	-0.9160	0.91	0.44
77	MC	0.5348	0.75	0.49
78	MC	-0.2786	0.85	0.29
79	MC	-0.7041	0.89	0.33
80	MC	1.4555	0.59	0.43
81	MC	-0.4237	0.86	0.42
82	GR	0.7946	0.71	0.54
83	GR	1.3428	0.61	0.59
84	OE	-1.3956	0.94	0.30
85	OE	0.8993	1.48	0.62
86	OE	0.3393	1.66	0.52
87	OE	1.5409	1.11	0.37
88	OE	1.3283	1.25	0.54
89	OE	1.1725	1.30	0.54
90	OE	2.0583	0.95	0.59
91	MC	-0.9137	0.90	0.41
92	MC	0.2953	0.78	0.22
93	MC	-1.4099	0.94	0.35
94	MC	0.4735	0.75	0.49
95	MC	-0.6314	0.88	0.23
96	MC	-0.0822	0.83	0.52
97	MC	-2.1551	0.97	0.28

Item	Type	Rasch	PC/Mean	RPB/Corr
98	MC	-2.0984	0.96	0.33
99	MC	-0.0074	0.82	0.38
100	MC	0.0842	0.81	0.34
101	MC	-0.8683	0.90	0.36
102	MC	0.1860	0.79	0.36
103	MC	0.5818	0.74	0.41
104	GR	2.4676	0.40	0.41
105	OE	-0.6579	1.85	0.44
106	OE	0.7119	1.47	0.56
107	OE	0.0317	1.51	0.40
108	OE	0.6104	1.52	0.49
109	OE	0.9599	1.30	0.48
110	OE	0.1970	1.61	0.38
111	OE	1.0759	1.29	0.47
112	OE	1.1924	1.89	0.57
113	OE	0.5072	2.41	0.63

Mathematics Form S Grade 6 Item Analysis

Grid-in Items
PC = Proportion Correct
RPB = Point-Biserial correlation

Multiple-choice Items
PC = Proportion Correct
RPB = Point-biserial correlation for keyed answer
A – D = Proportion answering each distractor; answer key is shaded

Open-ended Items
Mean = Mean OE score
Corr = Item-total correlation
0 – 3 = Percent of students at each score point

Item	Type	Rasch	PC/Mean	RPB/Corr
1	MC	-1.5562	0.92	0.13
2	MC	-2.7104	0.97	0.30
3	MC	-2.2485	0.96	0.32
4	MC	-1.5205	0.92	0.41
5	MC	-1.3251	0.91	0.42
6	MC	-0.7969	0.86	0.31
7	MC	-0.0544	0.77	0.65
8	MC	-0.9007	0.87	0.40
9	MC	-1.9157	0.94	0.34
10	MC	-0.5622	0.84	0.64
11	MC	0.3701	0.71	0.48
12	MC	0.0110	0.76	0.45
13	MC	0.3763	0.71	0.53
14	MC	1.5754	0.49	0.53
15	MC	0.2226	0.73	0.48
16	MC	2.3249	0.35	0.43
17	MC	0.0086	0.76	0.62
18	MC	0.6766	0.66	0.46
19	MC	-0.6667	0.85	0.56
20	MC	-0.3096	0.81	0.58
21	MC	0.6507	0.66	0.51
22	MC	0.0060	0.76	0.45
23	MC	-1.2508	0.90	0.37
24	MC	-0.3049	0.81	0.46
25	MC	-0.5377	0.83	0.46
26	MC	-0.3360	0.81	0.28

Item	Type	Rasch	PC/Mean	RPB/Corr
27	MC	0.3605	0.71	0.48
28	MC	1.1803	0.56	0.41
29	MC	-0.5586	0.84	0.48
30	MC	-0.6307	0.84	0.51
31	GR	-1.0995	0.89	0.37
32	GR	-0.6456	0.85	0.42
33	GR	-1.0292	0.88	0.41
34	GR	-1.3123	0.91	0.38
35	GR	0.3137	0.72	0.41
36	GR	0.7259	0.65	0.49
37	GR	0.3132	0.72	0.46
38	GR	0.5180	0.68	0.41
39	GR	0.5092	0.69	0.47
40	GR	0.6933	0.65	0.54
41	OE	-0.0120	0.77	0.56
42	OE	0.8068	0.63	0.56
43	OE	0.6702	1.38	0.71
44	OE	1.1419	1.15	0.65
45	OE	1.3750	1.07	0.65
46	OE	1.2483	1.12	0.62
47	OE	0.2108	1.53	0.59
48	OE	0.5826	1.42	0.58
49	MC	-1.2493	0.90	0.42
50	MC	0.2475	0.73	0.47
51	MC	0.1369	0.74	0.54
52	MC	-0.5679	0.84	0.40
53	MC	0.0286	0.76	0.51
54	MC	-0.9359	0.87	0.23
55	MC	-1.3763	0.91	0.31
56	MC	0.1672	0.74	0.51
57	MC	-1.6519	0.93	0.32
58	MC	-0.7301	0.85	0.35
59	MC	-0.1374	0.78	0.43
60	MC	-0.0413	0.77	0.29
61	MC	0.2837	0.72	0.52
62	MC	0.2377	0.73	0.43

Item	Type	Rasch	PC/Mean	RPB/Corr
63	MC	0.2175	0.73	0.44
64	MC	0.5411	0.68	0.40
65	MC	-0.1585	0.79	0.42
66	MC	-0.1877	0.79	0.34
67	MC	0.8605	0.62	0.45
68	MC	-0.4917	0.83	0.32
69	MC	-1.8317	0.94	0.40
70	MC	1.2784	0.55	0.41
71	MC	-1.2801	0.90	0.42
72	MC	0.7482	0.64	0.42
73	MC	0.5991	0.67	0.50
74	MC	-0.8751	0.87	0.54
75	GR	0.8712	0.62	0.47
76	GR	1.0188	0.59	0.53
77	GR	1.2852	0.54	0.51
78	GR	0.9706	0.60	0.41
79	GR	-0.5745	0.84	0.36
80	GR	0.0130	0.76	0.38
81	OE	-0.7887	0.86	0.30
82	OE	0.2514	0.73	0.59
83	OE	0.9503	1.25	0.57
84	OE	0.3654	1.43	0.33
85	OE	0.1020	1.60	0.64
86	OE	0.1891	1.53	0.58
87	OE	1.0507	1.18	0.66
88	OE	-0.2341	1.68	0.42
89	OE	2.4734	0.58	0.48
90	MC	-1.2380	0.90	0.33
91	MC	-0.0365	0.77	0.35
92	MC	-2.8647	0.97	0.14
93	MC	-1.0533	0.88	0.38
94	MC	-0.1461	0.79	0.38
95	MC	-0.7769	0.86	0.42
96	MC	-0.9907	0.88	0.35
97	MC	-1.1025	0.89	0.41
98	MC	-0.1248	0.78	0.31

Item	Type	Rasch	PC/Mean	RPB/Corr
99	MC	0.0879	0.75	0.33
100	MC	1.2621	0.55	0.23
101	MC	1.7681	0.45	0.44
102	MC	-1.4340	0.91	0.42
103	MC	-0.2066	0.79	0.52
104	MC	0.8711	0.62	0.37
105	GR	-0.0890	0.78	0.56
106	GR	1.2414	0.55	0.56
107	OE	-0.2352	0.80	0.34
108	OE	-0.5130	1.54	0.45
109	OE	-0.3990	1.68	0.48
110	OE	0.6472	1.33	0.50
111	OE	0.1813	1.52	0.53
112	OE	0.7859	1.28	0.54
113	OE	0.0983	1.48	0.56
114	OE	1.0356	1.23	0.45
115	OE	1.1026	1.78	0.59
116	OE	1.2073	1.72	0.63

Mathematics Form S Grade 7 Item Analysis

Grid-in Items
PC = Proportion Correct
RPB = Point-Biserial correlation

Multiple-choice Items
PC = Proportion Correct
RPB = Point-biserial correlation for keyed answer
A – D = Proportion answering each distractor; answer key is shaded

Open-ended Items
Mean = Mean OE score
Corr = Item-total correlation
0 – 3 = Percent of students at each score point

Item	Type	Rasch	PC/Mean	RPB/Corr
1	MC	-1.5742	0.89	0.32
2	MC	-1.0288	0.84	0.52
3	MC	-0.6711	0.80	0.57
4	MC	0.0315	0.69	0.43
5	MC	-0.1503	0.72	0.47
6	MC	0.3802	0.64	0.63
7	MC	-1.3897	0.88	0.35
8	MC	-0.2928	0.75	0.50
9	MC	0.4442	0.62	0.53
10	MC	0.3126	0.65	0.62
11	MC	-1.5008	0.89	0.29
12	MC	-0.9997	0.84	0.37
13	MC	-0.8910	0.83	0.48
14	MC	-1.9909	0.92	0.28
15	MC	-0.4460	0.77	0.50
16	MC	0.0129	0.70	0.51
17	MC	-0.3233	0.75	0.63
18	MC	0.0787	0.69	0.58
19	MC	-0.9265	0.83	0.45
20	MC	0.0619	0.69	0.45
21	MC	-0.3866	0.76	0.43
22	MC	0.0712	0.69	0.27
23	MC	0.8081	0.56	0.55
24	MC	0.4039	0.63	0.63
25	MC	-0.0347	0.71	0.50
26	MC	0.6631	0.58	0.54

Item	Type	Rasch	PC/Mean	RPB/Corr
27	MC	-0.4167	0.76	0.52
28	MC	-1.1182	0.85	0.45
29	MC	0.5670	0.60	0.42
30	MC	0.3171	0.65	0.35
31	MC	-0.8451	0.82	0.47
32	MC	0.8256	0.55	0.43
33	MC	-1.3763	0.88	0.55
34	MC	-0.0328	0.71	0.48
35	GR	-0.4619	0.77	0.42
36	GR	0.5635	0.60	0.39
37	GR	-0.2237	0.74	0.54
38	GR	-0.1563	0.72	0.46
39	GR	0.1686	0.67	0.57
40	GR	1.5562	0.41	0.58
41	OE	-0.2397	0.74	0.59
42	OE	0.9925	0.52	0.28
43	OE	-0.6340	0.79	0.57
44	OE	0.4403	0.62	0.64
45	OE	-0.4784	1.60	0.58
46	OE	0.0715	1.42	0.68
47	OE	0.4883	1.27	0.70
48	OE	2.3166	0.52	0.52
49	OE	0.0170	1.46	0.61
50	OE	0.7369	1.17	0.62
51	MC	-1.2598	0.86	0.35
52	MC	0.1768	0.67	0.24
53	MC	-1.5071	0.89	0.36
54	MC	0.4078	0.63	0.51
55	MC	0.4436	0.62	0.34
56	MC	0.7181	0.57	0.59
57	MC	-1.0091	0.84	0.54
58	MC	-0.1225	0.72	0.38
59	MC	-0.8306	0.82	0.47
60	MC	0.5126	0.61	0.26
61	MC	-0.8368	0.82	0.60
62	MC	0.1994	0.67	0.55

Item	Type	Rasch	PC/Mean	RPB/Corr
63	MC	0.5045	0.61	0.25
64	MC	0.4678	0.62	0.34
65	MC	-0.8121	0.82	0.39
66	MC	0.5078	0.61	0.38
67	MC	-0.1200	0.72	0.39
68	MC	-0.1934	0.73	0.32
69	MC	-0.7294	0.81	0.34
70	MC	-0.4549	0.77	0.31
71	MC	-0.3610	0.76	0.57
72	MC	-0.5350	0.78	0.50
73	GR	0.4570	0.62	0.52
74	GR	0.5487	0.60	0.51
75	GR	-1.9975	0.92	0.41
76	GR	0.0675	0.69	0.64
77	GR	-0.1697	0.73	0.49
78	GR	0.0549	0.69	0.50
79	GR	1.4347	0.44	0.51
80	GR	1.1110	0.50	0.52
81	OE	0.8330	0.55	0.62
82	OE	1.2992	0.46	0.57
83	OE	-0.4895	1.62	0.57
84	OE	0.1142	1.46	0.64
85	OE	1.3088	0.95	0.38
86	OE	0.0035	1.44	0.51
87	OE	-0.6285	1.70	0.52
88	OE	0.6024	1.25	0.71
89	OE	-0.2417	1.57	0.59
90	OE	1.2418	0.94	0.64
91	MC	-0.8361	0.82	0.35
92	MC	-0.0418	0.71	0.40
93	MC	0.4619	0.62	0.36
94	MC	-0.3032	0.75	0.26
95	MC	-1.1519	0.85	0.48
96	MC	-0.2820	0.74	0.34
97	MC	-0.8020	0.81	0.54
98	MC	1.0261	0.52	0.42

Item	Type	Rasch	PC/Mean	RPB/Corr
99	MC	-1.2327	0.86	0.40
100	MC	-0.6212	0.79	0.41
101	MC	-0.3621	0.76	0.44
102	MC	-0.6094	0.79	0.29
103	MC	-1.4390	0.88	0.44
104	MC	1.0494	0.51	0.37
105	GR	-0.0703	0.71	0.41
106	GR	0.5967	0.60	0.54
107	GR	1.8638	0.36	0.38
108	GR	-0.1119	0.72	0.42
109	GR	-0.0176	0.70	0.46
110	OE	-0.1524	0.72	0.45
111	OE	-1.1129	1.76	0.36
112	OE	-0.9985	1.57	0.44
113	OE	-0.3468	1.56	0.59
114	OE	0.2940	1.34	0.58
115	OE	0.0731	1.44	0.59
116	OE	0.1039	1.30	0.55
117	OE	0.2724	1.33	0.56
118	OE	0.5898	1.21	0.57
119	OE	0.1885	2.13	0.58
120	OE	0.7315	1.63	0.57

Mathematics Form S Grade 8 Item Analysis

Grid-in Items
PC = Proportion Correct
RPB = Point-Biserial correlation

Multiple-choice Items
PC = Proportion Correct
RPB = Point-biserial correlation for keyed answer
A – D = Proportion answering each distractor; answer key is shaded

Open-ended Items
Mean = Mean OE score
Corr = Item-total correlation
0 – 3 = Percent of students at each score point

Item	Type	Rasch	PC/Mean	RPB/Corr
1	MC	-0.9817	0.81	0.51
2	MC	-0.3941	0.73	0.47
3	MC	-0.0760	0.68	0.49
4	MC	0.2551	0.62	0.62
5	MC	0.6021	0.56	0.58
6	MC	0.0415	0.66	0.49
7	MC	-0.2598	0.71	0.48
8	MC	-0.2914	0.72	0.56
9	MC	0.2812	0.62	0.49
10	MC	0.3174	0.61	0.57
11	MC	-0.5037	0.75	0.53
12	MC	0.0357	0.66	0.57
13	MC	-1.2075	0.84	0.40
14	MC	1.1892	0.45	0.54
15	MC	-1.2627	0.85	0.31
16	MC	1.5074	0.39	0.25
17	MC	0.2800	0.62	0.42
18	MC	1.4294	0.40	0.29
19	MC	0.9436	0.49	0.29
20	MC	1.1317	0.46	0.23
21	MC	-0.2573	0.71	0.54
22	MC	-0.2611	0.71	0.30
23	MC	-0.3103	0.72	0.39
24	MC	-0.6841	0.78	0.51
25	MC	-2.2064	0.93	0.45
26	MC	-0.6713	0.77	0.47

Item	Type	Rasch	PC/Mean	RPB/Corr
27	GR	-0.2957	0.72	0.32
28	GR	0.0077	0.67	0.38
29	GR	0.9725	0.49	0.41
30	GR	1.3463	0.42	0.37
31	GR	0.3343	0.61	0.56
32	GR	1.8195	0.33	0.49
33	OE	-0.9857	0.81	0.54
34	OE	-1.2896	0.85	0.33
35	OE	-0.4397	0.74	0.37
36	OE	-0.5077	0.75	0.55
37	OE	0.5215	1.18	0.69
38	OE	0.7459	1.07	0.61
39	OE	0.5712	1.16	0.71
40	OE	0.0452	1.32	0.59
41	OE	-0.5159	1.59	0.55
42	OE	0.4521	1.20	0.54
43	MC	-0.8735	0.80	0.43
44	MC	-0.0789	0.68	0.50
45	MC	0.3393	0.61	0.52
46	MC	-0.0168	0.67	0.44
47	MC	-0.7754	0.79	0.47
48	MC	-0.7401	0.78	0.58
49	MC	-0.7667	0.79	0.48
50	MC	-0.4202	0.74	0.54
51	MC	0.2097	0.63	0.38
52	MC	-0.5330	0.75	0.46
53	MC	0.2200	0.63	0.35
54	MC	-1.4773	0.87	0.51
55	MC	-0.5180	0.75	0.42
56	MC	0.7317	0.54	0.36
57	MC	0.1112	0.65	0.55
58	MC	0.0523	0.66	0.55
59	GR	0.2974	0.62	0.63
60	GR	0.3329	0.61	0.52
61	GR	0.4395	0.59	0.62
62	GR	1.2603	0.43	0.56

Item	Type	Rasch	PC/Mean	RPB/Corr
63	GR	0.3793	0.60	0.49
64	GR	-0.6309	0.77	0.54
65	GR	-0.5133	0.75	0.51
66	GR	-0.0561	0.68	0.50
67	GR	0.4025	0.60	0.59
68	GR	0.4593	0.59	0.62
69	OE	-0.5640	0.76	0.53
70	OE	0.9166	0.50	0.62
71	OE	-0.1144	1.47	0.59
72	OE	0.1116	1.33	0.68
73	OE	-0.1616	1.49	0.61
74	OE	0.7934	1.06	0.62
75	OE	-0.5268	1.61	0.53
76	OE	0.9934	0.97	0.59
77	OE	-0.0849	1.45	0.69
78	OE	0.3773	1.26	0.70
79	OE	0.5641	1.13	0.41
80	OE	0.3001	1.30	0.67
81	OE	0.0893	1.39	0.54
82	MC	-1.4278	0.86	0.37
83	MC	-1.6112	0.88	0.17
84	MC	-1.2155	0.84	0.39
85	MC	-0.8207	0.79	0.34
86	MC	0.9561	0.49	0.35
87	MC	-1.7246	0.89	0.17
88	MC	1.0230	0.48	0.36
89	MC	-2.0556	0.92	0.41
90	MC	-0.6257	0.77	0.43
91	MC	-2.0651	0.92	0.45
92	MC	1.4331	0.40	0.37
93	MC	-1.1281	0.83	0.37
94	MC	0.9562	0.49	0.24
95	MC	1.1947	0.45	0.28
96	MC	0.0289	0.66	0.33
97	MC	-1.3814	0.86	0.46
98	MC	0.0872	0.65	0.38

Item	Type	Rasch	PC/Mean	RPB/Corr
99	MC	-1.1033	0.83	0.44
100	MC	-0.0833	0.68	0.51
101	GR	0.8970	0.50	0.61
102	GR	1.1627	0.45	0.59
103	GR	0.1350	0.65	0.48
104	GR	0.1044	0.65	0.48
105	OE	-1.7051	0.89	0.37
106	OE	-1.4734	0.87	0.37
107	OE	1.2245	0.44	0.50
108	OE	0.2218	1.27	0.41
109	OE	0.0745	1.33	0.56
110	OE	0.9712	0.98	0.51
111	OE	0.2992	1.30	0.58
112	OE	1.1869	0.88	0.62
113	OE	-0.9851	1.68	0.55
114	OE	0.3245	1.12	0.43
115	OE	-0.2832	1.53	0.66
116	OE	0.7425	1.65	0.67
117	OE	1.4088	1.15	0.63

Reading Comprehension Form S Grade 3 Item Analysis

Multiple-choice Items
PC = Proportion Correct
RPB = Point-biserial correlation for keyed answer
A – D = Proportion answering each distractor; answer key is shaded

Open-ended Items
Mean = Mean OE score
Corr = Item-total correlation
0 – 2 = Percent of students at each score point

Item	Type	Rasch	PC/Mean	RPB/Corr
1	MC	-2.1159	0.90	0.41
2	MC	-0.8638	0.76	0.32
3	MC	0.3471	0.55	0.39
4	MC	0.4531	0.53	0.27
5	MC	-1.0342	0.79	0.48
6	MC	0.0758	0.60	0.43
7	OE	-0.7945	1.32	0.34
8	OE	-0.3914	1.23	0.52
9	MC	-1.2808	0.82	0.41
10	MC	-1.3977	0.83	0.39
11	MC	-1.7910	0.87	0.52
12	MC	-0.6264	0.73	0.40
13	MC	-1.1428	0.80	0.50
14	OE	-0.8969	1.51	0.53
15	OE	-0.2756	1.27	0.37
16	OE	-1.3362	1.69	0.43
17	MC	-2.2386	0.91	0.41
18	MC	-0.5044	0.71	0.45
19	MC	-1.7149	0.87	0.48
20	OE	-0.5027	1.39	0.50
21	OE	-0.3103	1.32	0.51
22	MC	-0.1788	0.65	0.50
23	MC	-1.1055	0.80	0.43
24	MC	-1.5753	0.85	0.44
25	MC	-0.3772	0.68	0.43
26	MC	-2.3686	0.92	0.45
27	MC	-0.3487	0.68	0.45
28	MC	0.7202	0.48	0.37

Item	Type	Rasch	PC/Mean	RPB/Corr
29	MC	-0.2360	0.66	0.37
30	OE	0.8971	0.89	0.39
31	OE	-0.4300	1.36	0.44

Degree of Reading Power Form S Grade 3 Item Analysis

Multiple-choice Items
PC = Proportion Correct
RPB = Point-biserial correlation for keyed answer
A– E = Proportion answering each distractor; answer key is shaded

Item	Type	Rasch	PC	RPB
1	MC	-2.3469	0.92	0.45
2	MC	-1.2205	0.81	0.36
3	MC	-0.4722	0.70	0.36
4	MC	-1.7305	0.87	0.43
5	MC	-0.7153	0.74	0.51
6	MC	-1.9650	0.89	0.48
7	MC	-2.3710	0.92	0.46
8	MC	-0.4095	0.69	0.28
9	MC	-1.5681	0.85	0.22
10	MC	-0.7790	0.75	0.49
11	MC	-1.3888	0.83	0.52
12	MC	-0.9285	0.77	0.43
13	MC	0.6458	0.49	0.42
14	MC	-0.4158	0.69	0.57
15	MC	-0.7423	0.74	0.52
16	MC	0.0556	0.61	0.64
17	MC	1.6906	0.30	0.30
18	MC	-0.1307	0.64	0.50
19	MC	-0.5452	0.71	0.51
20	MC	-1.3724	0.83	0.36
21	MC	0.2322	0.57	0.57
22	MC	0.1235	0.59	0.56
23	MC	-0.2609	0.66	0.55
24	MC	0.0497	0.61	0.52
25	MC	-0.1951	0.65	0.39
26	MC	1.0337	0.42	0.44
27	MC	0.6589	0.49	0.45
28	MC	-0.7854	0.75	0.60
29	MC	0.9335	0.44	0.36
30	MC	0.8802	0.45	0.52
31	MC	0.3628	0.55	0.44

Item	Type	Rasch	PC	RPB
32	MC	0.5567	0.51	0.49
33	MC	1.8226	0.28	0.11
34	MC	0.3477	0.55	0.52
35	MC	0.7219	0.48	0.27
36	MC	1.3080	0.37	0.44
37	MC	1.3973	0.35	0.40
38	MC	1.7021	0.30	0.18
39	MC	2.7957	0.14	0.17
40	MC	1.9437	0.26	0.23
41	MC	2.0201	0.24	0.16
42	MC	0.2356	0.57	0.36

Reading Comprehension Form S Grade 4 Item Analysis

Multiple-choice Items
PC = Proportion Correct
RPB = Point-biserial correlation for keyed answer
A – D = Proportion answering each distractor; answer key is shaded

Open-ended Items
Mean = Mean OE score
Corr = Item-total correlation
0 – 2 = Percent of students at each score point

Item	Type	Rasch	PC/Mean	RPB/Corr
1	OE	-0.1424	1.54	0.55
2	MC	-1.2910	0.87	0.29
3	MC	0.4500	0.63	0.32
4	MC	0.3142	0.65	0.54
5	MC	-0.2858	0.75	0.54
6	MC	-0.1778	0.73	0.45
7	MC	-1.1507	0.86	0.35
8	OE	0.2371	1.36	0.48
9	OE	-0.8072	1.57	0.50
10	MC	-0.6912	0.81	0.49
11	MC	-1.3481	0.88	0.47
12	MC	-1.5563	0.90	0.47
13	MC	-2.1900	0.94	0.44
14	MC	-0.2982	0.75	0.42
15	OE	-0.0811	1.42	0.53
16	OE	0.2589	1.32	0.44
17	MC	-1.4236	0.88	0.50
18	MC	0.9773	0.53	0.33
19	MC	-0.8264	0.82	0.38
20	MC	-0.6115	0.80	0.37
21	MC	-1.0409	0.85	0.46
22	MC	1.4535	0.44	0.13
23	OE	0.8855	1.07	0.40
24	OE	0.7382	1.16	0.48
25	MC	-0.4529	0.78	0.40
26	MC	-0.5141	0.78	0.38
27	MC	-0.9996	0.84	0.32
28	MC	-1.1794	0.86	0.49

Item	Type	Rasch	PC/Mean	RPB/Corr
29	MC	0.2851	0.66	0.16
30	MC	0.8308	0.56	0.32
31	MC	0.4921	0.62	0.38
32	OE	0.8317	1.09	0.43

Degree of Reading Power Form S Grade 4 Item Analysis

Multiple-choice Items
PC = Proportion Correct
RPB = Point-biserial correlation for keyed answer
A– E = Proportion answering each distractor; answer key is shaded

Item	Type	Rasch	PC	RPB
1	MC	0.7139	0.58	0.41
2	MC	-1.7729	0.91	0.30
3	MC	-2.2567	0.94	0.38
4	MC	-1.1800	0.86	0.49
5	MC	-2.2697	0.94	0.43
6	MC	-1.1309	0.86	0.40
7	MC	-0.6011	0.80	0.49
8	MC	-1.3743	0.88	0.43
9	MC	-2.0293	0.93	0.44
10	MC	-0.3320	0.76	0.37
11	MC	0.1231	0.69	0.60
12	MC	-1.4996	0.89	0.49
13	MC	0.7738	0.57	0.46
14	MC	0.8376	0.56	0.53
15	MC	-0.4808	0.78	0.56
16	MC	0.2949	0.66	0.55
17	MC	0.2686	0.66	0.48
18	MC	-0.7289	0.81	0.47
19	MC	0.2968	0.66	0.47
20	MC	-0.5087	0.78	0.49
21	MC	0.3621	0.64	0.51
22	MC	0.5972	0.60	0.37
23	MC	-0.1778	0.73	0.49
24	MC	1.1391	0.50	0.38
25	MC	0.7123	0.58	0.48
26	MC	-0.4628	0.78	0.52
27	MC	-0.1750	0.73	0.54
28	MC	-1.0496	0.85	0.57
29	MC	2.5075	0.25	0.29
30	MC	-0.9213	0.83	0.55
31	MC	1.6814	0.39	0.47

Item	Type	Rasch	PC	RPB
32	MC	0.0129	0.70	0.52
33	MC	0.4536	0.63	0.55
34	MC	-0.9589	0.84	0.50
35	MC	-0.0561	0.72	0.52
36	MC	1.2867	0.47	0.50
37	MC	2.3512	0.27	0.06
38	MC	0.8120	0.56	0.39
39	MC	1.6708	0.40	0.31
40	MC	1.3709	0.45	0.41
41	MC	1.5337	0.42	0.23
42	MC	1.4949	0.43	0.36

Reading Comprehension Form S Grade 5 Item Analysis

Multiple-choice Items
PC = Proportion Correct
RPB = Point-biserial correlation for keyed answer
A – D = Proportion answering each distractor; answer key is shaded

Open-ended Items
Mean = Mean OE score
Corr = Item-total correlation
0 – 2 = Percent of students at each score point

Item	Type	Rasch	PC/Mean	RPB/Corr
1	OE	0.2741	1.27	0.45
2	MC	-1.3723	0.87	0.32
3	MC	-0.1763	0.71	0.44
4	MC	-0.7859	0.80	0.45
5	MC	-0.6903	0.78	0.40
6	MC	-1.2241	0.85	0.41
7	MC	-1.4199	0.87	0.40
8	MC	-1.2281	0.85	0.41
9	OE	-0.2092	1.36	0.39
10	OE	-0.8380	1.64	0.48
11	MC	-0.1605	0.70	0.40
12	MC	-1.8948	0.91	0.50
13	MC	-0.6056	0.77	0.47
14	MC	-0.6594	0.78	0.36
15	MC	-0.8861	0.81	0.39
16	OE	-0.0916	1.39	0.48
17	OE	0.0766	1.28	0.40
18	MC	-0.6074	0.77	0.31
19	MC	0.1979	0.64	0.44
20	MC	-0.9413	0.82	0.57
21	MC	-0.1270	0.70	0.38
22	MC	-0.6299	0.78	0.51
23	OE	0.2306	1.23	0.45
24	OE	-0.8123	1.55	0.40
25	OE	-0.2407	1.46	0.40
26	MC	-0.3086	0.73	0.51
27	MC	-2.4741	0.94	0.41
28	MC	1.1659	0.45	0.35

Item	Type	Rasch	PC/Mean	RPB/Corr
29	MC	-0.0367	0.68	0.47
30	MC	-0.4907	0.76	0.41
31	MC	-0.3474	1.45	0.56

Degree of Reading Power Form S Grade 5 Item Analysis

Multiple-choice Items
PC = Proportion Correct
RPB = Point-biserial correlation for keyed answer
A– E = Proportion answering each distractor; answer key is shaded

Item	Type	Rasch	PC	RPB
1	MC	-1.7264	0.90	0.44
2	MC	-1.1377	0.84	0.40
3	MC	-1.9580	0.91	0.35
4	MC	-0.8360	0.80	0.49
5	MC	-2.6497	0.95	0.39
6	MC	-1.7264	0.90	0.46
7	MC	-2.0811	0.92	0.44
8	MC	-0.2741	0.72	0.46
9	MC	-1.4724	0.87	0.50
10	MC	-2.1633	0.93	0.43
11	MC	-0.1607	0.70	0.53
12	MC	-0.9652	0.82	0.55
13	MC	-1.2960	0.86	0.39
14	MC	-0.9668	0.82	0.44
15	MC	1.0295	0.48	0.43
16	MC	-0.7552	0.79	0.52
17	MC	1.1151	0.46	0.28
18	MC	0.0077	0.68	0.36
19	MC	0.3300	0.62	0.49
20	MC	0.1630	0.65	0.34
21	MC	0.0449	0.67	0.22
22	MC	0.6089	0.56	0.51
23	MC	0.2857	0.63	0.55
24	MC	0.2343	0.63	0.43
25	MC	-1.0381	0.83	0.51
26	MC	0.5906	0.57	0.30
27	MC	-0.7523	0.79	0.44
28	MC	-0.0467	0.68	0.51
29	MC	0.4647	0.59	0.47
30	MC	-0.6823	0.78	0.52
31	MC	3.3038	0.13	0.12

Item	Type	Rasch	PC	RPB
32	MC	1.7797	0.34	0.25
33	MC	-0.5818	0.77	0.52
34	MC	-0.6199	0.77	0.46
35	MC	-0.6534	0.78	0.52
36	MC	1.1992	0.45	0.43
37	MC	1.9016	0.32	0.40
38	MC	1.4619	0.40	0.37
39	MC	1.3061	0.43	0.41
40	MC	-0.6007	0.77	0.47
41	MC	-0.5626	0.77	0.50
42	MC	2.2305	0.26	0.33
43	MC	0.8275	0.52	0.35
44	MC	1.6590	0.36	0.40
45	MC	1.5144	0.39	0.27
46	MC	0.6797	0.55	0.42
47	MC	1.3505	0.42	0.34
48	MC	1.1317	0.46	0.40
49	MC	2.5200	0.22	0.19

Reading Comprehension Form S Grade 6 Item Analysis

Multiple-choice Items
PC = Proportion Correct
RPB = Point-biserial correlation for keyed answer
A – D = Proportion answering each distractor; answer key is shaded

Open-ended Items
Mean = Mean OE score
Corr = Item-total correlation
0 – 2 = Percent of students at each score point

Item	Type	Rasch	PC/Mean	RPB/Corr
1	MC	0.2124	0.69	0.23
2	MC	-0.5605	0.80	0.46
3	MC	-0.4351	0.78	0.47
4	MC	-1.6895	0.91	0.40
5	MC	-1.0404	0.86	0.37
6	OE	0.5827	1.18	0.36
7	OE	0.0418	1.42	0.54
8	OE	-0.2532	1.50	0.55
9	OE	-0.4885	1.57	0.53
10	MC	-0.0146	0.72	0.37
11	MC	-1.5602	0.90	0.43
12	MC	1.3659	0.48	0.25
13	MC	-0.6542	0.81	0.51
14	MC	-0.1619	0.75	0.40
15	OE	0.0304	1.40	0.48
16	MC	-0.3883	0.78	0.29
17	MC	-0.1739	0.75	0.27
18	MC	-0.8048	0.83	0.38
19	MC	-0.3926	0.78	0.46
20	MC	-0.7392	0.82	0.40
21	MC	0.4518	0.65	0.43
22	MC	-1.7311	0.91	0.46
23	OE	-1.1336	1.79	0.44
24	OE	-0.0280	1.34	0.47
25	OE	0.3331	1.30	0.63
26	MC	-0.7311	0.82	0.50
27	MC	1.5753	0.44	0.38
28	MC	0.4718	0.64	0.26

Item	Type	Rasch	PC/Mean	RPB/Corr
29	MC	-0.2217	0.75	0.30
30	MC	0.0157	0.72	0.43
31	OE	-0.2672	1.32	0.48

Degree of Reading Power Form S Grade 6 Item Analysis

Multiple-choice Items
PC = Proportion Correct
RPB = Point-biserial correlation for keyed answer
A– E = Proportion answering each distractor; answer key is shaded

Item	Type	Rasch	PC	RPB
1	MC	0.1343	0.70	0.47
2	MC	-2.8934	0.97	0.34
3	MC	-1.8389	0.92	0.29
4	MC	-1.0471	0.86	0.41
5	MC	-2.1336	0.94	0.38
6	MC	0.1054	0.70	0.29
7	MC	-0.4083	0.78	0.59
8	MC	-1.4245	0.89	0.49
9	MC	0.0845	0.71	0.41
10	MC	-0.1699	0.75	0.56
11	MC	-0.6213	0.81	0.55
12	MC	-0.8879	0.84	0.47
13	MC	-0.4980	0.79	0.56
14	MC	-0.0744	0.73	0.42
15	MC	0.0125	0.72	0.45
16	MC	0.9648	0.55	0.47
17	MC	-0.9322	0.84	0.53
18	MC	2.4605	0.29	0.29
19	MC	-0.4109	0.78	0.40
20	MC	-0.3641	0.78	0.53
21	MC	-0.4980	0.79	0.37
22	MC	-0.4949	0.79	0.40
23	MC	-0.4827	0.79	0.58
24	MC	0.4319	0.65	0.48
25	MC	0.3340	0.67	0.44
26	MC	0.0561	0.71	0.41
27	MC	-0.1751	0.75	0.58
28	MC	0.0467	0.71	0.43
29	MC	0.8453	0.58	0.43
30	MC	1.4954	0.45	0.47
31	MC	1.5035	0.45	0.45

Item	Type	Rasch	PC	RPB
32	MC	0.0733	0.71	0.57
33	MC	-0.7575	0.83	0.52
34	MC	-0.0491	0.73	0.56
35	MC	0.9399	0.56	0.50
36	MC	1.9979	0.36	0.40
37	MC	0.8404	0.58	0.55
38	MC	0.8854	0.57	0.49
39	MC	0.3057	0.67	0.39
40	MC	0.3817	0.66	0.49
41	MC	1.4293	0.47	0.40
42	MC	1.4726	0.46	0.46
43	MC	2.9069	0.22	0.40
44	MC	3.3351	0.17	0.30
45	MC	0.1322	0.70	0.41
46	MC	0.3076	0.67	0.56
47	MC	0.6253	0.62	0.46
48	MC	0.6905	0.60	0.46
49	MC	1.2553	0.50	0.54

Reading Comprehension Form S Grade 7 Item Analysis

Multiple-choice Items
PC = Proportion Correct
RPB = Point-biserial correlation for keyed answer
A – D = Proportion answering each distractor; answer key is shaded

Open-ended Items
Mean = Mean OE score
Corr = Item-total correlation
0 – 2 = Percent of students at each score point

Item	Type	Rasch	PC/Mean	RPB/Corr
1	OE	-0.4927	1.61	0.43
2	MC	0.4843	0.67	0.30
3	MC	-1.9244	0.94	0.38
4	MC	-1.0984	0.88	0.41
5	MC	-0.2475	0.78	0.44
6	MC	1.5655	0.47	0.34
7	OE	0.6851	1.26	0.45
8	MC	0.5070	0.67	0.40
9	MC	0.0991	0.73	0.45
10	MC	1.1945	0.54	0.45
11	MC	0.3268	0.70	0.46
12	MC	-0.4481	0.81	0.50
13	OE	0.6712	1.29	0.62
14	OE	-0.0469	1.56	0.48
15	OE	-0.5876	1.55	0.44
16	OE	-0.1236	1.48	0.45
17	MC	0.1257	0.73	0.49
18	MC	0.3417	0.70	0.32
19	MC	0.8077	0.61	0.24
20	MC	-2.4177	0.96	0.31
21	OE	0.5599	1.30	0.54
22	OE	0.0329	1.48	0.53
23	MC	-1.3330	0.90	0.41
24	MC	-0.3539	0.80	0.51
25	MC	-0.2420	0.78	0.53
26	MC	-0.6981	0.84	0.53
27	MC	-0.8929	0.86	0.48
28	MC	-0.8664	0.86	0.53

Item	Type	Rasch	PC/Mean	RPB/Corr
29	OE	0.3495	1.36	0.53
30	OE	0.3057	1.36	0.45

Degree of Reading Power Form S Grade 7 Item Analysis

Multiple-choice Items
PC = Proportion Correct
RPB = Point-biserial correlation for keyed answer
A– E = Proportion answering each distractor; answer key is shaded

Item	Type	Rasch	PC	RPB
1	MC	-1.4208	0.90	0.43
2	MC	-3.1282	0.98	0.29
3	MC	0.0208	0.75	0.51
4	MC	-1.6941	0.92	0.42
5	MC	-1.1253	0.88	0.51
6	MC	-0.8742	0.86	0.46
7	MC	-0.5605	0.82	0.51
8	MC	0.2684	0.71	0.49
9	MC	-0.5896	0.83	0.51
10	MC	-0.6921	0.84	0.52
11	MC	1.7480	0.44	0.21
12	MC	-0.6349	0.83	0.50
13	MC	-1.4165	0.90	0.51
14	MC	-1.3459	0.90	0.46
15	MC	0.8481	0.61	0.53
16	MC	-0.9096	0.86	0.42
17	MC	-0.5486	0.82	0.49
18	MC	-0.1105	0.76	0.49
19	MC	-0.8859	0.86	0.48
20	MC	0.5403	0.66	0.42
21	MC	0.3193	0.70	0.54
22	MC	1.1152	0.56	0.41
23	MC	-0.4302	0.81	0.55
24	MC	-0.5529	0.82	0.46
25	MC	-0.1181	0.77	0.47
26	MC	1.6605	0.45	0.31
27	MC	0.9514	0.59	0.52
28	MC	-0.1622	0.77	0.59
29	MC	-0.1046	0.76	0.48
30	MC	0.4913	0.67	0.51
31	MC	-0.6347	0.83	0.56

Item	Type	Rasch	PC	RPB
32	MC	0.1507	0.73	0.46
33	MC	-0.3887	0.80	0.52
34	MC	1.2544	0.53	0.44
35	MC	0.3351	0.70	0.47
36	MC	0.2444	0.71	0.48
37	MC	2.0196	0.39	0.42
38	MC	2.0076	0.39	0.32
39	MC	1.9998	0.39	0.41
40	MC	1.0314	0.57	0.61
41	MC	0.4723	0.67	0.38
42	MC	1.8723	0.41	0.31
43	MC	1.0219	0.58	0.39
44	MC	1.3315	0.52	0.41
45	MC	2.5381	0.30	0.36
46	MC	1.3994	0.50	0.44
47	MC	1.8749	0.41	0.45
48	MC	0.8941	0.60	0.34
49	MC	2.0395	0.38	0.18

Reading Comprehension Form S Grade 8 Item Analysis

Multiple-choice Items
PC = Proportion Correct
RPB = Point-biserial correlation for keyed answer
A – D = Proportion answering each distractor; answer key is shaded

Open-ended Items
Mean = Mean OE score
Corr = Item-total correlation
0 – 2 = Percent of students at each score point

Item	Type	Rasch	PC/Mean	RPB/Corr
1	OE	-0.7910	1.59	0.41
2	OE	-0.2336	1.49	0.51
3	MC	-0.0848	0.75	0.42
4	MC	-0.3128	0.78	0.44
5	MC	0.4479	0.66	0.32
6	MC	0.0134	0.74	0.40
7	OE	-0.6207	1.60	0.53
8	OE	-0.6194	1.57	0.49
9	MC	1.9192	0.38	0.37
10	MC	-0.0528	0.75	0.18
11	MC	-0.3339	0.79	0.41
12	MC	-0.3682	0.79	0.42
13	MC	-0.3191	0.78	0.35
14	MC	-0.6610	0.83	0.50
15	MC	-1.6817	0.92	0.44
16	OE	0.3327	1.43	0.58
17	OE	0.4606	1.33	0.53
18	OE	0.7073	1.21	0.49
19	MC	0.1873	0.71	0.25
20	MC	1.1162	0.54	0.29
21	MC	-0.1930	0.77	0.25
22	MC	1.1634	0.53	0.39
23	MC	-0.5026	0.81	0.39
24	OE	0.0339	1.37	0.47
25	OE	0.1644	1.42	0.60
26	MC	-0.8879	0.85	0.46
27	MC	1.1212	0.54	0.34
28	MC	-0.1748	0.76	0.47

Item	Type	Rasch	PC/Mean	RPB/Corr
29	MC	0.8657	0.59	0.25
30	OE	0.2786	1.30	0.56

Degree of Reading Power Form S Grade 8 Item Analysis

Multiple-choice Items
PC = Proportion Correct
RPB = Point-biserial correlation for keyed answer
A– E = Proportion answering each distractor; answer key is shaded

Item	Type	Rasch	PC	RPB
1	MC	-0.2578	0.78	0.39
2	MC	-0.1042	0.75	0.34
3	MC	0.1995	0.71	0.40
4	MC	-1.8107	0.93	0.39
5	MC	-2.7210	0.97	0.34
6	MC	-1.4365	0.90	0.28
7	MC	-0.4194	0.80	0.40
8	MC	-1.3687	0.90	0.42
9	MC	0.3385	0.68	0.40
10	MC	-0.6512	0.83	0.50
11	MC	-0.0225	0.74	0.49
12	MC	-0.8335	0.85	0.40
13	MC	0.8812	0.58	0.39
14	MC	-1.0482	0.87	0.52
15	MC	-1.4835	0.91	0.39
16	MC	0.6239	0.63	0.40
17	MC	-1.0560	0.87	0.47
18	MC	-0.6948	0.83	0.54
19	MC	-0.9275	0.86	0.35
20	MC	0.9559	0.57	0.45
21	MC	1.1167	0.54	0.48
22	MC	0.9959	0.56	0.48
23	MC	-1.0678	0.87	0.41
24	MC	-0.3811	0.79	0.52
25	MC	-0.0510	0.75	0.40
26	MC	0.2388	0.70	0.47
27	MC	-0.4303	0.80	0.59
28	MC	-0.8591	0.85	0.52
29	MC	1.1982	0.52	0.41
30	MC	0.2767	0.69	0.52
31	MC	0.2405	0.70	0.37

Item	Type	Rasch	PC	RPB
32	MC	1.2066	0.52	0.31
33	MC	0.1980	0.71	0.50
34	MC	-0.4930	0.81	0.37
35	MC	0.7793	0.60	0.47
36	MC	0.9580	0.57	0.36
37	MC	0.5765	0.64	0.33
38	MC	1.9116	0.38	0.28
39	MC	0.6874	0.62	0.56
40	MC	1.9974	0.37	0.46
41	MC	0.7719	0.60	0.53
42	MC	0.7349	0.61	0.42
43	MC	0.9758	0.57	0.37
44	MC	0.1540	0.71	0.48
45	MC	0.6401	0.63	0.43
46	MC	0.6942	0.62	0.53
47	MC	1.8316	0.40	0.23
48	MC	2.1573	0.34	0.40
49	MC	1.9953	0.37	0.28

Editing and Revising Form S Grade 3 Item Analysis

Multiple-choice Items
PC = Proportion Correct
RPB = Point-biserial correlation for keyed answer
A – D = Proportion answering each distractor; answer key is shaded

Item	Type	Rasch	PC	RPB
1	MC	-0.5483	0.78	0.31
2	MC	1.3217	0.45	0.35
3	MC	1.0441	0.50	0.25
4	MC	-0.3751	0.75	0.38
5	MC	-1.3891	0.88	0.35
6	MC	-1.2191	0.86	0.55
7	MC	-1.3894	0.88	0.40
8	MC	0.5923	0.59	0.30
9	MC	-1.9338	0.92	0.40
10	MC	1.2905	0.45	0.23
11	MC	-0.0211	0.70	0.51
12	MC	1.0377	0.50	0.36
13	MC	-0.1903	0.73	0.51
14	MC	-0.6519	0.79	0.47
15	MC	-0.3919	0.76	0.38
16	MC	-0.1168	0.71	0.42
17	MC	-0.6789	0.80	0.45
18	MC	-1.0954	0.85	0.40
19	MC	0.8770	0.53	0.29
20	MC	-1.5242	0.89	0.42
21	MC	-0.7092	0.80	0.44
22	MC	-0.7911	0.81	0.59
23	MC	0.4841	0.61	0.38
24	MC	-0.7743	0.81	0.47
25	MC	-0.6738	0.80	0.47
26	MC	-0.0191	0.70	0.37
27	MC	0.0875	0.68	0.52
28	MC	1.4458	0.42	0.33
29	MC	-0.5478	0.78	0.42
30	MC	0.6301	0.58	0.50
31	MC	-0.3282	0.75	0.36
32	MC	0.4206	0.62	0.34

Direct Assessment of Writing Form S Grade 3 Item Analysis

Extended Response
Mean = Mean EX score
Corr = Item-total correlation
2 – 12 = Percent of students at each score point

Item	Type	Rasch	Mean	Corr	2	3	4	5	6	7	8	9	10	11	12
1	EX	-0.5483	8.11	0.53	0.01	0.00	0.02	0.02	0.11	0.13	0.32	0.17	0.14	0.05	0.02

Editing and Revising Form S Grade 4 Item Analysis

Multiple-choice Items
PC = Proportion Correct
RPB = Point-biserial correlation for keyed answer
A – D = Proportion answering each distractor; answer key is shaded

Item	Type	Rasch	PC	RPB
1	MC	0.5554	0.67	0.21
2	MC	-0.7236	0.85	0.45
3	MC	0.7501	0.63	0.22
4	MC	0.3203	0.71	0.29
5	MC	-1.0708	0.88	0.41
6	MC	0.2449	0.72	0.42
7	MC	0.3563	0.70	0.42
8	MC	-0.2287	0.79	0.38
9	MC	-0.4346	0.82	0.38
10	MC	0.5741	0.66	0.49
11	MC	0.1737	0.73	0.40
12	MC	-0.1568	0.78	0.46
13	MC	1.0924	0.57	0.35
14	MC	-0.6267	0.84	0.41
15	MC	-1.1124	0.89	0.44
16	MC	-0.6959	0.85	0.37
17	MC	-1.1990	0.89	0.44
18	MC	-0.5509	0.83	0.50
19	MC	0.7982	0.63	0.29
20	MC	-1.2098	0.89	0.45
21	MC	-0.6089	0.84	0.20
22	MC	-0.2981	0.80	0.48
23	MC	-0.9456	0.87	0.40
24	MC	0.8974	0.61	0.31
25	MC	-0.3566	0.81	0.54
26	MC	0.3493	0.70	0.45
27	MC	-0.1733	0.78	0.40
28	MC	0.3727	0.70	0.50
29	MC	0.2889	0.71	0.46
30	MC	-0.5230	0.83	0.46
31	MC	0.0867	0.74	0.47
32	MC	2.1772	0.37	0.32

Direct Assessment of Writing Form S Grade 4 Item Analysis

Extended Response
Mean = Mean EX score
Corr = Item-total correlation
2 – 12 = Percent of students at each score point

Item	Type	Rasch	Mean	Corr	2	3	4	5	6	7	8	9	10	11	12
1	EX	0.5554	8.63	0.55	0.00	0.00	0.01	0.01	0.05	0.08	0.36	0.20	0.15	0.09	0.04

Editing and Revising Form S Grade 5 Item Analysis

Multiple-choice Items
PC = Proportion Correct
RPB = Point-biserial correlation for keyed answer
A – D = Proportion answering each distractor; answer key is shaded

Item	Type	Rasch	PC	RPB
1	MC	1.3955	0.46	0.22
2	MC	0.3708	0.66	0.44
3	MC	-0.5437	0.80	0.45
4	MC	-0.6583	0.82	0.39
5	MC	-0.3718	0.78	0.41
6	MC	0.3089	0.67	0.28
7	MC	0.3151	0.67	0.27
8	MC	-0.8446	0.84	0.45
9	MC	-0.3881	0.78	0.25
10	MC	-0.0021	0.72	0.38
11	MC	-1.0424	0.86	0.36
12	MC	0.0877	0.71	0.43
13	MC	0.7279	0.59	0.31
14	MC	-0.4289	0.79	0.30
15	MC	0.5811	0.62	0.37
16	MC	-0.9024	0.85	0.42
17	MC	-0.9589	0.85	0.36
18	MC	0.6409	0.61	0.40
19	MC	-0.5251	0.80	0.39
20	MC	0.8358	0.57	0.38
21	MC	-0.5370	0.80	0.50
22	MC	0.7290	0.59	0.17
23	MC	0.1007	0.71	0.29
24	MC	-0.1705	0.75	0.43
25	MC	-0.3633	0.78	0.40
26	MC	-0.3471	0.77	0.47
27	MC	-1.0004	0.86	0.52
28	MC	-0.5325	0.80	0.56
29	MC	-0.5323	0.80	0.32
30	MC	-0.3112	0.77	0.50
31	MC	1.6791	0.41	0.31
32	MC	0.8417	0.57	0.32

Item	Type	Rasch	PC	RPB
33	MC	-0.3448	0.77	0.47
34	MC	-1.4400	0.90	0.38
35	MC	-0.6175	0.81	0.49
36	MC	-0.0140	0.72	0.50

Direct Assessment of Writing Form S Grade 5 Item Analysis

Extended Response
Mean = Mean EX score
Corr = Item-total correlation
2 – 12 = Percent of students at each score point

Item	Type	Rasch	Mean	Corr	2	3	4	5	6	7	8	9	10	11	12
1	EX	1.3955	8.05	0.51	0.00	0.00	0.01	0.01	0.12	0.15	0.39	0.16	0.11	0.04	0.02

Editing and Revising Form S Grade 6 Item Analysis

Multiple-choice Items
PC = Proportion Correct
RPB = Point-biserial correlation for keyed answer
A – D = Proportion answering each distractor; answer key is shaded

Item	Type	Rasch	PC	RPB
1	MC	-0.8389	0.85	0.30
2	MC	-0.2709	0.77	0.39
3	MC	0.8413	0.58	0.30
4	MC	0.2304	0.69	0.24
5	MC	-1.2587	0.89	0.22
6	MC	-0.4959	0.80	0.35
7	MC	-0.7942	0.84	0.43
8	MC	-0.4377	0.80	0.40
9	MC	1.4383	0.46	0.32
10	MC	-1.6949	0.92	0.28
11	MC	0.6294	0.62	0.51
12	MC	-0.2775	0.77	0.30
13	MC	0.5179	0.64	0.31
14	MC	0.8928	0.57	0.41
15	MC	-0.0861	0.74	0.41
16	MC	-0.9866	0.86	0.45
17	MC	-0.3262	0.78	0.41
18	MC	0.9202	0.56	0.12
19	MC	0.3532	0.67	0.42
20	MC	0.2468	0.69	0.46
21	MC	-0.4156	0.79	0.41
22	MC	-1.0665	0.87	0.43
23	MC	-0.0176	0.73	0.31
24	MC	0.1868	0.70	0.35
25	MC	0.3739	0.67	0.43
26	MC	0.0922	0.72	0.51
27	MC	0.1440	0.71	0.15
28	MC	0.2902	0.68	0.44
29	MC	0.5880	0.63	0.36
30	MC	-0.5766	0.81	0.53
31	MC	-0.6262	0.82	0.39
32	MC	-0.4137	0.79	0.44

Item	Type	Rasch	PC	RPB
33	MC	-0.2453	0.77	0.47
34	MC	-0.3415	0.78	0.34
35	MC	-0.3031	0.78	0.40
36	MC	1.7273	0.41	0.46

Direct Assessment of Writing Form S Grade 6 Item Analysis

Extended Response
Mean = Mean EX score
Corr = Item-total correlation
2 – 12 = Percent of students at each score point

Item	Type	Rasch	Mean	Corr	2	3	4	5	6	7	8	9	10	11	12
1	EX	-0.8389	7.93	0.51	0.00	0.00	0.01	0.02	0.12	0.16	0.38	0.17	0.09	0.03	0.01

Editing and Revising Form S Grade 7 Item Analysis

Multiple-choice Items
PC = Proportion Correct
RPB = Point-biserial correlation for keyed answer
A – D = Proportion answering each distractor; answer key is shaded

Item	Type	Rasch	PC	RPB
1	MC	-0.9427	0.84	0.35
2	MC	-0.7008	0.81	0.40
3	MC	-1.3928	0.88	0.44
4	MC	-0.1316	0.72	0.37
5	MC	-1.0609	0.85	0.39
6	MC	-2.4253	0.95	0.34
7	MC	-1.0403	0.85	0.44
8	MC	-0.4851	0.78	0.43
9	MC	-0.7500	0.81	0.34
10	MC	0.6468	0.58	0.30
11	MC	0.3614	0.64	0.28
12	MC	0.0260	0.70	0.30
13	MC	-0.4298	0.77	0.44
14	MC	-0.2998	0.75	0.45
15	MC	0.2042	0.66	0.42
16	MC	-0.4000	0.76	0.41
17	MC	-1.3713	0.88	0.47
18	MC	-0.9273	0.83	0.39
19	MC	-0.8605	0.83	0.42
20	MC	-0.3080	0.75	0.27
21	MC	1.3791	0.43	0.18
22	MC	0.4220	0.62	0.32
23	MC	-0.6279	0.80	0.36
24	MC	-0.3537	0.76	0.27
25	MC	0.4200	0.62	0.38
26	MC	-0.7859	0.82	0.34
27	MC	0.5235	0.60	0.34
28	MC	0.2117	0.66	0.21
29	MC	0.6285	0.58	0.23
30	MC	-0.0788	0.71	0.26
31	MC	0.9179	0.53	0.23
32	MC	-1.2151	0.87	0.50

Item	Type	Rasch	PC	RPB
33	MC	2.1390	0.29	0.21
34	MC	-0.6726	0.80	0.49
35	MC	-0.7412	0.81	0.50
36	MC	-0.2841	0.75	0.43
37	MC	-1.1573	0.86	0.48
38	MC	-0.4184	0.77	0.52
39	MC	-1.3585	0.88	0.45
40	MC	-0.9696	0.84	0.55

Extended Response
Mean = Mean EX score
Corr = Item-total correlation
2 – 12 = Percent of students at each score point

Direct Assessment of Writing Form S Grade 7 Item Analysis

Item	Type	Rasch	Mean	Corr	2	3	4	5	6	7	8	9	10	11	12
1	EX	-0.9427	8.17	0.59	0.01	0.00	0.02	0.02	0.10	0.12	0.34	0.18	0.14	0.05	0.02

Editing and Revising Form S Grade 8 Item Analysis

Multiple-choice Items
PC = Proportion Correct
RPB = Point-biserial correlation for keyed answer
A – D = Proportion answering each distractor; answer key is shaded

Item	Type	Rasch	PC	RPB
1	MC	-0.6274	0.81	0.41
2	MC	-1.7331	0.92	0.42
3	MC	1.0168	0.53	0.28
4	MC	-1.2188	0.87	0.38
5	MC	-1.9518	0.93	0.37
6	MC	0.5916	0.61	0.34
7	MC	-1.0068	0.85	0.45
8	MC	0.6943	0.59	0.39
9	MC	-1.7976	0.92	0.43
10	MC	-1.2091	0.87	0.43
11	MC	1.4723	0.44	0.19
12	MC	-1.4563	0.89	0.39
13	MC	-0.0844	0.73	0.43
14	MC	-0.6961	0.82	0.36
15	MC	-0.0895	0.73	0.48
16	MC	-1.1860	0.87	0.38
17	MC	0.1002	0.70	0.33
18	MC	0.8733	0.56	0.47
19	MC	-0.6875	0.82	0.49
20	MC	0.9212	0.55	0.12
21	MC	-1.1932	0.87	0.32
22	MC	-0.6445	0.81	0.47
23	MC	-0.7570	0.82	0.49
24	MC	-0.3713	0.77	0.39
25	MC	-0.5708	0.80	0.37
26	MC	-0.2981	0.76	0.47
27	MC	-0.9355	0.84	0.42
28	MC	-0.1732	0.74	0.41
29	MC	1.5619	0.43	0.50
30	MC	1.4368	0.45	0.40
31	MC	-0.1492	0.74	0.40
32	MC	-0.3999	0.78	0.28

Item	Type	Rasch	PC	RPB
33	MC	0.4334	0.64	0.53
34	MC	1.0166	0.53	0.43
35	MC	-0.1115	0.73	0.33
36	MC	1.1042	0.52	0.43
37	MC	0.2609	0.67	0.24
38	MC	-0.0191	0.72	0.47
39	MC	0.1852	0.69	0.26
40	MC	1.6180	0.42	0.40

Direct Assessment of Writing Form S Grade 8 Item Analysis

Extended Response
Mean = Mean EX score
Corr = Item-total correlation
2 – 12 = Percent of students at each score point

Item	Type	Rasch	Mean	Corr	2	3	4	5	6	7	8	9	10	11	12
1	EX	-0.6274	8.39	0.63	0.01	0.00	0.01	0.02	0.07	0.11	0.33	0.20	0.16	0.06	0.03

Science Form S Grade 5 Item Analysis

Multiple-choice Items
PC = Proportion Correct
RPB = Point-biserial correlation for keyed answer
A – D = Proportion answering each distractor; answer key is shaded

Open–ended Items
Mean = Mean OE score
Corr = Item-total correlation
0 – 2 = Percent of students at each score point

Item	Type	Rasch	PC/Mean	RPB/Corr
1	MC	0.2359	0.65	0.17
2	MC	0.0624	0.68	0.28
3	MC	0.2056	0.66	0.45
4	MC	-1.0202	0.84	0.44
5	MC	-0.7092	0.80	0.38
6	MC	-0.0622	0.70	0.43
7	MC	0.0220	0.69	0.50
8	MC	0.0567	0.68	0.24
9	MC	-0.4238	0.76	0.26
10	MC	-1.1366	0.86	0.38
11	MC	-0.5373	0.78	0.48
12	MC	-0.0220	0.70	0.32
13	MC	-0.2217	0.73	0.43
14	MC	-0.7432	0.81	0.27
15	MC	0.1710	0.66	0.32
16	MC	1.5204	0.39	0.26
17	MC	-1.6435	0.90	0.36
18	MC	1.8183	0.34	0.19
19	MC	0.5686	0.58	0.48
20	OE	1.4332	0.77	0.50
21	OE	1.3226	0.86	0.41
22	OE	1.0477	0.97	0.46
23	MC	1.2461	0.45	0.26
24	MC	0.3175	0.63	0.37
25	MC	0.5036	0.60	0.34
26	MC	0.2255	0.65	0.37
27	MC	-2.3647	0.95	0.25
28	MC	0.7308	0.55	0.30

Item	Type	Rasch	PC/Mean	RPB/Corr
29	MC	-0.6205	0.79	0.34
30	MC	-1.2333	0.87	0.41
31	MC	-0.2115	0.73	0.22
32	MC	-0.4754	0.77	0.36
33	MC	0.8038	0.54	0.38
34	MC	1.0428	0.49	0.35
35	MC	-0.8207	0.82	0.43
36	MC	-0.3655	0.75	0.35
37	MC	0.2435	0.65	0.35
38	MC	-2.0545	0.93	0.35
39	MC	0.5805	0.58	0.32

Science Form S Grade 8 Item Analysis

Multiple-choice Items
PC = Proportion Correct
RPB = Point-biserial correlation for keyed answer
A – D = Proportion answering each distractor; answer key is shaded

Open–ended Items
Mean = Mean OE score
Corr = Item-total correlation
0 – 2 = Percent of students at each score point

Item	Type	Rasch	PC/Mean	RPB/Corr
1	MC	-1.4724	0.87	0.36
2	MC	0.8131	0.50	0.29
3	MC	-0.2304	0.70	0.43
4	MC	0.1988	0.62	0.37
5	MC	0.0187	0.65	0.26
6	MC	-0.9484	0.81	0.45
7	MC	-0.6364	0.76	0.45
8	MC	-0.6080	0.76	0.38
9	MC	0.1793	0.62	0.28
10	MC	-0.3710	0.72	0.40
11	MC	-0.5639	0.75	0.47
12	MC	0.2265	0.61	0.25
13	MC	-1.1065	0.83	0.35
14	MC	1.8252	0.30	0.26
15	MC	0.0294	0.65	0.50
16	MC	-1.3954	0.86	0.39
17	MC	-0.5843	0.75	0.50
18	MC	2.6445	0.18	0.20
19	MC	-0.1821	0.69	0.42
20	MC	0.8097	0.50	0.32
21	MC	-0.7940	0.79	0.44
22	MC	-0.1161	0.68	0.34
23	OE	0.5876	1.09	0.55
24	OE	1.0420	0.91	0.58
25	OE	1.3978	0.74	0.52
26	MC	0.4920	0.56	0.37
27	MC	-0.9064	0.80	0.35
28	MC	1.0868	0.44	0.15

Item	Type	Rasch	PC/Mean	RPB/Corr
29	MC	-0.4293	0.73	0.33
30	MC	-0.5690	0.75	0.40
31	MC	-0.6905	0.77	0.37
32	MC	-0.1637	0.69	0.50
33	MC	0.1525	0.63	0.33
34	MC	1.1744	0.43	0.25
35	MC	-0.1696	0.69	0.44
36	MC	-1.3606	0.86	0.36
37	MC	-0.3285	0.71	0.44
38	MC	-0.2008	0.69	0.40
39	MC	1.2516	0.41	0.41
40	MC	1.1846	0.42	0.33
41	MC	-0.0563	0.67	0.40
42	MC	0.2017	0.62	0.54
43	MC	-0.5509	0.75	0.35
44	MC	1.2266	0.42	0.20
45	MC	0.1304	0.63	0.41
46	MC	-0.6027	0.76	0.54
47	MC	-0.8984	0.80	0.52
48	MC	-0.9260	0.80	0.43

Appendix C: Raw Score, Theta, Scale Score and Vertical Scale Score

Mathematics Grade 3 Form S

Raw Score	Theta	Scale Score	Vertical Scale Score
0	-6.2834	100	220
1	-5.0611	100	224
2	-4.3420	100	228
3	-3.9108	100	231
4	-3.5975	100	235
5	-3.3490	100	239
6	-3.1415	100	243
7	-2.9624	100	247
8	-2.8040	100	251
9	-2.6617	100	255
10	-2.5319	100	259
11	-2.4123	100	262
12	-2.3012	100	266
13	-2.1972	100	271
14	-2.0994	100	275
15	-2.0067	100	279
16	-1.9187	100	282
17	-1.8347	100	286
18	-1.7543	100	289
19	-1.6771	100	293
20	-1.6028	100	296
21	-1.5311	100	299
22	-1.4618	100	302
23	-1.3946	100	305
24	-1.3294	100	307
25	-1.2661	102	310
26	-1.2043	105	313
27	-1.1441	107	315
28	-1.0854	110	318
29	-1.0279	112	320
30	-0.9717	115	322
31	-0.9166	117	325
32	-0.8625	119	327
33	-0.8094	121	329

Raw Score	Theta	Scale Score	Vertical Scale Score
34	-0.7573	124	332
35	-0.7059	126	334
36	-0.6554	128	336
37	-0.6055	130	338
38	-0.5564	132	340
39	-0.5079	134	342
40	-0.4599	136	344
41	-0.4125	138	346
42	-0.3656	140	348
43	-0.3191	142	350
44	-0.2730	144	352
45	-0.2273	146	354
46	-0.1819	148	356
47	-0.1368	150	358
48	-0.0919	152	360
49	-0.0473	154	362
50	-0.0028	156	363
51	0.0415	157	365
52	0.0858	159	367
53	0.1300	161	369
54	0.1741	163	371
55	0.2182	165	373
56	0.2624	167	375
57	0.3066	169	377
58	0.3510	171	378
59	0.3955	172	380
60	0.4402	174	382
61	0.4851	176	384
62	0.5303	178	386
63	0.5758	180	388
64	0.6216	182	390
65	0.6678	184	392
66	0.7145	186	394
67	0.7616	188	396

Raw Score	Theta	Scale Score	Vertical Scale Score
68	0.8093	190	398
69	0.8575	192	400
70	0.9063	194	402
71	0.9558	196	404
72	1.0060	198	406
73	1.0570	200	408
74	1.1089	203	410
75	1.1616	205	413
76	1.2153	207	415
77	1.2700	210	417
78	1.3260	212	420
79	1.3830	214	422
80	1.4414	217	425
81	1.5012	219	427
82	1.5625	222	430
83	1.6255	225	432
84	1.6902	227	435
85	1.7570	230	438
86	1.8259	233	441
87	1.8972	236	444

Raw Score	Theta	Scale Score	Vertical Scale Score
88	1.9711	239	447
89	2.0480	242	450
90	2.1282	246	454
91	2.2123	249	457
92	2.3006	253	460
93	2.3940	257	464
94	2.4932	261	467
95	2.5992	266	470
96	2.7136	271	474
97	2.8379	276	477
98	2.9748	282	481
99	3.1275	288	484
100	3.3010	296	488
101	3.5030	304	492
102	3.7463	314	496
103	4.0547	328	500
104	4.4817	346	503
105	5.1974	376	507
106	6.4179	400	510

Mathematics Grade 4 Form S

Raw Score	Theta	Scale Score	Vertical Scale Score
0	-6.2623	100	265
1	-5.0421	100	270
2	-4.3262	100	274
3	-3.8983	100	278
4	-3.5886	100	283
5	-3.3437	100	287
6	-3.1400	100	291
7	-2.9647	100	295
8	-2.8103	100	299
9	-2.6718	100	304
10	-2.5461	100	308
11	-2.4305	100	312
12	-2.3235	100	316
13	-2.2235	100	320
14	-2.1297	100	324
15	-2.0411	100	328
16	-1.9571	102	331
17	-1.8771	105	335
18	-1.8007	108	338
19	-1.7274	111	341
20	-1.6570	114	344
21	-1.5891	117	347
22	-1.5235	119	350
23	-1.4600	122	352
24	-1.3983	124	355
25	-1.3384	127	357
26	-1.2801	129	360
27	-1.2232	131	362
28	-1.1676	133	365
29	-1.1133	136	367
30	-1.0600	138	369
31	-1.0078	140	371
32	-0.9566	142	374
33	-0.9061	144	376
34	-0.8566	146	378

Raw Score	Theta	Scale Score	Vertical Scale Score
35	-0.8077	148	380
36	-0.7595	150	382
37	-0.7120	152	384
38	-0.6651	154	386
39	-0.6187	155	388
40	-0.5727	157	390
41	-0.5272	159	392
42	-0.4822	161	394
43	-0.4375	163	396
44	-0.3931	164	397
45	-0.3491	166	399
46	-0.3053	168	401
47	-0.2618	170	403
48	-0.2185	171	405
49	-0.1754	173	407
50	-0.1325	175	409
51	-0.0896	176	410
52	-0.0470	178	412
53	-0.0044	180	414
54	0.0381	182	416
55	0.0806	183	418
56	0.1231	185	419
57	0.1655	187	421
58	0.2080	188	423
59	0.2506	190	425
60	0.2932	192	427
61	0.3359	193	428
62	0.3787	195	430
63	0.4217	197	432
64	0.4648	199	434
65	0.5082	200	436
66	0.5518	202	438
67	0.5956	204	439
68	0.6397	206	441
69	0.6841	207	443

Raw Score	Theta	Scale Score	Vertical Scale Score
70	0.7289	209	445
71	0.7740	211	447
72	0.8197	213	449
73	0.8657	215	451
74	0.9123	216	453
75	0.9594	218	455
76	1.0071	220	457
77	1.0556	222	459
78	1.1047	224	461
79	1.1547	226	463
80	1.2056	228	465
81	1.2574	230	467
82	1.3103	232	470
83	1.3645	235	472
84	1.4199	237	474
85	1.4767	239	477
86	1.5351	241	479
87	1.5953	244	482
88	1.6574	246	484
89	1.7217	249	487
90	1.7883	251	490

Raw Score	Theta	Scale Score	Vertical Scale Score
91	1.8576	254	493
92	1.9298	257	496
93	2.0053	260	499
94	2.0846	263	502
95	2.1679	267	506
96	2.2561	270	510
97	2.3497	274	514
98	2.4496	278	517
99	2.5569	282	521
100	2.6728	287	525
101	2.7992	292	529
102	2.9385	297	533
103	3.0940	304	537
104	3.2706	311	540
105	3.4759	319	544
106	3.7225	329	548
107	4.0341	341	552
108	4.4641	358	555
109	5.1824	387	559
110	6.4043	400	562

Mathematics Grade 5 Form S

Raw Score	Theta	Scale Score	Vertical Scale Score	Raw Score	Theta	Scale Score	Vertical Scale Score	Raw Score	Theta	Scale Score	Vertical Scale Score
0	-6.4734	100	295	35	-1.0848	143	401	70	0.2706	199	459
1	-5.2563	100	299	36	-1.0387	145	403	71	0.3058	201	460
2	-4.5445	100	302	37	-0.9933	147	405	72	0.3410	202	462
3	-4.1204	100	306	38	-0.9486	149	407	73	0.3762	204	463
4	-3.8142	100	310	39	-0.9046	150	409	74	0.4116	205	465
5	-3.5726	100	314	40	-0.8613	152	411	75	0.4469	207	466
6	-3.3718	100	317	41	-0.8185	154	413	76	0.4824	208	468
7	-3.1992	100	321	42	-0.7762	156	414	77	0.5181	210	469
8	-3.0473	100	325	43	-0.7346	157	416	78	0.5538	211	471
9	-2.9111	100	328	44	-0.6934	159	418	79	0.5897	212	472
10	-2.7875	100	332	45	-0.6527	161	420	80	0.6258	214	474
11	-2.6739	100	336	46	-0.6124	163	421	81	0.6621	215	476
12	-2.5686	100	339	47	-0.5726	164	423	82	0.6986	217	477
13	-2.4704	100	343	48	-0.5331	166	425	83	0.7354	219	479
14	-2.3782	100	347	49	-0.4941	167	426	84	0.7725	220	480
15	-2.2910	100	350	50	-0.4554	169	428	85	0.8098	222	482
16	-2.2084	100	354	51	-0.4170	171	430	86	0.8475	223	483
17	-2.1297	100	357	52	-0.3790	172	431	87	0.8856	225	485
18	-2.0545	103	360	53	-0.3412	174	433	88	0.9240	226	487
19	-1.9824	106	363	54	-0.3038	175	434	89	0.9628	228	488
20	-1.9132	108	366	55	-0.2666	177	436	90	1.0022	230	490
21	-1.8464	111	369	56	-0.2297	178	438	91	1.0420	231	492
22	-1.7819	114	372	57	-0.1930	180	439	92	1.0823	233	493
23	-1.7196	117	374	58	-0.1565	181	441	93	1.1231	235	495
24	-1.6591	119	377	59	-0.1202	183	442	94	1.1646	236	497
25	-1.6004	121	379	60	-0.0841	184	444	95	1.2068	238	499
26	-1.5432	124	382	61	-0.0481	186	445	96	1.2496	240	500
27	-1.4876	126	384	62	-0.0124	187	447	97	1.2931	242	502
28	-1.4333	128	386	63	0.0233	189	448	98	1.3375	244	504
29	-1.3804	131	389	64	0.0588	190	450	99	1.3827	245	506
30	-1.3285	133	391	65	0.0943	192	451	100	1.4288	247	508
31	-1.2779	135	393	66	0.1296	193	453	101	1.4758	249	510
32	-1.2282	137	395	67	0.1649	195	454	102	1.5239	251	512
33	-1.1795	139	397	68	0.2002	196	456	103	1.5732	253	514
34	-1.1317	141	399	69	0.2354	198	457	104	1.6237	255	516

Raw Score	Theta	Scale Score	Vertical Scale Score
105	1.6754	258	519
106	1.7286	260	521
107	1.7833	262	523
108	1.8397	264	526
109	1.8978	267	528
110	1.9579	269	531
111	2.0202	272	533
112	2.0848	275	536
113	2.1520	277	539
114	2.2222	280	542

Raw Score	Theta	Scale Score	Vertical Scale Score
115	2.2955	283	545
116	2.3725	287	549
117	2.4536	290	552
118	2.5393	293	556
119	2.6304	297	559
120	2.7277	301	562
121	2.8323	306	566
122	2.9455	310	569
123	3.0692	315	572
124	3.2058	321	575

Raw Score	Theta	Scale Score	Vertical Scale Score
125	3.3588	328	579
126	3.5329	335	582
127	3.7361	343	585
128	3.9810	353	588
129	4.2914	366	591
130	4.7208	384	594
131	5.4393	400	597
132	6.6619	400	600

Mathematics Grade 6 Form S

Raw Score	Theta	Scale Score	Vertical Scale Score	Raw Score	Theta	Scale Score	Vertical Scale Score	Raw Score	Theta	Scale Score	Vertical Scale Score
0	-6.5135	100	325	36	-1.0550	163	434	72	0.2514	212	490
1	-5.2928	100	329	37	-1.0111	164	436	73	0.2838	213	491
2	-4.5763	100	333	38	-0.9678	166	438	74	0.3162	215	493
3	-4.1480	100	336	39	-0.9253	168	440	75	0.3486	216	494
4	-3.8380	100	340	40	-0.8835	169	442	76	0.3810	217	496
5	-3.5931	100	344	41	-0.8423	171	444	77	0.4134	218	497
6	-3.3894	100	348	42	-0.8017	172	445	78	0.4459	220	498
7	-3.2142	100	352	43	-0.7617	174	447	79	0.4783	221	500
8	-3.0601	100	356	44	-0.7222	175	449	80	0.5109	222	501
9	-2.9221	100	359	45	-0.6832	177	450	81	0.5434	223	503
10	-2.7967	100	363	46	-0.6448	178	452	82	0.5761	225	504
11	-2.6817	101	367	47	-0.6067	180	454	83	0.6088	226	505
12	-2.5753	105	371	48	-0.5692	181	455	84	0.6417	227	507
13	-2.4761	109	375	49	-0.5320	182	457	85	0.6747	228	508
14	-2.3830	112	378	50	-0.4952	184	458	86	0.7078	230	510
15	-2.2953	115	382	51	-0.4588	185	460	87	0.7410	231	511
16	-2.2122	119	385	52	-0.4227	187	461	88	0.7745	232	512
17	-2.1332	122	389	53	-0.3869	188	463	89	0.8081	233	514
18	-2.0578	124	392	54	-0.3515	189	464	90	0.8419	235	515
19	-1.9857	127	395	55	-0.3164	191	466	91	0.8759	236	517
20	-1.9164	130	398	56	-0.2815	192	467	92	0.9102	237	518
21	-1.8499	132	401	57	-0.2469	193	469	93	0.9447	239	520
22	-1.7857	135	403	58	-0.2125	195	470	94	0.9795	240	521
23	-1.7237	137	406	59	-0.1784	196	472	95	1.0147	241	523
24	-1.6637	139	409	60	-0.1444	197	473	96	1.0501	243	524
25	-1.6055	142	411	61	-0.1107	198	475	97	1.0859	244	526
26	-1.5491	144	413	62	-0.0772	200	476	98	1.1221	245	527
27	-1.4942	146	416	63	-0.0438	201	478	99	1.1587	247	529
28	-1.4407	148	418	64	-0.0105	202	479	100	1.1958	248	530
29	-1.3886	150	420	65	0.0225	204	480	101	1.2333	250	532
30	-1.3378	152	422	66	0.0555	205	482	102	1.2713	251	534
31	-1.2882	154	425	67	0.0884	206	483	103	1.3099	252	535
32	-1.2396	156	427	68	0.1211	207	485	104	1.3491	254	537
33	-1.1921	157	429	69	0.1538	209	486	105	1.3889	255	539
34	-1.1455	159	431	70	0.1864	210	487	106	1.4294	257	540
35	-1.0999	161	433	71	0.2189	211	489	107	1.4706	259	542

Raw Score	Theta	Scale Score	Vertical Scale Score
108	1.5126	260	544
109	1.5556	262	546
110	1.5993	263	548
111	1.6442	265	549
112	1.6901	267	551
113	1.7371	269	553
114	1.7854	271	555
115	1.8351	272	558
116	1.8864	274	560
117	1.9392	276	562
118	1.9939	278	564
119	2.0504	281	567

Raw Score	Theta	Scale Score	Vertical Scale Score
120	2.1093	283	569
121	2.1704	285	572
122	2.2343	288	575
123	2.3011	290	577
124	2.3713	293	580
125	2.4452	296	584
126	2.5235	299	587
127	2.6067	302	590
128	2.6957	305	594
129	2.7913	309	597
130	2.8950	313	601
131	3.0084	317	604

Raw Score	Theta	Scale Score	Vertical Scale Score
132	3.1340	322	608
133	3.2749	327	611
134	3.4360	333	615
135	3.6248	340	618
136	3.8539	349	622
137	4.1469	360	626
138	4.5571	376	629
139	5.2544	400	633
140	6.4608	400	637

Mathematics Grade 7 Form S

Raw Score	Theta	Scale Score	Vertical Scale Score	Raw Score	Theta	Scale Score	Vertical Scale Score	Raw Score	Theta	Scale Score	Vertical Scale Score
0	-6.3631	100	355	37	-1.0853	176	465	74	0.0899	220	515
1	-5.1487	100	359	38	-1.0468	177	466	75	0.1187	222	516
2	-4.4408	100	363	39	-1.0090	179	468	76	0.1474	223	517
3	-4.0209	100	367	40	-0.9718	180	470	77	0.1762	224	518
4	-3.7190	100	371	41	-0.9352	181	471	78	0.2050	225	520
5	-3.4818	100	376	42	-0.8991	183	473	79	0.2338	226	521
6	-3.2857	100	380	43	-0.8636	184	474	80	0.2628	227	522
7	-3.1179	100	384	44	-0.8286	185	476	81	0.2917	228	523
8	-2.9709	104	388	45	-0.7941	187	477	82	0.3208	229	524
9	-2.8398	109	392	46	-0.7600	188	479	83	0.3499	230	526
10	-2.7213	113	396	47	-0.7263	189	480	84	0.3792	231	527
11	-2.6130	117	400	48	-0.6930	191	481	85	0.4086	233	528
12	-2.5131	121	404	49	-0.6601	192	483	86	0.4382	234	529
13	-2.4202	125	408	50	-0.6276	193	484	87	0.4678	235	531
14	-2.3334	128	412	51	-0.5953	194	486	88	0.4977	236	532
15	-2.2519	131	415	52	-0.5635	195	487	89	0.5278	237	533
16	-2.1748	134	419	53	-0.5319	197	488	90	0.5579	238	535
17	-2.1018	137	422	54	-0.5005	198	490	91	0.5884	239	536
18	-2.0323	139	425	55	-0.4695	199	491	92	0.6191	241	537
19	-1.9660	142	427	56	-0.4387	200	492	93	0.6500	242	538
20	-1.9026	144	430	57	-0.4081	201	494	94	0.6812	243	540
21	-1.8416	147	433	58	-0.3777	203	495	95	0.7126	244	541
22	-1.7830	149	435	59	-0.3476	204	496	96	0.7444	245	542
23	-1.7266	151	438	60	-0.3176	205	497	97	0.7764	247	544
24	-1.6720	153	440	61	-0.2878	206	499	98	0.8088	248	545
25	-1.6193	155	442	62	-0.2582	207	500	99	0.8416	249	547
26	-1.5681	157	444	63	-0.2286	208	501	100	0.8747	250	548
27	-1.5185	159	446	64	-0.1992	209	502	101	0.9083	252	549
28	-1.4703	161	448	65	-0.1700	211	504	102	0.9423	253	551
29	-1.4234	163	450	66	-0.1408	212	505	103	0.9767	254	552
30	-1.3777	164	452	67	-0.1118	213	506	104	1.0117	256	554
31	-1.3331	166	454	68	-0.0828	214	507	105	1.0471	257	555
32	-1.2895	168	456	69	-0.0539	215	509	106	1.0830	258	557
33	-1.2470	169	458	70	-0.0251	216	510	107	1.1196	260	558
34	-1.2053	171	460	71	0.0037	217	511	108	1.1568	261	560
35	-1.1645	173	461	72	0.0325	218	512	109	1.1946	263	562
36	-1.1246	174	463	73	0.0612	219	513	110	1.2331	264	563

Raw Score	Theta	Scale Score	Vertical Scale Score
111	1.2723	266	565
112	1.3124	267	567
113	1.3532	269	568
114	1.3950	270	570
115	1.4377	272	572
116	1.4814	273	574
117	1.5263	275	576
118	1.5723	277	578
119	1.6195	279	580
120	1.6682	281	582
121	1.7183	283	584
122	1.7700	284	586
123	1.8235	287	588

Raw Score	Theta	Scale Score	Vertical Scale Score
124	1.8789	289	591
125	1.9364	291	593
126	1.9962	293	596
127	2.0585	295	598
128	2.1236	298	601
129	2.1919	301	604
130	2.2638	303	607
131	2.3396	306	610
132	2.4200	309	614
133	2.5056	313	617
134	2.5974	316	621
135	2.6962	320	625
136	2.8036	324	628

Raw Score	Theta	Scale Score	Vertical Scale Score
137	2.9212	328	632
138	3.0516	333	635
139	3.1980	339	639
140	3.3655	345	642
141	3.5617	353	646
142	3.7995	362	650
143	4.1027	373	653
144	4.5249	390	657
145	5.2364	400	660
146	6.4545	400	664

Mathematics Grade 8 Form S

Raw Score	Theta	Scale Score	Vertical Scale Score	Raw Score	Theta	Scale Score	Vertical Scale Score	Raw Score	Theta	Scale Score	Vertical Scale Score
0	-6.3800	100	380	37	-1.0437	183	487	74	0.1343	227	537
1	-5.1643	100	384	38	-1.0046	185	489	75	0.1627	228	538
2	-4.4546	100	388	39	-0.9661	186	491	76	0.1910	229	540
3	-4.0327	100	392	40	-0.9283	188	492	77	0.2195	230	541
4	-3.7288	100	395	41	-0.8912	189	494	78	0.2479	231	542
5	-3.4896	100	399	42	-0.8546	190	495	79	0.2763	232	543
6	-3.2914	101	403	43	-0.8187	192	497	80	0.3047	233	545
7	-3.1215	107	407	44	-0.7833	193	498	81	0.3333	234	546
8	-2.9724	112	411	45	-0.7484	194	500	82	0.3619	235	547
9	-2.8392	117	415	46	-0.7140	195	501	83	0.3906	236	548
10	-2.7186	122	419	47	-0.6800	197	503	84	0.4194	237	549
11	-2.6082	126	422	48	-0.6465	198	504	85	0.4482	238	551
12	-2.5062	129	426	49	-0.6133	199	506	86	0.4772	239	552
13	-2.4114	133	430	50	-0.5806	200	507	87	0.5063	240	553
14	-2.3226	136	434	51	-0.5482	202	508	88	0.5356	241	554
15	-2.2391	139	438	52	-0.5162	203	510	89	0.5650	242	556
16	-2.1602	142	441	53	-0.4845	204	511	90	0.5946	244	557
17	-2.0853	145	443	54	-0.4532	205	512	91	0.6244	245	558
18	-2.0141	148	446	55	-0.4220	206	514	92	0.6544	246	559
19	-1.9460	150	449	56	-0.3912	207	515	93	0.6846	247	561
20	-1.8808	152	452	57	-0.3606	208	516	94	0.7151	248	562
21	-1.8183	155	455	58	-0.3303	210	518	95	0.7458	249	563
22	-1.7581	157	457	59	-0.3002	211	519	96	0.7768	250	565
23	-1.7001	159	460	60	-0.2703	212	520	97	0.8080	251	566
24	-1.6442	161	462	61	-0.2405	213	521	98	0.8396	253	567
25	-1.5900	163	464	62	-0.2110	214	523	99	0.8715	254	569
26	-1.5375	165	466	63	-0.1816	215	524	100	0.9038	255	570
27	-1.4866	167	469	64	-0.1524	216	525	101	0.9365	256	571
28	-1.4372	169	471	65	-0.1233	217	526	102	0.9695	257	573
29	-1.3891	171	473	66	-0.0943	218	528	103	1.0030	259	574
30	-1.3423	172	475	67	-0.0655	219	529	104	1.0369	260	576
31	-1.2966	174	477	68	-0.0368	220	530	105	1.0713	261	577
32	-1.2521	176	479	69	-0.0081	221	531	106	1.1063	262	578
33	-1.2086	177	480	70	0.0205	222	532	107	1.1417	264	580
34	-1.1661	179	482	71	0.0490	223	534	108	1.1778	265	582
35	-1.1244	180	484	72	0.0775	225	535	109	1.2145	266	583
36	-1.0837	182	486	73	0.1059	226	536	110	1.2518	268	585

Raw Score	Theta	Scale Score	Vertical Scale Score
111	1.2899	269	586
112	1.3287	271	588
113	1.3683	272	590
114	1.4088	273	591
115	1.4501	275	593
116	1.4925	277	595
117	1.5359	278	597
118	1.5805	280	599
119	1.6264	281	601
120	1.6735	283	603
121	1.7222	285	605
122	1.7724	287	607
123	1.8244	289	609

Raw Score	Theta	Scale Score	Vertical Scale Score
124	1.8782	291	611
125	1.9342	293	614
126	1.9924	295	616
127	2.0533	297	619
128	2.1169	300	621
129	2.1838	302	624
130	2.2543	305	627
131	2.3288	307	631
132	2.4080	310	634
133	2.4925	313	637
134	2.5833	317	641
135	2.6813	320	644
136	2.7880	324	648

Raw Score	Theta	Scale Score	Vertical Scale Score
137	2.9052	329	651
138	3.0353	333	655
139	3.1818	339	658
140	3.3494	345	661
141	3.5460	352	664
142	3.7843	361	668
143	4.0881	372	671
144	4.5108	388	674
145	5.2223	400	677
146	6.4401	400	680

Reading Grade 3 Form S

Raw Score	Theta	Scale Score	Vertical Scale Score
0	-6.2932	100	225
1	-5.0693	100	230
2	-4.3478	100	235
3	-3.9140	100	240
4	-3.5980	100	245
5	-3.3466	100	249
6	-3.1360	100	254
7	-2.9535	100	259
8	-2.7916	103	263
9	-2.6455	108	268
10	-2.5117	113	273
11	-2.3878	117	277
12	-2.2722	121	282
13	-2.1634	125	287
14	-2.0605	129	291
15	-1.9625	132	296
16	-1.8688	136	300
17	-1.7789	139	304
18	-1.6923	142	308
19	-1.6086	145	312
20	-1.5275	148	315
21	-1.4485	151	319
22	-1.3717	154	322
23	-1.2967	157	325
24	-1.2232	159	329
25	-1.1513	162	332
26	-1.0807	164	335
27	-1.0112	167	338
28	-0.9428	169	341

Raw Score	Theta	Scale Score	Vertical Scale Score
29	-0.8752	172	344
30	-0.8086	174	347
31	-0.7427	176	350
32	-0.6774	179	353
33	-0.6126	181	356
34	-0.5484	183	359
35	-0.4846	186	362
36	-0.4212	188	365
37	-0.3580	190	367
38	-0.2951	193	370
39	-0.2323	195	373
40	-0.1697	197	376
41	-0.1070	199	379
42	-0.0445	202	381
43	0.0182	204	384
44	0.0810	206	387
45	0.1439	208	390
46	0.2072	211	393
47	0.2706	213	395
48	0.3344	215	398
49	0.3987	218	401
50	0.4634	220	404
51	0.5286	222	407
52	0.5945	225	410
53	0.6611	227	413
54	0.7284	230	416
55	0.7966	232	419
56	0.8658	234	422
57	0.9360	237	425

Raw Score	Theta	Scale Score	Vertical Scale Score
58	1.0074	240	428
59	1.0801	242	432
60	1.1543	245	435
61	1.2300	248	438
62	1.3075	250	442
63	1.3870	253	445
64	1.4686	256	449
65	1.5526	259	453
66	1.6394	262	456
67	1.7293	266	460
68	1.8226	269	465
69	1.9198	272	469
70	2.0215	276	474
71	2.1284	280	478
72	2.2414	284	483
73	2.3614	288	488
74	2.4899	293	493
75	2.6286	298	498
76	2.7800	304	503
77	2.9475	310	508
78	3.1359	316	513
79	3.3530	324	519
80	3.6115	333	524
81	3.9351	345	530
82	4.3773	361	535
83	5.1082	387	541
84	16.6139	400	547

Reading Grade 4 Form S

Raw Score	Theta	Scale Score	Vertical Scale Score
0	-6.1306	100	250
1	-4.9073	100	255
2	-4.1866	100	259
3	-3.7537	100	264
4	-3.4385	100	268
5	-3.1879	100	272
6	-2.9782	100	277
7	-2.7966	100	281
8	-2.6357	101	286
9	-2.4905	106	290
10	-2.3577	111	294
11	-2.2350	116	299
12	-2.1205	120	303
13	-2.0130	125	308
14	-1.9113	128	312
15	-1.8147	132	317
16	-1.7225	136	321
17	-1.6341	139	325
18	-1.5491	142	329
19	-1.4672	145	332
20	-1.3879	149	336
21	-1.3110	151	339
22	-1.2362	154	343
23	-1.1634	157	346
24	-1.0924	160	349
25	-1.0228	163	352
26	-0.9548	165	355
27	-0.8881	168	358
28	-0.8224	170	361

Raw Score	Theta	Scale Score	Vertical Scale Score
29	-0.7579	173	364
30	-0.6943	175	367
31	-0.6316	178	370
32	-0.5697	180	372
33	-0.5084	182	375
34	-0.4477	185	378
35	-0.3876	187	381
36	-0.3279	189	383
37	-0.2686	191	386
38	-0.2097	194	389
39	-0.1509	196	391
40	-0.0924	198	394
41	-0.0339	200	396
42	0.0245	203	399
43	0.0828	205	402
44	0.1413	207	404
45	0.1999	209	407
46	0.2587	212	409
47	0.3178	214	412
48	0.3772	216	415
49	0.4370	219	417
50	0.4974	221	420
51	0.5582	223	423
52	0.6197	226	426
53	0.6819	228	428
54	0.7449	230	431
55	0.8089	233	434
56	0.8737	235	437
57	0.9398	238	440

Raw Score	Theta	Scale Score	Vertical Scale Score
58	1.0070	240	443
59	1.0756	243	446
60	1.1456	246	449
61	1.2173	248	452
62	1.2909	251	456
63	1.3664	254	459
64	1.4442	257	462
65	1.5244	260	466
66	1.6074	263	470
67	1.6936	267	474
68	1.7833	270	478
69	1.8769	274	482
70	1.9751	278	486
71	2.0785	281	491
72	2.1879	286	496
73	2.3045	290	501
74	2.4294	295	506
75	2.5647	300	511
76	2.7126	306	516
77	2.8765	312	521
78	3.0613	319	526
79	3.2745	327	530
80	3.5290	337	535
81	3.8482	349	540
82	4.2856	366	545
83	5.0111	394	550
84	16.5104	400	555

Reading Grade 5 Form S

Raw Score	Theta	Scale Score	Vertical Scale Score
0	-6.3463	100	279
1	-5.1260	100	283
2	-4.4098	100	287
3	-3.9815	100	290
4	-3.6711	100	294
5	-3.4253	100	297
6	-3.2203	100	301
7	-3.0437	100	305
8	-2.8878	100	308
9	-2.7476	100	312
10	-2.6200	100	316
11	-2.5023	105	320
12	-2.3930	109	323
13	-2.2907	112	327
14	-2.1943	116	331
15	-2.1029	119	335
16	-2.0161	123	339
17	-1.9330	126	343
18	-1.8534	129	347
19	-1.7768	132	350
20	-1.7028	134	353
21	-1.6313	137	356
22	-1.5620	140	359
23	-1.4946	142	362
24	-1.4291	145	365
25	-1.3650	147	368
26	-1.3025	149	371
27	-1.2412	152	374
28	-1.1812	154	376
29	-1.1223	156	379
30	-1.0644	158	381
31	-1.0074	160	384
32	-0.9512	163	386
33	-0.8958	165	389

Raw Score	Theta	Scale Score	Vertical Scale Score
34	-0.8410	167	391
35	-0.7869	169	394
36	-0.7333	171	396
37	-0.6802	173	398
38	-0.6276	175	401
39	-0.5754	177	403
40	-0.5235	179	405
41	-0.4719	180	407
42	-0.4205	182	410
43	-0.3694	184	412
44	-0.3184	186	414
45	-0.2676	188	416
46	-0.2168	190	419
47	-0.1661	192	421
48	-0.1154	194	423
49	-0.0646	196	425
50	-0.0138	198	428
51	0.0372	199	430
52	0.0883	201	432
53	0.1395	203	434
54	0.1911	205	437
55	0.2428	207	439
56	0.2950	209	441
57	0.3474	211	444
58	0.4003	213	446
59	0.4535	215	448
60	0.5074	217	451
61	0.5617	219	453
62	0.6166	221	456
63	0.6722	223	458
64	0.7285	225	460
65	0.7856	227	463
66	0.8436	230	466
67	0.9025	232	468

Raw Score	Theta	Scale Score	Vertical Scale Score
68	0.9623	234	471
69	1.0232	236	473
70	1.0854	239	476
71	1.1488	241	479
72	1.2136	243	482
73	1.2799	246	485
74	1.3479	248	488
75	1.4176	251	491
76	1.4894	254	494
77	1.5633	257	497
78	1.6396	259	501
79	1.7186	262	504
80	1.8006	265	508
81	1.8858	269	512
82	1.9747	272	515
83	2.0679	275	520
84	2.1657	279	524
85	2.2691	283	528
86	2.3788	287	533
87	2.4959	291	537
88	2.6219	296	541
89	2.7585	301	546
90	2.9083	307	550
91	3.0747	313	554
92	3.2627	320	558
93	3.4801	328	562
94	3.7397	338	566
95	4.0656	350	570
96	4.5115	367	573
97	5.2477	394	577
98	6.4834	400	582

Reading Grade 6 Form S

Raw Score	Theta	Scale Score	Vertical Scale Score
0	-6.3884	100	290
1	-5.1644	100	294
2	-4.4433	100	298
3	-4.0107	100	302
4	-3.6965	100	306
5	-3.4475	100	310
6	-3.2400	100	314
7	-3.0610	100	318
8	-2.9031	105	322
9	-2.7613	110	326
10	-2.6322	115	330
11	-2.5135	119	334
12	-2.4032	123	338
13	-2.3002	127	342
14	-2.2032	131	346
15	-2.1114	134	350
16	-2.0241	137	354
17	-1.9409	140	358
18	-1.8611	143	361
19	-1.7844	146	365
20	-1.7105	149	368
21	-1.6390	151	371
22	-1.5697	154	374
23	-1.5024	156	377
24	-1.4369	158	380
25	-1.3730	161	383
26	-1.3106	163	386
27	-1.2495	165	388
28	-1.1896	167	391
29	-1.1307	170	394
30	-1.0729	172	396
31	-1.0160	174	399
32	-0.9599	176	401
33	-0.9045	178	404

Raw Score	Theta	Scale Score	Vertical Scale Score
34	-0.8499	180	406
35	-0.7957	182	408
36	-0.7422	184	411
37	-0.6891	186	413
38	-0.6364	187	415
39	-0.5841	189	418
40	-0.5322	191	420
41	-0.4805	193	422
42	-0.4290	195	425
43	-0.3778	197	427
44	-0.3267	199	429
45	-0.2758	201	431
46	-0.2248	202	434
47	-0.1739	204	436
48	-0.1231	206	438
49	-0.0722	208	440
50	-0.0212	210	443
51	0.0299	212	445
52	0.0812	213	447
53	0.1326	215	449
54	0.1843	217	452
55	0.2362	219	454
56	0.2885	221	456
57	0.3411	223	459
58	0.3941	225	461
59	0.4475	227	463
60	0.5015	229	466
61	0.5560	231	468
62	0.6110	233	470
63	0.6667	235	473
64	0.7232	237	475
65	0.7804	239	478
66	0.8384	241	480
67	0.8974	243	483

Raw Score	Theta	Scale Score	Vertical Scale Score
68	0.9574	245	486
69	1.0184	247	488
70	1.0806	250	491
71	1.1441	252	494
72	1.2089	254	497
73	1.2754	257	500
74	1.3434	259	503
75	1.4132	262	506
76	1.4851	264	509
77	1.5591	267	512
78	1.6355	270	516
79	1.7145	273	519
80	1.7965	276	523
81	1.8819	279	526
82	1.9709	282	530
83	2.0642	285	535
84	2.1622	289	539
85	2.2657	293	543
86	2.3755	297	548
87	2.4928	301	553
88	2.6189	305	557
89	2.7556	310	562
90	2.9054	316	567
91	3.0718	322	571
92	3.2597	329	576
93	3.4768	337	581
94	3.7358	346	585
95	4.0608	358	590
96	4.5051	374	594
97	5.2389	400	599
98	6.4724	400	603

Reading Grade 7 Form S

Raw Score	Theta	Scale Score	Vertical Scale Score
0	-6.4136	100	300
1	-5.1842	100	304
2	-4.4562	100	308
3	-4.0176	100	312
4	-3.6982	100	316
5	-3.4444	100	320
6	-3.2325	100	325
7	-3.0495	100	329
8	-2.8879	100	333
9	-2.7426	100	338
10	-2.6102	100	342
11	-2.4883	103	346
12	-2.3751	108	351
13	-2.2691	112	355
14	-2.1694	115	360
15	-2.0750	119	364
16	-1.9853	122	368
17	-1.8995	126	372
18	-1.8174	129	376
19	-1.7386	132	379
20	-1.6625	134	383
21	-1.5890	137	386
22	-1.5178	140	389
23	-1.4487	142	392
24	-1.3815	145	395
25	-1.3160	147	398
26	-1.2520	150	401
27	-1.1894	152	404
28	-1.1282	155	406
29	-1.0681	157	409
30	-1.0092	159	412
31	-0.9512	161	414
32	-0.8942	163	417
33	-0.8380	165	419
34	-0.7825	167	422
35	-0.7277	170	424
36	-0.6736	172	427
37	-0.6200	174	429
38	-0.5670	176	432
39	-0.5144	178	434
40	-0.4623	180	436
41	-0.4104	181	439
42	-0.3590	183	441
43	-0.3078	185	443
44	-0.2569	187	445
45	-0.2061	189	448
46	-0.1555	191	450
47	-0.1050	193	452
48	-0.0546	195	454
49	-0.0042	197	457
50	0.0462	199	459
51	0.0966	201	461
52	0.1471	202	464
53	0.1976	204	466
54	0.2484	206	468
55	0.2993	208	470
56	0.3505	210	473
57	0.4020	212	475
58	0.4537	214	477
59	0.5059	216	480
60	0.5584	218	482
61	0.6113	220	484
62	0.6648	222	487
63	0.7188	224	489
64	0.7734	226	492
65	0.8287	228	494
66	0.8847	230	497
67	0.9416	232	499
68	0.9993	234	502
69	1.0579	237	504
70	1.1176	239	507
71	1.1785	241	510
72	1.2405	243	512
73	1.3039	246	515
74	1.3688	248	518
75	1.4354	251	521
76	1.5036	253	524
77	1.5739	256	527
78	1.6464	259	531
79	1.7213	262	534
80	1.7990	264	537
81	1.8796	267	541
82	1.9635	271	545
83	2.0514	274	549
84	2.1438	277	553
85	2.2411	281	557
86	2.3444	285	562
87	2.4546	289	566
88	2.5731	294	571
89	2.7016	298	575
90	2.8425	304	579
91	2.9992	310	584
92	3.1766	316	588
93	3.3820	324	593
94	3.6284	333	597
95	3.9394	345	602
96	4.3681	361	607
97	5.0846	388	612
98	6.3049	400	617

Reading Grade 8 Form S

Raw Score	Theta	Scale Score	Vertical Scale Score
0	-6.3403	100	305
1	-5.1168	100	310
2	-4.3963	100	315
3	-3.9639	100	319
4	-3.6497	100	324
5	-3.4004	100	328
6	-3.1923	100	333
7	-3.0126	100	337
8	-2.8537	104	342
9	-2.7109	109	346
10	-2.5806	114	351
11	-2.4605	118	355
12	-2.3489	122	359
13	-2.2443	125	364
14	-2.1458	129	368
15	-2.0524	132	372
16	-1.9636	135	376
17	-1.8787	138	380
18	-1.7974	141	384
19	-1.7191	144	387
20	-1.6436	147	391
21	-1.5706	149	394
22	-1.4999	152	397
23	-1.4312	154	400
24	-1.3643	157	403
25	-1.2993	159	406
26	-1.2357	161	409
27	-1.1735	163	412
28	-1.1127	165	414
29	-1.0530	168	417
30	-0.9944	170	420
31	-0.9369	172	422
32	-0.8803	174	425
33	-0.8246	176	427
34	-0.7696	178	430
35	-0.7154	180	432
36	-0.6618	181	434
37	-0.6089	183	437
38	-0.5564	185	439
39	-0.5045	187	441
40	-0.4531	189	444
41	-0.4021	191	446
42	-0.3514	192	448
43	-0.3011	194	451
44	-0.2510	196	453
45	-0.2012	198	455
46	-0.1516	199	457
47	-0.1021	201	459
48	-0.0528	203	462
49	-0.0036	205	464
50	0.0456	206	466
51	0.0948	208	468
52	0.1440	210	470
53	0.1933	212	473
54	0.2427	213	475
55	0.2922	215	477
56	0.3420	217	479
57	0.3919	219	481
58	0.4422	221	484
59	0.4927	222	486
60	0.5436	224	488
61	0.5950	226	491
62	0.6468	228	493
63	0.6992	230	495
64	0.7521	231	498
65	0.8056	233	500
66	0.8599	235	502
67	0.9150	237	505
68	0.9709	239	507
69	1.0278	241	510
70	1.0857	243	512
71	1.1447	245	515
72	1.2049	247	518
73	1.2665	250	520
74	1.3295	252	523
75	1.3942	254	526
76	1.4606	257	529
77	1.5291	259	532
78	1.5997	261	535
79	1.6727	264	539
80	1.7484	267	542
81	1.8271	269	545
82	1.9093	272	549
83	1.9952	275	553
84	2.0856	279	557
85	2.1811	282	561
86	2.2824	286	566
87	2.3907	289	570
88	2.5073	294	574
89	2.6339	298	579
90	2.7728	303	583
91	2.9276	308	588
92	3.1029	315	592
93	3.3064	322	597
94	3.5507	330	601
95	3.8596	341	606
96	4.2862	356	610
97	5.0006	382	615
98	6.2192	400	620

Writing Grade 3 Form S

Raw Score	Theta	Scale Score
0	-5.2118	100
1	-4.0503	100
2	-3.4130	100
3	-3.0570	100
4	-2.8125	107
5	-2.6269	114
6	-2.4769	119
7	-2.3505	124
8	-2.2405	128
9	-2.1424	131
10	-2.0532	135
11	-1.9708	138
12	-1.8937	140
13	-1.8206	143
14	-1.7506	145
15	-1.6831	148
16	-1.6174	150
17	-1.5529	153
18	-1.4894	155
19	-1.4264	157
20	-1.3638	159
21	-1.3010	162
22	-1.2380	164
23	-1.1745	166
24	-1.1104	169
25	-1.0455	171
26	-0.9798	173
27	-0.9131	176

Raw Score	Theta	Scale Score
28	-0.8456	178
29	-0.7770	181
30	-0.7074	183
31	-0.6369	186
32	-0.5655	188
33	-0.4932	191
34	-0.4201	194
35	-0.3462	196
36	-0.2716	199
37	-0.1961	202
38	-0.1199	204
39	-0.0428	207
40	0.0352	210
41	0.1142	213
42	0.1943	216
43	0.2756	219
44	0.3583	222
45	0.4424	225
46	0.5282	228
47	0.6156	231
48	0.7050	234
49	0.7963	237
50	0.8895	241
51	0.9849	244
52	1.0822	248
53	1.1815	251
54	1.2826	255
55	1.3855	259

Raw Score	Theta	Scale Score
56	1.4901	262
57	1.5961	266
58	1.7036	270
59	1.8127	274
60	1.9232	278
61	2.0355	282
62	2.1497	286
63	2.2664	291
64	2.3859	295
65	2.5090	299
66	2.6364	304
67	2.7690	309
68	2.9077	314
69	3.0537	319
70	3.2082	325
71	3.3727	330
72	3.5491	337
73	3.7402	344
74	3.9501	351
75	4.1854	360
76	4.4578	370
77	4.7901	382
78	5.2345	398
79	5.9595	400
80	7.1808	400

Writing Grade 4 Form S

Raw Score	Theta	Scale Score
0	-5.1647	100
1	-4.0034	100
2	-3.3664	100
3	-3.0119	100
4	-2.7702	104
5	-2.5883	111
6	-2.4431	116
7	-2.3221	120
8	-2.2180	123
9	-2.1261	127
10	-2.0435	129
11	-1.9680	132
12	-1.8979	134
13	-1.8322	137
14	-1.7698	139
15	-1.7100	141
16	-1.6522	143
17	-1.5960	145
18	-1.5409	147
19	-1.4867	149
20	-1.4328	150
21	-1.3791	152
22	-1.3253	154
23	-1.2711	156
24	-1.2165	158
25	-1.1611	160
26	-1.1048	162
27	-1.0474	164

Raw Score	Theta	Scale Score
28	-0.9888	166
29	-0.9289	168
30	-0.8676	170
31	-0.8047	172
32	-0.7403	174
33	-0.6743	177
34	-0.6066	179
35	-0.5372	181
36	-0.4662	184
37	-0.3934	186
38	-0.3188	189
39	-0.2423	192
40	-0.1640	194
41	-0.0838	197
42	-0.0015	200
43	0.0830	203
44	0.1695	206
45	0.2585	209
46	0.3498	212
47	0.4436	215
48	0.5398	219
49	0.6387	222
50	0.7400	225
51	0.8439	229
52	0.9502	233
53	1.0587	236
54	1.1692	240
55	1.2814	244

Raw Score	Theta	Scale Score
56	1.3950	248
57	1.5096	252
58	1.6250	256
59	1.7409	260
60	1.8569	264
61	1.9732	268
62	2.0898	272
63	2.2069	276
64	2.3249	280
65	2.4443	284
66	2.5658	288
67	2.6903	293
68	2.8188	297
69	2.9525	302
70	3.0930	307
71	3.2425	312
72	3.4032	317
73	3.5788	323
74	3.7743	330
75	3.9971	338
76	4.2599	347
77	4.5863	358
78	5.0293	374
79	5.7582	399
80	6.9861	400

Writing Grade 5 Form S

Raw Score	Theta	Scale Score
0	-5.2404	100
1	-4.1105	100
2	-3.5047	100
3	-3.1711	100
4	-2.9442	100
5	-2.7728	107
6	-2.6352	112
7	-2.5196	116
8	-2.4195	120
9	-2.3305	123
10	-2.2499	126
11	-2.1757	128
12	-2.1065	131
13	-2.0411	133
14	-1.9787	136
15	-1.9186	138
16	-1.8602	140
17	-1.8031	142
18	-1.7469	144
19	-1.6912	146
20	-1.6358	148
21	-1.5802	150
22	-1.5243	152
23	-1.4679	154
24	-1.4106	156
25	-1.3525	158
26	-1.2932	161
27	-1.2328	163
28	-1.1710	165
29	-1.1079	167
30	-1.0434	170

Raw Score	Theta	Scale Score
31	-0.9777	172
32	-0.9106	174
33	-0.8425	177
34	-0.7735	179
35	-0.7035	182
36	-0.6329	185
37	-0.5617	187
38	-0.4902	190
39	-0.4182	192
40	-0.3459	195
41	-0.2734	198
42	-0.2006	200
43	-0.1275	203
44	-0.0541	206
45	0.0198	208
46	0.0942	211
47	0.1692	214
48	0.2451	217
49	0.3218	219
50	0.3998	222
51	0.4789	225
52	0.5595	228
53	0.6418	231
54	0.7258	234
55	0.8119	237
56	0.9001	240
57	0.9905	244
58	1.0834	247
59	1.1786	250
60	1.2763	254
61	1.3763	258

Raw Score	Theta	Scale Score
62	1.4784	261
63	1.5825	265
64	1.6881	269
65	1.7950	273
66	1.9028	277
67	2.0111	281
68	2.1198	285
69	2.2286	289
70	2.3376	293
71	2.4467	297
72	2.5563	301
73	2.6666	305
74	2.7781	309
75	2.8913	313
76	3.0067	317
77	3.1251	321
78	3.2473	326
79	3.3744	330
80	3.5075	335
81	3.6482	340
82	3.7986	346
83	3.9617	352
84	4.1419	358
85	4.3459	366
86	4.5857	374
87	4.8836	385
88	5.2911	400
89	5.9751	400
90	7.1630	400

Writing Grade 6 Form S

Raw Score	Theta	Scale Score
0	-5.2843	100
1	-4.1175	100
2	-3.4731	100
3	-3.1118	100
4	-2.8640	100
5	-2.6769	104
6	-2.5268	109
7	-2.4016	114
8	-2.2939	118
9	-2.1988	122
10	-2.1135	125
11	-2.0356	128
12	-1.9634	130
13	-1.8959	133
14	-1.8320	135
15	-1.7710	138
16	-1.7123	140
17	-1.6554	142
18	-1.5999	144
19	-1.5453	146
20	-1.4915	148
21	-1.4380	150
22	-1.3847	152
23	-1.3313	154
24	-1.2776	156
25	-1.2234	158
26	-1.1685	160
27	-1.1129	162
28	-1.0563	164
29	-0.9986	167
30	-0.9398	169

Raw Score	Theta	Scale Score
31	-0.8799	171
32	-0.8187	173
33	-0.7564	176
34	-0.6928	178
35	-0.6283	180
36	-0.5626	183
37	-0.4960	185
38	-0.4286	188
39	-0.3604	190
40	-0.2915	193
41	-0.2219	196
42	-0.1517	198
43	-0.0809	201
44	-0.0095	204
45	0.0626	206
46	0.1355	209
47	0.2093	212
48	0.2839	214
49	0.3596	217
50	0.4366	220
51	0.5149	223
52	0.5947	226
53	0.6764	229
54	0.7599	232
55	0.8456	235
56	0.9337	239
57	1.0243	242
58	1.1176	246
59	1.2138	249
60	1.3130	253
61	1.4151	257

Raw Score	Theta	Scale Score
62	1.5203	261
63	1.6284	265
64	1.7392	269
65	1.8523	273
66	1.9675	277
67	2.0842	282
68	2.2022	286
69	2.3212	291
70	2.4408	295
71	2.5610	300
72	2.6820	304
73	2.8040	309
74	2.9273	313
75	3.0525	318
76	3.1804	323
77	3.3116	328
78	3.4473	333
79	3.5886	338
80	3.7370	344
81	3.8945	349
82	4.0634	356
83	4.2471	363
84	4.4503	370
85	4.6805	379
86	4.9502	389
87	5.2828	400
88	5.7313	400
89	6.4653	400
90	7.6964	400

Writing Grade 7 Form S

Raw Score	Theta	Scale Score
0	-5.4229	100
1	-4.2350	100
2	-3.5655	100
3	-3.1837	100
4	-2.9189	102
5	-2.7175	109
6	-2.5556	114
7	-2.4203	119
8	-2.3041	123
9	-2.2021	126
10	-2.1109	129
11	-2.0283	132
12	-1.9524	134
13	-1.8820	137
14	-1.8161	139
15	-1.7539	141
16	-1.6948	143
17	-1.6381	145
18	-1.5836	146
19	-1.5308	148
20	-1.4794	150
21	-1.4291	152
22	-1.3798	153
23	-1.3312	155
24	-1.2831	156
25	-1.2353	158
26	-1.1877	159
27	-1.1402	161
28	-1.0927	163
29	-1.0449	164
30	-0.9969	166
31	-0.9485	167
32	-0.8997	169
33	-0.8503	171

Raw Score	Theta	Scale Score
34	-0.8003	172
35	-0.7497	174
36	-0.6985	176
37	-0.6465	177
38	-0.5938	179
39	-0.5404	181
40	-0.4862	183
41	-0.4314	184
42	-0.3758	186
43	-0.3195	188
44	-0.2626	190
45	-0.2050	192
46	-0.1467	194
47	-0.0879	196
48	-0.0284	198
49	0.0319	200
50	0.0927	202
51	0.1542	204
52	0.2166	206
53	0.2797	208
54	0.3436	210
55	0.4085	212
56	0.4744	214
57	0.5413	216
58	0.6093	219
59	0.6786	221
60	0.7492	223
61	0.8210	226
62	0.8943	228
63	0.9690	231
64	1.0453	233
65	1.1229	236
66	1.2021	238
67	1.2826	241

Raw Score	Theta	Scale Score
68	1.3645	244
69	1.4476	246
70	1.5319	249
71	1.6171	252
72	1.7033	255
73	1.7903	258
74	1.8780	261
75	1.9663	263
76	2.0554	266
77	2.1451	269
78	2.2356	272
79	2.3270	275
80	2.4196	278
81	2.5134	281
82	2.6088	285
83	2.7060	288
84	2.8055	291
85	2.9076	294
86	3.0129	298
87	3.1217	302
88	3.2350	305
89	3.3534	309
90	3.4781	313
91	3.6106	318
92	3.7528	322
93	3.9079	327
94	4.0800	333
95	4.2761	340
96	4.5080	347
97	4.7984	357
98	5.1987	370
99	5.8760	392
100	7.0598	400

Writing Grade 8 Form S

Raw Score	Theta	Scale Score
0	-5.5256	100
1	-4.3269	100
2	-3.6441	100
3	-3.2514	100
4	-2.9784	100
5	-2.7710	106
6	-2.6052	112
7	-2.4677	117
8	-2.3505	121
9	-2.2485	125
10	-2.1582	128
11	-2.0771	131
12	-2.0033	133
13	-1.9354	136
14	-1.8723	138
15	-1.8131	140
16	-1.7572	142
17	-1.7040	144
18	-1.6531	146
19	-1.6041	148
20	-1.5566	149
21	-1.5103	151
22	-1.4651	153
23	-1.4207	154
24	-1.3768	156
25	-1.3334	157
26	-1.2902	159
27	-1.2472	160
28	-1.2041	162
29	-1.1609	164
30	-1.1174	165
31	-1.0735	167
32	-1.0291	168
33	-0.9841	170

Raw Score	Theta	Scale Score
34	-0.9385	171
35	-0.8920	173
36	-0.8447	175
37	-0.7965	177
38	-0.7474	178
39	-0.6972	180
40	-0.6460	182
41	-0.5937	184
42	-0.5402	186
43	-0.4858	188
44	-0.4301	190
45	-0.3733	192
46	-0.3154	194
47	-0.2564	196
48	-0.1963	198
49	-0.1349	200
50	-0.0725	202
51	-0.0089	205
52	0.0558	207
53	0.1218	209
54	0.1890	212
55	0.2574	214
56	0.3272	217
57	0.3982	219
58	0.4705	222
59	0.5442	224
60	0.6192	227
61	0.6956	230
62	0.7733	233
63	0.8522	235
64	0.9325	238
65	1.0139	241
66	1.0964	244
67	1.1801	247

Raw Score	Theta	Scale Score
68	1.2647	250
69	1.3503	253
70	1.4367	256
71	1.5240	259
72	1.6120	262
73	1.7008	266
74	1.7905	269
75	1.8810	272
76	1.9724	275
77	2.0649	279
78	2.1585	282
79	2.2535	285
80	2.3500	289
81	2.4483	292
82	2.5485	296
83	2.6511	300
84	2.7561	303
85	2.8641	307
86	2.9753	311
87	3.0904	315
88	3.2097	319
89	3.3342	324
90	3.4649	329
91	3.6032	334
92	3.7510	339
93	3.9114	345
94	4.0887	351
95	4.2899	358
96	4.5271	366
97	4.8229	377
98	5.2292	392
99	5.9137	400
100	7.1039	400

Science Grade 5 Form S

Raw Score	Theta	Scale Score
0	-5.3537	100
1	-4.1053	100
2	-3.3502	100
3	-2.8844	100
4	-2.5377	100
5	-2.2566	110
6	-2.0171	121
7	-1.8065	130
8	-1.6168	138
9	-1.4431	145
10	-1.2818	152
11	-1.1303	159
12	-0.9868	165
13	-0.8497	171
14	-0.7181	177
15	-0.5906	182
16	-0.4668	188
17	-0.3457	193
18	-0.2269	198
19	-0.1098	203
20	0.0060	208
21	0.1210	213
22	0.2356	218
23	0.3503	223
24	0.4653	228
25	0.5813	233
26	0.6985	238
27	0.8174	243
28	0.9387	248
29	1.0630	254
30	1.1911	259
31	1.3242	265
32	1.4635	271
33	1.6108	277

Raw Score	Theta	Scale Score
34	1.7686	284
35	1.9403	292
36	2.1310	300
37	2.3484	309
38	2.6054	320
39	2.9262	334
40	3.3642	353
41	4.0900	385
42	5.3169	400

Science Grade 8 Form S

Raw Score	Theta	Scale Score
0	-5.4009	100
1	-4.1749	100
2	-3.4500	100
3	-3.0123	100
4	-2.6919	106
5	-2.4357	117
6	-2.2197	126
7	-2.0314	133
8	-1.8632	140
9	-1.7101	147
10	-1.5688	152
11	-1.4369	158
12	-1.3126	163
13	-1.1946	168
14	-1.0817	173
15	-0.9732	177
16	-0.8681	181
17	-0.7661	186
18	-0.6666	190
19	-0.5692	194
20	-0.4734	198
21	-0.3790	202
22	-0.2855	205
23	-0.1928	209
24	-0.1006	213
25	-0.0086	217
26	0.0834	221
27	0.1757	224
28	0.2686	228
29	0.3622	232
30	0.4569	236
31	0.5529	240

Raw Score	Theta	Scale Score
32	0.6506	244
33	0.7502	248
34	0.8522	252
35	0.9570	257
36	1.0650	261
37	1.1770	266
38	1.2935	271
39	1.4155	276
40	1.5441	281
41	1.6807	286
42	1.8271	293
43	1.9857	299
44	2.1602	306
45	2.3554	314
46	2.5792	324
47	2.8444	334
48	3.1753	348
49	3.6254	367
50	4.3654	397
51	5.6037	400

Appendix D: 2007 Vertical Scaling Design

Step 1: Grades 5 and 4

		Items					
		Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
Students	Grade 3						
	Grade 4		**OP44**				
				SU45			
	Grade 5		SU54	**OP55**			
	Grade 6						
	Grade 7						
	Grade 8						

Step 2: Grades 4 and 3

		Items					
		Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
Students	Grade 3	**OP33**					
			SU34				
	Grade 4	SU43	**OP44**				
	Grade 5						
	Grade 6						
	Grade 7						
	Grade 8						

Step 3: Grades 5 and 6

		Items					
		Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
Students	Grade 3						
	Grade 4						
	Grade 5			**OP55**			
					SU56		
	Grade 6			SU65	**OP66**		
	Grade 7						
	Grade 8						

Step 4: Grades 6 and 7

		Items					
		Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
Students	Grade 3						
	Grade 4						
	Grade 5						
	Grade 6				**OP66**		
						SU67	
	Grade 7				SU76	**OP77**	
	Grade 8						

Step 5: Grades 7 and 8

		Items					
		Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
Students	Grade 3						
	Grade 4						
	Grade 5						
	Grade 6						
	Grade 7					**OP77**	
							SU78
	Grade 8					SU87	**OP88**

Appendix E: 2007 Vertical Scaling Item Parameters

Mathematics Grade 3

Item	Rasch	Item	Rasch	Item	Rasch	Item	Rasch
1	-2.8289	31	-1.0542	61	-1.5802	91	-1.6397
2	-2.8289	32	-1.9134	62	-1.9039	92	-1.3445
3	-2.3674	33	-2.3248	63	-3.2659	93	0.5030
4	-1.9349	34	-0.5533	64	-3.1784	94	0.0523
5	-3.1565	35	-0.5234	65	-3.6727		
6	-1.9165	36	-1.6831	66	-2.1237		
7	-2.9605	37	-2.2273	67	-2.4766		
8	-3.5134	38	-0.7116	68	-2.8326		
9	-2.7590	39	-0.0255	69	-2.1604		
10	-3.5899	40	-0.3118	70	-2.0956		
11	-2.9749	41	-0.6549	71	-1.5840		
12	-2.4750	42	-0.5423	72	-2.2827		
13	-2.2828	43	-0.3999	73	-1.9825		
14	-1.4639	44	-2.3204	74	-2.7443		
15	-2.6452	45	-0.5826	75	-0.2788		
16	-2.6303	46	-3.7232	76	-1.2143		
17	-4.1474	47	-3.6099	77	-1.8231		
18	-2.2995	48	-3.1113	78	-2.1420		
19	-3.1516	49	-2.7093	79	-2.8222		
20	-1.3555	50	-0.5573	80	-1.5169		
21	-1.6911	51	-1.8210	81	-1.6199		
22	-2.1563	52	-1.7251	82	-1.5752		
23	-3.5267	53	-1.3208	83	-1.7558		
24	-1.4084	54	-1.1930	84	-0.7891		
25	-2.6770	55	-1.6570	85	-0.3757		
26	-1.9881	56	-0.9115	86	-1.2356		
27	-1.7598	57	-2.1981	87	0.1570		
28	-0.9878	58	-2.1344	88	-2.2464		
29	-1.4148	59	-1.4836	89	-1.6672		
30	-1.6346	60	-2.1705	90	-1.4303		

Mathematics Grade 4

Item	Rasch	Item	Rasch	Item	Rasch	Item	Rasch
1	-1.3568	31	-1.5592	61	-1.8457	91	-0.0013
2	-1.2408	32	-1.8041	62	-1.5735	92	-0.7767
3	-0.8814	33	-0.0663	63	-2.7019	93	0.6334
4	-0.2297	34	-1.1577	64	-1.9994	94	-0.1058
5	-0.4677	35	-0.1147	65	-2.6518	95	0.0392
6	-0.6352	36	-1.1128	66	-1.5477	96	1.4420
7	-2.8457	37	-1.4850	67	-2.1216		
8	-1.0952	38	-0.7946	68	-1.5919		
9	-1.9060	39	-1.0541	69	-1.2198		
10	-0.9105	40	-1.3542	70	0.2857		
11	0.4287	41		71	-1.1513		
12	0.6741	42	-0.0857	72	-0.7915		
13	0.5269	43	-1.6381	73	-0.6878		
14	-0.4459	44	-0.6923	74	-0.6521		
15	-0.5082	45	-1.5974	75	-0.4266		
16	0.1620	46	-0.2013	76	-0.7894		
17	-0.1681	47	-2.9179	77	-0.9344		
18	0.5636	48	-1.7287	78	-0.5967		
19	-1.3851	49	-1.2675	79	-1.9560		
20	-0.3557	50	-1.1861	80	0.4345		
21	-1.1024	51	-0.4039	81	-0.9651		
22	-0.6729	52	-0.1272	82	-0.0384		
23	-1.3184	53	-1.2915	83	-1.5419		
24	-2.1129	54	-0.7645	84	-0.9469		
25	0.6601	55	-0.2368	85	0.4911		
26		56	0.0142	86	0.4323		
27	0.1883	57	-2.5592	87	0.5196		
28	-0.0949	58	0.6236	88	1.0539		
29	0.9666	59	-2.4591	89	0.6946		
30	0.1688	60	1.3347	90	-2.1113		

Mathematics Grade 5

Item	Rasch	Item	Rasch	Item	Rasch	Item	Rasch
1	0.2430	31	0.2563	61	-1.2513	91	-2.5352
2	-1.1374	32	0.2721	62	0.1707	92	0.9364
3	-1.4107	33	1.0004	63	0.5742	93	-0.4448
4	-0.6478	34	1.1034	64	0.7699	94	-1.6185
5	-1.4418	35	1.5466	65	0.3421	95	1.6568
6	-0.7330	36	0.8918	66	1.0528	96	
7	0.0795	37	-0.6235	67	-0.1787	97	-2.3061
8	-1.3261	38	-0.5573	68	0.6137	98	-1.7419
9	-1.8281	39	-1.0064	69	0.9084	99	0.0980
10	-1.7528	40	-0.5668	70	0.4264	100	0.7395
11	0.4860	41	-0.5533	71	1.4481	101	0.1134
12	-0.2347	42	-0.7844	72	0.7345	102	-0.0673
13	-0.7828	43	1.0470	73	2.1093	103	0.3062
14	-0.9799	44	1.7387	74	-0.1804	104	0.6890
15	-0.6139	45	0.4207	75	0.3146	105	
16	0.4722	46	0.9318	76	-1.0892	106	-0.7996
17	0.8383	47	1.1792	77	-1.9681	107	-0.3627
18	0.0323	48	1.2777	78	0.0812	108	0.1124
19	0.7017	49	0.6913	79	-2.1912	109	
20	0.5022	50		80	0.0181	110	1.1478
21	-0.2339	51	-0.7644	81	0.7413	111	0.2395
22	0.2839	52	-0.4867	82	1.7422	112	0.7315
23	-1.6341	53	-1.0874	83	0.8614	113	0.7131
24	-1.1040	54	-0.1301	84	0.1272		
25	0.5426	55	-1.8012	85	1.4567		
26	-1.5710	56	-1.5072	86	0.1992		
27	0.5407	57	-1.1452	87	1.1201		
28	0.5169	58	1.9280	88	0.6921		
29	-0.3732	59	-0.6823	89	2.0091		
30	-0.4858	60	0.1865	90	1.0146		

Mathematics Grade 6

Item	Rasch	Item	Rasch	Item	Rasch	Item	Rasch
1		31	-0.7939	61	0.6704	91	-0.5719
2		32	0.0366	62	1.1852	92	
3		33	-0.5048	63	1.5758	93	-0.6010
4	0.4495	34	-0.1615	64	1.6527	94	1.2601
5		35	1.3895	65	-0.2652	95	0.4007
6	0.0215	36	1.0923	66	1.6452	96	0.8343
7	0.3735	37	1.0030	67	1.2201	97	-0.3165
8	0.3375	38	1.3515	68	-0.6254	98	-0.3921
9	-0.5731	39	0.8677	69	-0.3384	99	1.6105
10	-0.5632	40	0.5838	70	1.8522	100	0.8216
11	1.9470	41	0.2909	71	0.9939	101	1.4601
12		42	1.0855	72	0.0884	102	2.3511
13	2.3273	43	2.1570	73	1.3038	103	1.2280
14	1.9761	44	1.2492	74	0.5231	104	0.1563
15	2.1892	45	1.4157	75	1.5465	105	2.9840
16	4.0231	46	1.9082	76	1.0031	106	0.7693
17	1.3887	47	1.3593	77	2.7053	107	-0.1900
18	0.8666	48	1.0128	78	2.5778	108	-0.4902
19	0.2592	49	-0.9193	79	1.1900	109	1.1349
20	0.7919	50	1.4976	80	1.1546	110	0.7909
21	0.9325	51	1.6723	81	1.2215	111	0.1987
22	1.3947	52	-0.0015	82	0.8889	112	
23	-0.8950	53	0.7809	83	0.8497	113	0.8111
24	0.4462	54	-0.3470	84	1.3505	114	2.3412
25	0.4503	55	0.1295	85	0.9314	115	1.7668
26		56	-1.1697	86	2.3232	116	2.3128
27	0.9129	57	-1.7431	87	0.9812		
28	2.4046	58	0.3350	88	1.6998		
29	0.1812	59	2.3287	89	2.3203		
30	0.0879	60	1.6443	90	1.8628		

Mathematics Grade 7

Item	Rasch	Item	Rasch	Item	Rasch	Item	Rasch
1	1.6452	31	2.7910	61	0.6478	91	1.6412
2	0.9978	32	0.6919	62	2.1939	92	0.5607
3	1.3189	33	2.0991	63	1.0881	93	1.5911
4	-0.0182	34	0.4326	64	1.3910	94	1.2450
5	0.3476	35	0.9154	65	1.6935	95	-0.1923
6	1.3623	36	2.6043	66	1.1128	96	0.4864
7	1.4797	37	2.8881	67	1.7952	97	1.1370
8	1.3931	38	1.4167	68	2.2867	98	3.2034
9	1.0928	39	1.3385	69	0.4971	99	0.3455
10	2.0582	40	1.2454	70	1.0727	100	-0.3284
11		41	0.8032	71	1.1418	101	1.2226
12	-0.4667	42	2.2834	72	1.5024	102	0.7798
13		43	1.0035	73	2.1359	103	0.8478
14	0.8611	44	1.2344	74	1.9791	104	1.8159
15	1.2069	45	2.3294	75	0.6566	105	2.1487
16	1.1550	46		76	1.6999	106	1.9329
17	1.7152	47	2.2300	77	3.1412	107	2.8423
18	2.1062	48	2.1005	78	3.6413	108	1.6330
19		49	1.1848	79	2.6361	109	1.9439
20	0.7116	50	1.8001	80	2.7781	110	1.5873
21	1.7317	51	-0.5794	81	4.1535	111	1.4191
22	2.2566	52	2.1742	82	3.3380	112	1.5634
23	1.7549	53	2.0938	83	1.3214	113	2.2074
24	1.4677	54	1.7031	84	2.2025	114	0.9626
25	1.9449	55	1.5473	85	3.2240	115	1.9166
26	1.3225	56	2.0468	86	1.7455	116	2.8778
27	2.9138	57	1.4236	87	1.2290	117	1.0076
28	1.2778	58	0.4976	88	2.5369	118	1.6561
29	0.6929	59	1.5459	89	2.7677	119	2.3484
30	1.9322	60	1.4187	90	2.2121	120	1.4833

Mathematics Grade 8

Item	Rasch	Item	Rasch	Item	Rasch	Item	Rasch
1	0.7142	31	2.4179	61	2.0525	91	1.3803
2	-0.1553	32	3.7860	62	2.1408	92	2.4175
3	1.5577	33	2.6466	63	1.5228	93	1.1683
4	1.2378	34	1.8214	64	2.8161	94	2.3084
5	2.4511	35	1.4226	65	1.5893	95	1.9837
6	1.4852	36	1.4770	66	3.0423	96	2.2688
7	2.2539	37	2.6153	67	2.8613	97	0.2606
8	2.1423	38	2.3687	68	2.7289	98	1.0831
9	1.2587	39	3.6861	69	3.1240	99	1.5549
10	2.1683	40	2.2154	70	3.5272	100	2.3493
11	2.4212	41	2.0238	71	1.6793	101	2.4743
12	2.1638	42	1.7555	72	2.0206	102	3.4871
13	1.2769	43	1.2808	73	1.6825	103	2.8794
14	3.3054	44	1.8446	74	2.8544	104	1.5141
15	1.0512	45	1.8863	75	3.3514	105	1.5069
16	3.2360	46	1.8680	76	2.2902	106	3.3533
17	4.0854	47	1.1331	77	3.0849	107	0.9235
18	2.0304	48	1.5075	78	2.1684	108	2.6986
19	2.2099	49	1.6237	79	2.8776	109	1.3295
20	1.7169	50	2.2365	80	1.6935	110	1.5370
21	2.0504	51	1.6284	81	2.6452	111	2.6014
22	1.9332	52	1.3946	82	-0.3455	112	3.0736
23	1.8264	53	1.6339	83	2.4389	113	2.5804
24	2.2983	54	2.1826	84	0.6018	114	0.9604
25	1.1153	55	1.3707	85	0.8505	115	2.3058
26	1.0233	56	3.1479	86	0.2512	116	3.2384
27	1.7201	57	1.4934	87	1.3091	117	3.8168
28	1.9424	58	1.6362	88	2.7917		
29	3.3517	59	1.8087	89	1.1807		
30	3.1742	60	2.0301	90	0.9951		

Reading Grade 3

Item	Rasch	Item	Rasch	Item	Rasch
1	-2.2752	31	-1.2373	61	-0.6064
2	-1.6975	32	-2.2198	62	0.0588
3	-1.8020	33	-3.4067	63	0.2450
4	-1.7297	34	0.1471	64	2.0209
5	-2.9475	35	-3.0766	65	-0.1800
6	-0.9245	36	-2.2975	66	-0.4630
7	-0.2724	37	-2.2905	67	-0.0562
8	-2.6627	38	-2.0748	68	0.3684
9	-0.7832	39	-0.4722	69	0.6888
10	-1.7056	40	-2.1046	70	-0.2298
11	0.0274	41	-0.3336	71	0.1948
12	-1.1025	42	-0.2262	72	2.9546
13	-0.7582	43	-1.3892	73	0.0359
14	-0.8707	44	-2.0555		
15	-2.7154	45	-2.4293		
16	-2.2477	46	0.1517		
17	-1.3746	47	-1.1577		
18	-1.2063	48	-1.2690		
19	0.3762	49	-2.5622		
20	-1.6417	50	-1.0729		
21	-0.2227	51	-0.4442		
22	-0.9508	52	1.8735		
23	-1.8797	53	-0.5480		
24	-2.2929	54	0.1520		
25	-1.1315	55	-0.9777		
26	-2.9637	56	-0.5158		
27	-0.9948	57	-0.9274		
28	-0.0592	58	0.5213		
29	0.0879	59	0.6859		
30	0.6637	60	-0.1596		

Reading Grade 4

Item	Rasch	Item	Rasch	Item	Rasch
1	-0.7089	31	0.1402	61	-0.6392
2	-0.1836	32	0.3316	62	-1.2143
3	-1.6700	33	-2.7555	63	0.0138
4	-0.4203	34	-0.4246	64	0.6999
5	-0.3009	35	-2.5469	65	0.9780
6	-0.9574	36	-2.4156	66	0.6070
7	-2.5057	37	-2.9201	67	-0.3407
8	0.4718	38	0.7037	68	1.3876
9	0.0449	39	-1.3012	69	1.0430
10	0.6372	40	-0.8776	70	1.2334
11	-0.2606	41	-0.3881	71	0.1436
12	-1.6258	42	-0.6515	72	0.2120
13	-0.9046	43	-1.9602	73	0.6090
14	-1.7263	44	-1.2707	74	0.7324
15	0.7509	45	-2.0750		
16	-0.0586	46	-1.3029		
17	-2.1638	47	-0.4253		
18	0.6454	48	-1.9542		
19	-0.3429	49	-0.4621		
20	-1.0316	50	-0.9550		
21	-1.6007	51	0.1880		
22	-0.8506	52	-1.3278		
23	-0.6032	53	-1.1946		
24	0.2684	54	-0.2376		
25	-1.0976	55	-0.9079		
26	-0.9530	56	0.1344		
27	-1.3296	57	-0.3709		
28	-2.0063	58	-0.8250		
29	-0.3332	59	0.1093		
30	0.2858	60	0.2162		

Reading Grade 5

Item	Rasch	Item	Rasch	Item	Rasch
1	0.4761	31	0.0701	61	-0.4597
2	-1.2916	32	-0.9537	62	0.6785
3	0.0686	33	-0.0553	63	1.3191
4	-0.6705	34	-0.4766	64	1.1737
5	-0.4715	35	-1.9012	65	0.0610
6	-1.0044	36	-0.6014	66	-0.3632
7	-1.0657	37	-2.1300	67	0.7273
8	-1.0273	38	0.0412	68	2.7605
9	-0.0134	39	-0.1381	69	1.0828
10	0.5252	40	-0.8039	70	2.1633
11	-1.0322	41	-0.4789	71	0.3668
12	-0.7421	42	0.4830	72	0.1463
13	0.2260	43	-0.6770	73	1.7036
14	-0.0905	44	-1.1085	74	2.7479
15	-1.1737	45	-0.0930	75	0.0783
16	0.4392	46	-0.2227	76	0.9983
17	0.3024	47	-0.5283	77	0.6077
18	-0.8568	48	-1.2816	78	1.5340
19	-0.2929	49	0.5868	79	2.5326
20	-0.5229	50	0.3920	80	1.0631
21	-1.2249	51	0.1618		
22	-0.6656	52	-0.5918		
23	1.3514	53	-0.1984		
24	0.3625	54	0.0811		
25	-0.4868	55	-0.3852		
26	-0.3425	56	0.7193		
27	-0.6531	57	0.6612		
28	0.1220	58	-0.5023		
29	-0.1804	59	0.3689		
30	0.8700	60	-0.2702		

Reading Grade 6

Item	Rasch	Item	Rasch	Item	Rasch
1	0.3440	31		60	-0.0156
2	0.2273	32	-0.8286	61	-0.1455
3	-0.2147	33	-0.9278	62	-0.3798
4	-0.1598	34	-1.5433	63	1.9635
5	-1.3337	35	-2.1579	64	-0.1416
6	-0.7368	36	0.8403	65	0.7694
7		37	0.2109	66	1.1086
8		38	-0.0994	67	2.4647
9		39	-0.2018	68	0.1839
10		40	0.2185	69	1.5365
11	-0.3305	41	-1.6415	70	1.9504
12	0.6884	42	-0.5216	71	0.7398
13	1.4165	43	1.2414	72	0.7333
14	0.4371	44	-0.8555	73	1.9378
15	0.9828	45	0.1595	74	1.7457
16	-0.1848	46	0.0015	75	2.5750
17		47	0.9341	76	1.7614
18		48	-0.0080	77	1.1785
19	-0.6227	49	0.4917	78	1.6963
20		50	-0.1116	79	1.3511
21	-0.3355	51	-0.6936	80	0.7651
22	-0.9129	52	-0.2615		
23		53	-0.9350		
24	0.3786	54	-0.4850		
25	-0.1675	55	-0.0487		
26	1.5991	56	0.4576		
27	0.6001	57	0.4803		
28	0.3259	58	0.9775		
29	0.6243	59	2.5622		
30					

Reading Grade 7

Item	Rasch	Item	Rasch	Item	Rasch
1	0.8380	31	-0.8242	61	0.7137
2	-0.1030	32	2.0739	62	0.7800
3	0.2115	33	-0.7778	63	0.5800
4	-0.5060	34	0.0685	64	0.8840
5	0.9224	35	-1.0503	65	3.8243
6	-0.2342	36	-1.2692	66	0.9976
7	1.6791	37	-0.6115	67	3.6574
8	0.9395	38	0.4427	68	2.8367
9	1.2416	39	-0.5769	69	1.1184
10	1.2094	40	-0.8495	70	0.3200
11	0.6480	41	1.1862	71	-0.0672
12	1.6882	42	-1.1745	72	2.0750
13	0.7562	43	-0.9524	73	2.6772
14	0.0093	44	2.1948	74	1.2851
15	1.1575	45	-0.6199	75	0.7597
16		46	2.5497	76	0.9321
17	0.8410	47	-0.0239	77	2.2661
18	0.4500	48	0.2340	78	1.4464
19	0.5534	49	0.2219	79	1.3375
20	-0.2206	50	0.2804		
21	1.4109	51	0.3534		
22		52	0.0063		
23	1.2756	53	0.2784		
24	-1.0703	54	0.9002		
25	0.3006	55	1.0462		
26	0.7926	56	0.4724		
27	-0.0052	57	0.0568		
28	0.3838	58	0.3424		
29	0.8190	59	0.1761		
30		60	0.2078		

Reading Grade 8

Item	Rasch	Item	Rasch	Item	Rasch
1	1.0162	31	0.4008	61	2.1807
2	-0.1109	32	-0.8264	62	0.5464
3	-0.1922	33	-0.4446	63	0.9193
4	0.9395	34	-1.1448	64	1.2376
5	-0.5964	35	-1.0438	65	0.3397
6	0.9717	36	0.2674	66	2.1689
7	0.6273	37	1.6623	67	0.4247
8	0.6985	38	-1.2522	68	1.4031
9	-0.0418	39	0.5921	69	-0.2368
10	0.6438	40	-1.2833	70	1.3233
11	0.9471	41	-0.5995	71	1.3018
12	2.6963	42	0.7230	72	2.9400
13	2.1340	43	0.0812	73	1.9515
14	1.5278	44	0.5894	74	1.2048
15	1.1405	45	0.4144	75	1.7735
16	1.6237	46	-0.2184	76	1.1724
17	0.8520	47	-0.5136	77	1.4446
18	1.5780	48	-1.0386	78	1.8979
19	0.2812	49	-0.0661	79	2.7678
20	1.7631	50	0.9103		
21	2.0243	51	-0.1334		
22	0.9542	52	1.7172		
23	0.5519	53	0.0844		
24	1.1824	54	1.1377		
25	-0.2073	55	-0.2513		
26	0.3962	56	-0.5704		
27	0.1540	57	1.1669		
28	0.1187	58	1.0414		
29	0.9496	59	1.1940		
30	1.2782	60	0.5009		

Writing Grade 3

Item	Rasch	Item	Rasch	Item	Rasch
1	-1.4741	13	-1.6637	25	-2.4646
2	0.2763	14	-1.7597	26	-1.2060
3	-1.4590	15	-2.4903	27	0.1170
4	-2.2403	16	-1.5150	28	-1.5508
5	-2.2946	17	-0.2095	29	-0.0744
6	-2.2011	18	-0.3857	30	1.1902
7	-0.4840	19	-1.0055	31	0.5604
8	-2.7743	20	-1.7566	32	-1.1443
9	0.3930	21	-2.4844	33	-0.4154
10	-2.0916	22	-1.4014		
11	0.0516	23	-1.0019		
12	-1.3091	24	-1.8822		

Writing Grade 4

Item	Rasch	Item	Rasch	Item	Rasch
1	-1.6297	13	0.5277	25	-0.5806
2	-2.0916	14	-1.3000	26	0.1892
3	-1.6228	15	-1.7257	27	0.5014
4	-0.6370	16	-1.2057	28	-0.5182
5	-0.3567	17	-1.9123	29	0.3989
6		18	-0.2495	30	-0.1365
7	-1.9289	19	0.8061	31	0.3808
8	-0.7405	20	-1.8641	32	-0.6383
9	-0.8236	21	-1.5819	33	-0.0641
10	-0.6989	22	-1.3858		
11	-0.5764	23	-0.8683		
12	-0.9747	24	-0.3335		

Writing Grade 5

Item	Rasch	Item	Rasch	Item	Rasch
1	-3.1593	16	1.0075	31	-0.4724
2	0.1348	17	-0.8109	32	1.5400
3	-0.4937	18	-0.1109	33	-0.3996
4	-0.9489	19	0.4488	34	-1.3201
5	0.1056	20	-0.8107	35	-0.5778
6	-1.0548	21	-0.2188	36	0.1354
7	-1.0246	22	-0.1517	37	0.4875
8	0.1202	23	0.8514		
9		24	0.4285		
10	0.2837	25	1.8522		
11	1.6013	26	0.1288		
12	-0.1356	27	0.2008		
13	1.2564	28	-0.7228		
14	0.4460	29	-0.5140		
15	-0.0582	30	-0.1896		

Writing Grade 6

Item	Rasch	Item	Rasch	Item	Rasch
1	-1.7052	16	0.0665	31	1.8773
2	0.1305	17	-0.6705	32	1.8679
3	-0.1322	18		33	
4	-0.0642	19	1.0092	34	0.5935
5	1.4983	20	0.3241	35	0.3727
6	0.9622	21	-1.5680	36	1.2068
7	-1.2308	22	-1.0867	37	1.1643
8	-0.6717	23			
9	0.1382	24	-0.3435		
10	1.1925	25			
11	-1.5716	26	-0.6509		
12	0.9652	27	-1.2760		
13	-0.1786	28	-1.0150		
14	0.5639	29	0.5384		
15	1.2100	30	-0.4157		

Writing Grade 7

Item	Rasch	Item	Rasch	Item	Rasch
1	0.3222	16	-0.9602	31	1.4731
2	0.8667	17	-0.4102	32	-1.0065
3	0.2429	18	0.4598	33	0.3709
4	-0.3226	19	0.7435	34	0.2850
5	-1.0618	20	1.2253	35	1.6603
6	-0.1466	21	-0.0728	36	0.8463
7	0.5837	22	-0.0417	37	-0.3258
8	1.3769	23	1.1431	38	0.1261
9	-0.1478	24	-0.5068	39	0.1095
10	0.0753	25	1.3140	40	0.4673
11	0.9270	26	0.8029	41	
12	0.3918	27	1.1450		
13	-1.1113	28	0.6241		
14	-0.1557	29	1.7900		
15	0.1155	30	-0.6119		

Writing Grade 8

Item	Rasch	Item	Rasch	Item	Rasch
1	-0.7905	16	0.2734	31	0.3256
2	0.1491	17	-0.8524	32	0.3309
3	1.8010	18	0.3506	33	1.1982
4	1.2044	19	1.1102	34	1.6574
5	0.3030	20	0.2901	35	0.5789
6	-1.1839	21	-0.2347	36	1.6865
7	0.3968	22	1.4689	37	0.5903
8	2.0109	23	0.2898	38	0.9258
9	-0.1073	24	-0.7876	39	0.6711
10	2.7727	25	-0.2807	40	2.1998
11	1.4980	26	-0.1807	41	1.1448
12	-0.4582	27	-0.2074		
13	-0.2045	28	0.5963		
14	2.1419	29	0.5115		
15	1.2272	30	2.0506		