



# **2008 MCAS Technical Report**



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Massachusetts Department of Elementary and Secondary Education

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Commissioner

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# 1. PURPOSE OF THIS REPORT AND OVERVIEW OF CHANGES IN 2008

## 1.1 Purpose of This Report

The Massachusetts Comprehensive Assessment System (MCAS) is the Commonwealth's program for student assessment developed in accordance with the *Education Reform Act of 1993*. The main purposes of MCAS are

- to measure student, school, and district performance in meeting the state's learning standards as detailed in the *Massachusetts Curriculum Frameworks*
- to improve student achievement and classroom instruction by providing diagnostic feedback regarding the acquisition of skills and knowledge
- to help determine English language arts, mathematics, and science and technology/engineering competency at the grade 10 level for the awarding of high school diplomas

The purpose of this *2008 MCAS Technical Report* is to document the technical quality and characteristics of the 2008 MCAS operational tests, and to present evidence of the validity and reliability of the intended uses of those tests' results. This *2008 Report* frequently references the *2007 MCAS Technical Report* for documentation of those elements of the MCAS program that did not change from 2007 to 2008. For all characteristics of the MCAS program that were modified in 2008, complete technical data and details are provided in this *2008 Report*.

**Please note that the *2007 MCAS Technical Report* is provided on the Department of Elementary and Secondary Education (ESE or "the Department") website at <http://www.doe.mass.edu/mcas/tech/?section=techreports>.**

This *2008 Report* provides detailed information regarding test design and development; scoring; and analysis and reporting of MCAS 2008 results at student, school, district, and statewide levels. This detailed information includes but is not limited to the following:

- test administration
- equating and scaling of tests
- statistical and psychometric summaries, including
  - item analyses
  - reliability evidence
  - validity evidence
  - equating evidence

In addition, this *Report* includes technical appendices containing detailed item-level and summary statistics related to each 2008 MCAS test and its results.

As mentioned above, the *2008 MCAS Technical Report* is designed to supplement the technical reports issued for previous MCAS administrations by providing information specific to the 2008

MCAS test administration. Previous technical reports, as well as other documents referenced in this report, provide additional background information about the MCAS program and its development and administration. *Technical Reports* for 1998–2007 are available online at <http://www.doe.mass.edu/mcas/tech/?section=techreports>.

This *Report* is primarily intended for experts in psychometrics and educational measurement. It assumes a working knowledge of measurement concepts, such as reliability and validity, and statistical concepts of correlation and central tendency. For some chapters, the reader is presumed to have basic familiarity with advanced topics in measurement and statistics, such as item response theory (IRT) and factor analysis.

## 1.2 Overview of Program Changes Introduced in 2008

In addition to changes detailed throughout this document, the following changes were made for the 2008 MCAS administration.

### 1.2.1 Summer Retests Discontinued

The summer retests in English Language Arts and Mathematics were discontinued as of summer 2007. In past years, summer retest forms were identical to the retest forms administered in November.

### 1.2.2 Competency Determination

**Beginning with the class of 2010**, to receive the Competency Determination required for high school graduation, students must *either*

- earn a scaled score of at least 240 on both the grade 10 MCAS English Language Arts and Mathematics tests
- or*
- earn a scaled score between 220 and 238 on both tests *and* fulfill the requirements of an Educational Proficiency Plan (EPP) (more information about EPP requirements can be found on the Department’s website at <http://www.doe.mass.edu/hsreform/epp>)

*and*

- earn a scaled score of at least 220 on one of the following high school (grades 9/10) MCAS Science and Technology/Engineering (STE) tests:
  - Biology
  - Chemistry
  - Introductory Physics
  - Technology/Engineering

Students must also meet all local graduation requirements.

**Students in the class of 2009** must earn a scaled score of 220 or higher on both the MCAS English Language Arts and the Mathematics tests to earn a Competency Determination.

### 1.2.3 High School (Grades 9/10) Science and Technology/Engineering Test Participation Requirements

The following participation requirements and guidelines applied to the spring 2008 high school (grades 9/10) Science and Technology/Engineering (STE) tests:

- All students were required to participate in a high school STE test by the end of grade 10.
- Only students in grades 9 and 10 (based on the grade designation reported in June 2008 Student Information Management System data) were eligible to participate.
- Students were not eligible to participate in more than one STE test per administration.
- Once a student had met the STE requirement for earning a Competency Determination (CD), he or she was not eligible to participate in another STE test.
- First-time and repeating grade 9 students who were enrolled in an STE course during the 2007–2008 school year and who had not met the STE requirement for earning a CD were eligible to test.
- First-time grade 9 students who were not enrolled in an STE course during the 2007–2008 school year were **not** eligible to test.
- All first-time and repeating grade 10 students who did not participate in an STE test in spring 2007 were required to participate in a spring 2008 STE test (regardless of course enrollment or the reason for their nonparticipation in spring 2007).
- Grade 10 students who participated in an STE test in spring 2007 but did not meet the STE requirement for earning a CD were eligible to participate in a spring 2008 STE test.
- Grade 11 students, grade 12 students, and adults who had exited high school were **not** eligible to test.
- Students in the class of 2010 or beyond who had previously failed an STE test had the right to participate in the spring 2008 STE test.
- If a student was enrolled in courses in more than one STE discipline, he or she was given the option of selecting which test to take.

An exhaustive list of student participation requirements for all grades and content areas can be found in the *Spring 2008 Principal's Administration Manual* on the Department's website at <http://www.doe.mass.edu/mcas/2008/admin/manual/pam.pdf>.

### 1.2.4 Scorer Training Modifications

#### 1.2.4.1 Field-Test Constructed-Response Items

In 2008, the process for scoring field-test constructed-response items was modified to improve psychometric consistency.

Since scorers of **common** constructed-response items are trained using an Anchor Set, a Training Set, and a Qualifying Set, psychometricians recommended that scorers of **field-test** items (which later may become common items) be trained as similarly as possible to scorers of common items. Because an item's Anchor Set and Qualifying Set contain similar student responses (those that are typical of each score point), the decision was made to keep only the Anchor Set, and to add a Training Set for scorer training of each field-test item.

Scorers of all 2008 field-test constructed-response items were trained using item-specific Anchor Sets and Training Sets. Each Training Set included five student responses that helped define the upper and lower extremes of the score point range.

#### **1.2.4.2 Common Constructed-Response Items**

Additionally, for scorers of common constructed-response items, the number of student responses in a Training Set changed from a standard of 10 in 2007 to a range of 5 to 15 in 2008. This change allowed for greater flexibility per item to include the number of responses that were adequate to establish both the score point range and the range of responses within each score point.

Further details about the purpose, selection, and use of each type of student response set (Anchor, Qualifying, and Training) are available in the *2007 MCAS Technical Report*.



## **2. MCAS 2008 TEST DEVELOPMENT AND DESIGN**

### **2.1 Standard MCAS Test Development and Design**

The 2008 MCAS administration included operational tests in the following grades and content areas:

- grade 3: English Language Arts, Mathematics
- grade 4: English Language Arts, Mathematics
- grade 5: English Language Arts, Mathematics, Science and Technology/Engineering
- grade 6: English Language Arts, Mathematics
- grade 7: English Language Arts, Mathematics
- grade 8: English Language Arts, Mathematics, Science and Technology/Engineering
- grade 10: English Language Arts, Mathematics
- high school (grades 9/10): end-of-course Science and Technology/Engineering (Biology, Chemistry, Introductory Physics, Technology/Engineering)

Since passing the grade 10 English Language Arts and Mathematics tests is one requirement for receiving a high school diploma, retest opportunities in those tests were offered for students in grade 10 and above who had not previously passed one or both tests. Retests were offered in November 2007 and March 2008.

The *2007 MCAS Technical Report* provides detailed information about the development and design of the English Language Arts, Mathematics, and Science and Technology/Engineering tests, about the types and design of items on MCAS tests, and about how MCAS tests are developed and constructed.

Appendix A provides information regarding the extent to which equating item sets for each content area-grade combination matched their corresponding common item sets in item types, number of possible score points, reporting category point distribution, difficulty, and discrimination.

Information is provided in sections 2.1.1 and 2.1.2 below about changes from 2007 to 2008 in test specifications for the Mathematics and Science and Technology/Engineering tests.

The following pilot tests were also administered during the 2008 MCAS administration:

- History and Social Science: grades 5 and 7
- U.S. History: high school (grades 10/11)

The 2008 pilot tests were similar to those administered during the 2007 MCAS administration. Detailed information about the development of the 2007 pilot tests is provided in the *2007 MCAS Technical Report*. Since this *2008 MCAS Technical Report* is intended to document the MCAS 2008 operational tests, detailed information about these 2008 pilot tests is not included in this *Report*.

The *Frameworks* for all content areas can be found at <http://www.doe.mass.edu/frameworks>.

## 2.1.1 Changes in 2008 Test Specifications

### 2.1.1.1 Mathematics

At grade 10, 28 unique open-response items were field-tested in 2008, compared to 27 in 2007. Of the 27 items field-tested in 2007, 25 were scored; the other two had issues that rendered them unscorable. All 28 open-response field test items were scored in 2008.

### 2.1.1.2 Science and Technology/Engineering

Table 2.1.1 shows the test specifications regarding distribution of common item points across *Framework* strands for the grade 5 MCAS 2008 Science and Technology/Engineering test. The 2007 tests distributed common item points evenly over all four strands; the 2008 tests distributed the most common item points across the Life Science and the Earth and Space Science strands.

**Table 2.1.1: MCAS 2008 Tests  
Common Item Point Distribution across *Framework* Strands:  
Science and Technology/Engineering, Grade 5**

<i>Framework</i> Strand	Percent of Points
Earth and Space Science	30%
Life Science	30%
Physical Sciences	25%
Technology/Engineering	15%
<b>Total</b>	<b>100%</b>

Table 2.1.2 shows the test design for each 2008 Science and Technology/Engineering test by grade level and item type. The number of high school Chemistry test forms halved in 2008 (from 12 in 2007 to 6 in 2008), and the number of high school Biology test forms increased from 14 in 2007 to 15 in 2008. The distribution of common items per form did not change in either test; numbers of matrix items across forms changed proportionately in each test form. Additionally, all high school tests were pre-equated; there were no matrix equating items for these tests.

**Table 2.1.2: 2008 MCAS Administration  
Test Design: Science and Technology/Engineering**

<b>Grade</b> HS = High School End-of-Course (grades 9/10) <b>Test Type</b> ST = Science and Technology/Engineering Bio = Biology Chem = Chemistry Intro. Phy = Introductory Physics Tech/Eng = Technology/Engineering			<b>Types of Items</b>																			
			<b>Items per Form</b>										<b>Matrix Items Across Forms</b>									
			<b>Common</b>				<b>Matrix</b>				<b>Total Positions</b>				<b>Equating Positions</b>				<b>Field-Test Positions</b>			
<i>Grade</i>	<i>Test Name</i>	<i># of Forms</i>	<i>MC</i>	<i>SA</i>	<i>OR</i>	<i>WP</i>	<i>MC</i>	<i>SA</i>	<i>OR</i>	<i>WP</i>	<i>MC</i>	<i>SA</i>	<i>OR</i>	<i>WP</i>	<i>MC</i>	<i>SA</i>	<i>OR</i>	<i>WP</i>	<i>MC</i>	<i>SA</i>	<i>OR</i>	<i>WP</i>
5	ST	17	34		5		7		1		119		17		34		5		85		12	
8	ST	17	34		5		7		1		119		17		34		5		85		12	
HS	Bio	15	40		5		12		2		180		30		--		--		180		30	
HS	Chem	6	40		5		12		2		72		12		--		--		72		12	
HS	Intro. Phy	10	40		5		12		2		120		20		--		--		120		20	
HS	Tech/Eng	5	40		5		20		2		100		10		--		--		100		10	

**GRADES 5 AND 8 TESTS**

Each matrix equating item appears in only one form.

**ALL HIGH SCHOOL TESTS**

These tests were pre-equated. The common items for each test also served as the equating items. There was no matrix equating set in each test.

**HIGH SCHOOL BIOLOGY**

2 OR field-test items were repeated across the forms (n=28 field test OR).

**HIGH SCHOOL INTRODUCTORY PHYSICS**

5 OR field-test items were repeated across the forms (n=15 field test OR).

## **2.2 MCAS Alternate Assessment (MCAS-Alt) Test Development and Design**

Students with significant disabilities whose IEP or 504 teams determine that they cannot participate in standard MCAS tests, even with accommodations, instead take the MCAS Alternate Assessment (MCAS-Alt). The MCAS-Alt assesses the same *Massachusetts Curriculum Framework* content areas and learning standards as those assessed by the standard MCAS tests. Evidence of student performance is submitted in an MCAS-Alt portfolio.

For detailed information about portfolio requirements, including examples of portfolio evidence and details regarding which strands are required in the content areas of English Language Arts, Mathematics, and Science and Technology/Engineering, please refer to the *2007 MCAS Technical Report*. Information regarding Competency Portfolios at grade 10 and beyond is also found in the *2007 Report*.

In 2008, portfolios submitted for students in grades 5, 7, and 10/11 were required to contain evidence in any three of the History and Social Science learning standards.

### **3. MCAS 2008 TEST ADMINISTRATION AND PARTICIPATION**

#### **3.1 MCAS 2008 Test Administration Schedule**

MCAS tests were administered during two periods in the spring of 2008:

- In March–April
  - grades 3–8 and 10 English Language Arts
  
- In May–June
  - grades 3–8 and 10 Mathematics
  - grades 5 and 8 Science and Technology/Engineering
  - high school (grades 9/10) end-of-course Science and Technology/Engineering
    - Biology
    - Chemistry
    - Introductory Physics
    - Technology/Engineering
  - grades 5 and 7 History and Social Science pilot test
  - high school (grades 10/11) U.S. History pilot test

The 2008 MCAS administration also included retest opportunities in English Language Arts and Mathematics for students in grades 10 and above who had not previously passed one or both tests. Retests were offered in November 2007 and March 2008.

MCAS Alternate Assessment (MCAS-Alt) portfolios were required to be submitted no later than April 13, 2008.

Table 3.1 on the following page shows the complete 2007–2008 MCAS test administration schedule.

#### **3.2 Test Administration Policies and Student Participation Requirements**

Details about test administration policies and student participation requirements, including participation requirements for students with disabilities and limited English proficient students, can be found in sections 3.1 and 3.2 of the *2007 MCAS Technical Report*.

**Table 3.1: 2007–2008 MCAS Test Administration Schedule**

Test Grade and Content Area	Test Administration Date(s)	Deadline for Return of Materials to Contractor
<b>Retest Administration Windows</b>		
<b>November 6–15, 2007</b>		
ELA Composition Retest	November 6	November 19
ELA Reading Comprehension Retest Sessions 1 and 2 Session 3	November 7 November 8	
Mathematics Retest Session 1 Session 2	November 14 November 15	
<b>March 3–7, 2008</b>		
Mathematics Retest Session 1 Session 2	March 3 March 4	March 11
ELA Composition Retest	March 5	
ELA Reading Comprehension Retest Sessions 1 and 2 Session 3	March 6 March 7	
<b>March–April 2008 Standard Test Administration Window</b>		
Grades 3–8 ELA Reading Comprehension	March 24–April 4	April 8
Grades 4, 7, and 10 ELA Composition	March 25	
Grade 10 ELA Reading Comprehension Sessions 1 and 2 Session 3	March 26 March 27	
Grades 4, 7, and 10 ELA Composition Make-Up	April 2	
<b>May–June 2008 Test Administration Window</b>		
<b>Standard Tests and Pilot Tests</b>		
Grades 3–8 Mathematics	May 12–29	May 30
Grades 5 and 8 Science and Technology/Engineering		
Grades 5 and 7 History and Social Science Pilot Tests		
Grade 10 Mathematics Session 1 Session 2	May 22 May 23	
High School (grades 10/11) U.S. History Pilot Test	May 23–29	
<b>High School (Grades 9/10) End-of-Course Science and Technology/Engineering Tests</b>		
Biology	June 3–4	June 9
Chemistry		
Introductory Physics		
Technology/ Engineering		

## **4. MCAS 2008 SCORING PROCEDURES AND METHODOLOGY**

### **4.1 Scoring of Standard Test Items**

Specific information regarding how student responses are scored is provided in the *2007 MCAS Technical Report*, including details regarding

- the physical handling of student test booklets and student responses
- the iScore scoring software
- the scoring of constructed-response items
  - scoring staff
  - scorer training
  - scoring methodology and procedures
  - reports generated during scoring

In 2008, there were slight changes from 2007 in scoring locations; the 2008 scoring locations are listed below. Additionally, the format of the Compilation Report generated during scoring changed—a sample report is included with this document as Appendix B.

#### **4.1.1 Scoring Specifications**

Detailed information regarding scoring specifications is available in sections 4.1.2.2–4.1.2.7 of the *2007 MCAS Technical Report*.

#### **4.1.2 Inter-Scorer Consistency Tables**

Inter-scorer consistency tables showing the percentages of agreement on double-scored constructed-response items are provided in Appendix C.

#### **4.1.3 2008 Scoring Locations**

The iScore database, its operation, and its administrative controls are all based in Dover, NH; however, MCAS 2008 test item responses were scored in the following locations:

- Troy, NY
  - grade 7 English Language Arts Composition
  - high school (grades 9/10) Biology
- Longmont, CO
  - grade 4 English Language Arts Composition
  - grades 4–5, 7–8, and 10 English Language Arts Reading Comprehension
  - grades 4–8 and 10 Mathematics
  - high school (grades 9/10) Introductory Physics

- Dover, NH
  - grade 10 English Language Arts Composition
  - grade 3 English Language Arts Reading Comprehension
  - high school (grades 9/10) Chemistry
  - high school (grades 9/10) Technology/Engineering
- Louisville, KY
  - grade 6 English Language Arts Reading Comprehension
  - grade 3 Mathematics
  - grades 5 and 8 Science and Technology/Engineering

The iScore system monitored accuracy, reliability, and consistency across all scoring sites. Constant daily communication and coordination were accomplished through e-mail, telephone, faxes, and secure websites, to ensure that critical information and scoring modifications were shared/implemented across all scoring sites.

## **4.2 Scoring of MCAS-Alt Portfolios**

Details regarding the scoring of MCAS-Alt portfolios are provided in the *2007 MCAS Technical Report*. Procedures in 2008, in general, followed those of 2007.

In 2008, there were slight changes in the following, detailed in the corresponding sections below:

- rubrics for two scoring dimensions
- numbers of portfolios submitted and approved for a Competency Determination
- composition of the Project Leadership Team (PLT)
- number of portfolios considered during selection of training materials
- number of applications to become MCAS-Alt portfolio scorers

### **4.2.1 Inter-Scorer Consistency Tables**

MCAS-Alt inter-scorer consistency tables for 2008 are provided in Appendix C.

### **4.2.2 Changes in Rubrics**

Rubrics in the scoring dimensions of Self-Evaluation and Generalized Performance were slightly modified to be more specific. The updated rubrics are included below.

#### **4.2.2.1 Self-Evaluation**

Two Self-Evaluation rubrics were modified in 2008.

Each strand was given a score in Self-Evaluation ranging from M to 2+ based on the scoring rubric shown in table 4.2.2-1.



**Table 4.2.2-1: Scoring Rubric for Self-Evaluation, Individual Strand Score**

Score Point		
M	1	2+
Evidence of self-correction, monitoring, goal-setting, and reflection was <b>not found</b> in this strand.	Student self-corrects, monitors, sets goals, and reflects on only <b>one piece of evidence</b> in this strand.	Student self-corrects, monitors, sets goals, and reflects on <b>two or more pieces of evidence</b> in this strand.

Although the rubric determining how individual strand scores were combined to arrive at a final score did not change, the descriptors of the overall content area scores were modified. Those modified descriptors are shown in table 4.2.2-2.

**Table 4.2.2-2: Rubric for Combined Self-Evaluation Score in Each Content Area**

Score Point				
M	1	2	3	4
Evidence of self-correction, task-monitoring, goal-setting, and reflection was not found in the student's portfolio in this content area.	Student infrequently self-corrects, monitors, sets goals, and reflects in this content area—evidence of Self-Evaluation was found in only one strand.	Student occasionally self-corrects, monitors, sets goals, and reflects in this content area—evidence of Self-Evaluation was found in two strands.	Student frequently self-corrects, monitors, sets goals, and reflects in this content area— <b>for a three strand portfolio</b> , one example of self-evaluation was found in each strand; <b>for a two strand portfolio</b> , two or more examples were found in one strand only.	Student self-corrects, monitors, sets goals, and reflects all or most of the time in this content area—two or more examples of Self-Evaluation were found in each strand.

#### 4.2.2.2 Generalized Performance

Two Generalized Performance rubrics were modified in 2008, and corrections were made to the tables showing how final Generalized Performance scores were determined.

Scorers totaled the numbers of contexts and approaches in each strand to determine a strand score of either 1 or 2+, based on the rubric shown in table 4.2.2-3.

**Table 4.2.2-3: Scoring Rubric for Generalized Performance**

Score Point	
1	2+
Student demonstrates knowledge and skills in this strand using a single context or one instructional approach.	Student demonstrates knowledge and skills in this strand using two or more contexts or instructional approaches.

A final Generalized Performance score was determined in the content area by combining the three scores for individual strands, as shown in table 4.2.2-4 or, in the case of a two-strand portfolio, by combining the two individual strand scores as shown in table 4.2.2-5. Both tables have been corrected in 2008 to reflect a highest possible overall score for Generalized Performance of 3.

**Table 4.2.2-4: Determination of  
Combined Generalized Performance Score  
for Each Content Area:  
3-Strand Portfolio**

Strand Score 1	Strand Score 2	Strand Score 3	Resulting Overall Score
1	1	1	1
1	1	2+	2
2+	2+	1	3
2+	2+	2+	3

**Table 4.2.2-5: Determination of  
Combined Generalized Performance Score  
for Each Content Area:  
2-Strand Portfolio**

Strand Score 1	Strand Score 2	Resulting Overall Score
1	1	1
1	2+	2
2+	2+	3

Descriptors for the Combined Generalized Performance scores were slightly modified in 2008 and are shown in table 4.2.2-6.

**Table 4.2.2-6: Rubric for  
Combined Generalized Performance Score  
in Each Content Area**

Score Point		
1	2	3
Student demonstrates knowledge and skills in one context; or using one approach and/or method of response and participation, in each strand.	Student demonstrates knowledge and skills in multiple contexts; or using multiple approaches and/or methods of response and participation, in only one strand.	Student demonstrates knowledge and skills in multiple contexts; or using multiple approaches and/or methods of response and participation, in two or more strands.

### 4.2.3 Competency Determinations

In 2008, a total of 28 English Language Arts, 58 Mathematics, and 24 Science and Technology/Engineering portfolios were submitted by students in grades 10 and above for consideration to earn a Competency Determination. Of these submissions, three English Language Arts portfolios, 14 Mathematics portfolios, and one Science and Technology/Engineering portfolio earned the Competency Determination.

### 4.2.4 Composition of the Project Leadership Team

In 2008, the MCAS-Alt Project Leadership Team (PLT) included four Teacher Consultants, compared with five in 2007, in addition to ESE and MP staff.

## **4.2.5 Training Materials Selection**

The PLT reviewed the same number of portfolios as in 2007 (140), but chose 66 sample strands to consider as exemplars for scorer training (64 sample strands were chosen in 2007). After double-scoring the 66 samples, 41 were in exact agreement for all five scoring dimensions. The 20 strands in the scorer sample set were chosen from these 41 samples.

## **4.2.6 Applicants to Score MCAS-Alt Portfolios**

In 2008, the ESE received over 350 applications to become MCAS-Alt portfolio scorers. The PLT chose 243 applicants, based on their familiarity with the MCAS-Alt, to attend MCAS-Alt Scorer Training sessions.

## **4.3 MCAS Equating and Scaling Procedures**

### **4.3.1 Equating**

In addition to the information below specific to the equating of 2008 MCAS tests, information is available in the *2007 MCAS Technical Report* about the purpose of equating, chained link design, a history of MCAS equating methods, and the delta method.

The data and procedures used to equate 2008 MCAS test results include evaluations of standard errors around item parameters, as well as the test characteristic curves (TCCs) that are the basis for MCAS equating and scaling procedures. The TCCs for the MCAS 2008 tests are provided in section 6.1.5 of this *Report*.

#### **4.3.1.1 Equating Methods**

A raw-score-to-theta equating procedure was used to equate the MCAS 2008 tests. For item calibration, the three-parameter logistic (3PL) model was used for dichotomous items, and the graded response model (GRM) for polytomous items. Item parameters are provided in Appendix D. Prior to fixing their parameter values, the anchor items were evaluated for use as equating items using the delta method (Holland and Wainer 1993).

For the 2008 MCAS administration, one test item was excluded from use in equating, based on delta analysis results, for the following tests:

- grade 3 Mathematics
- grade 4 Mathematics
- grade 5 Mathematics
- grade 5 ELA
- grade 6 Mathematics
- grade 7 Mathematics

All operational high school tests (grade 10 English Language Arts,<sup>1</sup> grade 10 Mathematics, and grades 9/10 Biology, Chemistry, Introductory Physics, and Technology/Engineering) and retests were pre-equated; therefore no delta analyses were performed for these tests.

The 2008 MCAS delta analyses tables are provided in Appendix E, tables E1.1–E1.14.

#### **4.3.1.2 Rescore Analyses**

##### ***Testing Contractor Analysis***

For the MCAS tests in English Language Arts; Mathematics; grades 5 and 8 Science and Technology/Engineering; and high school (grades 9/10) Biology, Chemistry, Introductory Physics, and Technology/Engineering, a rescore analysis was conducted by the testing contractor to evaluate potential constructed-response equating items. For each potential equating item, approximately 200 responses from the previous year’s test were randomly selected and rescored during the 2008 scoring sessions. The scores for the two years were compared; any items found to have a large difference between average scores were excluded as equating items.

Using Cohen’s (1960) effect size rules-of-thumb (wherein items with effect sizes greater than 0.80 are automatically removed as equating items), a handful of items whose effect sizes slightly exceeded the “negligible” range—i.e., beyond 0.20 (e.g., grade 5 English Language Arts Item #224867)—were added to a “watch list” and were further studied in terms of content and model fit.

Results of this rescore analysis are shown in Appendix E, tables E2.1 through E2.7. As indicated in the last column of each table, no items were discarded from use as equating items on the 2008 tests as a result of the watch list evaluation or due to large differences between average scores over two years.

#### **4.3.2 Scaling**

In addition to the information below specific to the scaling of 2008 MCAS tests, information is available in the *2007 MCAS Technical Report* regarding the purpose of scaling, scaled-score cut points for the four MCAS performance levels, and scaled-score standard error calculation; a figure illustrating the scaling procedure is also included. Raw-score to scaled-score conversion tables for the MCAS 2008 administration can be downloaded from the Department’s website at [http://www.doe.mass.edu/mcas/2008/news/conversion\\_table.xls](http://www.doe.mass.edu/mcas/2008/news/conversion_table.xls).

##### **4.3.2.1 Grade 10 ELA Raw Score-to-Scaled Score Conversion**

###### ***Overview of the Issue***

For results of both the spring 2008 grade 10 English Language Arts (ELA) test and the March 2008 ELA retest (collectively referred to in this section 4.3.2.1 as “the grade 10 ELA tests”), a data processing rule was incorrectly applied that resulted in minor inaccuracies in the raw score-

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<sup>1</sup> Although the grade 10 ELA writing prompt was new in 2008, the IRT parameters resulting from calibrating it were inconsistent with the observed difficulty level of the item. Consequently, parameters from the prior year’s prompt, which had similar classical statistics, were applied to the current year’s data.

to-scaled score conversion tables for these tests. The fundamental cause of the inaccuracies in the conversion tables was that an incorrect test characteristic curve (TCC) was used to map the raw scores onto the underlying theta metric (which was then converted to scaled scores).

**The most important thing to note about this issue is that correction did not change any raw score associated with performance level cut scores or with scores used for AYP decisions. Therefore, 2008 MCAS performance-level classifications were not affected and, in addition, there was no impact on AYP designations.**

### *Understanding the Error*

To understand the error and how it affected the conversion tables, one must have a general understanding of the following MCAS procedures:

- the MCAS grade 10 ELA test construction process and administration protocols
- how MCAS test scores are scaled
- details of the item response theory (IRT) calibration for grade 10 tests

### *MCAS Grade 10 ELA Test Construction and Administration Protocols*

The grade 10 MCAS ELA tests are comprised of two components: Composition and Reading Comprehension. The conversion table inaccuracies affected only the Reading Comprehension component of the tests.

The Reading Comprehension component is administered in three sessions. These three sessions are split into two different test booklets: a test booklet for sessions 1 and 2, and a separate test booklet for session 3. There are many forms of each of the two test booklets; common items are the same throughout all forms of each booklet, but matrix items, which include field test items, vary from form to form.

As part of MCAS grade 10 ELA Reading Comprehension test administration protocols, a given student can take a different test form for session 3 than for sessions 1 and 2. When analyzing the test's matrix items, it is important to know which test form a student took for each test booklet, so that the student's responses can be associated with the proper item to calculate correct statistics for that item.

Some of the common items that appeared on the 2008 grade 10 ELA tests and that were used to calculate 2008 performance level results originated as field test items in the spring 2007 grade 10 ELA test. It was in the analysis of those field test data that the error occurred, as explained in the section titled "MCAS Item Response Theory (IRT) Calibration for Grade 10 Tests" below.

### *How MCAS Test Scores are Scaled*

MCAS scaled scores are computed in a three-step process. In the first step of the process each raw score is mapped through the TCC to a corresponding theta value. In the second step of the process, linear transformations of the theta values are performed that result in unrounded scaled scores. In the final step of the process, rounding rules are applied to the unrounded scaled scores that result in the final scaled scores. Conversion tables are created that show the correspondence between the original raw scores and the final scaled scores.

A small data processing error in spring 2007 affected the TCCs for the 2008 grade 10 ELA tests (see below); the conversion tables for those tests were consequently affected, but changes were minor, as explained below.

#### *MCAS Item Response Theory (IRT) Calibration for Grade 10 Tests*

The data analysis systems used by Measured Progress to score multiple-choice items and calculate classical test theory (CTT) item statistics have been developed with the capability of identifying the form associated with each session a student takes so that the proper answer key is applied and the CTT statistics are properly calculated. These data analysis systems have worked correctly throughout the entire MCAS program. Consequently, all of the tests' classical statistics and student scores were calculated using correct procedures.

However, in a separate step that creates the data file used for the item response theory (IRT) calibration of the grade 10 ELA test, an error was made in 2006–2007. Because the 2008 grade 10 ELA tests were constructed using field test items from spring 2007, this error affected the TCCs of the 2008 tests that included those items.

To conduct the IRT calibration for any MCAS test, a data set of scored item responses is constructed specifically for use with the IRT software, PARSCALE. In this data set, following any student identification data, responses to common items appear in the first set of columns and responses to matrix items appear in the columns that follow. For construction of the grade 10 ELA tests' calibration data sets, a specific computer code was written to allow for students who used two different test forms. The code identifies which ELA Reading Comprehension session 3 form a student took and assigns the student's matrix item responses to that form. Without running this code, student responses for session 3 matrix items are assigned to the same form as sessions 1 and 2.

During the analysis of the data from the spring 2007 MCAS administration, the grade 10 ELA code for constructing the calibration data sets was not run. The result was that the calibration data set was not constructed properly and incorrect data were used to calibrate the matrix items for session 3; consequently, the item parameters for those matrix items were incorrect. It is important to note that

- item parameters for the matrix items in sessions 1 and 2 were based on correct data
- not all students had different form numbers for session 3; thus, not all of the session 3 matrix data were incorrect

Some of these session 3 matrix items and their parameters were used as common items on the 2008 grade 10 ELA tests. Because these tests were pre-equated using parameters based on incorrect data, the information used to calculate scaled scores was incorrect.

Table 4.3.2-1 below provides the total number of common items by type for each 2008 grade 10 ELA test, along with the number of those common items on each test that originated in session 3 in spring 2007.

**Table 4.3.2-1: Number of Spring 2007 Session 3 Matrix Items Used on 2008 Grade 10 ELA Tests and Total Number of 2008 Grade 10 ELA Common Items, by Type**

Item Type	Spring 2008 Test		March 2008 Retest	
	Spring 2007 Session 3 Matrix Items	Total Common Items	Spring 2007 Session 3 Matrix Items	Total Common Items
Multiple-Choice	14	36	9	36
Open-Response	1	6	0	6

***Impact of the Error***

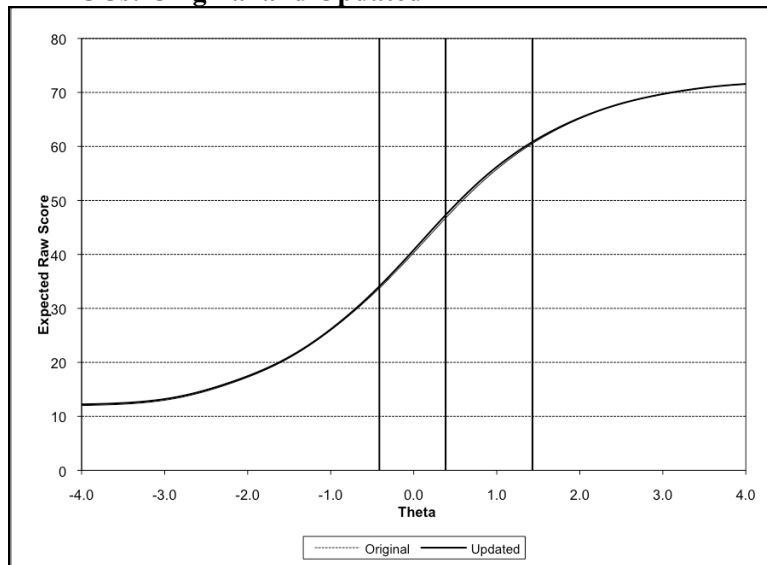
Once the data processing error for spring 2007 was identified, a new 2006–2007 data set was constructed that assigned student responses to their correct session 3 forms. The MCAS IRT calibrations were rerun using the correct data, and the resulting item parameters of the items used in 2008 were updated. A new TCC was constructed, and a new raw score-to-scaled score conversion table was developed for each 2008 test (conversion tables are available on the Department’s website at [http://www.doe.mass.edu/mcas/2008/news/conversion\\_table.xls](http://www.doe.mass.edu/mcas/2008/news/conversion_table.xls)).

***TCC Comparisons***

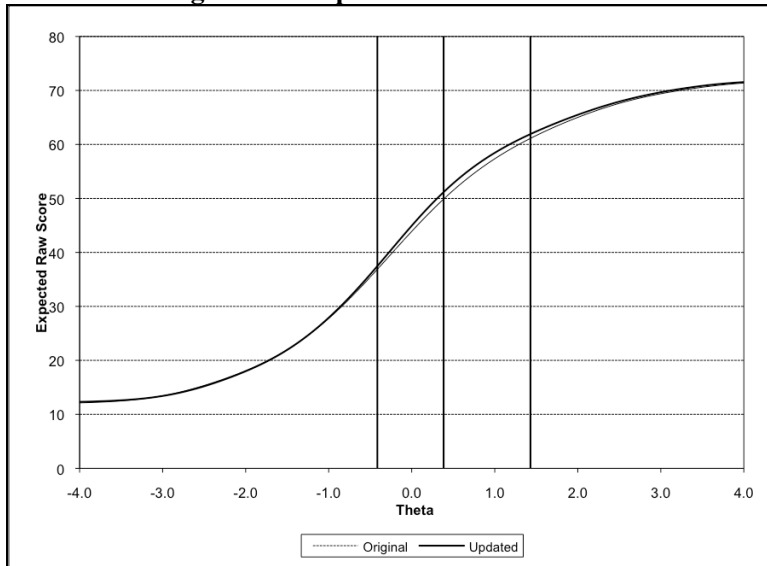
Figures 4.3.2-1–4.3.2-4 below visually display the differences between the original and updated TCCs for the 2008 grade 10 ELA tests. The vertical lines in the figures indicate where the cut points between the performance levels are located on the theta metric (left to right: *Failing/Needs Improvement; Needs Improvement/Proficient; Proficient/Advanced*).

Figure 4.3.2-1 plots both the original and updated TCCs for the spring 2008 grade 10 ELA test on the same graph; Figure 4.3.2-2 plots the same information for the March 2008 retest. In both figures, the x-axis is theta and the y-axis is the expected score on the test. For both tests, the differences between the original and updated TCCs are very small and difficult to detect visually without a high degree of magnification. This indicates the relatively small impact the updated item parameters had on the overall TCCs for these tests.

**Figure 4.3.2-1: MCAS Spring 2008 Grade 10 ELA Test TCCs: Original and Updated**

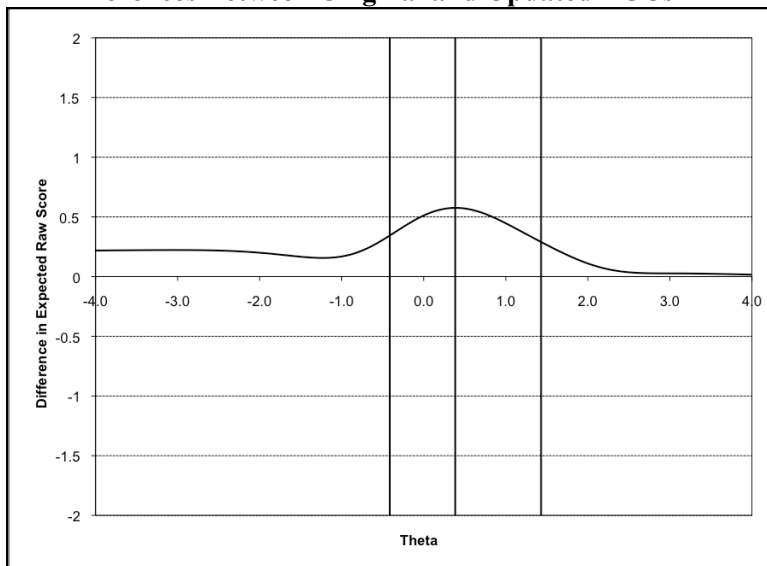


**Figure 4.3.2-2: MCAS March 2008 Grade 10 ELA Retest TCCs: Original and Updated**



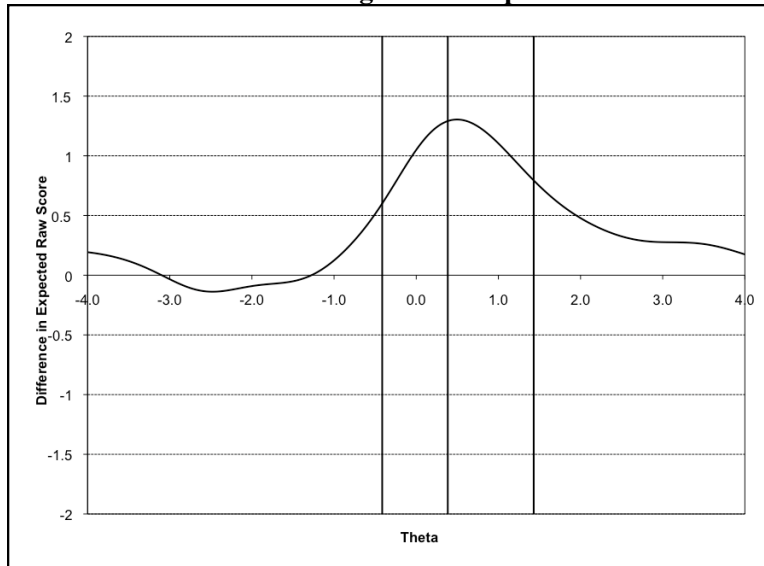
To provide a clearer display of where the TCCs differ and by how much, Figures 4.3.2-3 and 4.3.2-4 plot the differences between the original and updated TCCs for both tests. In these figures, the  $x$ -axis is theta (as in figures 4.3.2-1 and 4.3.2-2), but here the  $y$ -axis is the difference between the TCCs. If the TCCs did not differ at all, the graph would simply show a straight line at zero for every theta value. However, the TCCs do differ. For the spring 2008 test, at the point of maximal difference, which is close to the *Needs Improvement/Proficient* cut, the TCCs differ by about 0.6 raw score points and the average difference is 0.2 raw score point. For the March 2008 retest, there is more variation between the TCCs. The maximal difference here is about 1.3 points, but the average is still about 0.2 point.

**Figure 4.3.2-3: MCAS Spring 2008 Grade 10 ELA Test Differences Between Original and Updated TCCs**





**Figure 4.3.2-4: MCAS March 2008 ELA Retest  
Differences Between Original and Updated TCCs**



*Conversion Table Comparisons*

Because the original and updated TCCs are very similar, the differences in their raw score-to-scaled score conversion tables are minor.

Tables 4.3.2-2 and 4.3.2-3 show the specific impact of the spring 2007 data processing error on results for the two 2008 grade 10 ELA tests. The two tables present data from the conversion tables that were used operationally (“Original”) as well as from the conversion tables constructed after the data files had been corrected (“New,” available on the Department’s website at [http://www.doe.mass.edu/mcas/2008/news/conversion\\_table.xls](http://www.doe.mass.edu/mcas/2008/news/conversion_table.xls)). The tables show only those raw scores that were associated with a changed reported scaled score. When there was no change in the reported scaled score, the associated raw score is not shown.

**Table 4.3.2-2: MCAS Spring 2008 Grade 10 ELA Test:  
Comparisons of Original and New Scaled Scores and Estimated Thetas  
for All Raw Scores Affected by 2007 Field Test Data Processing Error**

Raw Score	Scaled Score		Students		Estimated $\theta$		Unrounded Scaled Score	
	Original	New	<i>n</i>	%	Original	New	Original	New
18	214	212	47	0.1	-1.879	-1.909	213.03	212.92
37	226	224	736	1	-0.203	-0.229	225.30	224.63
41	232	230	1143	1.6	0.041	0.011	231.41	230.64
45	238	236	1659	2.3	0.280	0.246	237.40	236.55
48	242	240	2074	2.9	0.463	0.428	241.51	240.83
51	246	244	2468	3.5	0.656	0.619	245.20	244.50
54	250	248	2789	3.9	0.865	0.829	249.20	248.50
58	256	254	2940	4.1	1.186	1.152	255.34	254.69
59	258	256	2876	4.1	1.278	1.244	257.09	256.45
64	266	264	2287	3.2	1.836	1.814	265.17	264.90

**Table 4.3.2-3: MCAS March 2008 Grade 10 ELA Retest:  
Comparisons of Original and New Scaled Scores and Estimated Thetas  
for All Raw Scores Affected by 2007 Field Test Data Processing Error**

Raw Score	Scaled Score		Students		Estimated $\theta$		Unrounded Scaled Score	
	Original	New	<i>n</i>	%	Original	New	Original	New
13	208	206	34	0.9	-3.179	-3.195	207.05	206.94
38	222	220	112	2.8	-0.347	-0.384	221.67	220.74
39	224	222	133	3.3	-0.289	-0.329	223.14	222.13
41	226	224	83	2.1	-0.172	-0.219	226.07	224.88
42	228	226	97	2.4	-0.113	-0.164	227.55	226.26
43	230	228	68	1.7	-0.053	-0.109	229.04	227.64
45	232	230	93	2.3	0.068	0.003	232.07	230.46
46	234	232	55	1.4	0.130	0.061	233.62	231.90
47	236	234	59	1.5	0.193	0.120	235.21	233.38
48	236	234	47	1.2	0.258	0.180	236.83	234.89
49	238	236	49	1.2	0.324	0.242	238.50	236.44

The tables show that all changes in scaled scores are of the same magnitude (2 points) and in the same direction. The unrounded scaled scores confirm that these differences are very small in magnitude, and these magnitudes are inflated due to the rounding rules used throughout the MCAS program.<sup>2</sup>

*No Cut Score or AYP Impact*

**The most noteworthy finding from the recalculation of the data is that no raw score associated with a cut score changed, and therefore no performance-level classifications were affected. Consequently, there was no impact on AYP designations.**

*Assurance of Isolation of the Problem*

Given that the test administration protocols for grades 3 through 8 assessments are not the same as those for grade 10, there was no potential for this problem to occur in those grades. Calibration data were verified and confirmed to be appropriately constructed for the following grade 10 tests:

- ELA (spring test and retest)
  - 2006
  - 2008
- Mathematics (spring test and retest)
  - 2006
  - 2007
  - 2008

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<sup>2</sup> Computed scaled scores for MCAS are rounded to the nearest even integer. The scaled score has a range of 200 to 280, inclusive, resulting in 41 distinct scaled-score values reported.

## ***Prevention of Future Occurrences of the Problem***

### *In Data Analysis*

The item analysis system that is used to construct the calibration data set has been modified to automatically run the appropriate subroutine when the system calls in grade 10 MCAS ELA or mathematics data. Once the calibration data set is constructed, a thorough visual inspection of the data will be performed by Data Analysis staff who have extensive knowledge of MCAS test design and test administration protocols. It will be visually apparent to these staff whether the calibration data were constructed appropriately. Data Analysis staff will deliver the data to psychometrics only if visual inspection of the data confirms that the correct procedure was executed. To ensure this step is completed properly, the rules for implementing the visual inspection will be documented in the decision rules.

### *In Psychometrics*

Upon receipt of data, psychometric staff will, as a matter of standard operating procedure, perform a thorough visual inspection of all MCAS data received from Data Analysis. This evaluation will be done on all equating files, item list files, and student response data sets. Additionally, psychometricians will cross-reference classical test theory statistics calculated by PARSCALE to those calculated by Data Analysis using the item analysis system. This will allow verification that data used by Data Analysis for a variety of other purposes are consistent with the input files used for IRT analysis and equating. Moreover, calculation of the CTT statistics and the IRT parameters by the psychometricians will be conducted using the same piece of software (PARSCALE) used in the equating process. Ultimately, this approach will establish an independent evaluation of the data between psychometricians and Data Analysis, and this evaluation will form a direct link to the programs used in equating.

## **5. REPORTING OF MCAS 2008 RESULTS**

### **5.1 Standard Setting**

No standard setting was necessary for the 2008 MCAS tests. Information is available in the *2007 MCAS Technical Report* about past standard-setting activities.

### **5.2 Standard MCAS Test Results**

Results for the standard MCAS tests are reported according to four performance levels:

- *Advanced (Above Proficient at grade 3)*
- *Proficient*
- *Needs Improvement*
- *Warning (Failing at high school)*

Descriptions of these performance levels are provided in section 5.1.1.1 of the *2007 MCAS Technical Report*.

#### **5.2.1 Performance Level Results**

Statewide performance level results can be found in the document *Spring 2008 MCAS Tests: Summary of State Results* (<http://www.doe.mass.edu/mcas/2008/results/summary.pdf>).

Results for each 2008 test item, including average item score and percent of total student responses across the state, are available on the Department's website at <http://profiles.doe.mass.edu/mcas/mcasitems2.aspx?grade=03&subjectcode=ELA&linkid=2&orgcode=00000000&fycode=2008&orgtypecode=0&>.

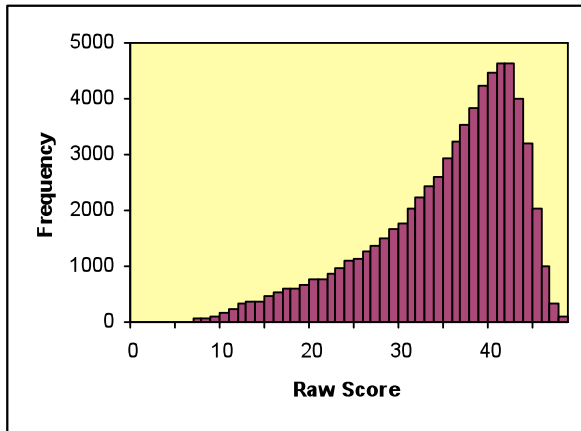
#### **5.2.2 Scaled-Score Distributions**

Figures 5.2.A through 5.2.T-2 and tables 5.2.2.1 through 5.2.2.18 show the 2008 scaled-score distributions for each grade and content area combination (for grade 3, raw-score distributions are shown, since no scaled scores are calculated for grade 3 test results).

Analyses were conducted only on students who attempted all sessions and who were not coded as "not tested." No scaled scores are calculated for test results of first-year limited English proficient (LEP) students in any grade.

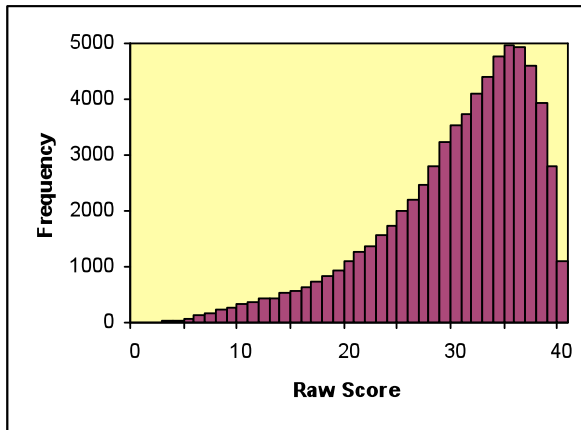
In some cases, two or more low score points map onto the same scaled score, while in other cases, no raw scores map onto a scaled score. This explains why scaled score distributions contain spikes and gaps that are not evident in raw score distributions.

**Figure 5.2.A:  
2008 MCAS  
Raw Score Distribution  
Grade 3 English Language Arts**



N	69,208
Std. Deviation	8.19
Skewness	-0.97
Kurtosis	0.37

**Figure 5.2.B:  
2008 MCAS  
Raw Score Distribution  
Grade 3 Mathematics**

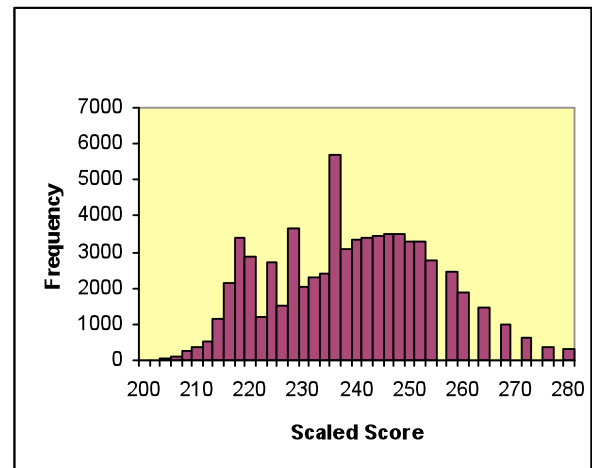


N	69,451
Std. Deviation	7.20
Skewness	-1.05
Kurtosis	0.74

**Table 5.2.2.1:  
2008 MCAS Scaled Score Distribution  
Grade 4 English Language Arts**

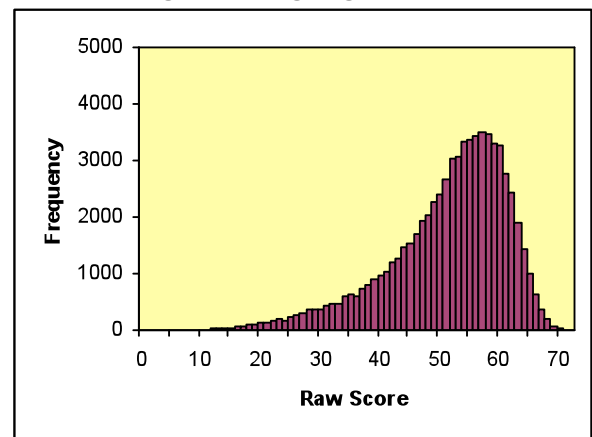
Score	Frequency	Percentage	Cumulative Percentage
200	1	0.0	0.0
202	6	0.0	0.0
204	36	0.1	0.1
206	99	0.1	0.2
208	274	0.4	0.6
210	341	0.5	1.1
212	527	0.8	1.8
214	1151	1.6	3.5
216	2116	3.0	6.5
218	3381	4.8	11.3
220	2889	4.1	15.5
222	1199	1.7	17.2
224	2729	3.9	21.1
226	1523	2.2	23.2
228	3633	5.2	28.4
230	2043	2.9	31.3
232	2283	3.3	34.6
234	2400	3.4	38.0
236	5705	8.1	46.2
238	3064	4.4	50.6
240	3343	4.8	55.3
242	3381	4.8	60.2
244	3444	4.9	65.1
246	3502	5.0	70.1
248	3479	5.0	75.1
250	3310	4.7	79.8
252	3266	4.7	84.5
254	2777	4.0	88.4
256	0	0.0	88.4
258	2437	3.5	91.9
260	1899	2.7	94.6
262	0	0.0	94.6
264	1444	2.1	96.7
266	0	0.0	96.7
268	990	1.4	98.1
270	0	0.0	98.1
272	642	0.9	99.0
274	0	0.0	99.0
276	370	0.5	99.5
278	0	0.0	99.5
280	326	0.5	100.0

**Figure 5.2.C-1:  
2008 MCAS  
Scaled Score Distribution  
Grade 4 English Language Arts**



N	70,010
Std. Deviation	14.57
Skewness	0.15
Kurtosis	-0.45

**Figure 5.2.C-2:  
2008 MCAS  
Raw Score Distribution  
Grade 4 English Language Arts**

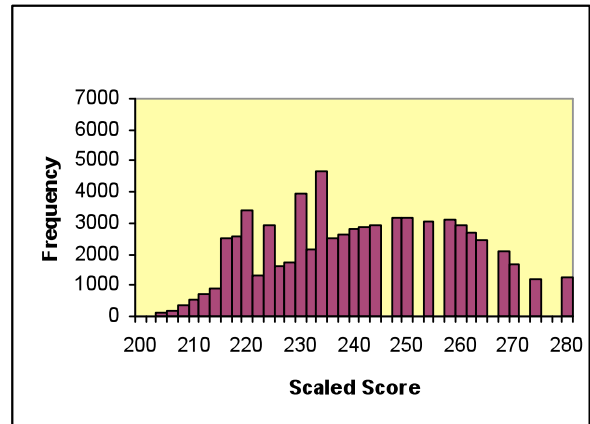


N	70,010
Std. Deviation	9.92
Skewness	-1.05
Kurtosis	1.08

**Table 5.2.2.2:  
2008 MCAS Scaled Score Distribution  
Grade 4 Mathematics**

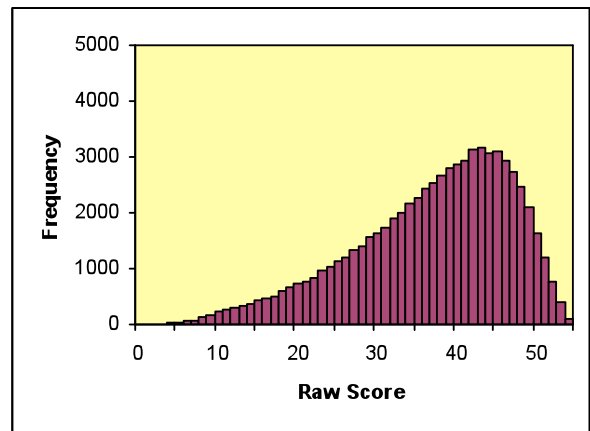
Score	Frequency	Percentage	Cumulative Percentage
200	0	0.0	0.0
202	8	0.0	0.0
204	121	0.2	0.2
206	203	0.3	0.5
208	372	0.5	1.0
210	547	0.8	1.8
212	723	1.0	2.8
214	905	1.3	4.1
216	2510	3.6	7.7
218	2575	3.7	11.3
220	3386	4.8	16.1
222	1338	1.9	18.0
224	2940	4.2	22.2
226	1636	2.3	24.5
228	1718	2.4	27.0
230	3923	5.6	32.6
232	2162	3.1	35.6
234	4680	6.7	42.3
236	2542	3.6	45.9
238	2655	3.8	49.7
240	2791	4.0	53.7
242	2859	4.1	57.7
244	2937	4.2	61.9
246	0	0.0	61.9
248	3149	4.5	66.4
250	3155	4.5	70.9
252	0	0.0	70.9
254	3060	4.4	75.2
256	0	0.0	75.2
258	3090	4.4	79.6
260	2946	4.2	83.8
262	2721	3.9	87.7
264	2481	3.5	91.2
266	0	0.0	91.2
268	2108	3.0	94.2
270	1646	2.3	96.5
272	0	0.0	96.5
274	1195	1.7	98.2
276	0	0.0	98.2
278	0	0.0	98.2
280	1249	1.8	100.0

**Figure 5.2.D-1:  
2008 MCAS  
Scaled Score Distribution  
Grade 4 Mathematics**



N	70,331
Std. Deviation	17.51
Skewness	0.21
Kurtosis	-0.87

**Figure 5.2.D-2:  
2008 MCAS  
Raw Score Distribution  
Grade 4 Mathematics**

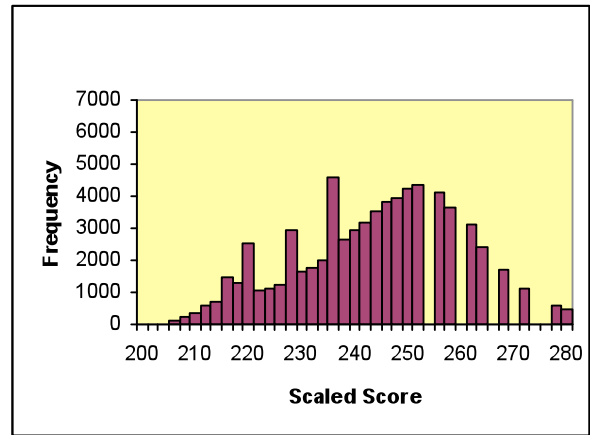


N	70,331
Std. Deviation	9.84
Skewness	-0.71
Kurtosis	-0.05

**Table 5.2.2.3:  
2008 MCAS Scaled Score Distribution  
Grade 5 English Language Arts**

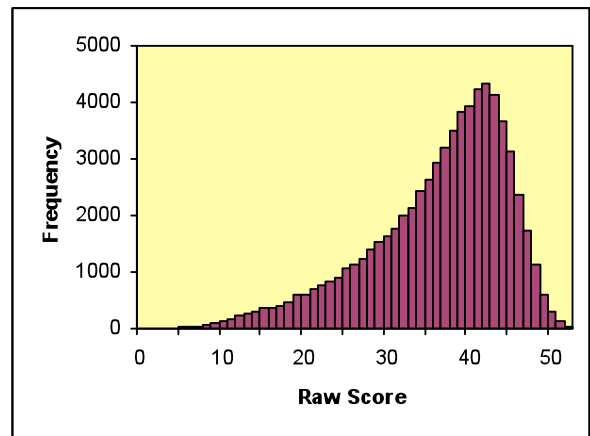
Score	Frequency	Percentage	Cumulative Percentage
200	0	0.0	0.0
202	0	0.0	0.0
204	20	0.0	0.0
206	132	0.2	0.2
208	224	0.3	0.5
210	382	0.5	1.1
212	566	0.8	1.9
214	729	1.0	3.0
216	1479	2.1	5.1
218	1296	1.9	6.9
220	2523	3.6	10.6
222	1055	1.5	12.1
224	1129	1.6	13.7
226	1238	1.8	15.5
228	2943	4.2	19.7
230	1649	2.4	22.1
232	1774	2.6	24.7
234	1989	2.9	27.5
236	4568	6.6	34.1
238	2619	3.8	37.9
240	2946	4.2	42.1
242	3191	4.6	46.7
244	3515	5.1	51.8
246	3818	5.5	57.3
248	3931	5.7	62.9
250	4230	6.1	69.0
252	4324	6.2	75.2
254	0	0.0	75.2
256	4123	5.9	81.2
258	3666	5.3	86.4
260	0	0.0	86.4
262	3122	4.5	90.9
264	2383	3.4	94.4
266	0	0.0	94.4
268	1723	2.5	96.8
270	0	0.0	96.8
272	1137	1.6	98.5
274	0	0.0	98.5
276	0	0.0	98.5
278	601	0.9	99.3
280	460	0.7	100.0

**Figure 5.2.E-1:  
2008 MCAS  
Scaled Score Distribution  
Grade 5 English Language Arts**



N	69,485
Std. Deviation	15.15
Skewness	-0.11
Kurtosis	-0.46

**Figure 5.2.E-2:  
2008 MCAS  
Raw Score Distribution  
Grade 5 English Language Arts**



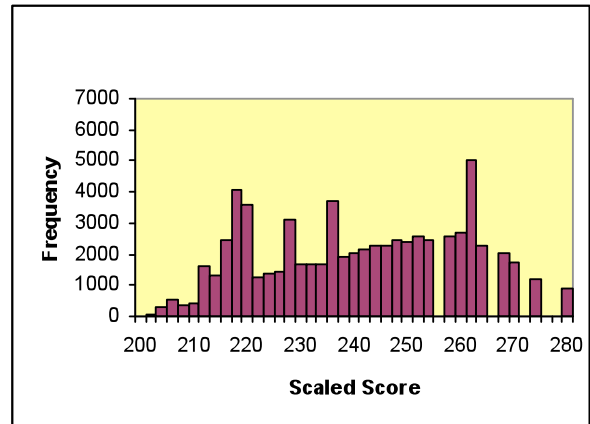
N	69,485
Std. Deviation	8.36
Skewness	-0.93
Kurtosis	0.48



**Table 5.2.2.4:  
2008 MCAS Scaled Score Distribution  
Grade 5 Mathematics**

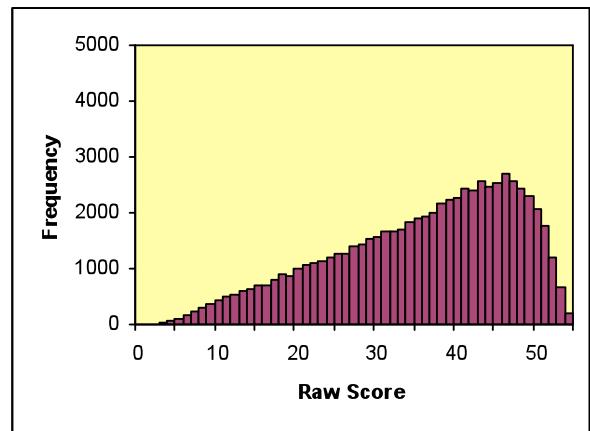
Score	Frequency	Percentage	Cumulative Percentage
200	1	0.0	0.0
202	31	0.0	0.0
204	320	0.5	0.5
206	542	0.8	1.3
208	367	0.5	1.8
210	432	0.6	2.4
212	1631	2.3	4.8
214	1312	1.9	6.7
216	2428	3.5	10.2
218	4070	5.8	16.0
220	3569	5.1	21.1
222	1277	1.8	23.0
224	1390	2.0	25.0
226	1423	2.0	27.0
228	3115	4.5	31.5
230	1675	2.4	33.9
232	1652	2.4	36.3
234	1695	2.4	38.7
236	3737	5.4	44.1
238	1936	2.8	46.9
240	2015	2.9	49.7
242	2177	3.1	52.9
244	2248	3.2	56.1
246	2260	3.2	59.4
248	2430	3.5	62.8
250	2387	3.4	66.3
252	2563	3.7	70.0
254	2478	3.6	73.5
256	0	0.0	73.5
258	2544	3.7	77.2
260	2699	3.9	81.1
262	5006	7.2	88.3
264	2288	3.3	91.5
266	0	0.0	91.5
268	2051	2.9	94.5
270	1761	2.5	97.0
272	0	0.0	97.0
274	1185	1.7	98.7
276	0	0.0	98.7
278	0	0.0	98.7
280	889	1.3	100.0

**Figure 5.2.F-1:  
2008 MCAS  
Scaled Score Distribution  
Grade 5 Mathematics**



N	69,584
Std. Deviation	18.44
Skewness	0.02
Kurtosis	-1.07

**Figure 5.2.F-2:  
2008 MCAS  
Raw Score Distribution  
Grade 5 Mathematics**

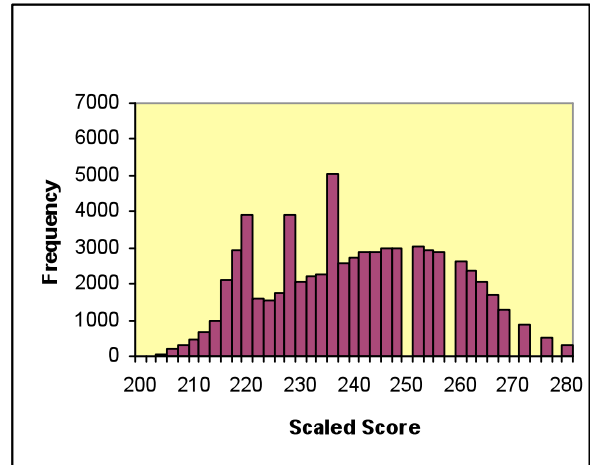


N	69,584
Std. Deviation	11.47
Skewness	-0.57
Kurtosis	-0.54

**Table 5.2.2.5:  
2008 MCAS Scaled Score Distribution  
Grade 5 Science and  
Technology/Engineering**

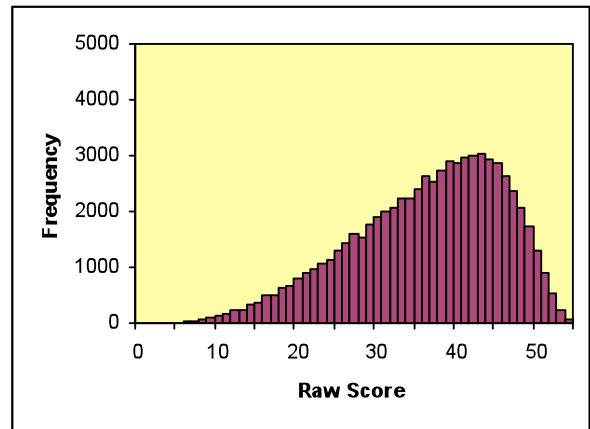
Score	Frequency	Percentage	Cumulative Percentage
200	1	0.0	0.0
202	2	0.0	0.0
204	32	0.0	0.1
206	196	0.3	0.3
208	289	0.4	0.7
210	479	0.7	1.4
212	683	1.0	2.4
214	981	1.4	3.8
216	2117	3.0	6.9
218	2935	4.2	11.1
220	3892	5.6	16.7
222	1599	2.3	19.0
224	1545	2.2	21.2
226	1753	2.5	23.7
228	3914	5.6	29.3
230	2075	3.0	32.3
232	2219	3.2	35.5
234	2250	3.2	38.7
236	5046	7.2	45.9
238	2550	3.7	49.6
240	2741	3.9	53.5
242	2899	4.2	57.7
244	2865	4.1	61.8
246	2969	4.3	66.1
248	3004	4.3	70.4
250	0	0.0	70.4
252	3025	4.3	74.7
254	2918	4.2	78.9
256	2870	4.1	83.0
258	0	0.0	83.0
260	2648	3.8	86.8
262	2361	3.4	90.2
264	2075	3.0	93.2
266	1719	2.5	95.6
268	1302	1.9	97.5
270	0	0.0	97.5
272	900	1.3	98.8
274	0	0.0	98.8
276	537	0.8	99.6
278	0	0.0	99.6
280	296	0.4	100.0

**Figure 5.2.G-1:  
2008 MCAS  
Scaled Score Distribution  
Grade 5 Science and  
Technology/Engineering**



N	69,687
Std. Deviation	16.30
Skewness	0.14
Kurtosis	-0.85

**Figure 5.2.G-2:  
2008 MCAS  
Raw Score Distribution  
Grade 5 Science and  
Technology/Engineering**

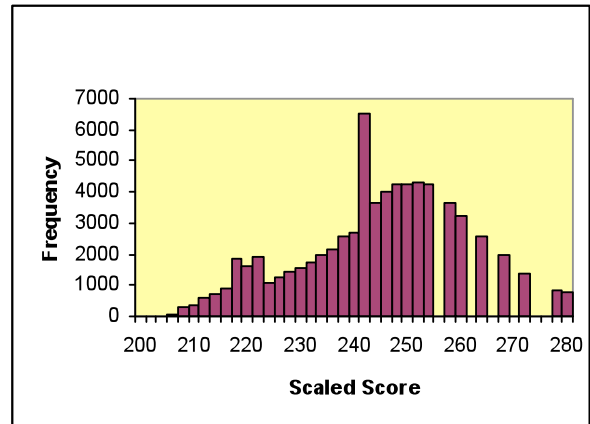


N	69,687
Std. Deviation	9.37
Skewness	-0.56
Kurtosis	-0.29

**Table 5.2.2.6:  
2008 MCAS Scaled Score Distribution  
Grade 6 English Language Arts**

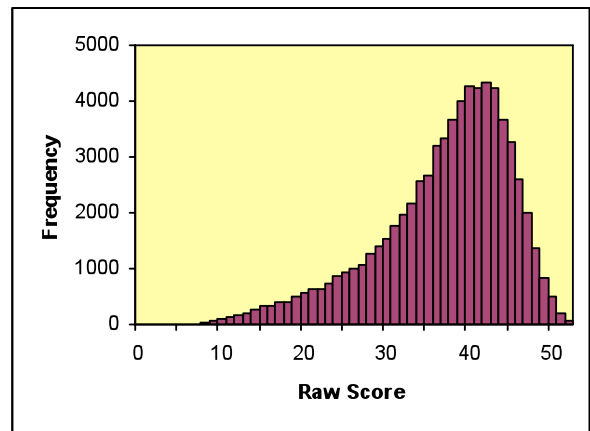
Score	Frequency	Percentage	Cumulative Percentage
200	0	0.0	0.0
202	0	0.0	0.0
204	19	0.0	0.0
206	53	0.1	0.1
208	278	0.4	0.5
210	363	0.5	1.0
212	573	0.8	1.8
214	725	1.0	2.9
216	908	1.3	4.1
218	1826	2.6	6.7
220	1607	2.3	9.0
222	1931	2.7	11.8
224	1080	1.5	13.3
226	1271	1.8	15.1
228	1410	2.0	17.1
230	1545	2.2	19.3
232	1764	2.5	21.8
234	1953	2.8	24.6
236	2152	3.1	27.6
238	2559	3.6	31.3
240	2680	3.8	35.1
242	6546	9.3	44.4
244	3654	5.2	49.6
246	3996	5.7	55.3
248	4260	6.1	61.3
250	4223	6.0	67.3
252	4334	6.2	73.5
254	4219	6.0	79.5
256	0	0.0	79.5
258	3654	5.2	84.7
260	3260	4.6	89.3
262	0	0.0	89.3
264	2588	3.7	93.0
266	0	0.0	93.0
268	1988	2.8	95.8
270	0	0.0	95.8
272	1375	2.0	97.7
274	0	0.0	97.7
276	0	0.0	97.7
278	820	1.2	98.9
280	764	1.1	100.0

**Figure 5.2.H-1:  
2008 MCAS  
Scaled Score Distribution  
Grade 6 English Language Arts**



N	70,378
Std. Deviation	15.02
Skewness	-0.14
Kurtosis	-0.22

**Figure 5.2.H-2:  
2008 MCAS  
Raw Score Distribution  
Grade 6 English Language Arts**

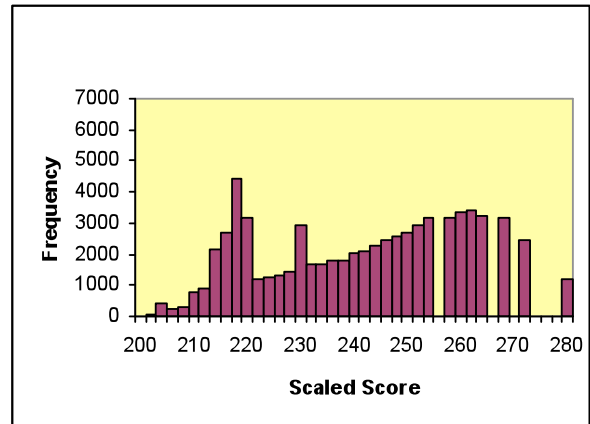


N	70,378
Std. Deviation	8.05
Skewness	-0.94
Kurtosis	0.62

**Table 5.2.2.7:  
2008 MCAS Scaled Score Distribution  
Grade 6 Mathematics**

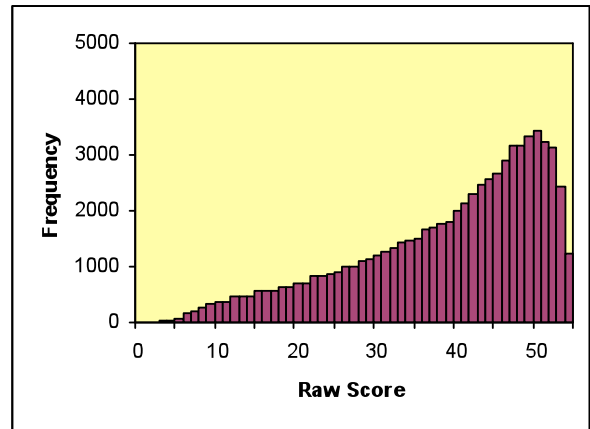
Score	Frequency	Percentage	Cumulative Percentage
200	0	0.0	0.0
202	57	0.1	0.1
204	428	0.6	0.7
206	256	0.4	1.1
208	321	0.5	1.5
210	750	1.1	2.6
212	920	1.3	3.9
214	2170	3.1	7.0
216	2676	3.8	10.8
218	4417	6.3	17.0
220	3195	4.5	21.6
222	1210	1.7	23.3
224	1253	1.8	25.0
226	1334	1.9	26.9
228	1429	2.0	29.0
230	2952	4.2	33.2
232	1654	2.3	35.5
234	1705	2.4	37.9
236	1768	2.5	40.4
238	1815	2.6	43.0
240	2005	2.8	45.8
242	2118	3.0	48.9
244	2287	3.2	52.1
246	2465	3.5	55.6
248	2583	3.7	59.3
250	2664	3.8	63.0
252	2902	4.1	67.2
254	3170	4.5	71.7
256	0	0.0	71.7
258	3176	4.5	76.2
260	3341	4.7	80.9
262	3436	4.9	85.8
264	3225	4.6	90.4
266	0	0.0	90.4
268	3149	4.5	94.8
270	0	0.0	94.8
272	2425	3.4	98.3
274	0	0.0	98.3
276	0	0.0	98.3
278	0	0.0	98.3
280	1224	1.7	100.0

**Figure 5.2.I-1:  
2008 MCAS  
Scaled Score Distribution  
Grade 6 Mathematics**



N	70,480
Std. Deviation	18.79
Skewness	-0.06
Kurtosis	-1.10

**Figure 5.2.I-2:  
2008 MCAS  
Raw Score Distribution  
Grade 6 Mathematics**

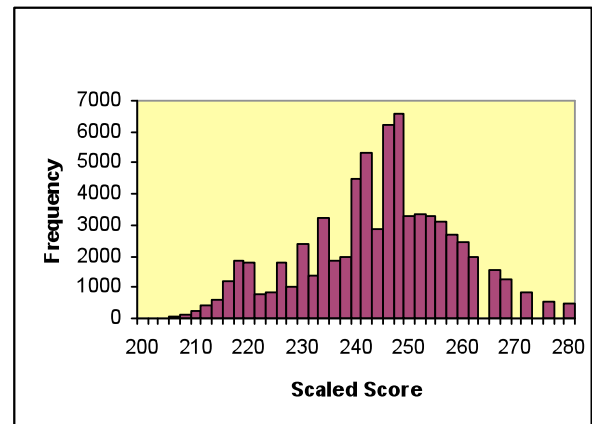


N	70,480
Std. Deviation	11.68
Skewness	-0.84
Kurtosis	-0.15

**Table 5.2.2.8:  
2008 MCAS Scaled Score Distribution  
Grade 7 English Language Arts**

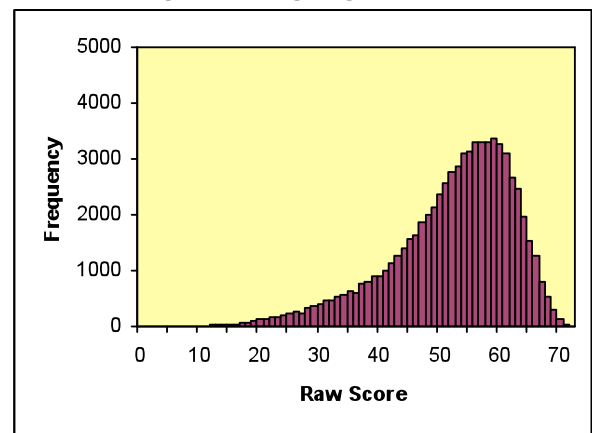
Score	Frequency	Percentage	Cumulative Percentage
200	0	0.0	0.0
202	5	0.0	0.0
204	19	0.0	0.0
206	75	0.1	0.1
208	95	0.1	0.3
210	255	0.4	0.6
212	422	0.6	1.2
214	604	0.8	2.1
216	1185	1.6	3.7
218	1861	2.6	6.3
220	1788	2.5	8.8
222	763	1.1	9.8
224	810	1.1	11.0
226	1815	2.5	13.5
228	999	1.4	14.9
230	2401	3.3	18.2
232	1400	1.9	20.2
234	3204	4.5	24.6
236	1872	2.6	27.2
238	1989	2.8	30.0
240	4501	6.3	36.3
242	5354	7.4	43.7
244	2858	4.0	47.7
246	6239	8.7	56.4
248	6601	9.2	65.5
250	3285	4.6	70.1
252	3365	4.7	74.8
254	3267	4.5	79.3
256	3091	4.3	83.6
258	2667	3.7	87.4
260	2469	3.4	90.8
262	1972	2.7	93.5
264	0	0.0	93.5
266	1546	2.2	95.7
268	1256	1.7	97.4
270	0	0.0	97.4
272	816	1.1	98.6
274	0	0.0	98.6
276	536	0.7	99.3
278	0	0.0	99.3
280	497	0.7	100.0

**Figure 5.2.J-1:  
2008 MCAS  
Scaled Score Distribution  
Grade 7 English Language Arts**



N	71,882
Std. Deviation	13.91
Skewness	-0.22
Kurtosis	-0.10

**Figure 5.2.J-2:  
2008 MCAS  
Raw Score Distribution  
Grade 7 English Language Arts**

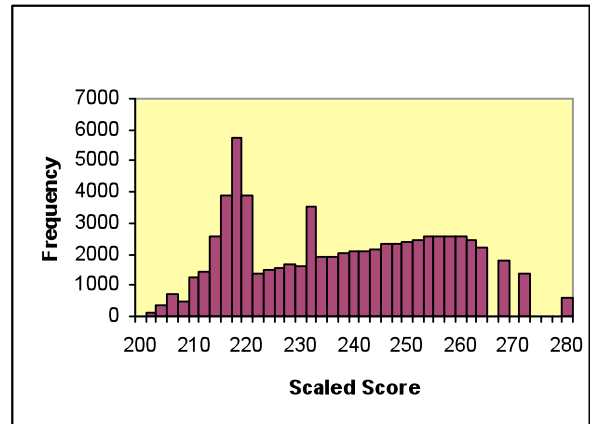


N	71,882
Std. Deviation	10.23
Skewness	-0.98
Kurtosis	0.90

**Table 5.2.2.9:  
2008 MCAS Scaled Score Distribution  
Grade 7 Mathematics**

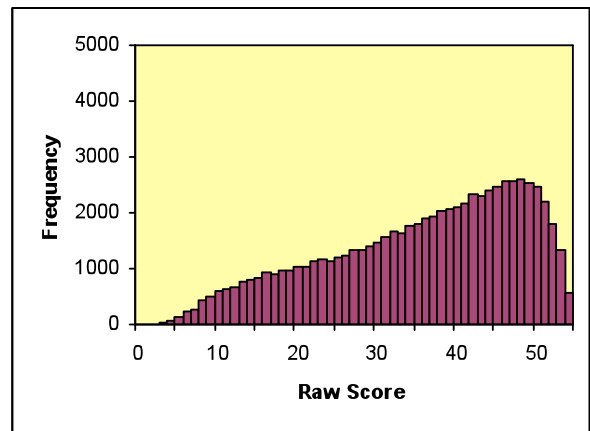
Score	Frequency	Percentage	Cumulative Percentage
200	3	0.0	0.0
202	104	0.1	0.1
204	346	0.5	0.6
206	711	1.0	1.6
208	497	0.7	2.3
210	1241	1.7	4.0
212	1439	2.0	6.0
214	2568	3.6	9.6
216	3894	5.4	15.0
218	5716	7.9	22.9
220	3890	5.4	28.3
222	1387	1.9	30.2
224	1473	2.0	32.3
226	1577	2.2	34.5
228	1658	2.3	36.8
230	1626	2.3	39.0
232	3553	4.9	44.0
234	1887	2.6	46.6
236	1921	2.7	49.2
238	2019	2.8	52.0
240	2079	2.9	54.9
242	2116	2.9	57.9
244	2168	3.0	60.9
246	2346	3.3	64.1
248	2312	3.2	67.3
250	2415	3.4	70.7
252	2452	3.4	74.1
254	2565	3.6	77.6
256	2568	3.6	81.2
258	2593	3.6	84.8
260	2550	3.5	88.3
262	2471	3.4	91.8
264	2209	3.1	94.8
266	0	0.0	94.8
268	1806	2.5	97.3
270	0	0.0	97.3
272	1350	1.9	99.2
274	0	0.0	99.2
276	0	0.0	99.2
278	0	0.0	99.2
280	577	0.8	100.0

**Figure 5.2.K-1:  
2008 MCAS  
Scaled Score Distribution  
Grade 7 Mathematics**



N	72,087
Std. Deviation	18.28
Skewness	0.12
Kurtosis	-1.13

**Figure 5.2.K-2:  
2008 MCAS  
Raw Score Distribution  
Grade 7 Mathematics**

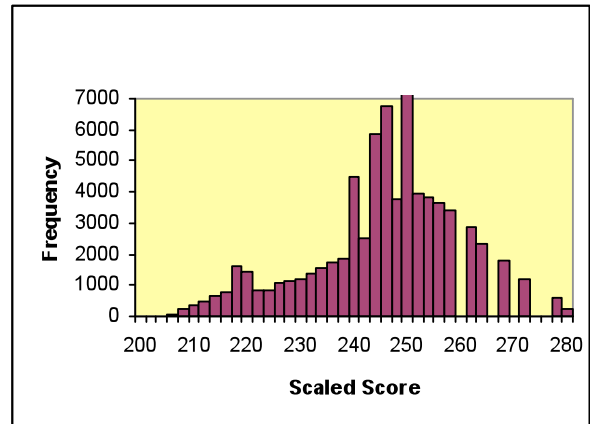


N	72,087
Std. Deviation	12.25
Skewness	-0.54
Kurtosis	-0.70

**Table 5.2.2.10:  
2008 MCAS Scaled Score Distribution  
Grade 8 English Language Arts**

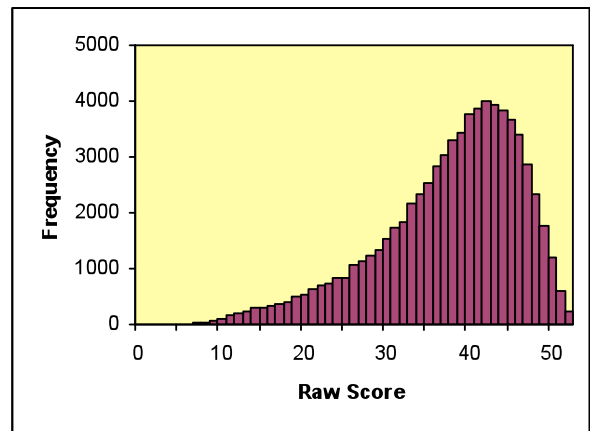
Score	Frequency	Percentage	Cumulative Percentage
200	0	0.0	0.0
202	0	0.0	0.0
204	12	0.0	0.0
206	43	0.1	0.1
208	234	0.3	0.4
210	353	0.5	0.9
212	505	0.7	1.6
214	640	0.9	2.5
216	786	1.1	3.6
218	1643	2.3	5.8
220	1419	2.0	7.8
222	826	1.1	8.9
224	825	1.1	10.1
226	1061	1.5	11.5
228	1118	1.5	13.1
230	1225	1.7	14.8
232	1349	1.9	16.6
234	1546	2.1	18.8
236	1741	2.4	21.2
238	1844	2.5	23.7
240	4511	6.2	30.0
242	2526	3.5	33.5
244	5867	8.1	41.6
246	6731	9.3	50.9
248	3769	5.2	56.1
250	7883	10.9	67.0
252	3938	5.4	72.4
254	3838	5.3	77.7
256	3668	5.1	82.8
258	3406	4.7	87.5
260	0	0.0	87.5
262	2871	4.0	91.5
264	2331	3.2	94.7
266	0	0.0	94.7
268	1777	2.5	97.2
270	0	0.0	97.2
272	1209	1.7	98.8
274	0	0.0	98.8
276	0	0.0	98.8
278	613	0.8	99.7
280	230	0.3	100.0

**Figure 5.2.L-1:  
2008 MCAS  
Scaled Score Distribution  
Grade 8 English Language Arts**



N	72,338
Std. Deviation	13.66
Skewness	-0.45
Kurtosis	0.24

**Figure 5.2.L-2:  
2008 MCAS  
Raw Score Distribution  
Grade 8 English Language Arts**

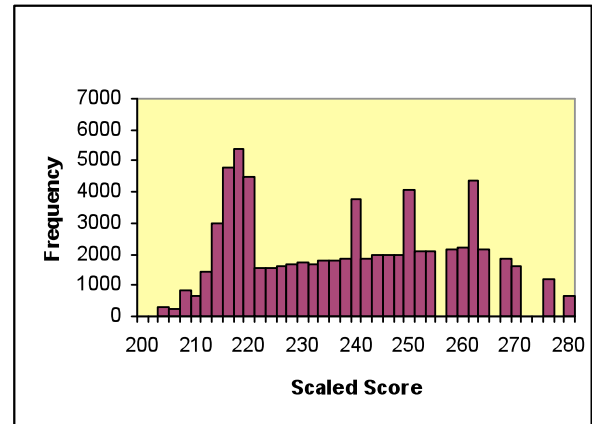


N	72,338
Std. Deviation	8.53
Skewness	-0.90
Kurtosis	0.50

**Table 5.2.2.11:  
2008 MCAS Scaled Score Distribution  
Grade 8 Mathematics**

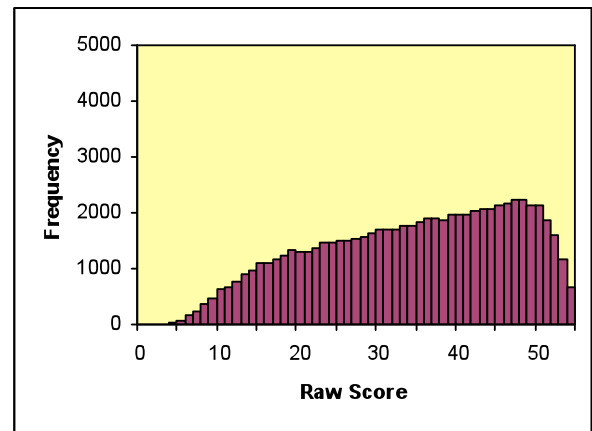
Score	Frequency	Percentage	Cumulative Percentage
200	2	0.0	0.0
202	18	0.0	0.0
204	274	0.4	0.4
206	228	0.3	0.7
208	839	1.2	1.9
210	639	0.9	2.8
212	1441	2.0	4.8
214	2978	4.1	8.9
216	4796	6.6	15.5
218	5410	7.5	23.0
220	4476	6.2	29.1
222	1545	2.1	31.3
224	1579	2.2	33.5
226	1621	2.2	35.7
228	1700	2.3	38.0
230	1711	2.4	40.4
232	1700	2.3	42.8
234	1773	2.4	45.2
236	1774	2.5	47.7
238	1839	2.5	50.2
240	3781	5.2	55.4
242	1863	2.6	58.0
244	1966	2.7	60.7
246	1981	2.7	63.4
248	1966	2.7	66.2
250	4077	5.6	71.8
252	2073	2.9	74.7
254	2123	2.9	77.6
256	0	0.0	77.6
258	2170	3.0	80.6
260	2234	3.1	83.7
262	4369	6.0	89.7
264	2125	2.9	92.6
266	0	0.0	92.6
268	1872	2.6	95.2
270	1613	2.2	97.5
272	0	0.0	97.5
274	0	0.0	97.5
276	1181	1.6	99.1
278	0	0.0	99.1
280	665	0.9	100.0

**Figure 5.2.M-1:  
2008 MCAS  
Scaled Score Distribution  
Grade 8 Mathematics**



N	72,402
Std. Deviation	18.90
Skewness	0.19
Kurtosis	-1.13

**Figure 5.2.M-2:  
2008 MCAS  
Raw Score Distribution  
Grade 8 Mathematics**



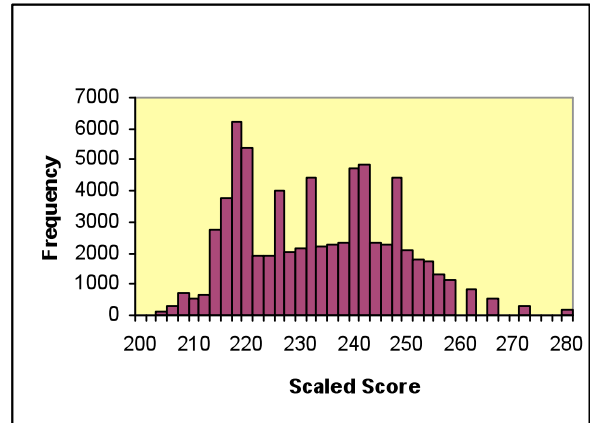
N	72,402
Std. Deviation	12.28
Skewness	-0.32
Kurtosis	-0.94



**Table 5.2.2.12:  
2008 MCAS Scaled Score Distribution  
Grade 8 Science and  
Technology/Engineering**

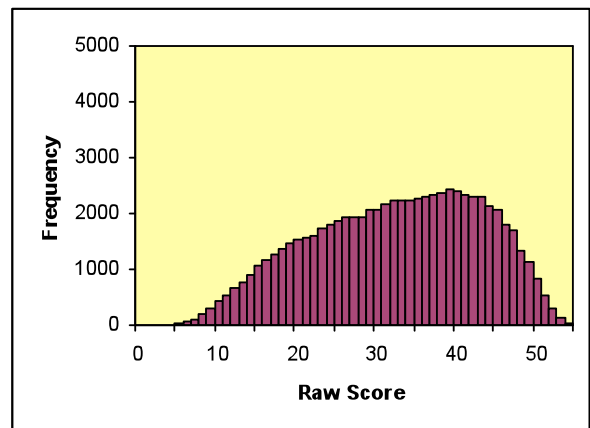
Score	Frequency	Percentage	Cumulative Percentage
200	1	0.0	0.0
202	5	0.0	0.0
204	108	0.1	0.2
206	298	0.4	0.6
208	714	1.0	1.6
210	545	0.8	2.3
212	655	0.9	3.2
214	2728	3.8	7.0
216	3791	5.2	12.2
218	6194	8.6	20.8
220	5405	7.5	28.3
222	1939	2.7	30.9
224	1929	2.7	33.6
226	4008	5.5	39.1
228	2063	2.9	42.0
230	2161	3.0	45.0
232	4454	6.2	51.1
234	2224	3.1	54.2
236	2254	3.1	57.3
238	2316	3.2	60.5
240	4704	6.5	67.0
242	4854	6.7	73.7
244	2350	3.2	77.0
246	2296	3.2	80.2
248	4434	6.1	86.3
250	2081	2.9	89.2
252	1804	2.5	91.7
254	1710	2.4	94.0
256	1326	1.8	95.9
258	1149	1.6	97.4
260	0	0.0	97.4
262	821	1.1	98.6
264	0	0.0	98.6
266	545	0.8	99.3
268	0	0.0	99.3
270	0	0.0	99.3
272	308	0.4	99.8
274	0	0.0	99.8
276	0	0.0	99.8
278	0	0.0	99.8
280	174	0.2	100.0

**Figure 5.2.N-1:  
2008 MCAS  
Scaled Score Distribution  
Grade 8 Science and  
Technology/Engineering**



N	72,348
Std. Deviation	14.07
Skewness	0.27
Kurtosis	-0.66

**Figure 5.2.N-2:  
2008 MCAS  
Raw Score Distribution  
Grade 8 Science and  
Technology/Engineering**

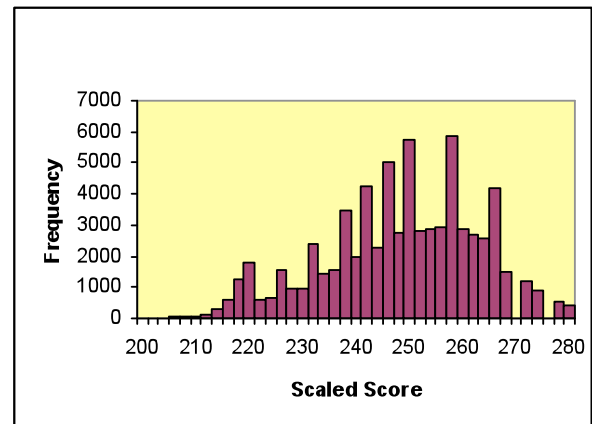


N	72,348
Std. Deviation	10.58
Skewness	-0.25
Kurtosis	-0.83

**Table 5.2.2.13:  
2008 MCAS Scaled Score Distribution  
Grade 10 English Language Arts**

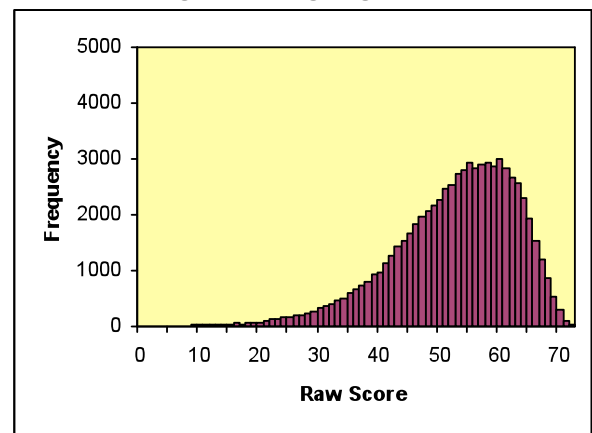
Score	Frequency	Percentage	Cumulative Percentage
200	0	0.0	0.0
202	3	0.0	0.0
204	23	0.0	0.0
206	66	0.1	0.1
208	52	0.1	0.2
210	79	0.1	0.3
212	101	0.1	0.5
214	309	0.4	0.9
216	587	0.8	1.7
218	1262	1.8	3.5
220	1768	2.5	6.0
222	604	0.8	6.8
224	666	0.9	7.8
226	1526	2.1	9.9
228	936	1.3	11.2
230	975	1.4	12.6
232	2398	3.4	15.9
234	1433	2.0	18.0
236	1534	2.2	20.1
238	3498	4.9	25.0
240	1967	2.8	27.8
242	4257	6.0	33.8
244	2280	3.2	37.0
246	5015	7.0	44.0
248	2736	3.8	47.9
250	5731	8.0	55.9
252	2841	4.0	59.9
254	2893	4.1	64.0
256	2939	4.1	68.1
258	5868	8.2	76.3
260	2850	4.0	80.3
262	2683	3.8	84.1
264	2557	3.6	87.7
266	4214	5.9	93.6
268	1520	2.1	95.7
270	0	0.0	95.7
272	1208	1.7	97.4
274	878	1.2	98.7
276	0	0.0	98.7
278	522	0.7	99.4
280	420	0.6	100.0

**Figure 5.2.O-1:  
2008 MCAS  
Scaled Score Distribution  
Grade 10 English Language Arts**



N	71,199
Std. Deviation	14.37
Skewness	-0.38
Kurtosis	-0.31

**Figure 5.2.O-2:  
2008 MCAS  
Raw Score Distribution  
Grade 10 English Language Arts**

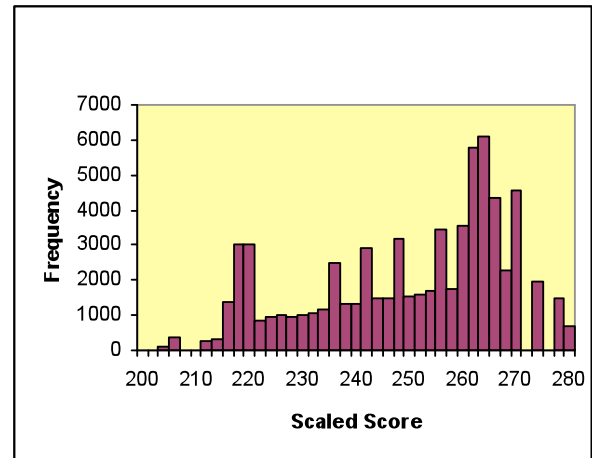


N	71,199
Std. Deviation	10.26
Skewness	-0.86
Kurtosis	0.79

**Table 5.2.2.14:  
2008 MCAS Scaled Score Distribution  
Grade 10 Mathematics**

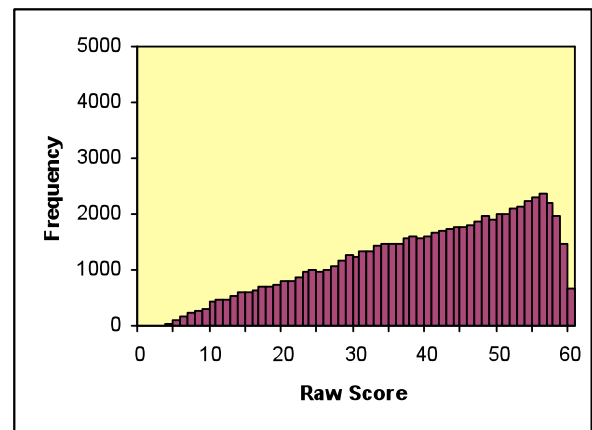
Score	Frequency	Percentage	Cumulative Percentage
200	2	0.0	0.0
202	18	0.0	0.0
204	131	0.2	0.2
206	382	0.5	0.8
208	0	0.0	0.8
210	0	0.0	0.8
212	279	0.4	1.1
214	305	0.4	1.6
216	1359	1.9	3.5
218	3020	4.3	7.8
220	3047	4.3	12.1
222	875	1.2	13.3
224	958	1.4	14.7
226	993	1.4	16.1
228	981	1.4	17.5
230	992	1.4	18.9
232	1069	1.5	20.4
234	1176	1.7	22.1
236	2499	3.5	25.6
238	1337	1.9	27.5
240	1317	1.9	29.4
242	2899	4.1	33.5
244	1479	2.1	35.6
246	1482	2.1	37.7
248	3168	4.5	42.1
250	1559	2.2	44.4
252	1616	2.3	46.6
254	1681	2.4	49.0
256	3459	4.9	53.9
258	1771	2.5	56.4
260	3569	5.1	61.5
262	5763	8.2	69.6
264	6084	8.6	78.3
266	4374	6.2	84.4
268	2300	3.3	87.7
270	4569	6.5	94.2
272	0	0.0	94.2
274	1957	2.8	96.9
276	0	0.0	96.9
278	1475	2.1	99.0
280	683	1.0	100.0

**Figure 5.2.P-1:  
2008 MCAS  
Scaled Score Distribution  
Grade 10 Mathematics**



N	70,628
Std. Deviation	18.05
Skewness	-0.56
Kurtosis	-0.80

**Figure 5.2.P-2:  
2008 MCAS  
Raw Score Distribution  
Grade 10 Mathematics**

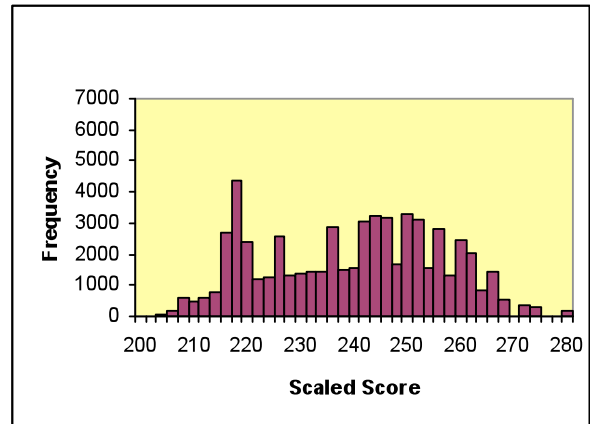


N	70,628
Std. Deviation	13.58
Skewness	-0.51
Kurtosis	-0.68

**Table 5.2.2.15:  
2008 MCAS Scaled Score Distribution  
High School (Grades 9/10) Biology**

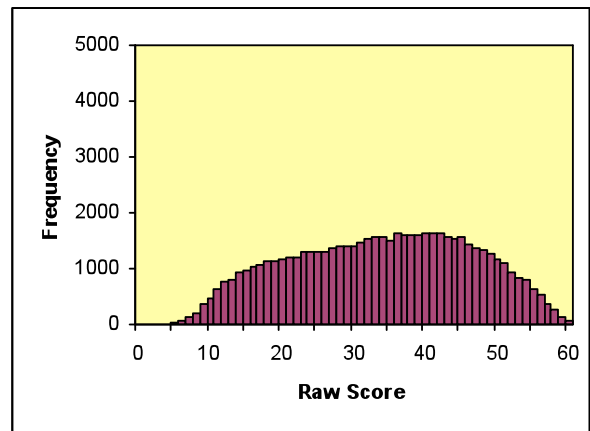
Score	Frequency	Percentage	Cumulative Percentage
200	1	0.0	0.0
202	3	0.0	0.0
204	48	0.1	0.1
206	196	0.3	0.4
208	571	1.0	1.4
210	455	0.8	2.1
212	618	1.0	3.2
214	764	1.3	4.4
216	2709	4.5	8.9
218	4381	7.3	16.2
220	2365	3.9	20.2
222	1206	2.0	22.2
224	1286	2.1	24.3
226	2590	4.3	28.6
228	1291	2.2	30.8
230	1380	2.3	33.1
232	1407	2.3	35.4
234	1410	2.3	37.8
236	2872	4.8	42.6
238	1517	2.5	45.1
240	1575	2.6	47.7
242	3081	5.1	52.9
244	3215	5.4	58.2
246	3191	5.3	63.5
248	1646	2.7	66.3
250	3268	5.4	71.7
252	3112	5.2	76.9
254	1554	2.6	79.5
256	2812	4.7	84.2
258	1334	2.2	86.4
260	2436	4.1	90.5
262	2042	3.4	93.9
264	833	1.4	95.3
266	1451	2.4	97.7
268	530	0.9	98.6
270	0	0.0	98.6
272	382	0.6	99.2
274	272	0.5	99.7
276	0	0.0	99.7
278	0	0.0	99.7
280	207	0.3	100.0

**Figure 5.2.Q-1:  
2008 MCAS  
Scaled Score Distribution  
High School (Grades 9/10) Biology**



N	60,011
Std. Deviation	16.35
Skewness	-0.07
Kurtosis	-1.00

**Figure 5.2.Q-2:  
2008 MCAS  
Raw Score Distribution  
High School (Grades 9/10) Biology**

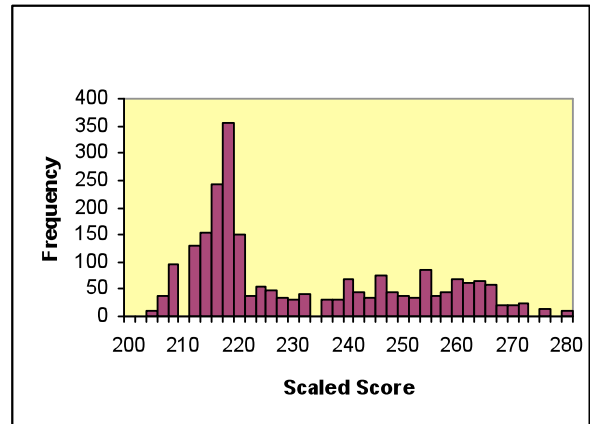


N	60,011
Std. Deviation	12.53
Skewness	-0.11
Kurtosis	-0.92

**Table 5.2.2.16:  
2008 MCAS Scaled Score Distribution  
High School (Grades 9/10) Chemistry**

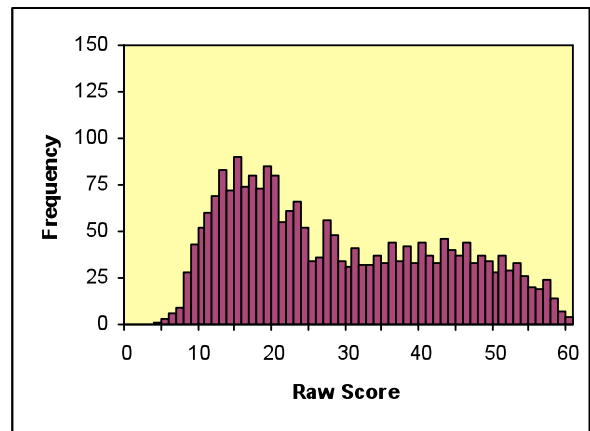
Score	Frequency	Percentage	Cumulative Percentage
200	0	0.0	0.0
202	0	0.0	0.0
204	10	0.4	0.4
206	37	1.6	2.0
208	95	4.1	6.1
210	0	0.0	6.1
212	129	5.5	11.6
214	155	6.6	18.2
216	244	10.4	28.7
218	354	15.2	43.9
220	152	6.5	50.4
222	36	1.5	51.9
224	56	2.4	54.3
226	48	2.1	56.4
228	34	1.5	57.8
230	31	1.3	59.1
232	41	1.8	60.9
234	0	0.0	60.9
236	32	1.4	62.3
238	32	1.4	63.6
240	70	3.0	66.6
242	44	1.9	68.5
244	34	1.5	70.0
246	75	3.2	73.2
248	44	1.9	75.1
250	37	1.6	76.7
252	33	1.4	78.1
254	86	3.7	81.8
256	37	1.6	83.3
258	44	1.9	85.2
260	70	3.0	88.2
262	62	2.7	90.9
264	66	2.8	93.7
266	59	2.5	96.2
268	20	0.9	97.1
270	19	0.8	97.9
272	24	1.0	98.9
274	0	0.0	98.9
276	14	0.6	99.5
278	0	0.0	99.5
280	11	0.5	100.0

**Figure 5.2.R-1:  
2008 MCAS  
Scaled Score Distribution  
High School (Grades 9/10) Chemistry**



N	2,335
Std. Deviation	19.66
Skewness	0.63
Kurtosis	-1.01

**Figure 5.2.R-2:  
2008 MCAS  
Raw Score Distribution  
High School (Grades 9/10) Chemistry**

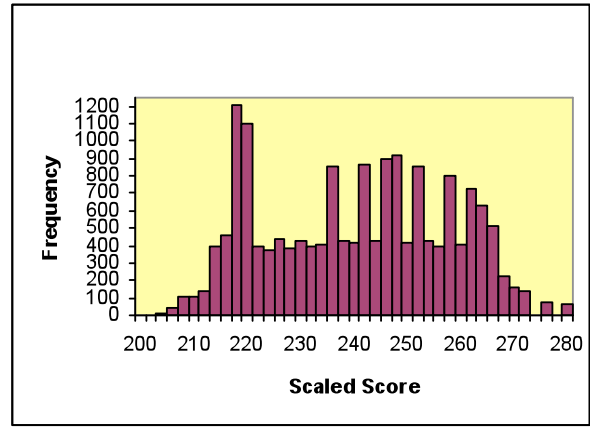


N	2,335
Std. Deviation	14.17
Skewness	0.42
Kurtosis	-1.04

**Table 5.2.2.17:**  
**2008 MCAS Scaled Score Distribution**  
**High School (Grades 9/10) Introductory**  
**Physics**

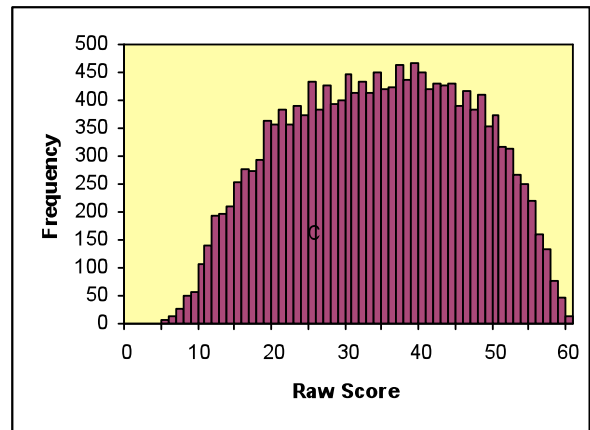
Score	Frequency	Percentage	Cumulative Percentage
200	1	0.0	0.0
202	0	0.0	0.0
204	7	0.0	0.0
206	39	0.2	0.3
208	107	0.6	0.9
210	108	0.6	1.5
212	141	0.8	2.4
214	390	2.3	4.7
216	461	2.7	7.4
218	1204	7.1	14.5
220	1100	6.5	20.9
222	390	2.3	23.2
224	372	2.2	25.4
226	433	2.5	28.0
228	383	2.3	30.2
230	426	2.5	32.7
232	393	2.3	35.0
234	401	2.4	37.4
236	860	5.1	42.4
238	432	2.5	45.0
240	413	2.4	47.4
242	870	5.1	52.5
244	425	2.5	55.0
246	899	5.3	60.3
248	917	5.4	65.7
250	421	2.5	68.2
252	855	5.0	73.2
254	430	2.5	75.7
256	390	2.3	78.0
258	800	4.7	82.7
260	411	2.4	85.1
262	725	4.3	89.4
264	633	3.7	93.1
266	516	3.0	96.2
268	221	1.3	97.5
270	161	0.9	98.4
272	134	0.8	99.2
274	0	0.0	99.2
276	76	0.4	99.6
278	0	0.0	99.6
280	60	0.4	100.0

**Figure 5.2.S-1:**  
**2008 MCAS**  
**Scaled Score Distribution**  
**High School (Grades 9/10) Introductory**  
**Physics**



N	17,005
Std. Deviation	17.09
Skewness	-0.03
Kurtosis	-1.10

**Figure 5.2.S-2:**  
**2008 MCAS**  
**Raw Score Distribution**  
**High School (Grades 9/10) Introductory**  
**Physics**

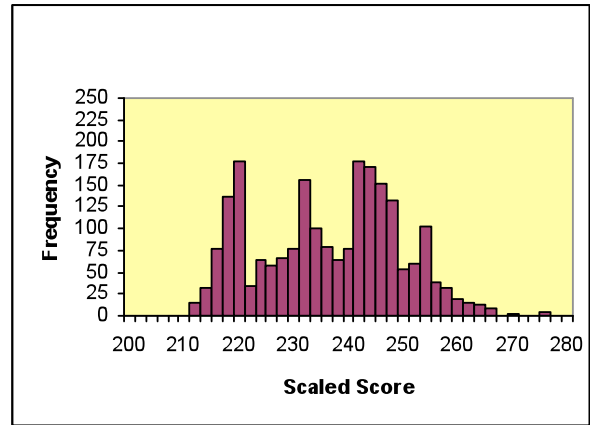


N	17,005
Std. Deviation	12.42
Skewness	-0.07
Kurtosis	-0.94

**Table 5.2.2.18:  
2008 MCAS Scaled Score Distribution  
High School (Grades 9/10)  
Technology/Engineering**

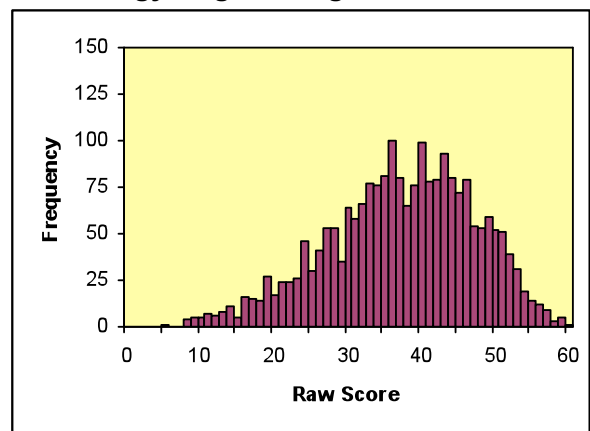
Score	Frequency	Percentage	Cumulative Percentage
200	0	0.0	0.0
202	0	0.0	0.0
204	0	0.0	0.0
206	0	0.0	0.0
208	1	0.0	0.0
210	0	0.0	0.0
212	14	0.6	0.7
214	32	1.5	2.1
216	77	3.5	5.6
218	137	6.2	11.9
220	177	8.1	19.9
222	35	1.6	21.5
224	64	2.9	24.4
226	58	2.6	27.1
228	66	3.0	30.1
230	77	3.5	33.6
232	157	7.1	40.7
234	100	4.5	45.3
236	80	3.6	48.9
238	65	3.0	51.9
240	76	3.5	55.3
242	177	8.1	63.4
244	172	7.8	71.2
246	152	6.9	78.1
248	133	6.1	84.2
250	53	2.4	86.6
252	59	2.7	89.3
254	103	4.7	93.9
256	39	1.8	95.7
258	31	1.4	97.1
260	19	0.9	98.0
262	14	0.6	98.6
264	12	0.5	99.2
266	9	0.4	99.6
268	0	0.0	99.6
270	3	0.1	99.7
272	0	0.0	99.7
274	0	0.0	99.7
276	5	0.2	100.0
278	0	0.0	100.0
280	1	0.0	100.0

**Figure 5.2.T-1:  
2008 MCAS  
Scaled Score Distribution  
High School (Grades 9/10)  
Technology/Engineering**



N	2,198
Std. Deviation	12.98
Skewness	0.01
Kurtosis	-0.79

**Figure 5.2.T-2:  
2008 MCAS  
Raw Score Distribution  
High School (Grades 9/10)  
Technology/Engineering**



N	2,198
Std. Deviation	10.02
Skewness	-0.40
Kurtosis	-0.23

## 5.3 MCAS-Alt Results

Results for the MCAS-Alt are reported according to the following seven performance levels:

- *Advanced (Above Proficient at grade 3)*
- *Proficient*
- *Needs Improvement*
- *Progressing*
- *Emerging*
- *Awareness*
- *Incomplete*

The MCAS-Alt performance levels of *Incomplete*, *Awareness*, *Emerging*, and *Progressing* are included in the *Warning/Failing* performance level data shown throughout this document and on MCAS reports of school and district results. Descriptions of the MCAS-Alt performance levels are provided in section 5.1.2.1 of the *2007 MCAS Technical Report*.

### 5.3.1 Performance Level Results

Tables 5.3.1-1 through 5.3.1-8 show the 2008 MCAS-Alt performance level results for each grade and content area.

**Table 5.3.1-1: 2008 MCAS-Alt  
Performance Level Results  
Grade 3 English Language Arts and Mathematics**

Performance Level Results				
Performance Level	Content Area			
	English Language Arts		Mathematics	
	Number	Percent*	Number	Percent*
Incomplete	85	7.78	66	6.12
Awareness	15	1.37	19	1.76
Emerging	76	6.96	55	5.1
Progressing	914	83.7	938	86.93
Needs Improvement	2	0.18	1	0.09
Proficient	0	0	0	0
Above Proficient	0	0	0	0
<b>Total</b>	<b>1092</b>		<b>1079</b>	

\*Percentages may not total 100 due to rounding.



**Table 5.3.1-2: 2008 MCAS-Ait  
Performance Level Results  
Grade 4 English Language Arts and Mathematics**

Performance Level Results				
Performance Level	Content Area			
	English Language Arts		Mathematics	
	Number	Percent*	Number	Percent*
Incomplete	74	5.98	92	7.43
Awareness	11	0.89	9	0.73
Emerging	83	6.7	47	3.79
Progressing	1068	86.27	1086	87.65
Needs Improvement	2	0.16	5	0.4
Proficient	0	0	0	0
Advanced	0	0	0	0
<b>Total</b>	<b>1238</b>		<b>1239</b>	

\*Percentages may not total 100 due to rounding.

**Table 5.3.1-3: 2008 MCAS-Ait  
Performance Level Results  
Grade 5 English Language Arts, Mathematics, and  
Science and Technology/Engineering**

Performance Level Results						
Performance Level	Content Area					
	English Language Arts		Mathematics		Science and Technology/Engineering	
	Number	Percent*	Number	Percent*	Number	Percent*
Incomplete	124	10.47	123	9.94	88	8.23
Awareness	15	1.27	12	0.97	9	0.84
Emerging	51	4.31	66	5.33	86	8.04
Progressing	994	83.95	1036	83.68	886	82.88
Needs Improvement	0	0	1	0.08	0	0
Proficient	0	0	0	0	0	0
Advanced	0	0	0	0	0	0
<b>Total</b>	<b>1184</b>		<b>1238</b>		<b>1069</b>	

\*Percentages may not total 100 due to rounding.

**Table 5.3.1-4: 2008 MCAS-Ait  
Performance Level Results  
Grade 6 English Language Arts and Mathematics**

Performance Level Results				
Performance Level	Content Area			
	English Language Arts		Mathematics	
	Number	Percent*	Number	Percent*
Incomplete	122	10.02	165	12.95
Awareness	16	1.31	20	1.57
Emerging	62	5.09	61	4.79
Progressing	1014	83.32	1024	80.38
Needs Improvement	3	0.25	4	0.31
Proficient	0	0	0	0
Advanced	0	0	0	0
<b>Total</b>	<b>1217</b>		<b>1274</b>	

\*Percentages may not total 100 due to rounding.

**Table 5.3.1-5: 2008 MCAS-Alt  
Performance Level Results  
Grade 7 English Language Arts and Mathematics**

Performance Level Results				
Performance Level	Content Area			
	English Language Arts		Mathematics	
	Number	Percent*	Number	Percent*
Incomplete	91	8.3	108	9.38
Awareness	15	1.37	22	1.91
Emerging	112	10.21	66	5.73
Progressing	878	80.04	955	82.9
Needs Improvement	1	0.09	1	0.09
Proficient	0	0	0	0
Advanced	0	0	0	0
<b>Total</b>	<b>1097</b>		<b>1152</b>	

\*Percentages may not total 100 due to rounding.

**Table 5.3.1-6: 2008 MCAS-Alt  
Performance Level Results  
Grade 8 English Language Arts, Mathematics, and  
Science and Technology/Engineering**

Performance Level Results						
Performance Level	Content Area					
	English Language Arts		Mathematics		Science and Technology/Engineering	
	Number	Percent*	Number	Percent*	Number	Percent*
Incomplete	117	12.04	116	11.01	83	8.77
Awareness	11	1.13	14	1.33	12	1.27
Emerging	49	5.04	44	4.17	113	11.95
Progressing	795	81.79	878	83.3	738	78.01
Needs Improvement	0	0	2	0.19	0	0
Proficient	0	0	0	0	0	0
Advanced	0	0	0	0	0	0
<b>Total</b>	<b>972</b>		<b>1054</b>		<b>946</b>	

\*Percentages may not total 100 due to rounding.

**Table 5.3.1-7: 2008 MCAS-Alt  
Performance Level Results  
Grade 10 English Language Arts and Mathematics**

Performance Level Results				
Performance Level	Content Area			
	English Language Arts		Mathematics	
	Number	Percent*	Number	Percent*
Incomplete	86	9.93	83	9.56
Awareness	16	1.85	15	1.73
Emerging	114	13.16	139	16.01
Progressing	650	75.06	630	72.58
Needs Improvement	0	0	1	0.12
Proficient	0	0	0	0
Advanced	0	0	0	0
<b>Total</b>	<b>866</b>		<b>868</b>	

\*Percentages may not total 100 due to rounding.

**Table 5.3.1-8: 2008 MCAS-Alt  
Performance Level Results  
High School (Grades 9/10) Science and Technology/Engineering**

Performance Level Results		
Performance Level	Content Area	
	Science and Technology/Engineering	
	Number	Percent*
Incomplete	153	17.15
Awareness	18	2.02
Emerging	103	11.55
Progressing	617	69.17
Needs Improvement	1	0.11
Proficient	0	0
Advanced	0	0
<b>Total</b>	<b>892</b>	

\*Percentages may not total 100 due to rounding.

### 5.3.2 Scoring Dimension Results

Tables 5.3.2.1-1 through 5.3.2.5-9 display 2008 results for the MCAS-Alt in each of the following scoring dimensions:

- Level of Complexity (section 5.3.2.1)
- Demonstration of Skills and Concepts (section 5.3.2.2)
- Independence (section 5.3.2.3)
- Self-Evaluation (section 5.3.2.4)
- Generalized Performance (section 5.3.2.5)

For information on the determination of score in each dimension, see section 4.2 of this document, as well as section 4.2 of the *2007 MCAS Technical Report*.

#### 5.3.2.1 Level of Complexity

In 2008, 94.46 percent of all portfolio strands received a Level of Complexity score of 3, signifying that the student was addressing learning standards below grade-level expectations. A small number (3.29 percent) of students accessed the learning standards through “access skills” and received a score of 2. A total of 2.22 percent of students received a score of 4 or 5, signifying that the student was addressing learning standards at or above grade-level expectations.

Tables 5.3.2.1-1 through 5.3.2.1-7 show the distribution of Level of Complexity scores on the 2008 MCAS-Alt by strand for each grade in the content area(s) tested at that grade. Table 5.3.2.1-8 shows Level of Complexity score distribution by strand for all tested grades combined.

**Table 5.3.2.1-1: 2008 MCAS-Ait  
Statewide Score Distribution for Level of Complexity by Strand, Grade 3**

Score Point	Content Area											
	English Language Arts Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			Mathematics NmbSn = Number Sense and Operations Pattnrs = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability					Science and Technology/Engineering Earth = Earth Science Life = Life Science Phys = Physical Sciences Tch/E = Technology/Engineering			
	Lang	Read	Comp	NmbSn	Pattnrs	Geom	Meas	Data	Earth	Life	Phys	Tch/E
1	0	0		0	0							
2	30	55		39	37							
3	1026	1005		1015	1006							
4	16	21		21	20							
5	2	3		1	1							

**Table 5.3.2.1-2: 2008 MCAS-Ait  
Statewide Score Distribution for Level of Complexity by Strand, Grade 4**

Score Point	Content Area											
	English Language Arts Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			Mathematics NmbSn = Number Sense and Operations Pattnrs = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability					Science and Technology/Engineering Earth = Earth Science Life = Life Science Phys = Physical Sciences Tch/E = Technology/Engineering			
	Lang	Read	Comp	NmbSn	Pattnrs	Geom	Meas	Data	Earth	Life	Phys	Tch/E
1	0	0	0	0				0				
2	33	42	27	28				26				
3	1155	1149	1161	1170				1183				
4	20	22	25	18				16				
5	4	4	3	5				5				

**Table 5.3.2.1-3: 2008 MCAS-Ait  
Statewide Score Distribution for Level of Complexity by Strand, Grade 5**

Score Point	Content Area											
	English Language Arts Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			Mathematics NmbSn = Number Sense and Operations Pattnrs = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability					Science and Technology/Engineering Earth = Earth Science Life = Life Science Phys = Physical Sciences Tch/E = Technology/Engineering			
	Lang	Read	Comp	NmbSn	Pattnrs	Geom	Meas	Data	Earth	Life	Phys	Tch/E
1	0	1		0			0		0	0	0	0
2	28	45		41			37		30	36	32	9
3	1095	1102		1150			1136		931	927	816	287
4	24	22		30			33		13	14	10	8
5	1	0		1			3		0	0	0	0

**Table 5.3.2.1-4: 2008 MCAS-Alt  
Statewide Score Distribution for Level of Complexity by Strand, Grade 6**

Score Point	Content Area											
	<b>English Language Arts</b> Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			<b>Mathematics</b> NmbSn = Number Sense and Operations Pattrns = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability					<b>Science and Technology/Engineering</b> Earth = Earth Science Life = Life Science Phys = Physical Sciences Tch/E = Technology/Engineering			
	Lang	Read	Comp	NmbSn	Pattrns	Geom	Meas	Data	Earth	Life	Phys	Tch/E
1	0	1		2	2							
2	36	44		39	37							
3	1133	1144		1192	1116							
4	15	16		37	36							
5	3	3		4	4							

**Table 5.3.2.1-5: 2008 MCAS-Alt  
Statewide Score Distribution for Level of Complexity by Strand, Grade 7**

Score Point	Content Area											
	<b>English Language Arts</b> Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			<b>Mathematics</b> NmbSn = Number Sense and Operations Pattrns = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability					<b>Science and Technology/Engineering</b> Earth = Earth Science Life = Life Science Phys = Physical Sciences Tch/E = Technology/Engineering			
	Lang	Read	Comp	NmbSn	Pattrns	Geom	Meas	Data	Earth	Life	Phys	Tch/E
1	0	0	0	1				1				
2	28	33	34	38				31				
3	1013	1033	1023	1090				1077				
4	19	17	12	18				19				
5	1	1	2	1				1				

**Table 5.3.2.1-6: 2008 MCAS-Alt  
Statewide Score Distribution for Level of Complexity by Strand, Grade 8**

Score Point	Content Area											
	<b>English Language Arts</b> Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			<b>Mathematics</b> NmbSn = Number Sense and Operations Pattrns = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability					<b>Science and Technology/Engineering</b> Earth = Earth Science Life = Life Science Phys = Physical Sciences Tch/E = Technology/Engineering			
	Lang	Read	Comp	NmbSn	Pattrns	Geom	Meas	Data	Earth	Life	Phys	Tch/E
1	0	1		0		0			0	0	0	2
2	24	41		36		28			33	31	29	24
3	895	903		973		970			792	812	599	380
4	18	13		38		35			23	27	21	6
5	0	0		2		2			1	1	1	2

**Table 5.3.2.1-7: 2008 MCAS-Ait  
Statewide Score Distribution for Level of Complexity by Strand,  
Grade 10 and High School (Grades 9/10)**

Content Area												
Score Point	English Language Arts (grade 10 only)			Mathematics (grade 10 only)					Science and Technology/Engineering (grades 9/10 end-of-course tests)			
	Lang	Read	Comp	NmbSn	Patrn	Geom	Meas	Data	Bio	Chem	Phys	T/E
1	0	1	0	0	0	0	0	0	2	0	0	0
2	35	29	42	18	19	19	9	13	75	4	10	5
3	811	797	802	688	476	431	419	431	1863	200	139	191
4	8	8	6	15	10	15	8	11	57	1	34	0
5	0	3	1	3	1	1	4	1	0	0	4	0

**Table 5.3.2.1-8: 2008 MCAS-Ait  
Statewide Score Distribution for Level of Complexity by Strand,  
All Tested Grades Combined**

Content Area																
Score Point	English Language Arts			Mathematics					Science and Technology/Engineering							
	Lang	Read	Comp	NmbSn	Patrn	Geom	Meas	Data	Grades 5 and 8				Grades 9/10			
	Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			NmbSn = Number Sense and Operations Patrn = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability					Earth = Earth Science Life = Life Science Phys = Physical Sciences Tch/E = Technology/Engineering				Bio = Biology Chem = Chemistry Phys = Introductory Physics T/E = Technology/Engineering			
1	1	3	0	3	2	0	0	1	0	0	0	2	2	0	0	2
2	208	302	96	237	93	47	46	72	63	67	61	33	75	4	10	33
3	7114	7138	2995	7291	2598	1401	1555	2678	1723	1739	1415	667	1863	200	139	667
4	120	117	45	175	66	50	41	48	36	41	31	14	57	1	34	14
5	14	12	5	17	6	3	7	7	1	1	1	2	0	0	4	2

Tables 5.3.2.1-9 and 5.3.2.1-10 show the 2008 statewide MCAS-Alt Composite Level of Complexity score distributions for all tested grades combined, by content area and for combined content areas, respectively.

**Table 5.3.2.1-9: 2008 MCAS-Alt Statewide Score Distribution for Composite Level of Complexity by Content Area, All Tested Grades Combined**

*ALT = portfolios for students with significant cognitive disabilities*

*GL = portfolios measured against grade-level learning standards*

*MOD = portfolios measured against modified learning standards*

*MIS = not determined due to missing data*

Score Point	Content Area			
	English Language Arts	Mathematics	Science and Technology/Engineering	
			Grades 5 & 8	High School (grades 9/10)
ALT	7173	7453	1848	788
GL	94	147	27	22
MOD	64	70	31	4
MIS	335	234	109	78

**Table 5.3.2.1-10: 2008 MCAS-Alt Statewide Score Distribution for Composite Level of Complexity, All Content Areas Combined**

*ALT = portfolios for students with significant cognitive disabilities*

*GL = portfolios measured against grade-level learning standards*

*MOD = portfolios measured against modified learning standards*

*MIS = not determined due to missing data*

Score Point	Grade Level	
	Grades 3–8 and 10	High School (Grades 9/10) End-of-Course Science and Technology/Engineering Tests
ALT	16474	788
GL	268	22
MOD	165	4
MIS	678	78

### 5.3.2.2 Demonstration of Skills and Concepts

Tables 5.3.2.2-1 through 5.3.2.2-7 show the 2008 statewide distribution of all MCAS-Alt scores for Demonstration of Skills and Concepts in all portfolio strands, by grade. Table 5.3.2.2-8 shows the statewide score distribution by strand for all tested grades combined.

**Table 5.3.2.2-1: 2008 MCAS-Alt  
Statewide Score Distribution for Demonstration of Skills and Concepts  
by Strand, Grade 3**

Score Point	Content Area											
	English Language Arts Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			Mathematics NmbSn = Number Sense and Operations Pattrns = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability					Science and Technology/Engineering Earth = Earth Science Life = Life Science Phys = Physical Sciences Tch/E = Technology/Engineering			
	Lang	Read	Comp	NmbSn	Pattrns	Geom	Meas	Data	Earth	Life	Phys	Tch/E
M	39	35		28	35							
1	0	0		0	1							
2	13	11		13	13							
3	71	96		87	65							
4	951	942		948	950							

**Table 5.3.2.2-2: 2008 MCAS-Alt  
Statewide Score Distribution for Demonstration of Skills and Concepts  
by Strand, Grade 4**

Score Point	Content Area											
	English Language Arts Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			Mathematics NmbSn = Number Sense and Operations Pattrns = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability					Science and Technology/Engineering Earth = Earth Science Life = Life Science Phys = Physical Sciences Tch/E = Technology/Engineering			
	Lang	Read	Comp	NmbSn	Pattrns	Geom	Meas	Data	Earth	Life	Phys	Tch/E
M	34	48	30	41				47				
1	2	2	1	1				3				
2	10	12	20	10				3				
3	65	71	88	77				66				
4	1101	1084	1077	1101				1102				



**Table 5.3.2.2-3: 2008 MCAS-Alt  
Statewide Score Distribution for Demonstration of Skills and Concepts  
by Strand, Grade 5**

Content Area												
<b>English Language Arts</b> Lang = Language Read = Literature (Reading) Comp = Composition (Writing)				<b>Mathematics</b> NmbSn = Number Sense and Operations Pattnrs = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability					<b>Science and Technology/Engineering</b> Earth = Earth Science Life = Life Science Phys = Physical Sciences Tch/E = Technology/Engineering			
Score Point	Lang	Read	Comp	NmbSn	Pattnrs	Geom	Meas	Data	Earth	Life	Phys	Tch/E
M	61	54		52			65		44	60	33	13
1	0	0		2			0		0	0	0	1
2	7	13		8			11		4	7	10	1
3	73	90		93			90		63	62	64	20
4	1007	1013		1067			1043		863	848	751	269

**Table 5.3.2.2-4: 2008 MCAS-Alt  
Statewide Score Distribution for Demonstration of Skills and Concepts  
by Strand, Grade 6**

Content Area												
<b>English Language Arts</b> Lang = Language Read = Literature (Reading) Comp = Composition (Writing)				<b>Mathematics</b> NmbSn = Number Sense and Operations Pattnrs = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability					<b>Science and Technology/Engineering</b> Earth = Earth Science Life = Life Science Phys = Physical Sciences Tch/E = Technology/Engineering			
Score Point	Lang	Read	Comp	NmbSn	Pattnrs	Geom	Meas	Data	Earth	Life	Phys	Tch/E
M	54	52		51	62							
1	0	0		0	0							
2	12	8		18	14							
3	81	101		99	86							
4	1040	1047		1106	1033							

**Table 5.3.2.2-5: 2008 MCAS-Alt  
Statewide Score Distribution for Demonstration of Skills and Concepts  
by Strand, Grade 7**

Content Area												
<b>English Language Arts</b> Lang = Language Read = Literature (Reading) Comp = Composition (Writing)				<b>Mathematics</b> NmbSn = Number Sense and Operations Pattnrs = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability					<b>Science and Technology/Engineering</b> Earth = Earth Science Life = Life Science Phys = Physical Sciences Tch/E = Technology/Engineering			
Score Point	Lang	Read	Comp	NmbSn	Pattnrs	Geom	Meas	Data	Earth	Life	Phys	Tch/E
M	46	43	48	46				51				
1	0	0	3	3				0				
2	16	13	13	13				18				
3	85	109	94	102				79				
4	914	919	913	984				981				

**Table 5.3.2.2-6: 2008 MCAS-Alt  
Statewide Score Distribution for Demonstration of Skills and Concepts  
by Strand, Grade 8**

Score Point	Content Area											
	<b>English Language Arts</b> Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			<b>Mathematics</b> NmbSn = Number Sense and Operations Pattrns = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability					<b>Science and Technology/Engineering</b> Earth = Earth Science Life = Life Science Phys = Physical Sciences Tch/E = Technology/Engineering			
	<i>Lang</i>	<i>Read</i>	<i>Comp</i>	<i>NmbSn</i>	<i>Pattrns</i>	<i>Geom</i>	<i>Meas</i>	<i>Data</i>	<i>Earth</i>	<i>Life</i>	<i>Phys</i>	<i>Tch/E</i>
M	51	48		64		56			43	70	32	29
1	0	1		0		1			1	1	1	1
2	10	11		7		13			12	11	7	7
3	68	73		95		73			61	51	55	21
4	808	825		883		892			732	738	555	356

**Table 5.3.2.2-7: 2008 MCAS-Alt  
Statewide Score Distribution for Demonstration of Skills and Concepts  
by Strand, Grade 10 and High School (Grades 9/10)**

Content Area												
<b>English Language Arts (grade 10 only)</b>			<b>Mathematics (grade 10 only)</b>					<b>Science and Technology/Engineering (grades 9/10 end-of-course tests)</b>				
Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			NmbSn = Number Sense and Operations Pattrn = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability					Bio = Biology Chem = Chemistry Phys = Introductory Physics T/E = Technology/Engineering				
Score Point	Lang	Read	Comp	NmbSn	Pattrn	Geom	Meas	Data	Bio	Chem	Phys	T/E
M	71	51	62	65	54	59	55	35	242	5	17	31
1	1	0	2	2	2	0	1	0	3	0	0	0
2	9	8	11	8	9	4	4	2	30	3	3	2
3	86	110	92	74	47	46	44	32	167	26	18	26
4	671	682	687	575	394	357	336	387	1555	171	149	137

**Table 5.3.2.2-8: 2008 MCAS-Alt  
Statewide Score Distribution for Demonstration of Skills and Concepts  
by Strand, All Tested Grades Combined**

Content Area																
<b>English Language Arts</b>				<b>Mathematics</b>					<b>Science and Technology/Engineering</b>							
Lang = Language Read = Literature (Reading) Comp = Composition (Writing)				NmbSn = Number Sense and Operations Pattrn = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability					<b>Grades 5 and 8</b>				<b>High School (Grades 9/10)</b>			
									Earth = Earth Science Life = Life Science Phys = Physical Sciences Tch/E = Technology/Engineering				Bio = Biology Chem = Chemistry Phys = Introductory Physics T/E = Technology/Engineering			
Score Point	Lang	Read	Comp	NmbSn	Pattrns	Geom	Meas	Data	Earth	Life	Phys	Tch/E	Bio	Chem	Phys	T/E
M	356	331	140	347	151	115	120	133	87	130	65	42	242	5	17	31
1	3	3	6	8	3	1	1	3	1	1	1	2	3	0	0	0
2	77	76	44	77	36	17	15	23	16	18	17	8	30	3	3	2
3	529	650	274	627	198	119	134	177	124	113	119	41	167	26	18	26
4	6492	6512	2677	6664	2377	1249	1379	2470	1595	1586	1306	625	1555	171	149	137

### 5.3.2.3 Independence

Tables 5.3.2.3-1 through 5.3.2.3-7 show the 2008 statewide distribution of MCAS-Alt scores for Independence in all strands, by grade. Table 5.3.2.3-8 shows the statewide score distribution by strand for all tested grades combined.

**Table 5.3.2.3-1: 2008 MCAS-Alt  
Statewide Score Distribution for Independence by Strand, Grade 3**

Score Point	Content Area											
	English Language Arts Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			Mathematics NmbSn = Number Sense and Operations Pattrns = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability					Science and Technology/Engineering Earth = Earth Science Life = Life Science Phys = Physical Sciences Tch/E = Technology/Engineering			
	Lang	Read	Comp	NmbSn	Pattrns	Geom	Meas	Data	Earth	Life	Phys	Tch/E
M	39	35		28	35							
1	3	11		3	7							
2	18	26		28	17							
3	106	118		114	109							
4	908	894		903	896							

**Table 5.3.2.3-2: 2008 MCAS-Alt  
Statewide Score Distribution for Independence by Strand, Grade 4**

Score Point	Content Area											
	English Language Arts Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			Mathematics NmbSn = Number Sense and Operations Pattrns = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability					Science and Technology/Engineering Earth = Earth Science Life = Life Science Phys = Physical Sciences Tch/E = Technology/Engineering			
	Lang	Read	Comp	NmbSn	Pattrns	Geom	Meas	Data	Earth	Life	Phys	Tch/E
M	34	48	30	41				47				
1	3	4	6	3				3				
2	17	17	28	19				13				
3	102	120	153	122				139				
4	1056	1028	999	1045				1019				

**Table 5.3.2.3-3: 2008 MCAS-Alt  
Statewide Score Distribution for Independence by Strand, Grade 5**

Score Point	Content Area											
	English Language Arts Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			Mathematics NmbSn = Number Sense and Operations Pattrns = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability					Science and Technology/Engineering Earth = Earth Science Life = Life Science Phys = Physical Sciences Tch/E = Technology/Engineering			
	Lang	Read	Comp	NmbSn	Pattrns	Geom	Meas	Data	Earth	Life	Phys	Tch/E
M	60	54		52			65		44	60	33	13
1	4	3		4			2		3	1	6	0
2	21	26		21			31		22	15	18	7
3	97	116		124			120		102	103	100	25
4	966	971		1021			991		803	798	701	259

**Table 5.3.2.3-4: 2008 MCAS-Ait  
Statewide Score Distribution for Independence by Strand, Grade 6**

Content Area												
<b>English Language Arts</b> Lang = Language Read = Literature (Reading) Comp = Composition (Writing)				<b>Mathematics</b> NmbSn = Number Sense and Operations Pattns = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability					<b>Science and Technology/Engineering</b> Earth = Earth Science Life = Life Science Phys = Physical Sciences Tch/E = Technology/Engineering			
Score Point	Lang	Read	Comp	NmbSn	Pattns	Geom	Meas	Data	Earth	Life	Phys	Tch/E
M	54	52		51	62							
1	4	7		5	8							
2	23	28		24	21							
3	136	120		145	110							
4	970	1001		1049	994							

**Table 5.3.2.3-5: 2008 MCAS-Ait  
Statewide Score Distribution for Independence by Strand, Grade 7**

Content Area												
<b>English Language Arts</b> Lang = Language Read = Literature (Reading) Comp = Composition (Writing)				<b>Mathematics</b> NmbSn = Number Sense and Operations Pattns = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability					<b>Science and Technology/Engineering</b> Earth = Earth Science Life = Life Science Phys = Physical Sciences Tch/E = Technology/Engineering			
Score Point	Lang	Read	Comp	NmbSn	Pattns	Geom	Meas	Data	Earth	Life	Phys	Tch/E
M	46	43	48	46				51				
1	7	8	13	12				13				
2	28	25	32	24				34				
3	111	121	141	137				120				
4	869	887	837	929				911				

**Table 5.3.2.3-6: 2008 MCAS-Ait  
Statewide Score Distribution for Independence by Strand, Grade 8**

Content Area												
<b>English Language Arts</b> Lang = Language Read = Literature (Reading) Comp = Composition (Writing)				<b>Mathematics</b> NmbSn = Number Sense and Operations Pattns = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability					<b>Science and Technology/Engineering</b> Earth = Earth Science Life = Life Science Phys = Physical Sciences Tch/E = Technology/Engineering			
Score Point	Lang	Read	Comp	NmbSn	Pattns	Geom	Meas	Data	Earth	Life	Phys	Tch/E
M	41	48		64		56			43	70	32	29
1	4	4		4		5			5	3	4	4
2	15	26		17		19			19	19	12	8
3	91	99		116		79			77	88	63	47
4	776	781		848		876			705	691	539	326

**Table 5.3.2.3-7: 2008 MCAS-AIT  
Statewide Score Distribution for Independence by Strand,  
Grade 10 and High School (Grades 9/10)**

Content Area												
Score Point	<i>English Language Arts (grade 10 only)</i>			<i>Mathematics (grade 10 only)</i>					<i>Science and Technology/Engineering (grades 9/10 end-of-course tests)</i>			
	<i>Lang</i>	<i>Read</i>	<i>Comp</i>	<i>NmbSn</i>	<i>Patrn</i>	<i>Geom</i>	<i>Meas</i>	<i>Data</i>	<i>Bio</i>	<i>Chem</i>	<i>Phys</i>	<i>T/E</i>
M	71	51	63	65	54	59	55	54	242	5	17	31
1	12	14	13	14	10	10	3	10	35	4	3	0
2	17	25	31	12	13	12	17	13	60	10	3	0
3	137	139	146	103	69	59	53	69	246	32	21	24
4	601	622	601	530	360	326	312	360	1414	154	143	141

**Table 5.3.2.3-8: 2008 MCAS-AIT  
Statewide Score Distribution for Independence by Strand,  
All Tested Grades Combined**

Content Area																
Score Point	<i>English Language Arts</i>			<i>Mathematics</i>					<i>Science and Technology/Engineering</i>							
	<i>Lang</i>	<i>Read</i>	<i>Comp</i>	<i>NmbSn</i>	<i>Patrn</i>	<i>Geom</i>	<i>Meas</i>	<i>Data</i>	<i>Grades 5 and 8</i>				<i>High School (Grades 9/10)</i>			
M	355	331	141	347	151	115	120	133	87	130	65	42	242	5	17	31
1	37	51	32	45	25	15	5	19	8	4	10	4	35	4	3	0
2	139	173	91	145	51	31	48	52	41	34	30	15	60	10	3	0
3	780	833	440	861	288	138	173	337	179	191	163	72	246	32	21	24
4	6146	6184	2437	6325	2250	1202	1303	2265	1508	1489	1240	585	1414	154	143	141

### 5.3.2.4 Self-Evaluation

Tables 5.3.2.4-1 through 5.3.2.4-7 show the 2008 statewide MCAS-Alt score distribution for Self-Evaluation in each content area, by grade. Table 5.3.2.4-8 shows the statewide score distribution by content area for all tested grades combined. Table 5.3.2.4-9 shows the 2008 statewide MCAS-Alt Self-Evaluation score distributions for all content areas combined.

**Table 5.3.2.4-1: 2008 MCAS-Alt  
Statewide Score Distribution for Self-Evaluation by Content Area,  
Grade 3**

Score Point	Content Area	
	English Language Arts	Mathematics
M	19	25
1	30	19
2	29	28
3	25	26
4	989	981

**Table 5.3.2.4-2: 2008 MCAS-Alt  
Statewide Score Distribution for Self-Evaluation by Content Area,  
Grade 4**

Score Point	Content Area	
	English Language Arts	Mathematics
M	26	42
1	15	14
2	56	17
3	47	28
4	1094	1138

**Table 5.3.2.4-3: 2008 MCAS-Alt  
Statewide Score Distribution for Self-Evaluation by Content Area,  
Grade 5**

Score Point	Content Area		
	English Language Arts	Mathematics	Science and Technology/ Engineering
M	25	27	28
1	41	36	14
2	17	22	53
3	26	24	56
4	1075	1129	918

**Table 5.3.2.4-4: 2008 MCAS-Alt  
Statewide Score Distribution for Self-Evaluation by Content Area,  
Grade 6**

Score Point	Content Area	
	English Language Arts	Mathematics
M	29	26
1	41	85
2	26	25
3	23	17
4	1098	1121

**Table 5.3.2.4-5: 2008 MCAS-Alt  
Statewide Score Distribution for Self-Evaluation by Content Area,  
Grade 7**

Score Point	Content Area	
	English Language Arts	Mathematics
M	17	29
1	14	40
2	74	16
3	44	16
4	948	1051

**Table 5.3.2.4-6: 2008 MCAS-Alt  
Statewide Score Distribution for Self-Evaluation by Content Area,  
Grade 8**

Score Point	Content Area		
	English Language Arts	Mathematics	Science and Technology/ Engineering
M	26	28	23
1	59	39	15
2	8	8	53
3	20	22	33
4	859	957	822

**Table 5.3.2.4-7: 2008 MCAS-Alt  
Statewide Score Distribution for Self-Evaluation by Content Area,  
Grade 10 and High School (Grades 9/10)**

Score Point	Content Area		
	English Language Arts (grade 10 only)	Mathematics (grade 10 only)	Science and Technology/ Engineering (grades 9/10)
M	43	42	44
1	13	15	45
2	51	28	49
3	64	59	55
4	695	724	699



**Table 5.3.2.4-8: 2008 MCAS-Alt  
Statewide Score Distribution for Self-Evaluation  
by Content Area, All Tested Grades Combined**

Score Point	Content Area			
	English Language Arts	Mathematics	Science and Technology/ Engineering	
			Grades 5 & 8	Grades 9/10
M	185	219	51	44
1	213	248	29	45
2	261	144	106	49
3	249	192	89	55
4	6758	7101	1740	699

**Table 5.3.2.4-9: 2008 MCAS-Alt  
Statewide Score Distribution for Self-Evaluation,  
All Content Areas Combined**

Score Point	Grade Level	
	Grades 3–8 and 10	High School (Grades 9/10) End-of-Course Science and Technology/Engineering Tests
M	455	44
1	490	45
2	511	49
3	530	55
4	15599	699

**5.3.2.5 Generalized Performance**

Tables 5.3.2.5-1 through 5.3.2.5-7 show the 2008 statewide MCAS-Alt score distributions for Generalized Performance for each content area, by grade. Table 5.3.2.5-8 shows the statewide score distribution by content area for all tested grades combined. Table 5.3.2.5-9 shows the statewide score distribution for all content areas combined.

**Table 5.3.2.5-1: 2008 MCAS-Alt Statewide Score Distribution  
for Generalized Performance by Content Area, Grade 3**

Score Point	Content Area	
	<i>English Language Arts</i>	<i>Mathematics</i>
1	57	44
2	133	105
3	902	930

**Table 5.3.2.5-2: 2008 MCAS-Alt Statewide Score Distribution for Generalized Performance by Content Area, Grade 4**

Score Point	Content Area	
	<i>English Language Arts</i>	<i>Mathematics</i>
1	57	48
2	59	120
3	1122	1071

**Table 5.3.2.5-3: 2008 MCAS-Alt Statewide Score Distribution for Generalized Performance by Content Area, Grade 5**

Score Point	Content Area		
	<i>English Language Arts</i>	<i>Mathematics</i>	<i>Science and Technology/Engineering</i>
1	70	69	44
2	143	96	26
3	971	1073	999

**Table 5.3.2.5-4: 2008 MCAS-Alt Statewide Score Distribution for Generalized Performance by Content Area, Grade 6**

Score Point	Content Area	
	<i>English Language Arts</i>	<i>Mathematics</i>
1	60	72
2	149	175
3	1008	1027

**Table 5.3.2.5-5: 2008 MCAS-Alt Statewide Score Distribution for Generalized Performance by Content Area, Grade 7**

Score Point	Content Area	
	<i>English Language Arts</i>	<i>Mathematics</i>
1	53	48
2	55	159
3	989	945

**Table 5.3.2.5-6: 2008 MCAS-Alt Statewide Score Distribution for Generalized Performance by Content Area, Grade 8**

Score Point	Content Area		
	<i>English Language Arts</i>	<i>Mathematics</i>	<i>Science and Technology/Engineering</i>
1	76	50	28
2	159	121	47
3	737	883	871

**Table 5.3.2.5-7: 2008 MCAS-Alt Statewide Score Distribution for Generalized Performance by Content Area, Grade 10 and High School (Grades 9/10)**

Score Point	Content Area		
	<i>English Language Arts (grade 10 only)</i>	<i>Mathematics (grade 10 only)</i>	<i>Science and Technology/Engineering (grades 9/10)</i>
1	44	44	40
2	65	57	67
3	757	767	785

**Table 5.3.2.5-8: 2008 MCAS-Alt Statewide Score Distribution  
for Generalized Performance by Content Area, All Tested Grades Combined**

Score Point	Content Area			
	English Language Arts	Mathematics	Science and Technology/Engineering	
			Grades 5 and 8	Grades 9/10
1	417	375	72	40
2	763	833	73	67
3	6486	6696	1870	785

**Table 5.3.2.5-9: 2008 MCAS-Alt Statewide Score Distribution  
for Generalized Performance,  
All Content Areas Combined**

Score Point	Grade Level	
	Grades 3–8 and 10	High School (Grades 9/10) End-of-Course Science and Technology/Engineering
1	864	40
2	1669	67
3	15052	785

### 5.3.3 MCAS-Alt Participation Data

MCAS-Alt student portfolios were measured against one of three sets of standards—*alternate achievement standards, modified achievement standards, or grade-level achievement standards*—based on the following criteria:

- the level of complexity of the evidence in the portfolio
- whether it was determined that the student was working at or near grade-level expectations, somewhat below grade-level expectations, or well below grade-level expectations (pursuant to U.S. Department of Education Title 1 regulations)

Tables 5.3.3-1 through 5.3.3-7 show statewide participation data for the 2008 MCAS-Alt disaggregated by method of measurement (i.e., the numbers and percentages of MCAS-Alts measured on grade-level standards and on alternate achievement standards).

**Table 5.3.3-1: 2008 MCAS-Alt Participation Results  
Grade 3 English Language Arts and Mathematics**

Assessment Format and Achievement Standard Measured	Content Area			
	English Language Arts		Mathematics	
	Number	Percent*	Number	Percent*
Standard MCAS test, measured on grade-level achievement standards	69192	98.45	69314	98.47
MCAS-Alt, measured on grade-level achievement standards	15	0.02	20	0.03
MCAS-Alt, measured on modified achievement standards	9	0.01	2	0.00
MCAS-Alt, measured on alternate achievement standards	1042	1.48	1041	1.48
MCAS-Alt, achievement standards level not determined	26	0.04	16	0.02
<b>Total</b>	<b>70284</b>		<b>70393</b>	

\*Percentages may not total 100 due to rounding.

**Table 5.3.3-2: 2008 MCAS-Alt Participation Results  
Grade 4 English Language Arts and Mathematics**

Assessment Format and Achievement Standard Measured	Content Area			
	English Language Arts		Mathematics	
	Number	Percent*	Number	Percent*
Standard MCAS test, measured on grade-level achievement standards	69924	98.26	70211	98.27
MCAS-Alt, measured on grade-level achievement standards	19	0.03	13	0.02
MCAS-Alt, measured on modified achievement standards	10	0.01	8	0.01
MCAS-Alt, measured on alternate achievement standards	1154	1.62	1194	1.67
MCAS-Alt, achievement standards level not determined	55	0.08	24	0.03
<b>Total</b>	<b>71162</b>		<b>71450</b>	

\*Percentages may not total 100 due to rounding.

**Table 5.3.3-3: 2008 MCAS-Alt Participation Results  
Grade 5 English Language Arts, Mathematics, and  
Science and Technology/Engineering**

Assessment Format and Achievement Standard Measured	Content Area					
	English Language Arts		Mathematics		Science and Technology/Engineering	
	Number	Percent*	Number	Percent*	Number	Percent*
Standard MCAS test, measured on grade-level achievement standards	69460	98.32	69510	98.25	69620	98.49
MCAS-Alt, measured on grade-level achievement standards	20	0.03	28	0.04	9	0.01
MCAS-Alt, measured on modified achievement standards	7	0.01	10	0.01	14	0.02
MCAS-Alt, measured on alternate achievement standards	1114	1.58	1166	1.65	985	1.39
MCAS-Alt, achievement standards level not determined	43	0.06	34	0.05	61	0.09
<b>Total</b>	<b>70644</b>		<b>70748</b>		<b>70689</b>	

\*Percentages may not total 100 due to rounding.

**Table 5.3.3-4: 2008 MCAS-Alt Participation Results  
Grade 6 English Language Arts and Mathematics**

Assessment Format and Achievement Standard Measured	Content Area			
	English Language Arts		Mathematics	
	Number	Percent*	Number	Percent*
Standard MCAS test, measured on grade-level achievement standards	70358	98.30	70405	98.22
MCAS-Alt, measured on grade-level achievement standards	12	0.02	30	0.04
MCAS-Alt, measured on modified achievement standards	7	0.01	15	0.02
MCAS-Alt, measured on alternate achievement standards	1156	1.62	1146	1.60
MCAS-Alt, achievement standards level not determined	42	0.06	83	0.12
<b>Total</b>	<b>71575</b>		<b>71679</b>	

\*Percentages may not total 100 due to rounding.

**Table 5.3.3-5: 2008 MCAS-Alt Participation Results  
Grade 7 English Language Arts and Mathematics**

Assessment Format and Achievement Standard Measured	Content Area			
	English Language Arts		Mathematics	
	Number	Percent*	Number	Percent*
Standard MCAS test, measured on grade-level achievement standards	71702	98.49	72017	98.43
MCAS-Alt, measured on grade-level achievement standards	10	0.01	15	0.02
MCAS-Alt, measured on modified achievement standards	12	0.02	8	0.01
MCAS-Alt, measured on alternate achievement standards	1003	1.38	1101	1.50
MCAS-Alt, achievement standards level not determined	72	0.10	28	0.04
<b>Total</b>	<b>72799</b>		<b>73169</b>	

\*Percentages may not total 100 due to rounding.

**Table 5.3.3-6: 2008 MCAS-Alt Participation Results  
Grade 8 English Language Arts, Mathematics, and  
Science and Technology/Engineering**

Assessment Format and Achievement Standard Measured	Content Area					
	English Language Arts		Mathematics		Science and Technology/Engineering	
	Number	Percent*	Number	Percent*	Number	Percent*
Standard MCAS test, measured on grade-level achievement standards	72296	98.67	72311	98.56	72257	98.71
MCAS-Alt, measured on grade-level achievement standards	11	0.02	28	0.04	18	0.02
MCAS-Alt, measured on modified achievement standards	12	0.02	17	0.02	17	0.02
MCAS-Alt, measured on alternate achievement standards	900	1.23	983	1.34	863	1.18
MCAS-Alt, achievement standards level not determined	49	0.07	26	0.04	48	0.07
<b>Total</b>	<b>73268</b>		<b>73365</b>		<b>73203</b>	

\*Percentages may not total 100 due to rounding.

**Table 5.3.3-7: 2008 MCAS-Alt Participation Results  
Grade 10 English Language Arts and Mathematics; and  
Grades 9/10 Science and Technology/Engineering**

Assessment Format and Achievement Standard Measured	Content Area					
	English Language Arts (grade 10 only)		Mathematics (grade 10 only)		Science and Technology/Engineering (grades 9/10)	
	Number	Percent*	Number	Percent*	Number	Percent*
Standard MCAS test, measured on grade-level achievement standards	70644	98.79	70298	98.78	80432	98.90
MCAS-Alt, measured on grade-level achievement standards	7	0.01	13	0.02	22	0.03
MCAS-Alt, measured on modified achievement standards	7	0.01	10	0.01	4	0.00
MCAS-Alt, measured on alternate achievement standards	804	1.12	822	1.16	788	0.97
MCAS-Alt, achievement standards level not determined	48	0.07	23	0.03	78	0.10
<b>Total</b>	<b>71510</b>		<b>71166</b>		<b>81324</b>	

\*Percentages may not total 100 due to rounding.

## 5.4 Reports of Test Results

### 5.4.1 Reports Generated

In addition to statewide results reported in the document *Spring 2008 MCAS Tests: Summary of State Results* (<http://www.doe.mass.edu/mcas/2008/results/summary.pdf>), results for the 2008 MCAS tests were provided to individual students and their parents/guardians, schools, and districts through the following MCAS reports:

- parent/guardian report
- school report
- district report
- test item analysis reports
  - school test item analysis roster
  - school test item analysis report summary
  - district test item analysis report summary

Each report was designed to disseminate information applicable only to the receiving party. A guide to interpreting the results was provided with each report; these interpretive guides are available at <http://www.doe.mass.edu/mcas/results.html>. Descriptions of the reports can be found in section 5.6 of the *2007 MCAS Technical Report*.

## 6. STATISTICAL AND PSYCHOMETRIC SUMMARIES

Both qualitative and quantitative analyses are conducted to ensure that MCAS questions meet the standards presented in the *Standards for Educational and Psychological Testing* (American Educational Research Association, American Psychological Association, & National Council on Measurement in Education 1999) and the *Code of Fair Testing Practices in Education* (Joint Committee on Testing Practices 1988). Three categories of statistical evaluations are performed to ensure that MCAS questions meet these standards:

- difficulty indices
- discrimination (item-to-total-score correlation)
- subgroup differences in item performance (differential item functioning, or DIF)

The results of these evaluations for the 2008 MCAS administration are presented below. Additional information and explanation about statistical evaluation, including guidance regarding comparisons among data and an explanation of DIF procedure, is presented in the *2007 MCAS Technical Report*.

### 6.1 Item Difficulty and Discrimination

The difficulty of MCAS items was measured by averaging the proportion of points received for an item across all students to whom the item was administered. Multiple-choice and short-answer items (i.e., dichotomous items) were scored correct or incorrect; for these items, the difficulty index was simply the proportion of students who answered correctly.

Open-response items and ELA Compositions (i.e., polytomous items) received scores within ranges specific to the item type.

- Open-response items were scored 0–4.
- ELA Compositions were scored by two different scorers, each of whom assigned a separate score for each ELA Composition scoring dimension:
  - one score for Standard English Conventions (1–4 points)
  - one score for Topic Development (1–6 points)The two scorers' scores were combined (summed) for each dimension, resulting in a final Standard English Conventions score in the range 2–8 and a final Topic Development score in the range 2–12.

For MCAS open-response items, the item-to-total-score correlation used as the discrimination index was the *Pearson product-moment* correlation; for MCAS dichotomous items, the *point-biserial* correlation was used.



### 6.1.1 Summary of Item Analysis Results

Summary statistics of the difficulty and discrimination indices for each item are provided in tables 6.1.1-1 through 6.1.1-7. In general, the 2008 MCAS item difficulty and discrimination indices were within acceptable and expected ranges.

Multiple-choice items generally had a lower level of difficulty and less discrimination than constructed-response items. The lower difficulty of multiple-choice items is expected due to the opportunity of guessing correctly, and the higher discrimination of constructed-response items is expected due to the correlation of a larger range of item score points with total test scores.

**Table 6.1.1-1: MCAS 2008  
Average Difficulty and Discrimination of Different Item Types  
English Language Arts, Grades 3–8 and 10**

Grade Level	Statistics	Item Type		
		All	Multiple-Choice	Open-Response and Writing Prompt
3	Difficulty	0.76 ( 0.13)	0.78 ( 0.10)	0.50 ( 0.13)
	Discrimination	0.43 ( 0.07)	0.42 ( 0.06)	0.50 ( 0.11)
	Number of Items	78	72	6
4	Difficulty	0.75 ( 0.12)	0.79 ( 0.07)	0.49 ( 0.03)
	Discrimination	0.42 ( 0.08)	0.41 ( 0.07)	0.56 ( 0.06)
	Number of Items	82	72	10
5	Difficulty	0.74 ( 0.11)	0.77 ( 0.08)	0.52 ( 0.04)
	Discrimination	0.42 ( 0.08)	0.40 ( 0.06)	0.54 ( 0.07)
	Number of Items	82	72	10
6	Difficulty	0.73 ( 0.12)	0.76 ( 0.10)	0.56 ( 0.05)
	Discrimination	0.42 ( 0.09)	0.40 ( 0.07)	0.57 ( 0.07)
	Number of Items	82	72	10
7	Difficulty	0.76 ( 0.11)	0.79 ( 0.09)	0.58 ( 0.09)
	Discrimination	0.43 ( 0.11)	0.39 ( 0.07)	0.65 ( 0.04)
	Number of Items	84	72	12
8	Difficulty	0.75 ( 0.11)	0.77 ( 0.09)	0.59 ( 0.05)
	Discrimination	0.43 ( 0.10)	0.40 ( 0.07)	0.63 ( 0.04)
	Number of Items	82	72	10
10	Difficulty	0.73 ( 0.10)	0.74 ( 0.10)	0.64 ( 0.07)
	Discrimination	0.39 ( 0.12)	0.34 ( 0.07)	0.64 ( 0.03)
	Number of Items	154	132	22

Numbers in parentheses denote standard deviations.

**Table 6.1.1-2: MCAS 2008**  
**Average Difficulty and Discrimination of Different Item Types**  
**Mathematics, Grades 3–8 and 10**

Grade Level	Statistics	Item Type		
		All	Multiple-Choice	Short-Answer and Open-Response
3	Difficulty	0.77 ( 0.11)	0.80 ( 0.10)	0.70 ( 0.11)
	Discrimination	0.43 ( 0.08)	0.42 ( 0.06)	0.45 ( 0.09)
	Number of Items	70	50	20
4	Difficulty	0.71 ( 0.16)	0.74 ( 0.14)	0.61 ( 0.17)
	Discrimination	0.43 ( 0.09)	0.41 ( 0.07)	0.51 ( 0.10)
	Number of Items	78	58	20
5	Difficulty	0.70 ( 0.12)	0.73 ( 0.12)	0.62 ( 0.12)
	Discrimination	0.47 ( 0.10)	0.44 ( 0.07)	0.55 ( 0.10)
	Number of Items	78	58	20
6	Difficulty	0.74 ( 0.10)	0.77 ( 0.09)	0.68 ( 0.11)
	Discrimination	0.48 ( 0.09)	0.45 ( 0.06)	0.57 ( 0.12)
	Number of Items	78	58	20
7	Difficulty	0.68 ( 0.11)	0.69 ( 0.11)	0.65 ( 0.10)
	Discrimination	0.49 ( 0.10)	0.46 ( 0.06)	0.59 ( 0.11)
	Number of Items	78	58	20
8	Difficulty	0.63 ( 0.15)	0.66 ( 0.14)	0.57 ( 0.14)
	Discrimination	0.48 ( 0.11)	0.45 ( 0.08)	0.59 ( 0.13)
	Number of Items	78	58	20
10	Difficulty	0.55 ( 0.13)	0.55 ( 0.13)	0.54 ( 0.13)
	Discrimination	0.45 ( 0.14)	0.39 ( 0.09)	0.63 ( 0.11)
	Number of Items	126	96	30

Numbers in parentheses denote standard deviations.

**Table 6.1.1-3: MCAS 2008**  
**Average Difficulty and Discrimination of Different Item Types**  
**Science and Technology/Engineering, Grades 5 and 8**

Grade Level	Statistics	Item Type		
		All	Multiple-Choice	Open-Response
5	Difficulty	0.71 ( 0.14)	0.74 ( 0.12)	0.54 ( 0.12)
	Discrimination	0.37 ( 0.08)	0.35 ( 0.07)	0.50 ( 0.08)
	Number of Items	78	68	10
8	Difficulty	0.64 ( 0.15)	0.65 ( 0.15)	0.52 ( 0.06)
	Discrimination	0.40 ( 0.12)	0.36 ( 0.08)	0.63 ( 0.06)
	Number of Items	78	68	10

Numbers in parentheses denote standard deviations.

**Table 6.1.1-4: MCAS 2008  
Average Difficulty and Discrimination of Different Item Types  
Biology, High School (Grades 9/10)**

Statistics	Item Type		
	All	Multiple-Choice	Open-Response
Difficulty	0.60 ( 0.15)	0.63 ( 0.14)	0.44 ( 0.12)
Discrimination	0.42 ( 0.13)	0.39 ( 0.08)	0.70 ( 0.04)
Number of Items	45	40	5

Numbers in parentheses denote standard deviations.

**Table 6.1.1-5: MCAS 2008  
Average Difficulty and Discrimination of Different Item Types  
Chemistry, High School (Grades 9/10)**

Statistics	Item Type		
	All	Multiple-Choice	Open-Response
Difficulty	0.51 ( 0.13)	0.53 ( 0.13)	0.39 ( 0.06)
Discrimination	0.46 ( 0.14)	0.43 ( 0.10)	0.76 ( 0.04)
Number of Items	45	40	5

Numbers in parentheses denote standard deviations.

**Table 6.1.1-6: MCAS 2008  
Average Difficulty and Discrimination of Different Item Types  
Introductory Physics, High School (Grades 9/10)**

Statistics	Item Type		
	All	Multiple-Choice	Open-Response
Difficulty	0.58 ( 0.16)	0.58 ( 0.17)	0.54 ( 0.09)
Discrimination	0.41 ( 0.12)	0.38 ( 0.09)	0.67 ( 0.03)
Number of Items	45	40	5

Numbers in parentheses denote standard deviations.

**Table 6.1.1-7: MCAS 2008  
Average Difficulty and Discrimination of Different Item Types  
Technology/Engineering, High School (Grades 9/10)**

Statistics	Item Type		
	All	Multiple-Choice	Open-Response
Difficulty	0.64 ( 0.14)	0.65 ( 0.15)	0.56 ( 0.10)
Discrimination	0.34 ( 0.09)	0.32 ( 0.07)	0.51 ( 0.09)
Number of Items	45	40	5

Numbers in parentheses denote standard deviations.

## 6.1.2 Differential Item Functioning (DIF)

The DIF procedure (Dorans and Kulick 1986) determines the difference in item performance for groups of students matched for achievement on the total test in the following ways:

- by calculating average item performance for students at every total score
- by calculating an overall average
- by weighting the total score distribution so it is the same for the two groups

For the 2008 MCAS tests, three subgroups were evaluated for DIF:

- male/female
- White/African American
- White/Hispanic

Other race/ethnicity groups (e.g., Asian) were not analyzed using DIF procedures because limited sample sizes would have inflated the type I error rates.

Computed DIF indices theoretically range from  $-1.00$  to  $1.00$  for multiple-choice items; those for constructed-response items (short-answer, open-response, and ELA Composition writing prompts) are adjusted to the same scale. Dorans and Holland (1993) suggest that index values between  $-0.05$  and  $0.05$ , dubbed Type A, should be considered “negligible.” Most 2008 MCAS items fell within this range. The authors further suggest that any item with a value between  $-0.10$  and  $-0.05$  or between  $0.05$  and  $0.10$  (Type B) could be considered “low” DIF, but should be inspected to ensure that no possible effect is overlooked. Finally, they recommend that any items with a value less than  $-0.10$  or greater than  $0.10$  (Type C) should be considered “high” DIF and be carefully examined. Each 2008 MCAS test item was categorized according to these guidelines.

#### **6.1.2.1 DIF Analysis by Test Form and Item Type**

Tables 6.1.2.1-1 to 6.1.2.1-20 show the number of items classified into each DIF category by test form and item type (i.e., multiple-choice or open-response—in English Language Arts, open-response includes ELA Composition writing prompts at grades 4, 7, and 10; in Mathematics, open-response includes short-answer items at all grades).

The counts of high DIF across forms are as follows:

- male versus female
  - 8 forms with 1 item high DIF
  - 3 forms with 2 items high DIF
  - 1 form with 3 or more items high DIF
- White versus African American
  - 23 forms with 1 item high DIF
  - 6 forms with 2 items high DIF
  - 5 forms with 3 or more items high DIF
- White versus Hispanic
  - 20 forms with 1 item high DIF
  - 6 forms with 2 items high DIF
  - 6 forms with 3 or more items high DIF

**Table 6.1.2.1-1: MCAS 2008  
DIF Analysis by Form  
English Language Arts, Grade 3**

*A = negligible DIF, B = low DIF, C = high DIF*

Form Number	Male/Female DIF Class									White/African American DIF Class									White/Hispanic DIF Class								
	All			MC			OR			All			MC			OR			All			MC			OR		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Common	41	1	0	39	1	0	2	0	0	39	3	0	37	3	0	2	0	0	39	2	1	37	2	1	2	0	0
01	9	0	0	8	0	0	1	0	0	9	0	0	8	0	0	1	0	0	9	0	0	8	0	0	1	0	0
02	8	1	0	7	1	0	1	0	0	9	0	0	8	0	0	1	0	0	9	0	0	8	0	0	1	0	0
13	9	0	0	8	0	0	1	0	0	8	1	0	7	1	0	1	0	0	8	0	1	7	0	1	1	0	0
14	9	0	0	8	0	0	1	0	0	8	1	0	7	1	0	1	0	0	8	1	0	7	1	0	1	0	0

**Table 6.1.2.1-2: MCAS 2008  
DIF Analysis by Form  
English Language Arts, Grade 4**

*A = negligible DIF, B = low DIF, C = high DIF*

Form Number	Male/Female DIF Class									White/African American DIF Class									White/Hispanic DIF Class								
	All			MC			OR			All			MC			OR			All			MC			OR		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Common	37	3	0	34	2	0	3	1	0	34	6	0	30	6	0	4	0	0	34	5	1	30	5	1	4	0	0
01	8	1	0	7	1	0	1	0	0	6	3	0	5	3	0	1	0	0	4	4	1	3	4	1	1	0	0
03	4	1	0	3	1	0	1	0	0	4	1	0	4	0	0	0	1	0	4	1	0	4	0	0	0	1	0
05	9	0	0	8	0	0	1	0	0	9	0	0	8	0	0	1	0	0	9	0	0	8	0	0	1	0	0
08	4	1	0	3	1	0	1	0	0	3	0	2	2	0	2	1	0	0	3	2	0	2	2	0	1	0	0
10	9	0	0	8	0	0	1	0	0	6	3	0	5	3	0	1	0	0	7	2	0	6	2	0	1	0	0
12	2	1	2	1	1	2	1	0	0	4	1	0	3	1	0	1	0	0	4	1	0	3	1	0	1	0	0

**Table 6.1.2.1-3: MCAS 2008  
DIF Analysis by Form  
English Language Arts, Grade 5**

*A = negligible DIF, B = low DIF, C = high DIF*

Form Number	Male/Female DIF Class									White/African American DIF Class									White/Hispanic DIF Class								
	All			MC			OR			All			MC			OR			All			MC			OR		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Common	35	5	0	32	4	0	3	1	0	35	3	2	31	3	2	4	0	0	32	7	1	28	7	1	4	0	0
01	8	1	0	7	1	0	1	0	0	7	2	0	6	2	0	1	0	0	8	1	0	7	1	0	1	0	0
03	5	0	0	4	0	0	1	0	0	4	1	0	3	1	0	1	0	0	5	0	0	4	0	0	1	0	0
05	8	1	0	8	0	0	0	1	0	9	0	0	8	0	0	1	0	0	8	1	0	7	1	0	1	0	0
08	5	0	0	4	0	0	1	0	0	3	1	1	2	1	1	1	0	0	5	0	0	4	0	0	1	0	0
10	8	1	0	7	1	0	1	0	0	8	1	0	7	1	0	1	0	0	7	2	0	6	2	0	1	0	0
12	4	1	0	3	1	0	1	0	0	5	0	0	4	0	0	1	0	0	5	0	0	4	0	0	1	0	0

**Table 6.1.2.1-4: MCAS 2008  
DIF Analysis by Form  
English Language Arts, Grade 6**  
*A = negligible DIF, B = low DIF, C = high DIF*

Form Number	Male/Female DIF Class									White/African American DIF Class									White/Hispanic DIF Class								
	All			MC			OR			All			MC			OR			All			MC			OR		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Common	37	2	1	34	1	1	3	1	0	31	8	1	27	8	1	4	0	0	33	6	1	29	6	1	4	0	0
01	8	1	0	8	0	0	0	1	0	9	0	0	8	0	0	1	0	0	8	1	0	7	1	0	1	0	0
03	2	3	0	1	3	0	1	0	0	4	1	0	3	1	0	1	0	0	4	1	0	3	1	0	1	0	0
05	8	1	0	7	1	0	1	0	0	6	1	2	5	1	2	1	0	0	7	2	0	6	2	0	1	0	0
08	5	0	0	4	0	0	1	0	0	4	1	0	3	1	0	1	0	0	4	1	0	3	1	0	1	0	0
10	6	3	0	5	3	0	1	0	0	5	4	0	4	4	0	1	0	0	6	3	0	5	3	0	1	0	0
12	4	1	0	4	0	0	0	1	0	2	2	1	1	2	1	1	0	0	2	3	0	1	3	0	1	0	0

**Table 6.1.2.1-5: MCAS 2008  
DIF Analysis by Form  
English Language Arts, Grade 7**  
*A = negligible DIF, B = low DIF, C = high DIF*

Form Number	Male/Female DIF Class									White/African American DIF Class									White/Hispanic DIF Class								
	All			MC			OR			All			MC			OR			All			MC			OR		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Common	40	2	0	34	2	0	6	0	0	33	8	1	27	8	1	6	0	0	35	7	0	29	7	0	6	0	0
01	8	1	0	7	1	0	1	0	0	8	1	0	7	1	0	1	0	0	9	0	0	8	0	0	1	0	0
03	3	2	0	2	2	0	1	0	0	4	1	0	4	0	0	0	1	0	4	1	0	3	1	0	1	0	0
05	7	2	0	6	2	0	1	0	0	5	4	0	4	4	0	1	0	0	4	5	0	3	5	0	1	0	0
08	4	1	0	3	1	0	1	0	0	2	3	0	1	3	0	1	0	0	4	1	0	3	1	0	1	0	0
10	5	4	0	4	4	0	1	0	0	8	1	0	7	1	0	1	0	0	6	3	0	5	3	0	1	0	0
12	4	1	0	3	1	0	1	0	0	4	1	0	3	1	0	1	0	0	4	1	0	4	0	0	0	1	0

**Table 6.1.2.1-6: MCAS 2008  
DIF Analysis by Form  
English Language Arts, Grade 8**  
*A = negligible DIF, B = low DIF, C = high DIF*

Form Number	Male/Female DIF Class									White/African American DIF Class									White/Hispanic DIF Class								
	All			MC			OR			All			MC			OR			All			MC			OR		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Common	31	8	1	29	6	1	2	2	0	35	5	0	31	5	0	4	0	0	35	4	1	31	4	1	4	0	0
01	7	2	0	6	2	0	1	0	0	7	2	0	6	2	0	1	0	0	8	1	0	7	1	0	1	0	0
03	4	1	0	4	0	0	0	1	0	3	1	1	2	1	1	1	0	0	3	1	1	2	1	1	1	0	0
05	6	2	1	6	1	1	0	1	0	8	1	0	7	1	0	1	0	0	7	1	1	6	1	1	1	0	0
08	5	0	0	4	0	0	1	0	0	4	1	0	3	1	0	1	0	0	3	1	1	2	1	1	1	0	0
10	8	1	0	8	0	0	0	1	0	9	0	0	8	0	0	1	0	0	8	1	0	7	1	0	1	0	0
12	5	0	0	4	0	0	1	0	0	4	1	0	3	1	0	1	0	0	5	0	0	4	0	0	1	0	0

**Table 6.1.2.1-7: MCAS 2008  
DIF Analysis by Form  
English Language Arts, Grade 10**

*A = negligible DIF, B = low DIF, C = high DIF*

Form Number	Male/Female DIF Class									White/African American DIF Class									White/Hispanic DIF Class								
	All			MC			OR			All			MC			OR			All			MC			OR		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Common	35	6	1	30	5	1	5	1	0	34	6	2	29	5	2	5	1	0	35	5	2	29	5	2	6	0	0
01	12	2	0	11	1	0	1	1	0	6	4	4	4	4	4	2	0	0	7	5	2	5	5	2	2	0	0
02	13	1	0	12	0	0	1	1	0	10	3	1	8	3	1	2	0	0	9	5	0	7	5	0	2	0	0
13	8	6	0	8	4	0	0	2	0	10	3	1	8	3	1	2	0	0	8	3	3	6	3	3	2	0	0
14	9	3	2	7	3	2	2	0	0	8	5	1	6	5	1	2	0	0	6	4	4	4	4	4	2	0	0
25	11	3	0	11	1	0	0	2	0	7	4	3	5	4	3	2	0	0	7	3	4	5	3	4	2	0	0
26	12	2	0	12	0	0	0	2	0	10	2	2	8	2	2	2	0	0	8	4	2	6	4	2	2	0	0
37	9	5	0	9	3	0	0	2	0	6	6	2	6	4	2	0	2	0	6	7	1	4	7	1	2	0	0
38	7	5	2	5	5	2	2	0	0	6	2	6	4	2	6	2	0	0	6	3	5	4	3	5	2	0	0

**Table 6.1.2.1-8: MCAS 2008  
DIF Analysis by Form  
Mathematics, Grade 3**

*A = negligible DIF, B = low DIF, C = high DIF*

Form Number	Male/Female DIF Class									White/African American DIF Class									White/Hispanic DIF Class								
	All			MC			OR			All			MC			OR			All			MC			OR		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Common	34	1	0	24	1	0	10	0	0	27	8	0	21	4	0	6	4	0	30	5	0	22	3	0	8	2	0
1	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0
2	1	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	0
3	3	0	0	2	0	0	1	0	0	1	2	0	1	1	0	0	1	0	3	0	0	2	0	0	1	0	0
4	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0
5	2	1	0	2	0	0	0	1	0	3	0	0	2	0	0	1	0	0	2	1	0	2	0	0	0	1	0
6	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0
7	3	0	0	2	0	0	1	0	0	2	1	0	1	1	0	1	0	0	3	0	0	2	0	0	1	0	0
8	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0
9	3	0	0	2	0	0	1	0	0	2	0	1	1	0	1	1	0	0	2	1	0	1	1	0	1	0	0
10	3	0	0	3	0	0	0	0	0	2	1	0	2	1	0	0	0	0	3	0	0	3	0	0	0	0	0
11	3	0	0	2	0	0	1	0	0	2	1	0	1	1	0	1	0	0	2	1	0	2	0	0	0	1	0
12	3	0	0	3	0	0	0	0	0	3	0	0	3	0	0	0	0	0	3	0	0	3	0	0	0	0	0
13	3	0	0	3	0	0	0	0	0	3	0	0	3	0	0	0	0	0	3	0	0	3	0	0	0	0	0
14	3	0	0	3	0	0	0	0	0	2	1	0	2	1	0	0	0	0	2	1	0	2	1	0	0	0	0
15	3	0	0	3	0	0	0	0	0	3	0	0	3	0	0	0	0	0	2	1	0	2	1	0	0	0	0

**Table 6.1.2.1-9: MCAS 2008  
DIF Analysis by Form  
Mathematics, Grade 4**

*A = negligible DIF, B = low DIF, C = high DIF*

Form Number	Male/Female DIF Class									White/African American DIF Class									White/Hispanic DIF Class								
	All			MC			OR			All			MC			OR			All			MC			OR		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Common	37	2	0	28	1	0	9	1	0	35	4	0	26	3	0	9	1	0	36	3	0	27	2	0	9	1	0
1	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0
2	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0
3	1	1	0	1	0	0	0	1	0	1	1	0	1	0	0	0	1	0	2	0	0	1	0	0	1	0	0
4	4	0	0	3	0	0	1	0	0	3	1	0	2	1	0	1	0	0	3	1	0	2	1	0	1	0	0
5	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0
6	3	1	0	2	1	0	1	0	0	2	1	1	1	1	1	1	0	0	2	1	1	1	1	1	1	0	0
7	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0
8	3	1	0	2	1	0	1	0	0	3	1	0	3	0	0	0	1	0	3	1	0	2	1	0	1	0	0
9	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0
10	2	1	0	2	1	0	0	0	0	2	0	1	2	0	1	0	0	0	2	1	0	2	1	0	0	0	0
11	0	2	0	0	1	0	0	1	0	1	1	0	0	1	0	1	0	0	2	0	0	1	0	0	1	0	0
12	2	1	0	2	1	0	0	0	0	3	0	0	3	0	0	0	0	0	3	0	0	3	0	0	0	0	0
13	2	1	0	2	1	0	0	0	0	0	2	1	0	2	1	0	0	0	2	0	1	2	0	1	0	0	0
14	2	1	0	2	1	0	0	0	0	2	1	0	2	1	0	0	0	0	3	0	0	3	0	0	0	0	0
15	3	0	0	3	0	0	0	0	0	3	0	0	3	0	0	0	0	0	3	0	0	3	0	0	0	0	0

**Table 6.1.2.1-10: MCAS 2008  
DIF Analysis by Form  
Mathematics, Grade 5**

*A = negligible DIF, B = low DIF, C = high DIF*

Form Number	Male/Female DIF Class									White/African American DIF Class									White/Hispanic DIF Class								
	All			MC			OR			All			MC			OR			All			MC			OR		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Common	33	6	0	23	6	0	10	0	0	36	3	0	26	3	0	10	0	0	37	2	0	27	2	0	10	0	0
1	0	1	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0
2	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0
3	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0
4	3	1	0	2	1	0	1	0	0	3	1	0	2	1	0	1	0	0	3	1	0	2	1	0	1	0	0
5	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0
6	4	0	0	3	0	0	1	0	0	4	0	0	3	0	0	1	0	0	4	0	0	3	0	0	1	0	0
7	1	1	0	0	1	0	1	0	0	1	1	0	0	1	0	1	0	0	2	0	0	1	0	0	1	0	0
8	4	0	0	3	0	0	1	0	0	4	0	0	3	0	0	1	0	0	4	0	0	3	0	0	1	0	0
9	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0
10	1	2	0	1	2	0	0	0	0	2	0	1	2	0	1	0	0	0	3	0	0	3	0	0	0	0	0
11	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0
12	3	0	0	3	0	0	0	0	0	3	0	0	3	0	0	0	0	0	3	0	0	3	0	0	0	0	0
13	3	0	0	3	0	0	0	0	0	2	1	0	2	1	0	0	0	0	3	0	0	3	0	0	0	0	0
14	3	0	0	3	0	0	0	0	0	3	0	0	3	0	0	0	0	0	2	1	0	2	1	0	0	0	0
15	3	0	0	3	0	0	0	0	0	3	0	0	3	0	0	0	0	0	2	1	0	2	1	0	0	0	0



**Table 6.1.2.1-11: MCAS 2008  
DIF Analysis by Form  
Mathematics, Grade 6**

*A = negligible DIF, B = low DIF, C = high DIF*

Form Number	Male/Female DIF Class									White/African American DIF Class									White/Hispanic DIF Class								
	All			MC			OR			All			MC			OR			All			MC			OR		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Common	36	2	1	26	2	1	10	0	0	35	4	0	26	3	0	9	1	0	38	1	0	28	1	0	10	0	0
1	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0
2	1	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	0
3	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0
4	4	0	0	3	0	0	1	0	0	3	1	0	3	0	0	0	1	0	4	0	0	3	0	0	1	0	0
5	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0
6	3	1	0	2	1	0	1	0	0	2	2	0	1	2	0	1	0	0	3	1	0	2	1	0	1	0	0
7	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0	1	1	0	0	1	0	1	0	0
8	4	0	0	3	0	0	1	0	0	3	1	0	2	1	0	1	0	0	4	0	0	3	0	0	1	0	0
9	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0
10	2	1	0	2	1	0	0	0	0	3	0	0	3	0	0	0	0	0	3	0	0	3	0	0	0	0	0
11	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0
12	3	0	0	3	0	0	0	0	0	3	0	0	3	0	0	0	0	0	3	0	0	3	0	0	0	0	0
13	3	0	0	3	0	0	0	0	0	3	0	0	3	0	0	0	0	0	3	0	0	3	0	0	0	0	0
14	3	0	0	3	0	0	0	0	0	2	1	0	2	1	0	0	0	0	3	0	0	3	0	0	0	0	0
15	3	0	0	3	0	0	0	0	0	3	0	0	3	0	0	0	0	0	3	0	0	3	0	0	0	0	0

**Table 6.1.2.1-12: MCAS 2008  
DIF Analysis by Form  
Mathematics, Grade 7**

*A = negligible DIF, B = low DIF, C = high DIF*

Form Number	Male/Female DIF Class									White/African American DIF Class									White/Hispanic DIF Class								
	All			MC			OR			All			MC			OR			All			MC			OR		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Common	31	8	0	23	6	0	8	2	0	34	5	0	26	3	0	8	2	0	38	1	0	29	0	0	9	1	0
1	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0
2	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0
3	1	1	0	1	0	0	0	1	0	1	1	0	1	0	0	0	1	0	1	1	0	0	1	0	1	0	0
4	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0
5	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0
6	2	1	0	1	1	0	1	0	0	3	0	0	2	0	0	1	0	0	3	0	0	2	0	0	1	0	0
7	4	0	0	3	0	0	1	0	0	4	0	0	3	0	0	1	0	0	4	0	0	3	0	0	1	0	0
8	4	0	0	3	0	0	1	0	0	4	0	0	3	0	0	1	0	0	2	2	0	1	2	0	1	0	0
9	5	0	0	4	0	0	1	0	0	5	0	0	4	0	0	1	0	0	4	1	0	3	1	0	1	0	0
10	4	1	0	3	1	0	1	0	0	5	0	0	4	0	0	1	0	0	5	0	0	4	0	0	1	0	0
11	3	1	0	3	1	0	0	0	0	4	0	0	4	0	0	0	0	0	4	0	0	4	0	0	0	0	0
12	4	0	0	4	0	0	0	0	0	4	0	0	4	0	0	0	0	0	4	0	0	4	0	0	0	0	0

**Table 6.1.2.1-13: MCAS 2008  
DIF Analysis by Form  
Mathematics, Grade 8**

*A = negligible DIF, B = low DIF, C = high DIF*

Form Number	Male/Female DIF Class									White/African American DIF Class									White/Hispanic DIF Class								
	All			MC			OR			All			MC			OR			All			MC			OR		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Common	33	6	0	25	4	0	8	2	0	34	5	0	25	4	0	9	1	0	35	4	0	26	3	0	9	1	0
1	2	0	0	1	0	0	1	0	0	1	1	0	0	1	0	1	0	0	1	1	0	0	1	0	1	0	0
2	1	1	0	1	0	0	0	1	0	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0
3	1	1	0	0	1	0	1	0	0	2	0	0	1	0	0	1	0	0	0	2	0	0	1	0	0	1	0
4	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0
5	2	0	0	1	0	0	1	0	0	1	1	0	1	0	0	1	0	0	1	1	0	0	1	0	1	0	0
6	2	1	0	1	1	0	1	0	0	1	1	1	0	1	1	1	0	0	3	0	0	2	0	0	1	0	0
7	4	0	0	3	0	0	1	0	0	4	0	0	3	0	0	1	0	0	4	0	0	3	0	0	1	0	0
8	3	1	0	2	1	0	1	0	0	3	1	0	2	1	0	1	0	0	4	0	0	3	0	0	1	0	0
9	5	0	0	4	0	0	1	0	0	4	1	0	3	1	0	1	0	0	5	0	0	4	0	0	1	0	0
10	4	1	0	3	1	0	1	0	0	2	3	0	1	3	0	1	0	0	4	1	0	3	1	0	1	0	0
11	4	0	0	4	0	0	0	0	0	4	0	0	4	0	0	0	0	0	3	1	0	3	1	0	0	0	0
12	4	0	0	4	0	0	0	0	0	2	2	0	2	2	0	0	0	0	4	0	0	4	0	0	0	0	0

**Table 6.1.2.1-14: MCAS 2008  
DIF Analysis by Form  
Mathematics, Grade 10**

*A = negligible DIF, B = low DIF, C = high DIF*

Form Number	Male/Female DIF Class									White/African American DIF Class									White/Hispanic DIF Class								
	All			MC			OR			All			MC			OR			All			MC			OR		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Common	40	2	0	30	2	0	10	0	0	39	3	0	29	3	0	10	0	0	41	1	0	31	1	0	10	0	0
01	4	0	0	4	0	0	0	0	0	4	0	0	4	0	0	0	0	0	2	2	0	2	2	0	0	0	0
02	3	0	0	2	0	0	1	0	0	2	0	1	1	0	1	1	0	0	2	1	0	2	0	0	0	1	0
03	4	0	0	4	0	0	0	0	0	3	1	0	3	1	0	0	0	0	2	0	2	2	0	2	0	0	0
04	2	1	0	0	1	0	2	0	0	0	3	0	0	1	0	0	2	0	1	2	0	0	1	0	1	1	0
05	2	2	0	1	2	0	1	0	0	2	1	1	1	1	1	1	0	0	2	1	1	1	1	1	1	0	0
06	3	0	0	2	0	0	1	0	0	2	1	0	1	1	0	1	0	0	1	1	1	1	0	1	0	1	0
07	3	1	0	3	0	0	0	1	0	2	2	0	1	2	0	1	0	0	1	3	0	0	3	0	1	0	0
08	3	0	0	2	0	0	1	0	0	1	2	0	1	1	0	0	1	0	1	2	0	0	2	0	1	0	0
09	3	1	0	2	1	0	1	0	0	3	1	0	3	0	0	0	1	0	4	0	0	3	0	0	1	0	0
10	2	1	0	1	1	0	1	0	0	2	0	1	1	0	1	1	0	0	3	0	0	2	0	0	1	0	0
11	4	0	0	4	0	0	0	0	0	4	0	0	4	0	0	0	0	0	4	0	0	4	0	0	0	0	0
12	3	0	0	2	0	0	1	0	0	3	0	0	2	0	0	1	0	0	2	1	0	1	1	0	1	0	0
13	4	0	0	4	0	0	0	0	0	4	0	0	4	0	0	0	0	0	3	1	0	3	1	0	0	0	0
14	2	0	0	2	0	0	0	0	0	2	0	0	2	0	0	0	0	0	1	1	0	1	1	0	0	0	0
15	4	0	0	4	0	0	0	0	0	2	2	0	2	2	0	0	0	0	4	0	0	4	0	0	0	0	0
16	2	0	0	1	0	0	1	0	0	1	1	0	1	0	0	0	1	0	0	2	0	0	1	0	0	1	0
17	3	1	0	2	1	0	1	0	0	2	1	1	1	1	1	1	0	0	1	2	1	1	1	1	0	1	0
18	3	0	0	2	0	0	1	0	0	2	1	0	1	1	0	1	0	0	3	0	0	2	0	0	1	0	0
19	4	0	0	3	0	0	1	0	0	4	0	0	3	0	0	1	0	0	1	2	1	1	1	1	0	1	0
20	2	1	0	2	0	0	0	1	0	3	0	0	2	0	0	1	0	0	3	0	0	2	0	0	1	0	0
21	4	0	0	3	0	0	1	0	0	0	4	0	0	3	0	0	1	0	3	1	0	2	1	0	1	0	0
22	3	0	0	2	0	0	1	0	0	0	2	1	0	1	1	0	1	0	0	3	0	0	2	0	0	1	0
23	4	0	0	4	0	0	0	0	0	4	0	0	4	0	0	0	0	0	3	1	0	3	1	0	0	0	0
24	2	1	0	1	1	0	1	0	0	1	2	0	1	1	0	0	1	0	2	1	0	2	0	0	0	1	0
26	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0
28	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0

**Table 6.1.2.1-15: MCAS 2008  
DIF Analysis by Form  
Science and Technology/Engineering, Grade 5**

*A = negligible DIF, B = low DIF, C = high DIF*

Form Number	Male/Female DIF Class									White/African American DIF Class									White/Hispanic DIF Class								
	All			MC			OR			All			MC			OR			All			MC			OR		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Common	35	3	1	31	2	1	4	1	0	34	5	0	29	5	0	5	0	0	35	2	2	30	2	2	5	0	0
1	3	0	0	3	0	0	0	0	0	2	1	0	2	1	0	0	0	0	1	2	0	1	2	0	0	0	0
2	4	0	0	4	0	0	0	0	0	3	1	0	3	1	0	0	0	0	4	0	0	4	0	0	0	0	0
3	3	0	0	2	0	0	1	0	0	3	0	0	2	0	0	1	0	0	3	0	0	2	0	0	1	0	0
4	3	0	0	3	0	0	0	0	0	2	0	1	2	0	1	0	0	0	3	0	0	3	0	0	0	0	0
5	3	0	0	3	0	0	0	0	0	1	2	0	1	2	0	0	0	0	2	1	0	2	1	0	0	0	0
6	4	0	0	3	0	0	1	0	0	3	1	0	2	1	0	1	0	0	4	0	0	3	0	0	1	0	0
7	3	0	0	2	0	0	1	0	0	2	1	0	2	0	0	0	1	0	2	1	0	2	0	0	0	1	0
8	3	0	0	2	0	0	1	0	0	3	0	0	2	0	0	1	0	0	3	0	0	2	0	0	1	0	0
9	3	0	0	3	0	0	0	0	0	2	1	0	2	1	0	0	0	0	2	1	0	2	1	0	0	0	0
10	2	1	0	2	1	0	0	0	0	2	1	0	2	1	0	0	0	0	2	1	0	2	1	0	0	0	0
11	3	0	0	3	0	0	0	0	0	2	1	0	2	1	0	0	0	0	2	0	1	2	0	1	0	0	0
12	3	1	0	2	1	0	1	0	0	3	1	0	2	1	0	1	0	0	3	1	0	2	1	0	1	0	0

**Table 6.1.2.1-16: MCAS 2008  
DIF Analysis by Form  
Science and Technology/Engineering, Grade 8**

*A = negligible DIF, B = low DIF, C = high DIF*

Form Number	Male/Female DIF Class									White/African American DIF Class									White/Hispanic DIF Class								
	All			MC			OR			All			MC			OR			All			MC			OR		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Common	33	6	0	29	5	0	4	1	0	35	4	0	32	2	0	3	2	0	32	7	0	29	5	0	3	2	0
1	3	0	0	3	0	0	0	0	0	1	2	0	1	2	0	0	0	0	3	0	0	3	0	0	0	0	0
2	4	0	0	4	0	0	0	0	0	3	1	0	3	1	0	0	0	0	4	0	0	4	0	0	0	0	0
3	1	2	0	1	1	0	0	1	0	3	0	0	2	0	0	1	0	0	3	0	0	2	0	0	1	0	0
4	2	0	1	2	0	1	0	0	0	2	0	1	2	0	1	0	0	0	3	0	0	3	0	0	0	0	0
5	2	0	1	2	0	1	0	0	0	3	0	0	3	0	0	0	0	0	3	0	0	3	0	0	0	0	0
6	4	0	0	3	0	0	1	0	0	4	0	0	3	0	0	1	0	0	3	1	0	2	1	0	1	0	0
7	3	0	0	2	0	0	1	0	0	2	1	0	1	1	0	1	0	0	3	0	0	2	0	0	1	0	0
8	2	1	0	1	1	0	1	0	0	2	1	0	1	1	0	1	0	0	2	0	1	1	0	1	1	0	0
9	3	0	0	3	0	0	0	0	0	1	1	1	1	1	1	0	0	0	2	0	1	2	0	1	0	0	0
10	2	1	0	2	1	0	0	0	0	2	1	0	2	1	0	0	0	0	1	2	0	1	2	0	0	0	0
11	2	1	0	2	1	0	0	0	0	2	1	0	2	1	0	0	0	0	2	1	0	2	1	0	0	0	0
12	4	0	0	3	0	0	1	0	0	3	1	0	2	1	0	1	0	0	4	0	0	3	0	0	1	0	0

**Table 6.1.2.1-17: MCAS 2008  
DIF Analysis by Form  
High School Biology (Grades 9/10)**  
*A = negligible DIF, B = low DIF, C = high DIF*

Form Number	Male/Female DIF Class									White/African American DIF Class									White/Hispanic DIF Class								
	All			MC			OR			All			MC			OR			All			MC			OR		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Common	42	3	0	37	3	0	5	0	0	41	4	0	36	4	0	5	0	0	43	2	0	38	2	0	5	0	0

**Table 6.1.2.1-18: MCAS 2008  
DIF Analysis by Form  
High School Chemistry (Grades 9/10)**  
*A = negligible DIF, B = low DIF, C = high DIF*

Form Number	Male/Female DIF Class									White/African American DIF Class									White/Hispanic DIF Class								
	All			MC			OR			All			MC			OR			All			MC			OR		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Common	42	3	0	37	3	0	5	0	0	28	14	3	24	13	3	4	1	0	29	12	4	25	11	4	4	1	0

**Table 6.1.2.1-19: MCAS 2008  
DIF Analysis by Form  
High School Introductory Physics (Grades 9/10)**  
*A = negligible DIF, B = low DIF, C = high DIF*

Form Number	Male/Female DIF Class									White/African American DIF Class									White/Hispanic DIF Class								
	All			MC			OR			All			MC			OR			All			MC			OR		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Common	37	8	0	32	8	0	5	0	0	31	13	1	27	12	1	4	1	0	38	5	2	34	4	2	4	1	0

**Table 6.1.2.1-20: MCAS 2008  
DIF Analysis by Form  
High School Technology/Engineering (Grades 9/10)**  
*A = negligible DIF, B = low DIF, C = high DIF*

Form Number	Male/Female DIF Class									White/African American DIF Class									White/Hispanic DIF Class								
	All			MC			OR			All			MC			OR			All			MC			OR		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Common	29	10	6	27	7	6	2	3	0	26	12	7	21	12	7	5	0	0	29	6	10	25	5	10	4	1	0

### 6.1.2.2 DIF Categorization by Gender and Item Type

Tables 6.1.2.2-1 through 6.1.2.2-7 show the number of items, by item type, in each of the three DIF categories that favor males or females. Considering only common items (on which individual student scores are based):

- On three tests, one common item was categorized as having high DIF (e.g., grade 5 Science and Technology/Engineering).
- On three tests, two common items had high DIF (e.g., grade 4 ELA).
- Two high school tests had more than four items with high DIF (grade 10 ELA had five items and high school Technology/Engineering had six items).

**Table 6.1.2.2-1: MCAS 2008  
DIF Categorization of Common Items by Gender and Item Type  
English Language Arts  
Grades 3–8 and 10**

*MC = multiple-choice, OR = open-response and writing prompt*

Grade Level	Item Type	Negligible DIF				Low DIF				High DIF			
		Favor Female	Favor Male	Number	%	Favor Female	Favor Male	Number	%	Favor Female	Favor Male	Number	%
3	MC	38	32	70	97	0	2	2	3	0	0	0	0
	OR	6	0	6	100	0	0	0	0	0	0	0	0
4	MC	32	32	64	89	0	6	6	8	0	2	2	3
	OR	9	0	9	90	1	0	1	10	0	0	0	0
5	MC	29	36	65	90	2	5	7	10	0	0	0	0
	OR	8	0	8	80	2	0	2	20	0	0	0	0
6	MC	18	45	63	88	0	8	8	11	0	1	1	1
	OR	7	0	7	70	3	0	3	30	0	0	0	0
7	MC	12	47	59	82	0	13	13	18	0	0	0	0
	OR	12	0	12	100	0	0	0	0	0	0	0	0
8	MC	24	37	61	85	2	7	9	13	0	2	2	3
	OR	5	0	5	50	5	0	5	50	0	0	0	0
10	MC	50	55	105	80	5	17	22	17	0	5	5	4
	OR	11	0	11	50	11	0	11	50	0	0	0	0

**Table 6.1.2.2-2: MCAS 2008  
DIF Categorization of Common Items by Gender and Item Type  
Mathematics  
Grades 3–8 and 10**

*MC = multiple-choice, OR = open-response and short-answer*

Grade Level	Item Type	Negligible DIF				Low DIF				High DIF			
		Favor Female	Favor Male	Number	%	Favor Female	Favor Male	Number	%	Favor Female	Favor Male	Number	%
3	MC	29	20	49	98	0	1	1	2	0	0	0	0
	OR	9	10	19	95	0	1	1	5	0	0	0	0
4	MC	27	23	50	86	0	8	8	14	0	0	0	0
	OR	12	5	17	85	0	3	3	15	0	0	0	0
5	MC	30	18	48	83	2	8	10	17	0	0	0	0
	OR	15	4	19	95	1	0	1	5	0	0	0	0
6	MC	29	24	53	91	0	4	4	7	0	1	1	2
	OR	12	8	20	100	0	0	0	0	0	0	0	0
7	MC	27	22	49	84	6	3	9	16	0	0	0	0
	OR	13	4	17	85	0	3	3	15	0	0	0	0
8	MC	29	21	50	86	2	6	8	14	0	0	0	0
	OR	14	3	17	85	1	2	3	15	0	0	0	0
10	MC	41	46	87	91	3	6	9	9	0	0	0	0
	OR	19	9	28	93	1	1	2	7	0	0	0	0

**Table 6.1.2.2-3: MCAS 2008**  
**DIF Categorization of Common Items by Gender and Item Type**  
**Science and Technology/Engineering**  
**Grades 5 and 8**

*MC = multiple-choice, OR = open-response*

Grade Level	Item Type	Negligible DIF				Low DIF				High DIF			
		Favor Female	Favor Male	Number	%	Favor Female	Favor Male	Number	%	Favor Female	Favor Male	Number	%
5	MC	25	38	63	93	0	4	4	6	0	1	1	1
	OR	6	3	9	90	1	0	1	10	0	0	0	0
8	MC	28	29	57	84	2	7	9	13	0	2	2	3
	OR	8	0	8	80	2	0	2	20	0	0	0	0

**Table 6.1.2.2-4: MCAS 2008**  
**DIF Categorization of Common Items by Gender and Item Type**  
**High School Biology (Grades 9/10)**

*MC = multiple-choice, OR = open-response*

Item Type	Negligible DIF				Low DIF				High DIF			
	Favor Female	Favor Male	Number	%	Favor Female	Favor Male	Number	%	Favor Female	Favor Male	Number	%
MC	20	17	37	93	0	3	3	8	0	0	0	0
OR	4	1	5	100	0	0	0	0	0	0	0	0

**Table 6.1.2.2-5: MCAS 2008**  
**DIF Categorization of Common Items by Gender and Item Type**  
**High School Chemistry (Grades 9/10)**

*MC = multiple-choice, OR = open-response*

Item Type	Negligible DIF				Low DIF				High DIF			
	Favor Female	Favor Male	Number	%	Favor Female	Favor Male	Number	%	Favor Female	Favor Male	Number	%
MC	19	18	37	93	0	3	3	8	0	0	0	0
OR	4	1	5	100	0	0	0	0	0	0	0	0

**Table 6.1.2.2-6: MCAS 2008**  
**DIF Categorization of Common Items by Gender and Item Type**  
**High School Introductory Physics (Grades 9/10)**

*MC = multiple-choice, OR = open-response*

Item Type	Negligible DIF				Low DIF				High DIF			
	Favor Female	Favor Male	Number	%	Favor Female	Favor Male	Number	%	Favor Female	Favor Male	Number	%
MC	19	13	32	80	4	4	8	20	0	0	0	0
OR	1	4	5	100	0	0	0	0	0	0	0	0

**Table 6.1.2.2-7: MCAS 2008**  
**DIF Categorization of Common Items by Gender and Item Type**  
**High School Technology/Engineering (Grades 9/10)**

*MC = multiple-choice, OR = open-response*

Item Type	Negligible DIF				Low DIF				High DIF			
	Favor Female	Favor Male	Number	%	Favor Female	Favor Male	Number	%	Favor Female	Favor Male	Number	%
MC	13	14	27	68	1	6	7	18	0	6	6	15
OR	1	1	2	40	3	0	3	60	0	0	0	0

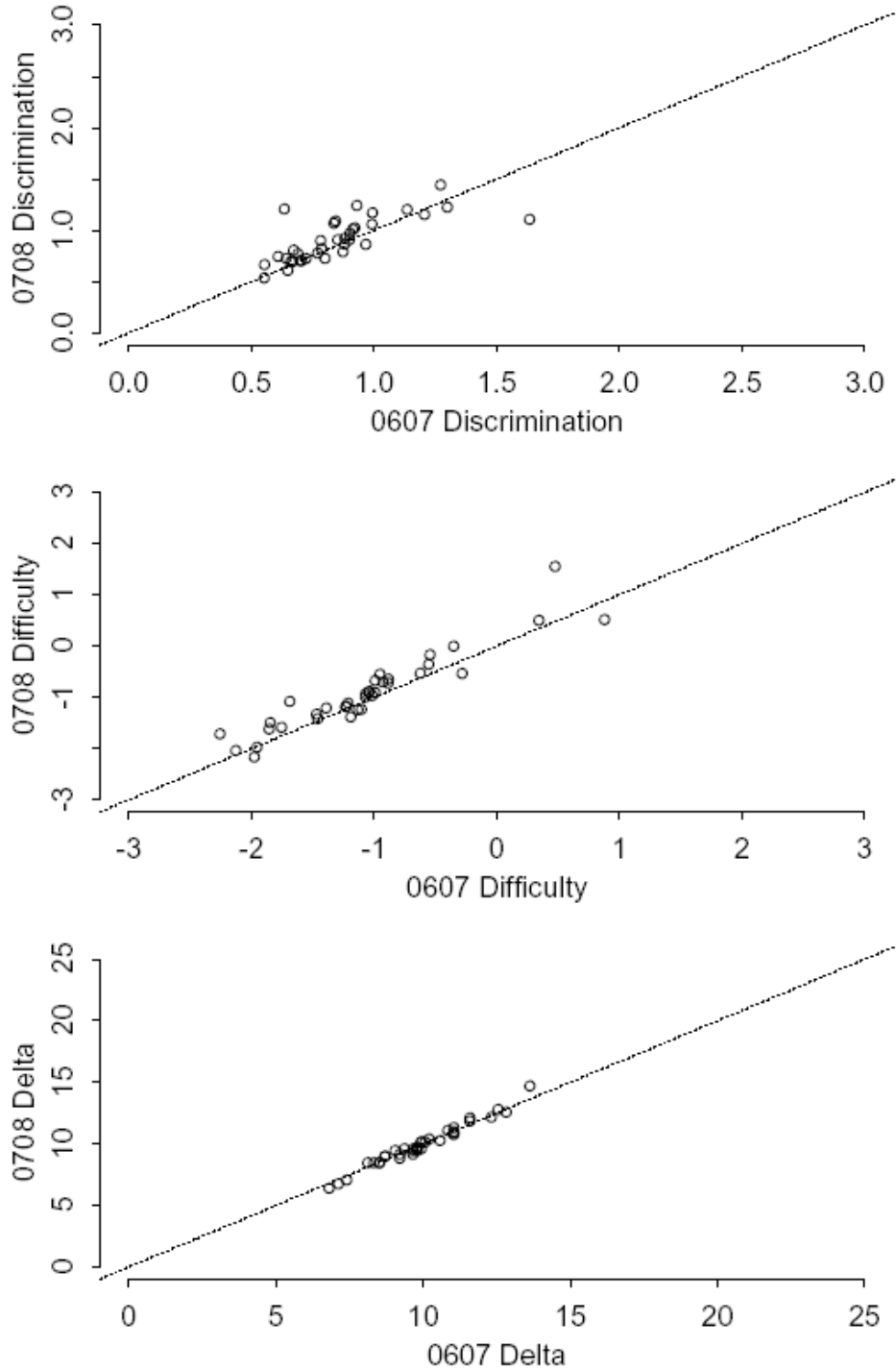
### **6.1.3 Item Response Theory (IRT) Analyses**

For MCAS 2008, the three-parameter logistic (3PL) model was used for dichotomous items. The graded-response model (GRM) was used for polytomous items. Detailed definitions of the 3PL model and the GRM are presented in the *2007 MCAS Technical Report*, along with descriptions of how item category characteristic curves (ICCCs), item characteristic curves (ICCs), and test characteristic curves (TCCs) are computed.

Figure 6.1.3 on pages 77–116 presents, for each MCAS grade and content area test combination, a comparison between the 2008 and 2007 discrimination and difficulty indices, with the 2008 TCC. The 2007 TCC is included when applicable.

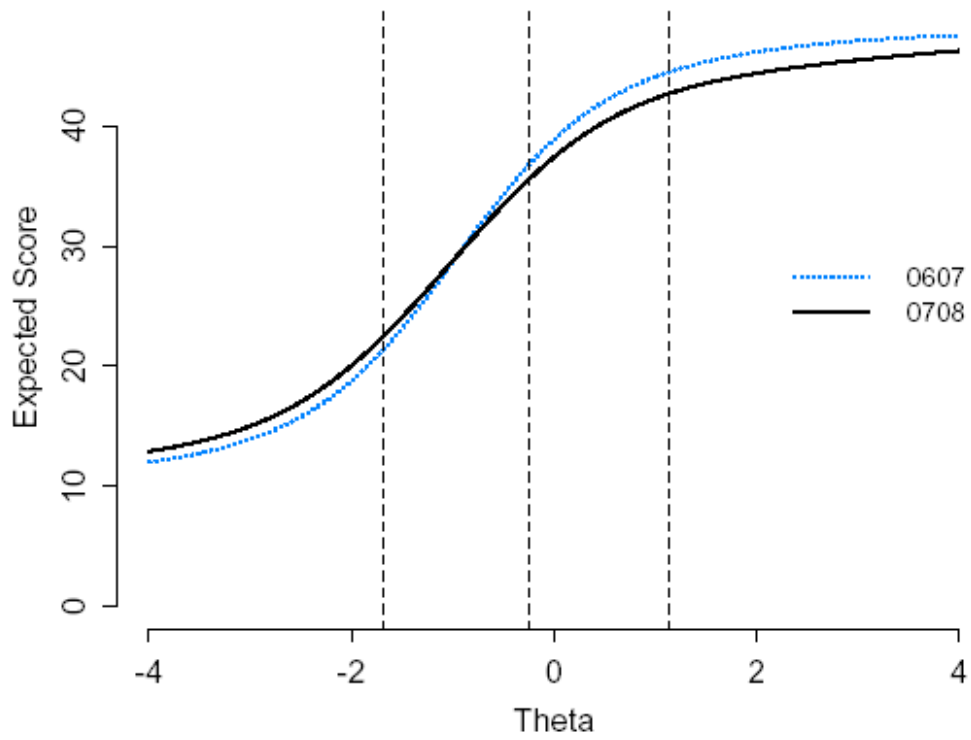
**Figure 6.1.3:**  
**MCAS 2008 Administration Calibration Statistics**  
**By Grade and Content Area**

**MCAS 2007–08 Grade 03—ELA**



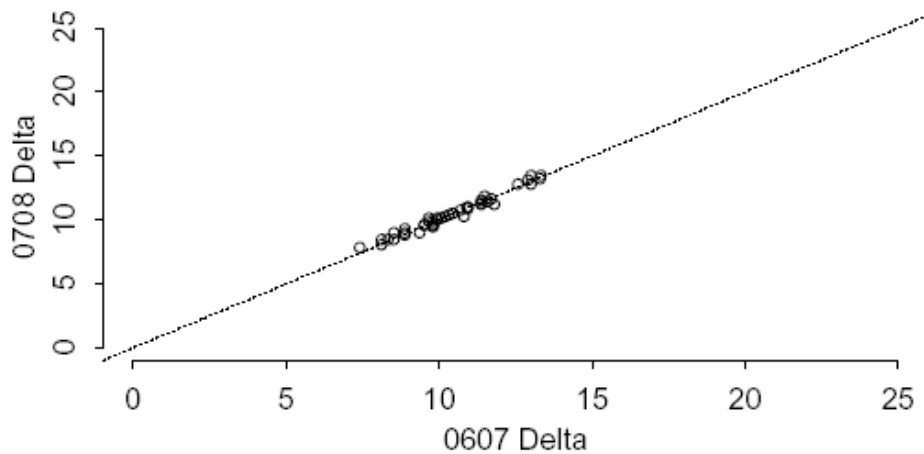
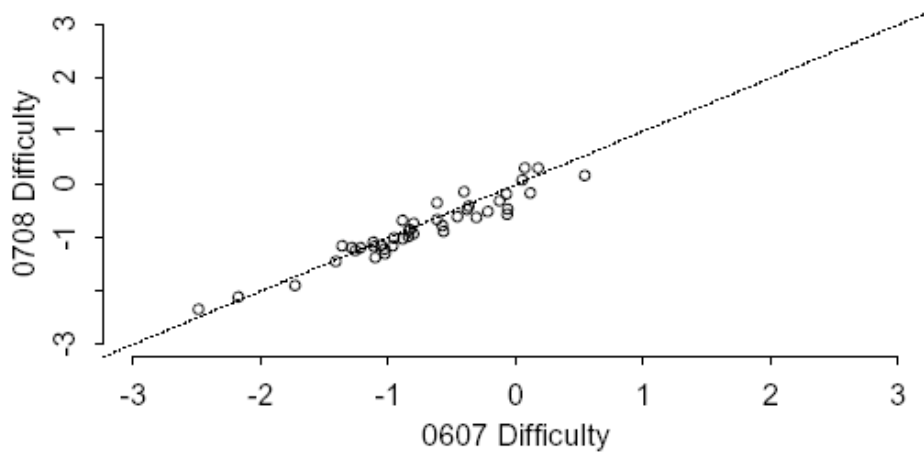
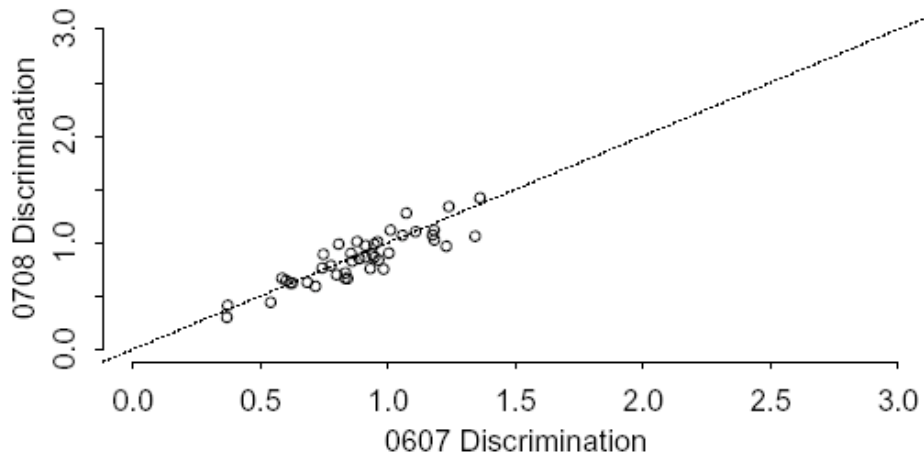
MCAS0708 Grade 03 ela



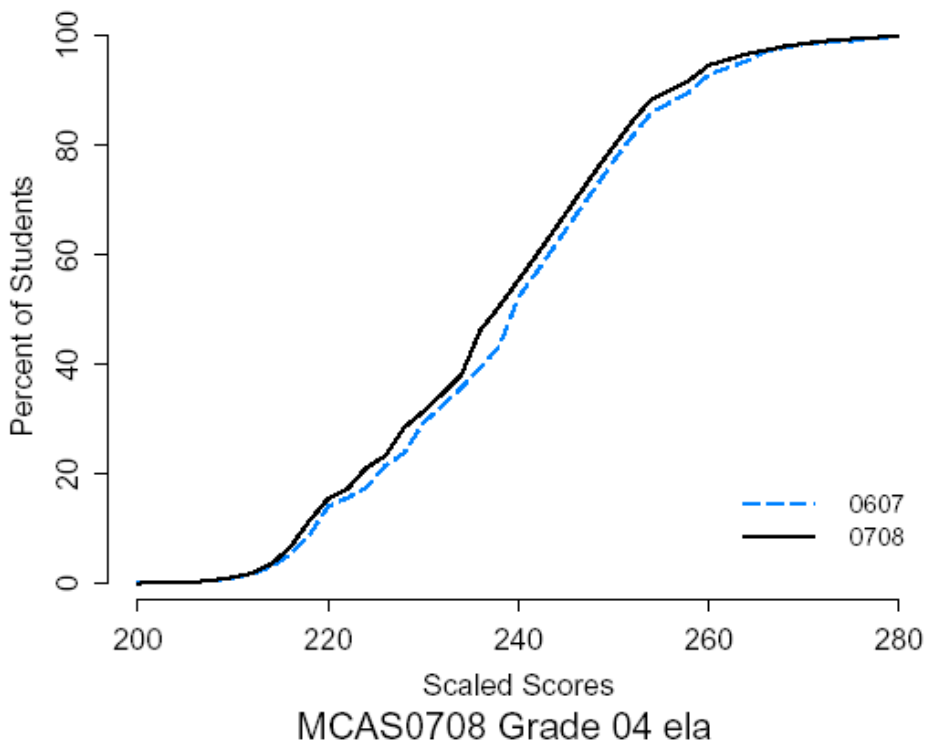
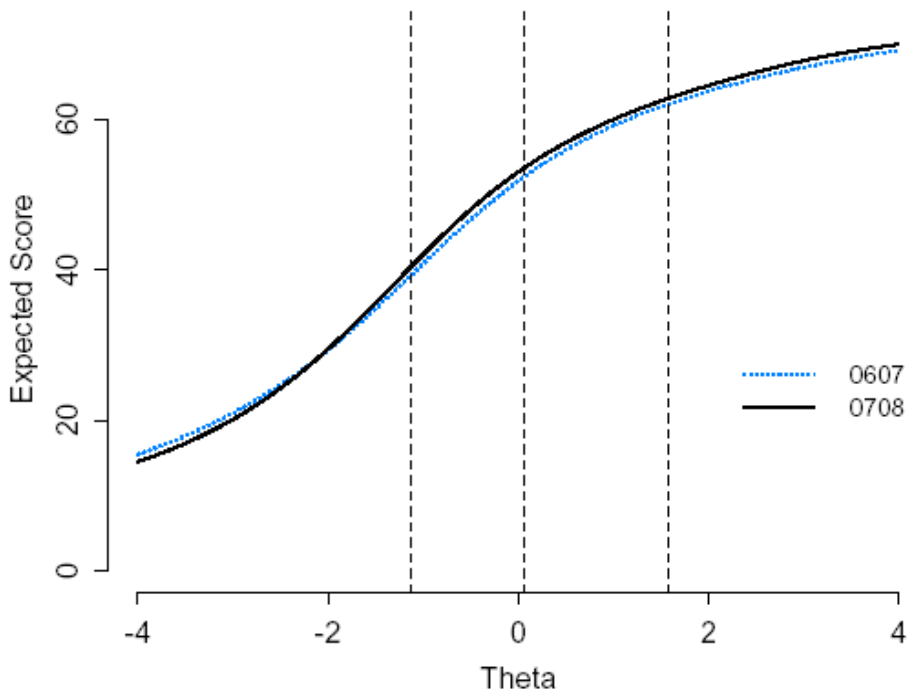


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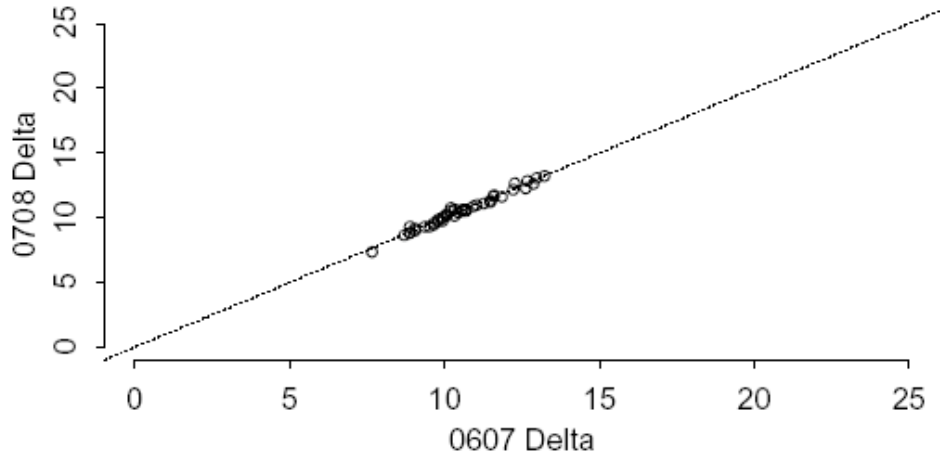
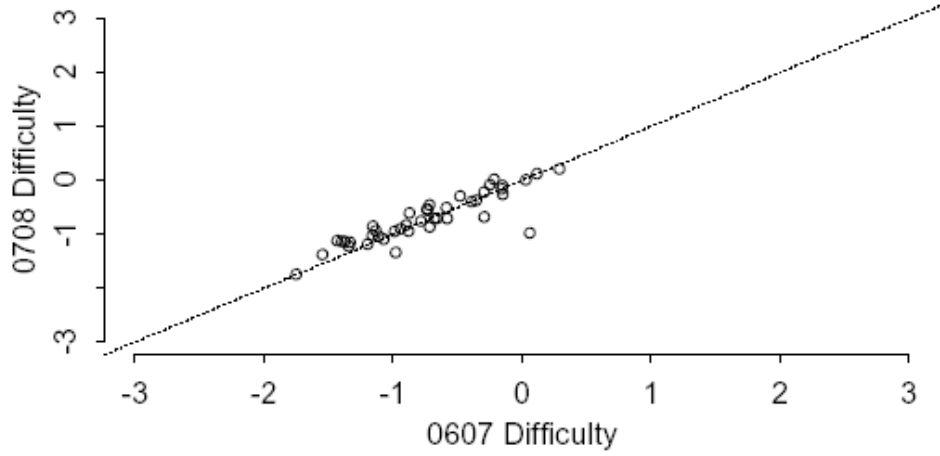
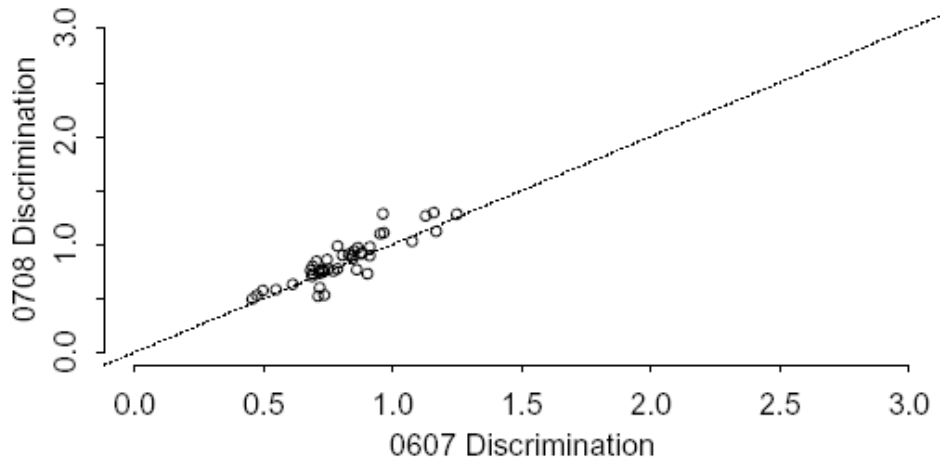
MCAS 2007–08 Grade 04—ELA



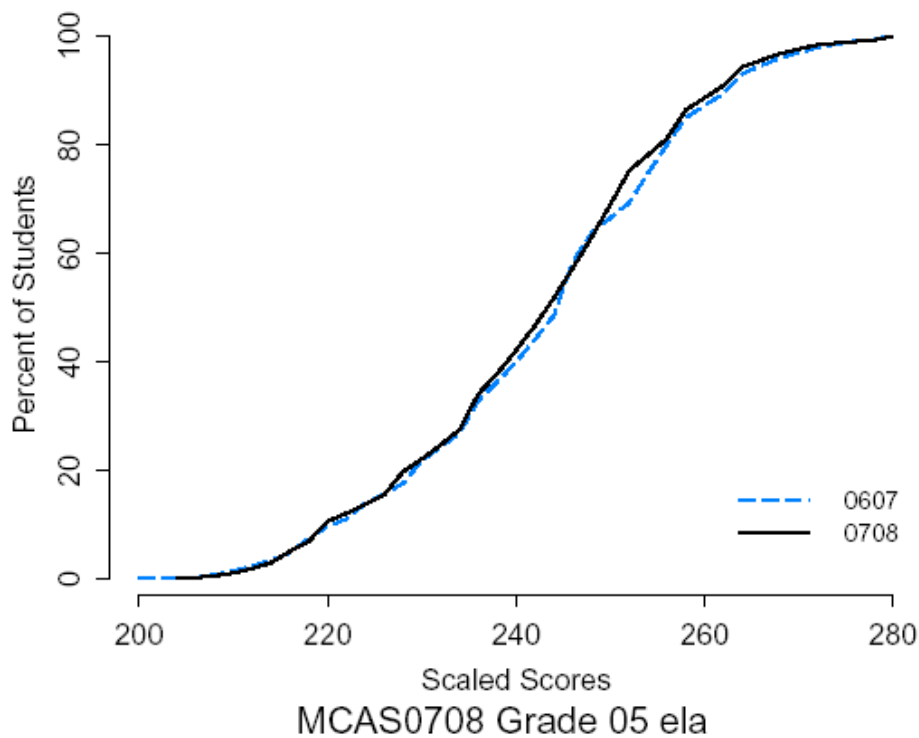
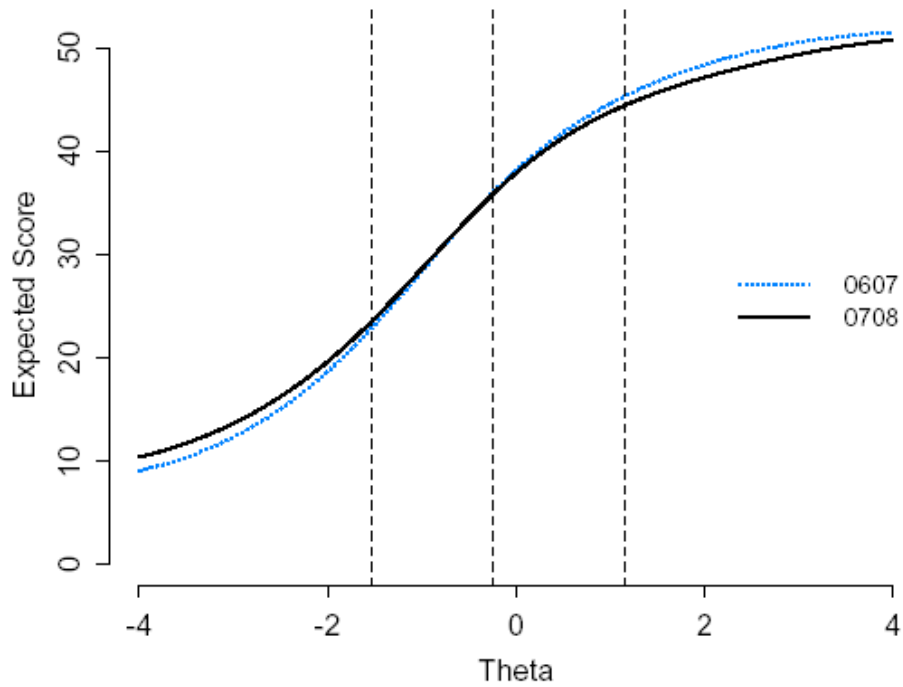
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MCAS 2007–08 Grade 05—ELA

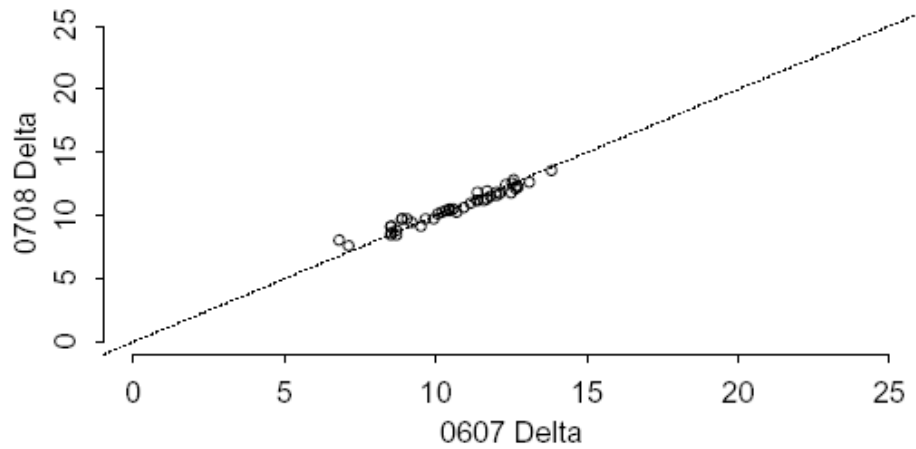
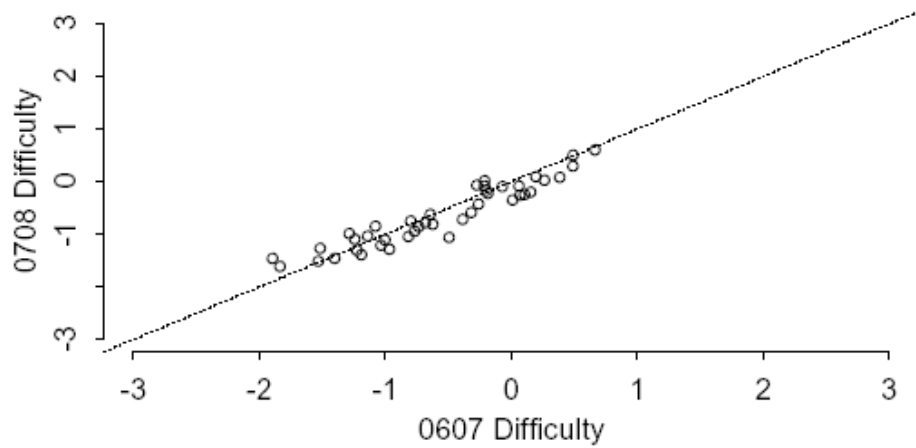
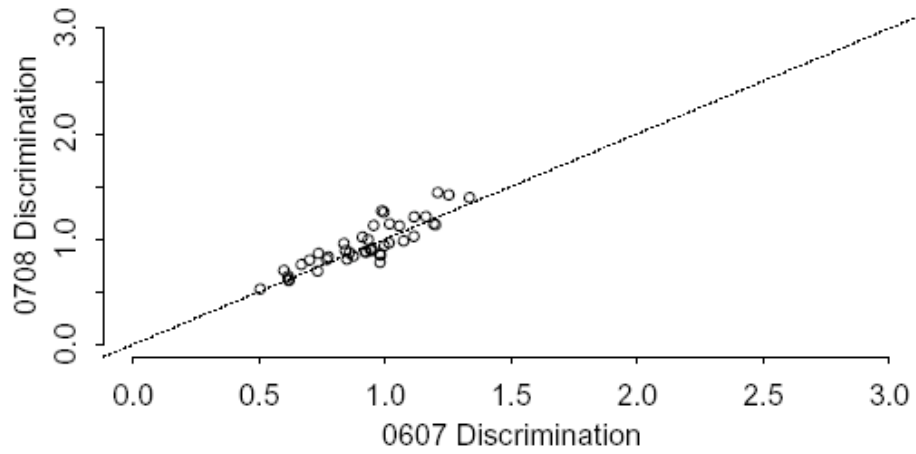


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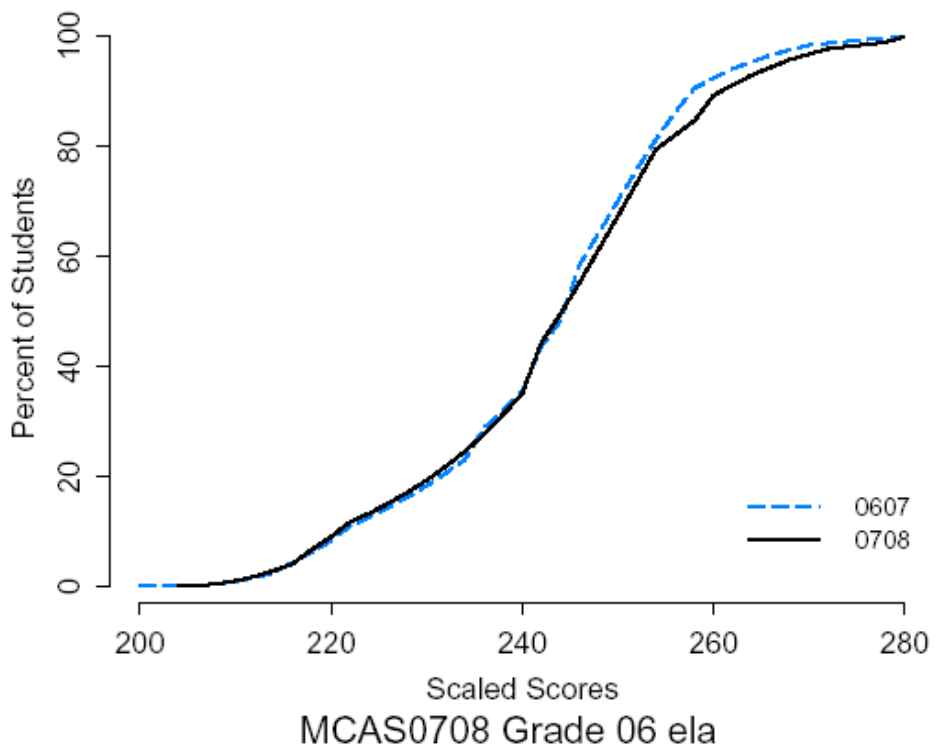
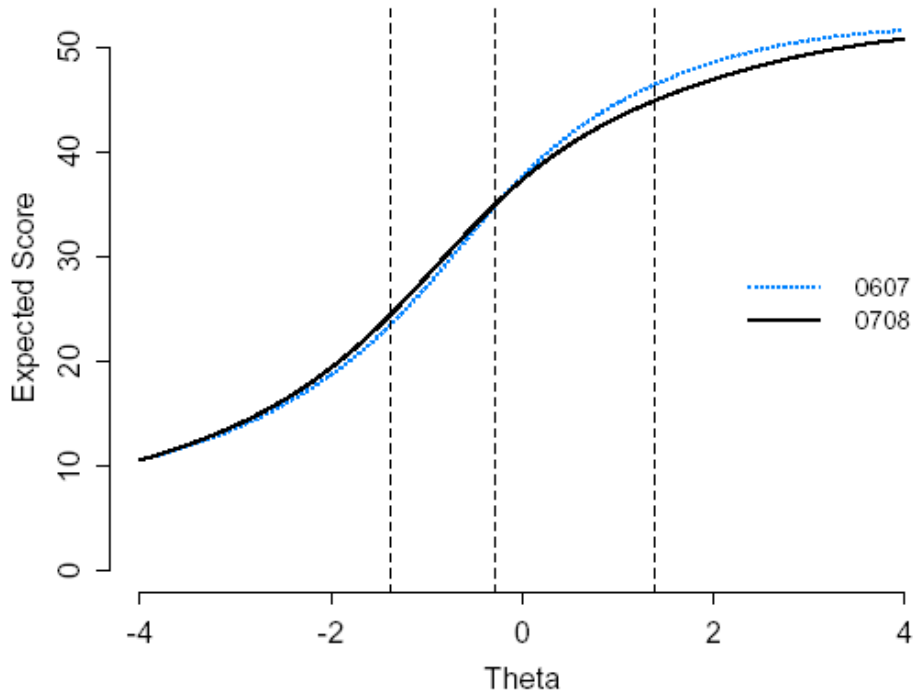


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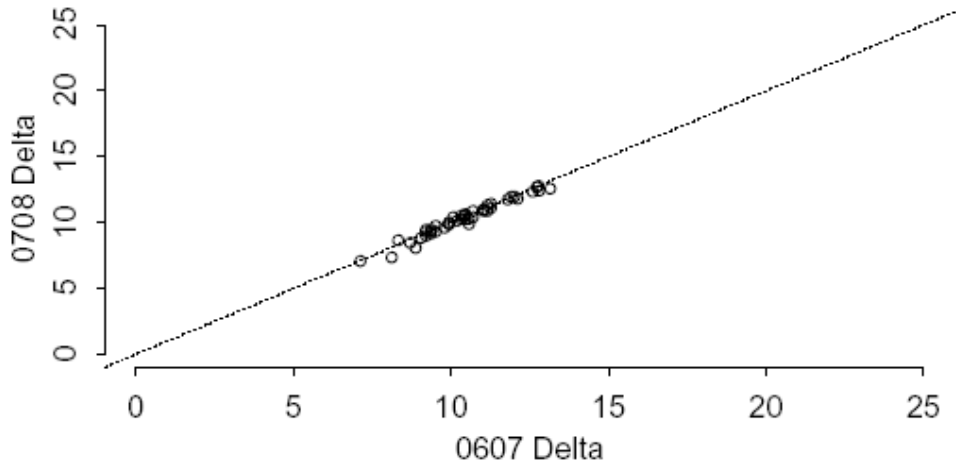
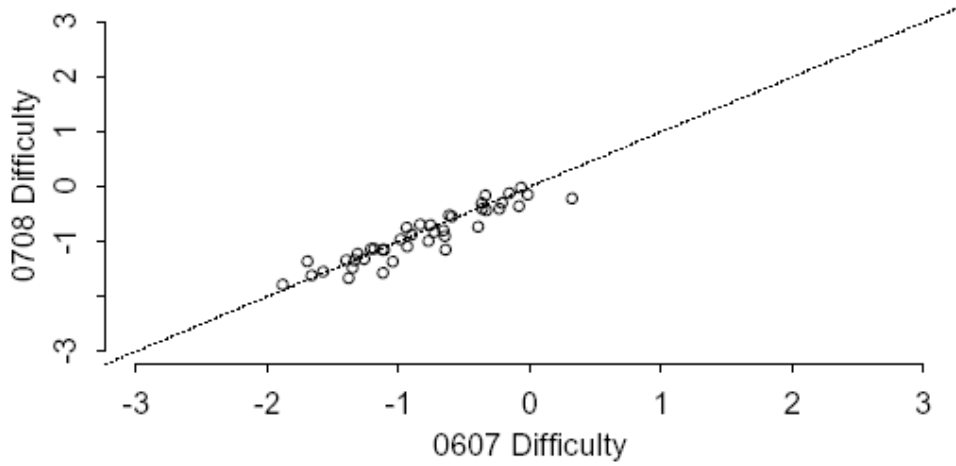
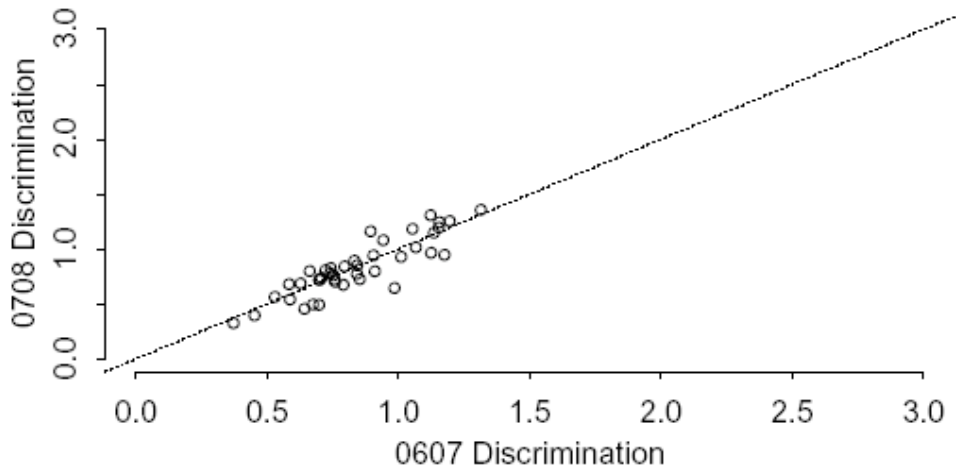
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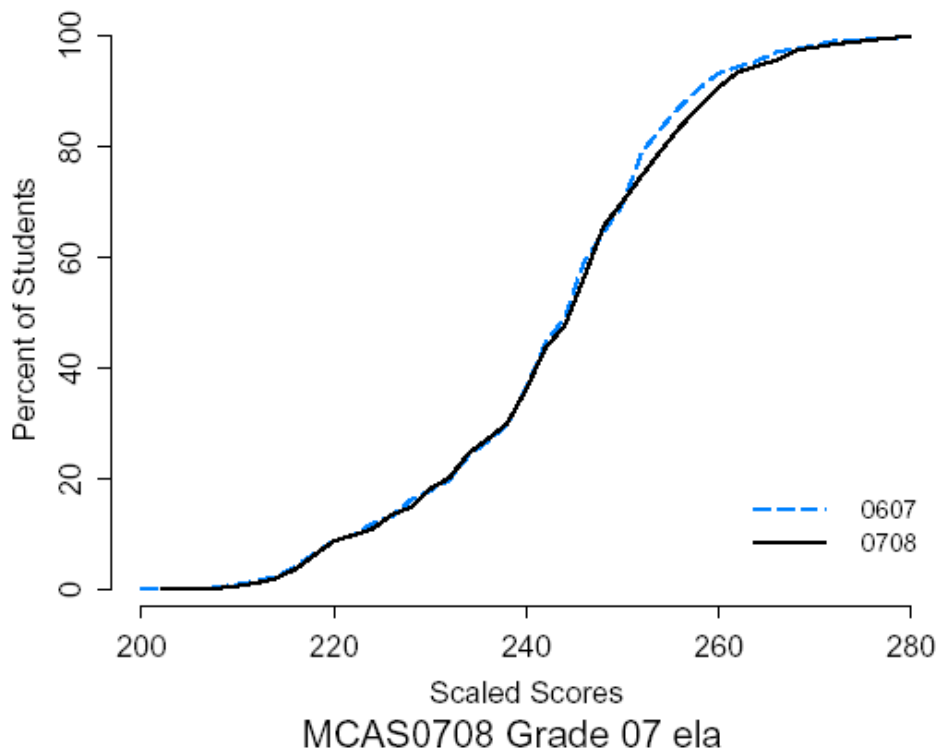
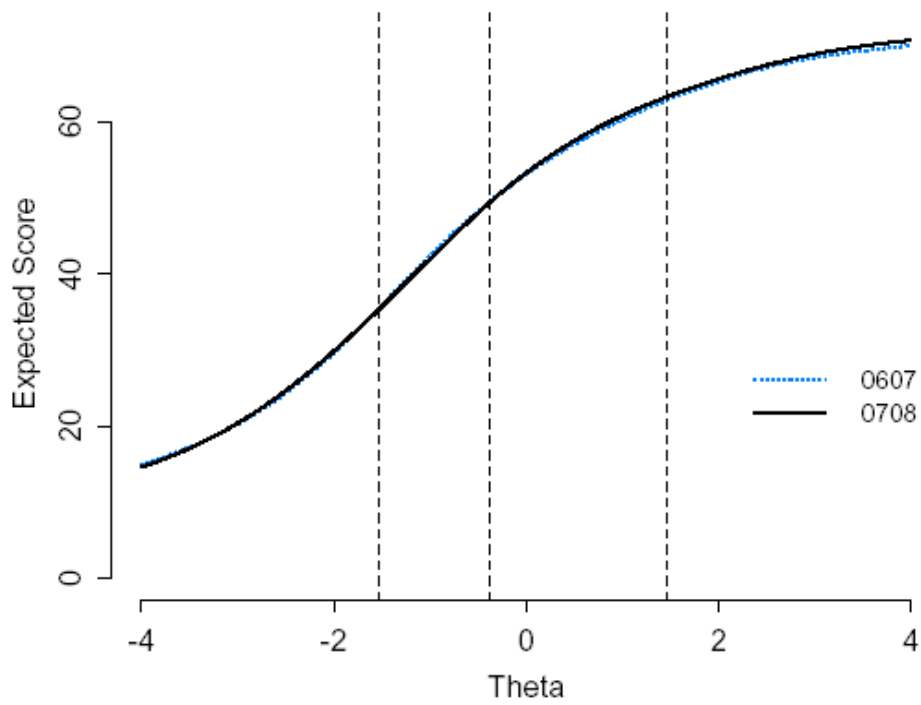


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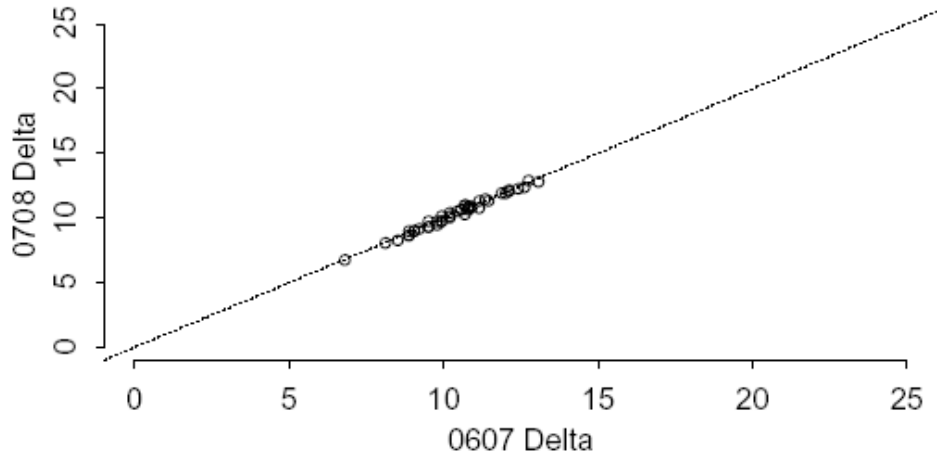
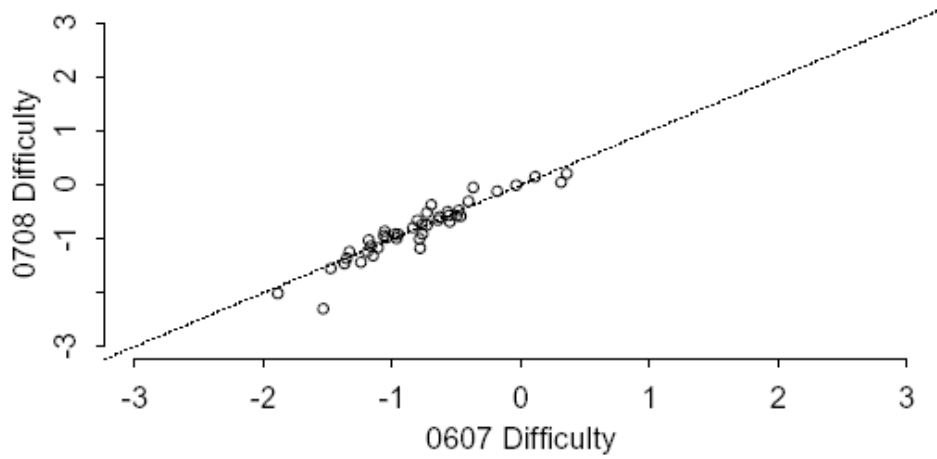
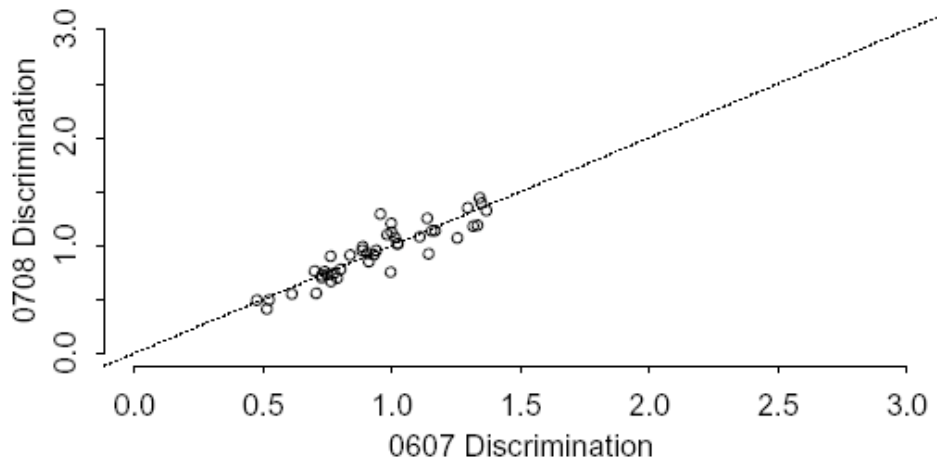


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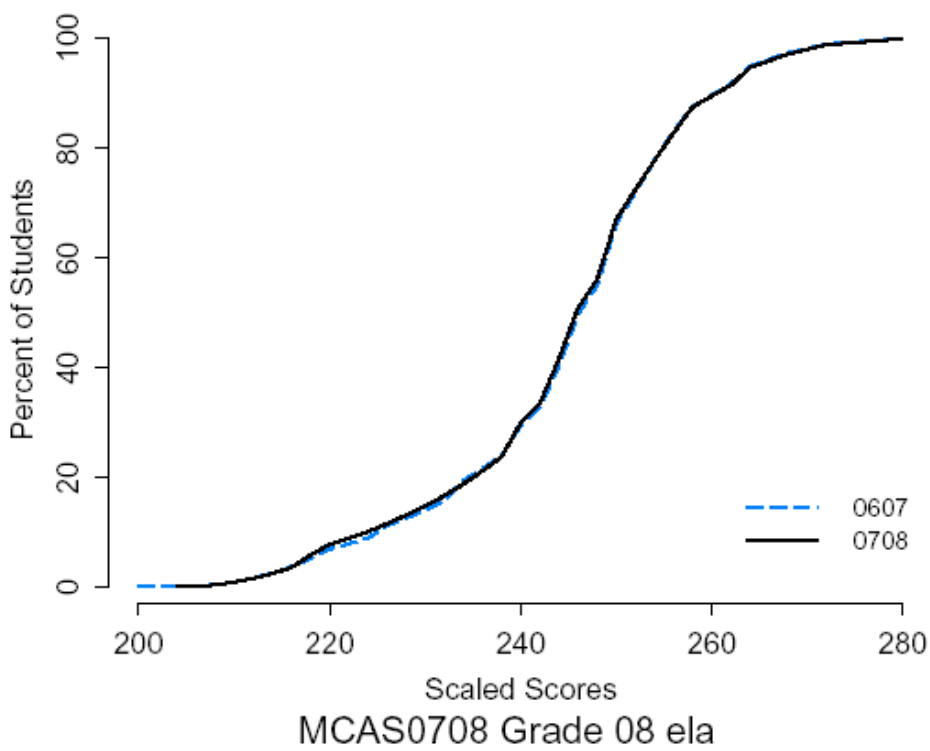
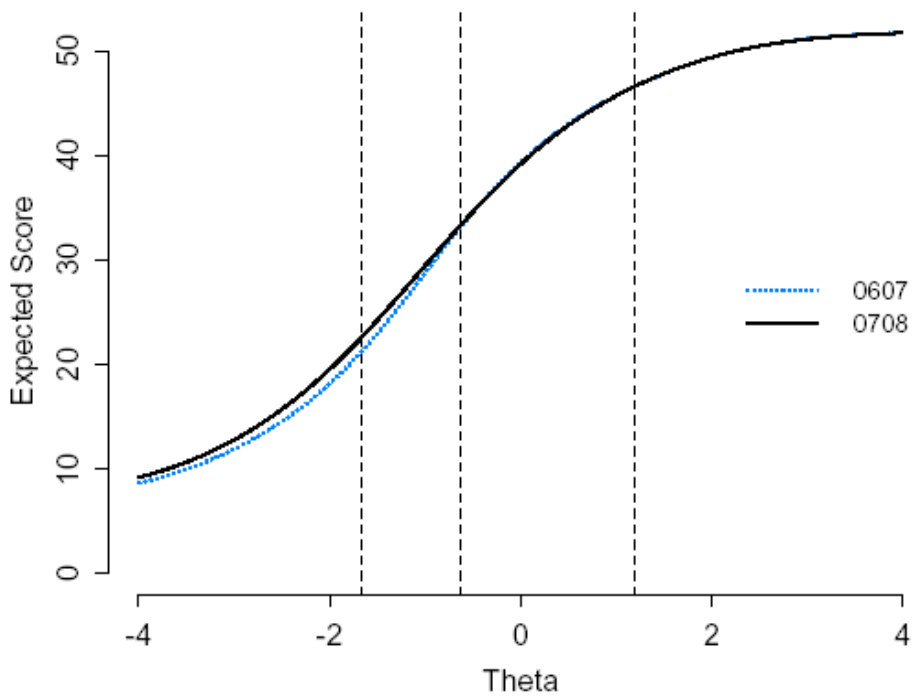




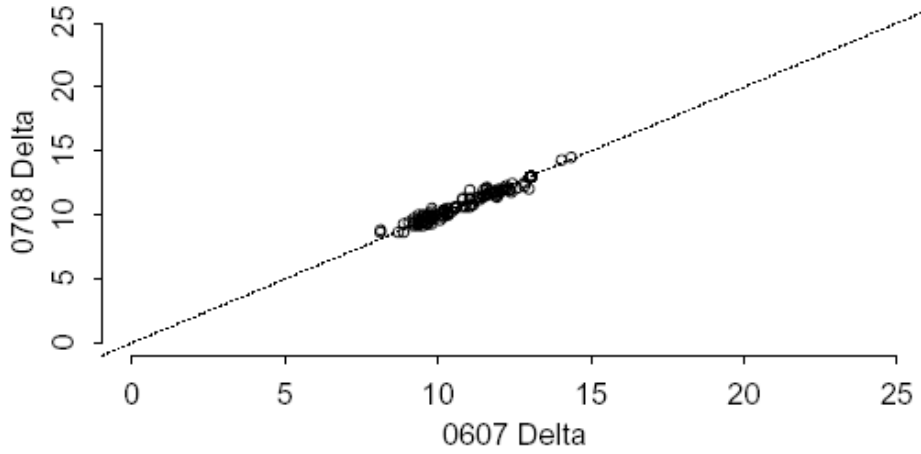
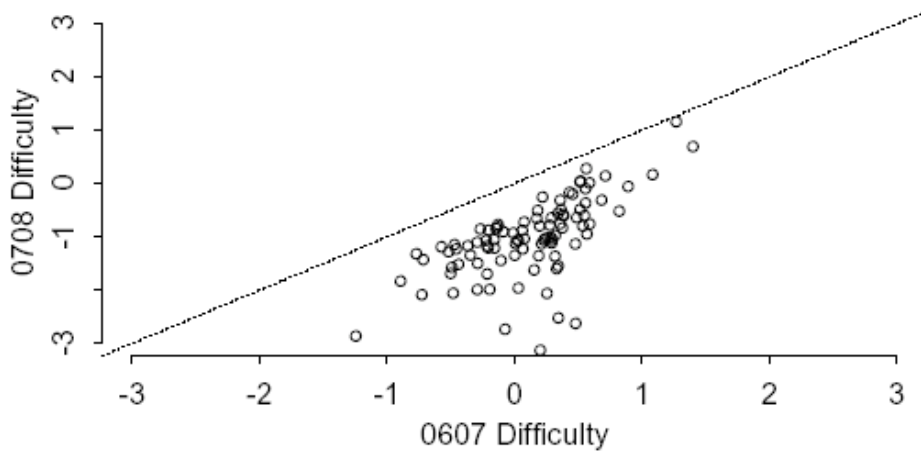
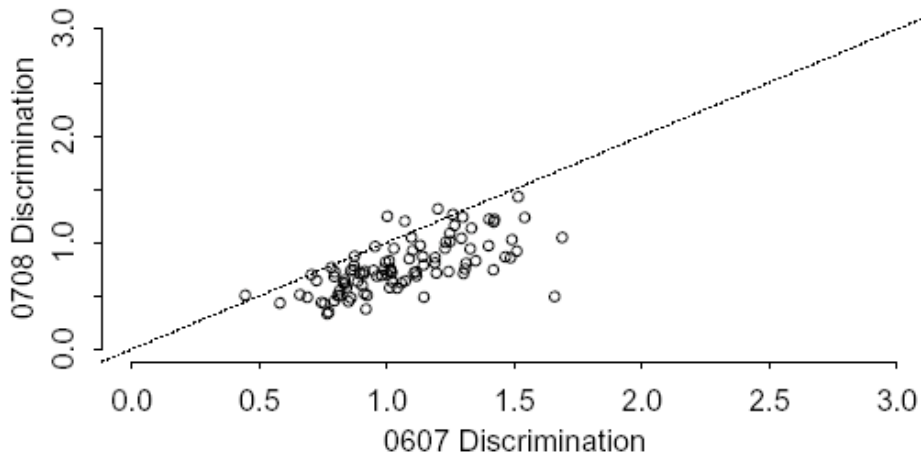
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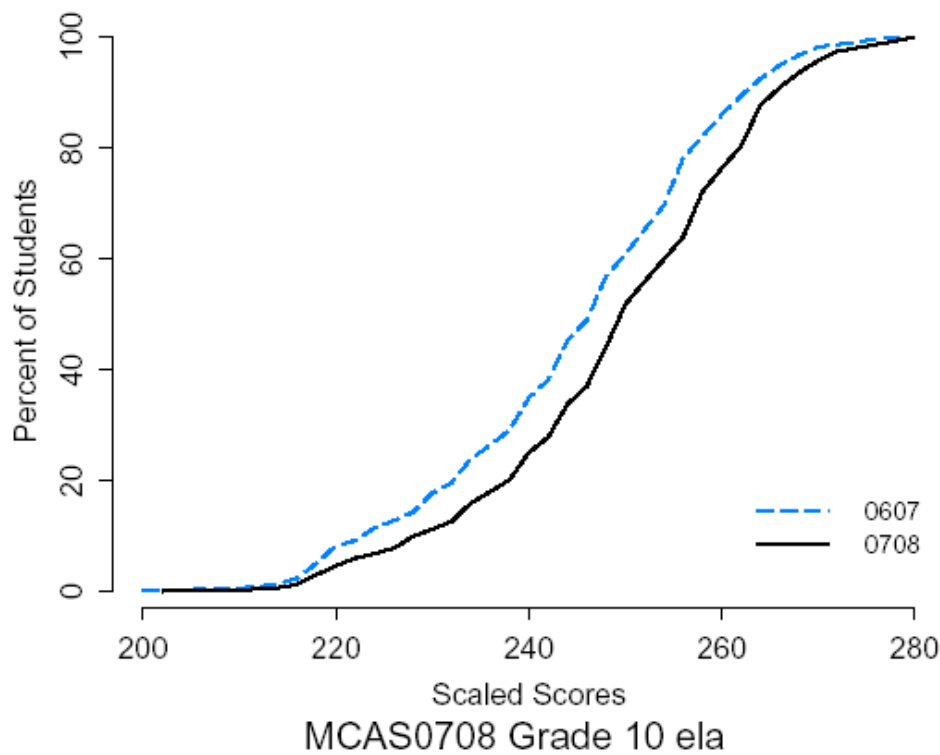
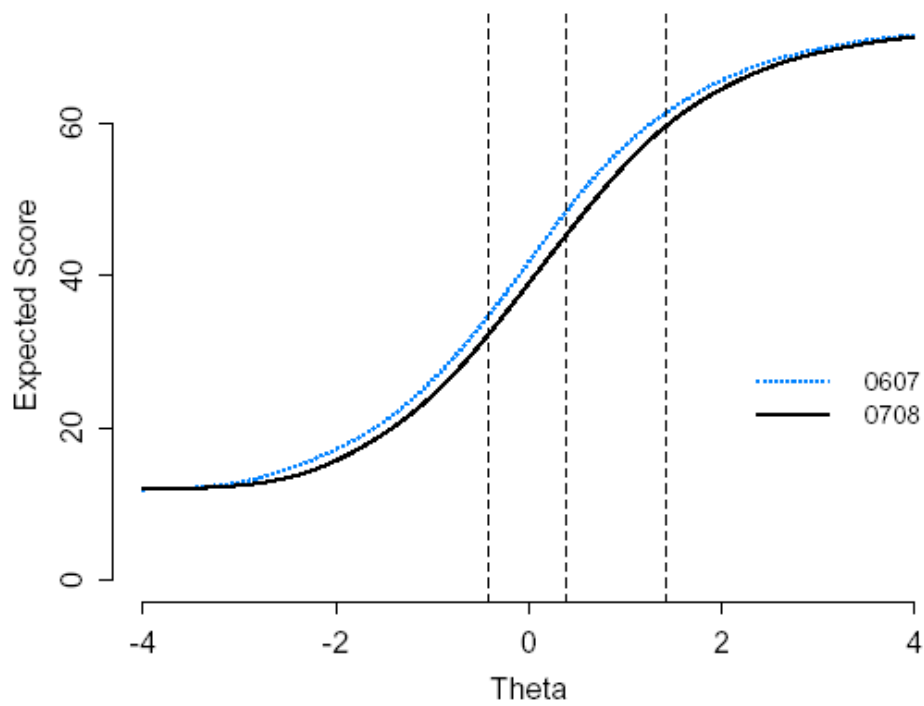
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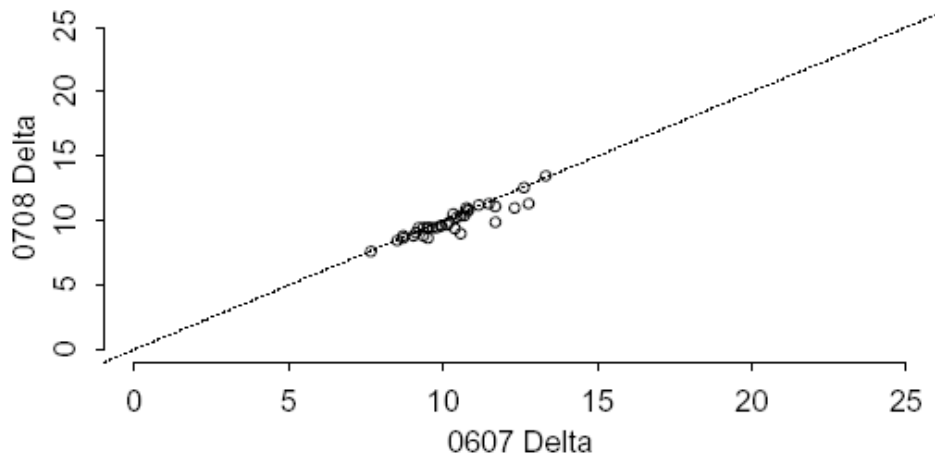
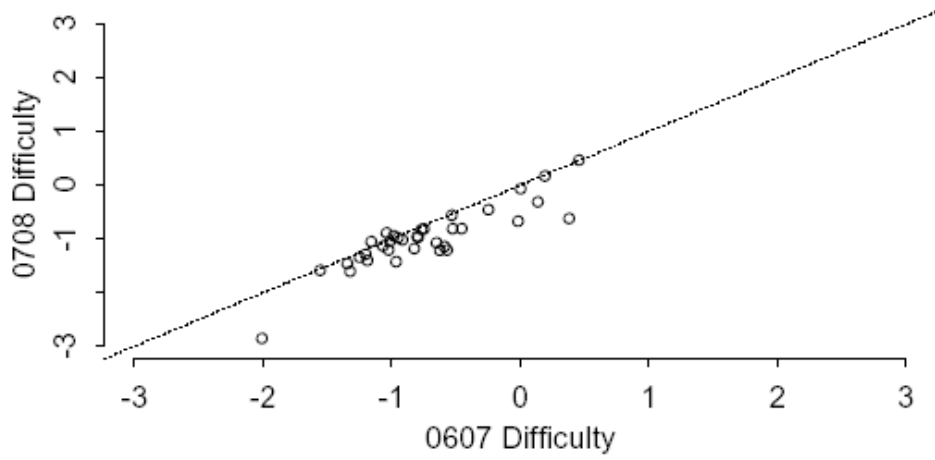
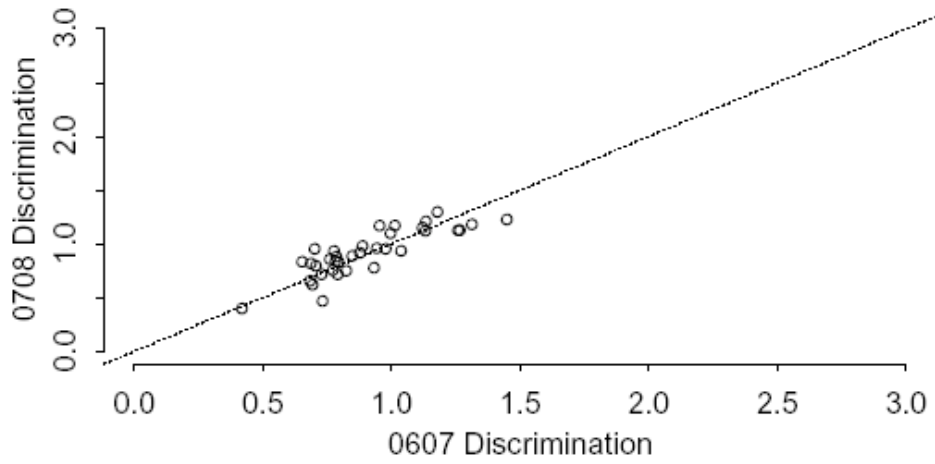
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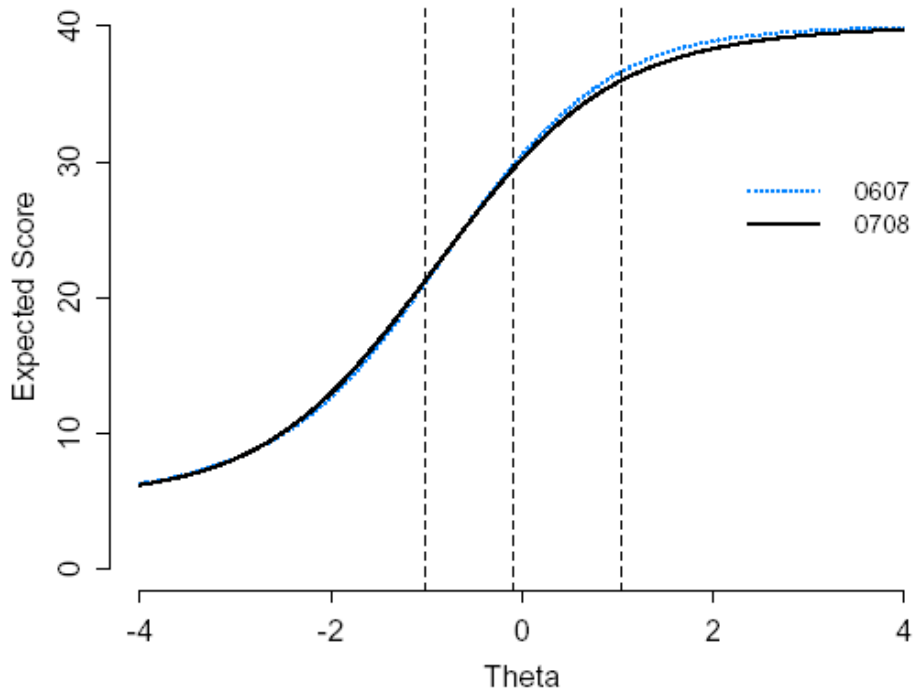
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MCAS 2007–08 Grade 03—Mathematics

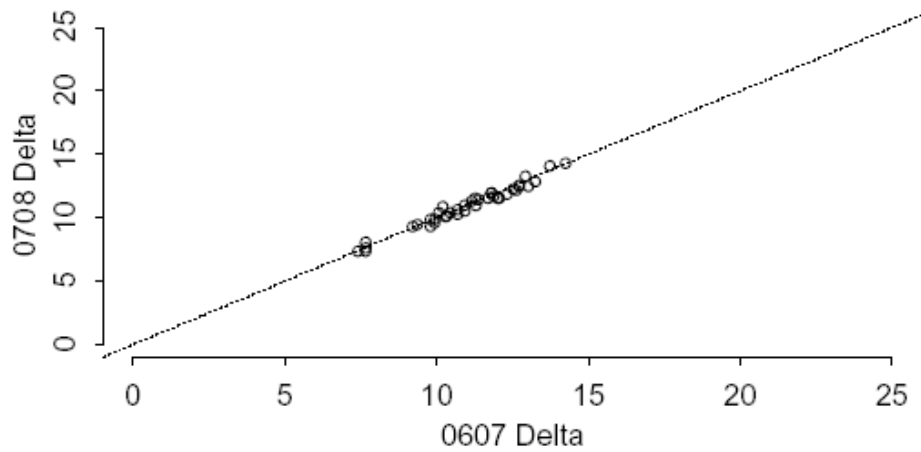
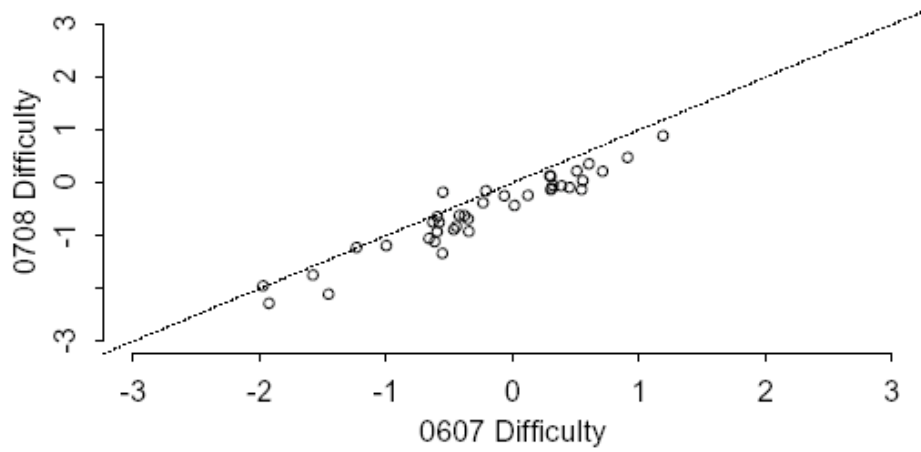
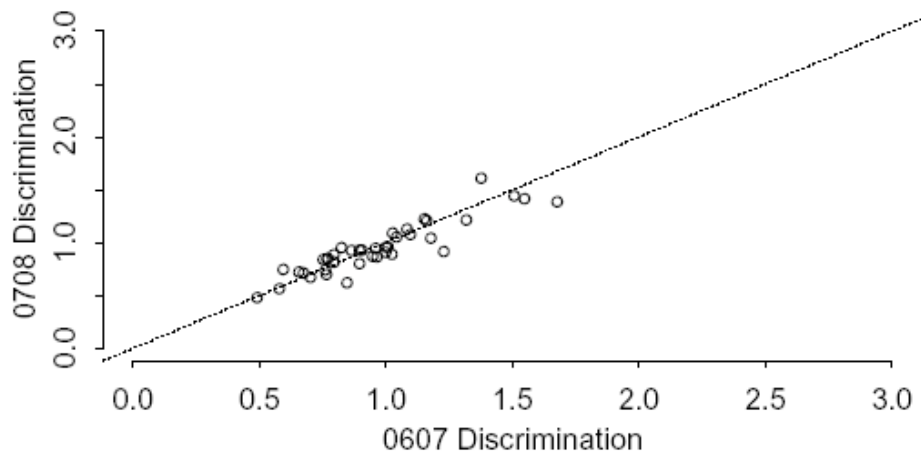


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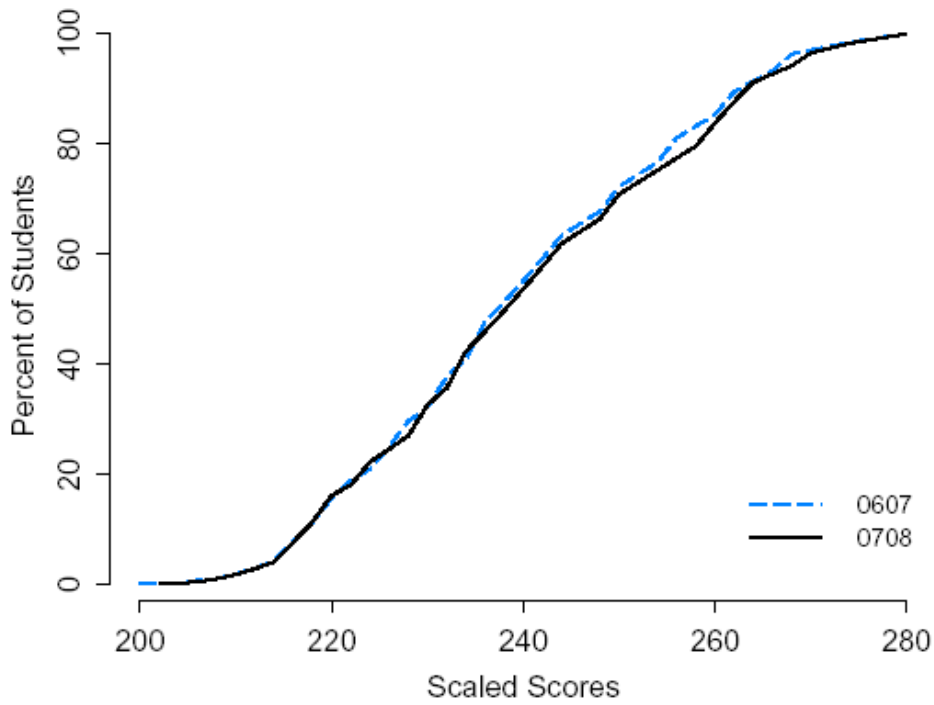
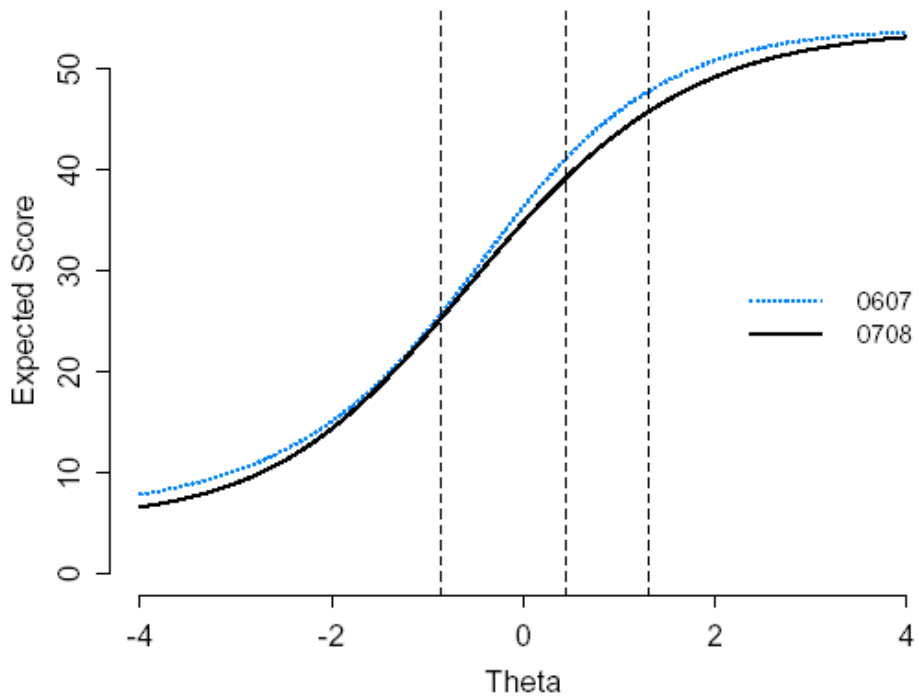
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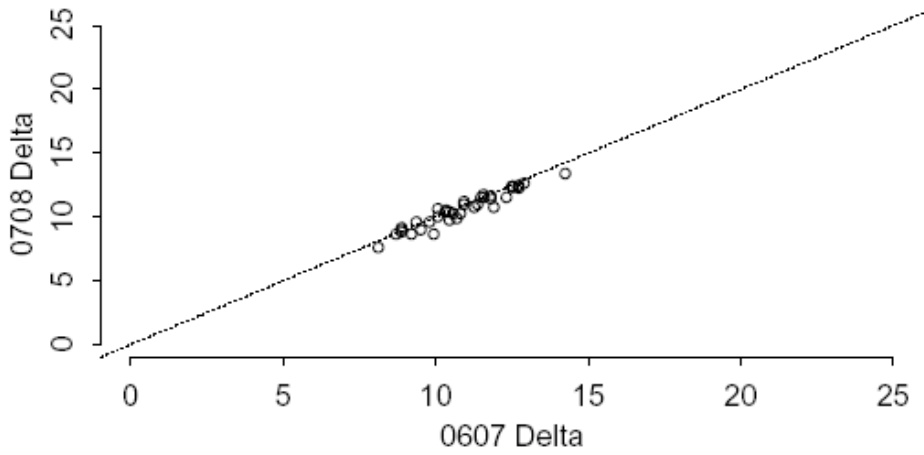
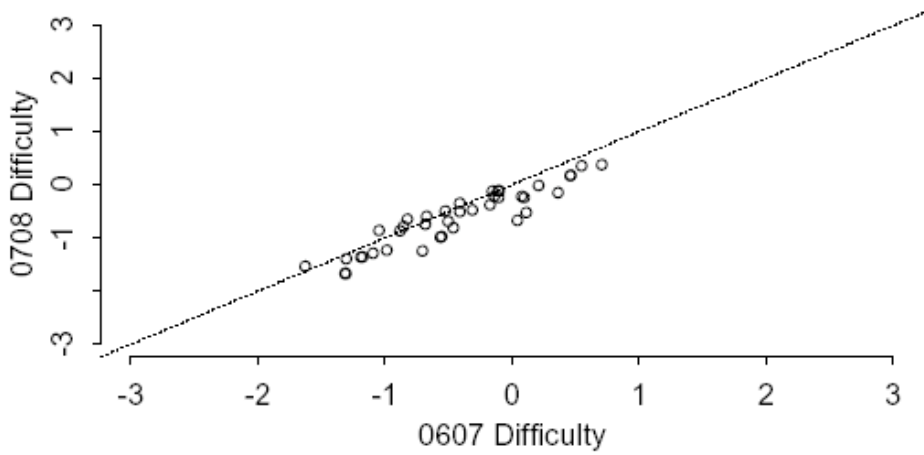
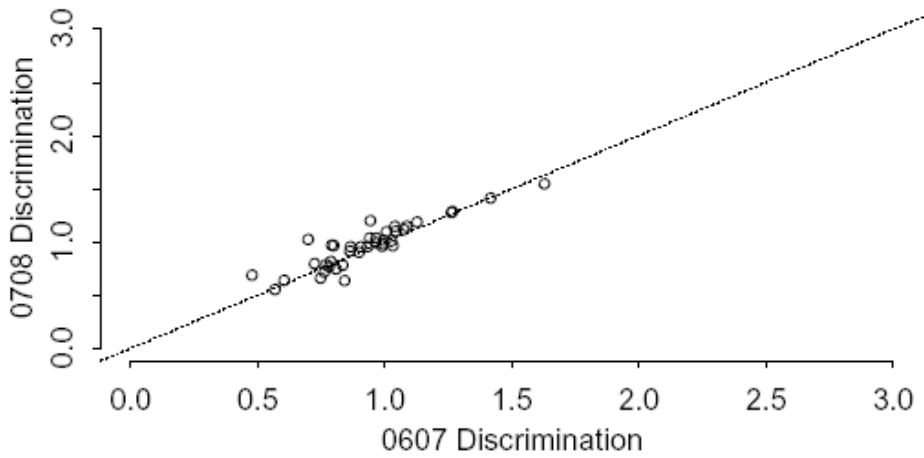
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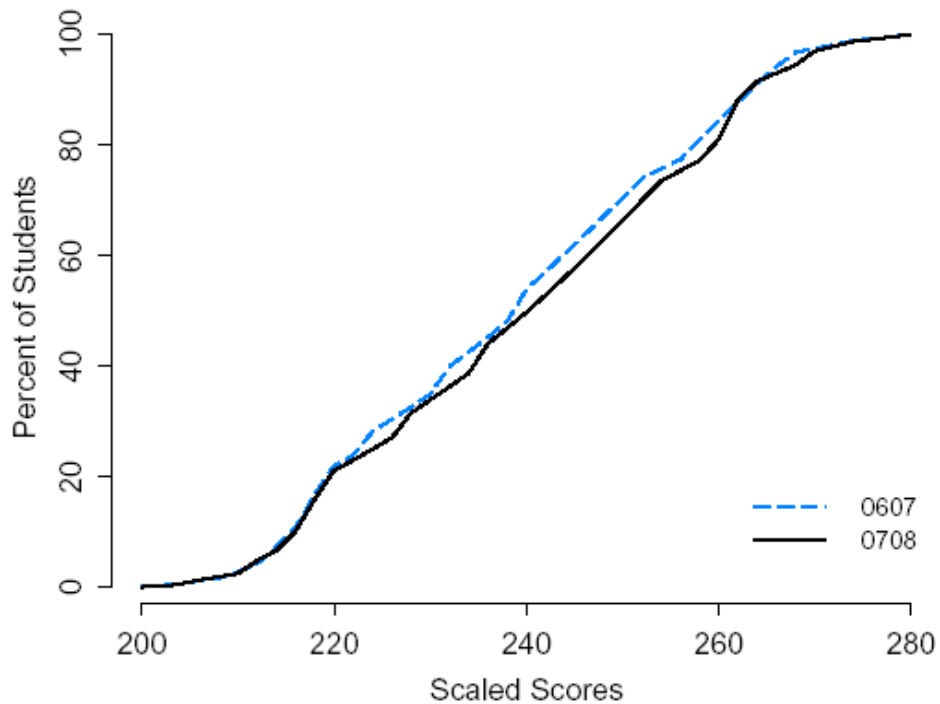
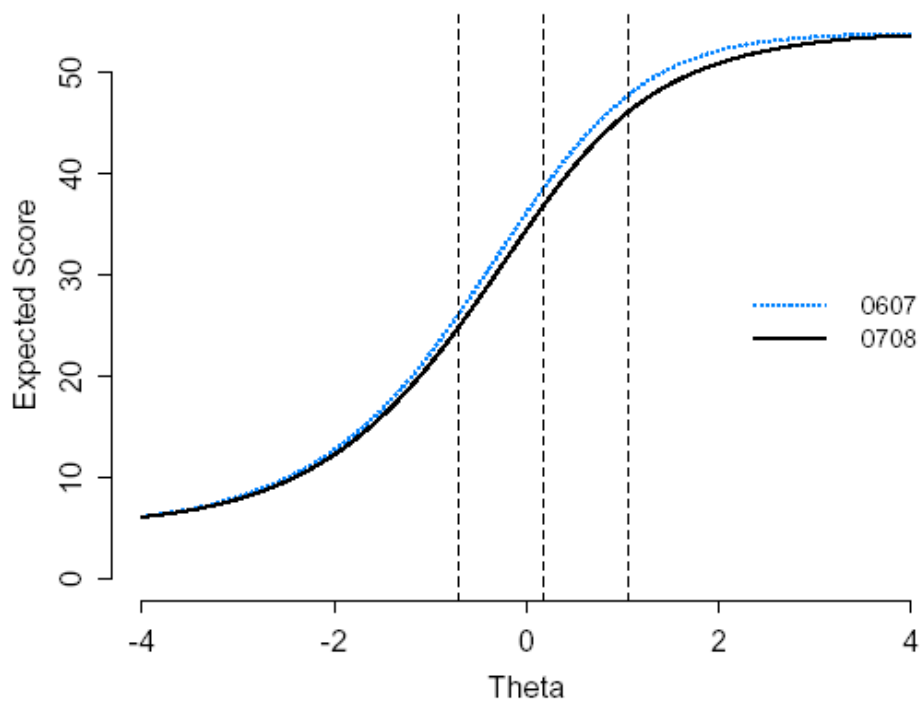


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MCAS 2007–08 Grade 05—Mathematics

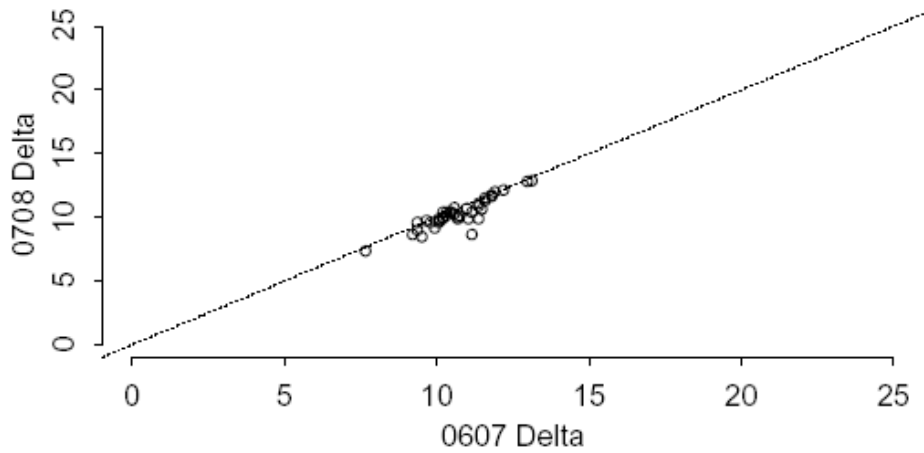
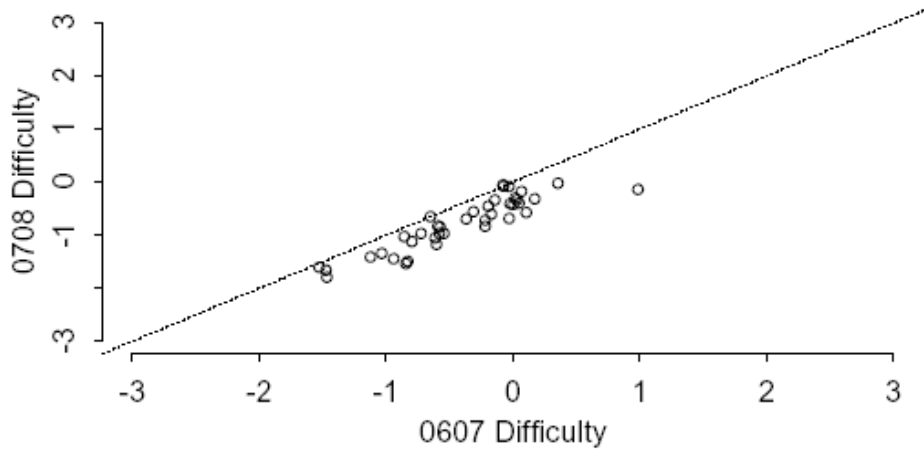
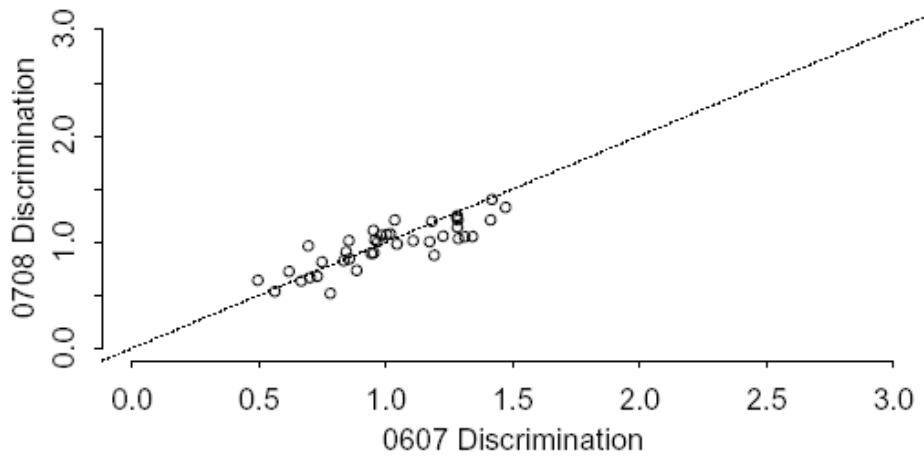


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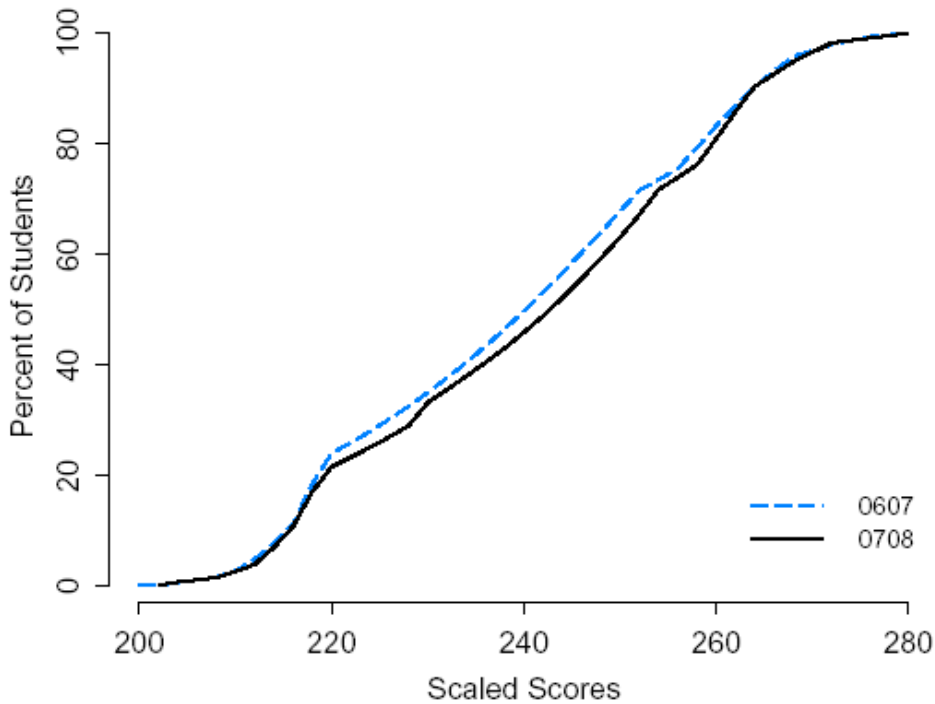
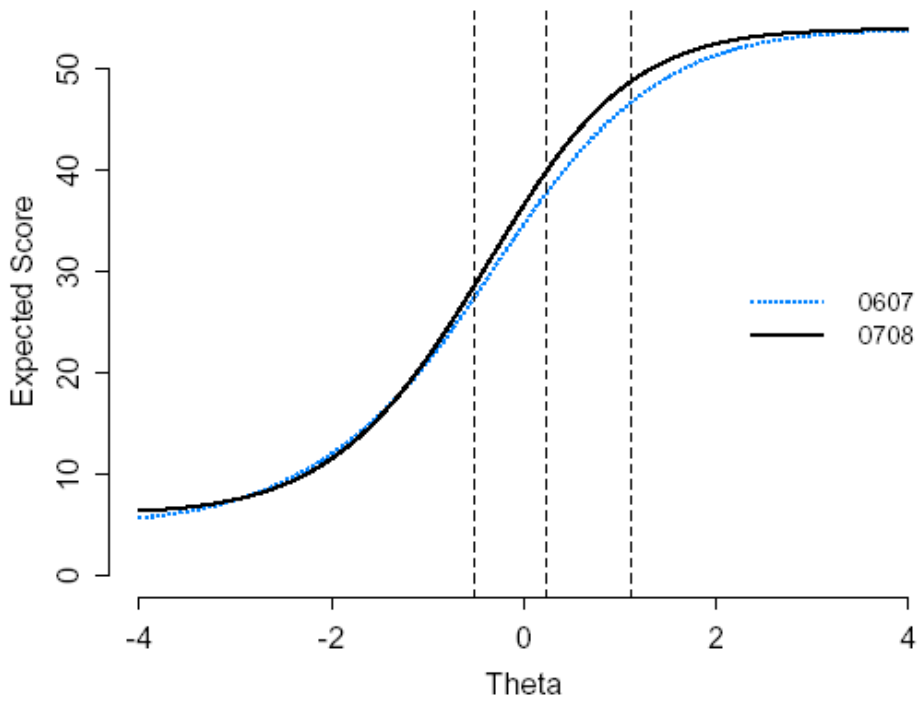


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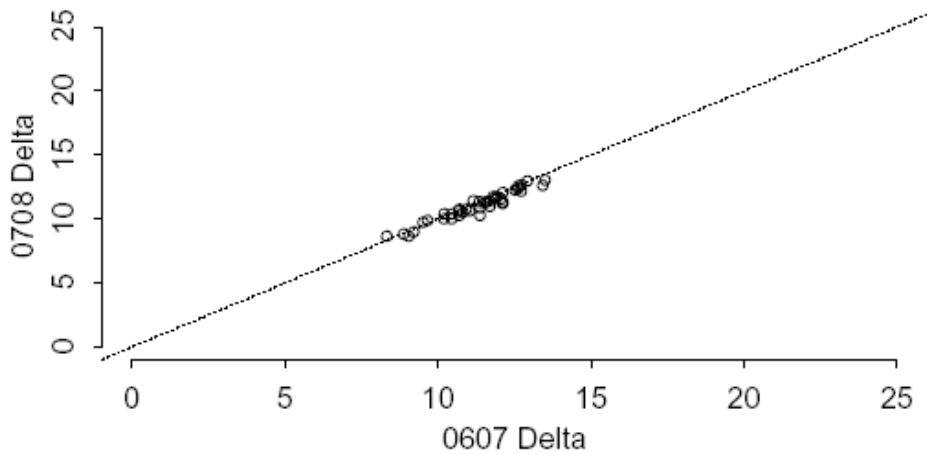
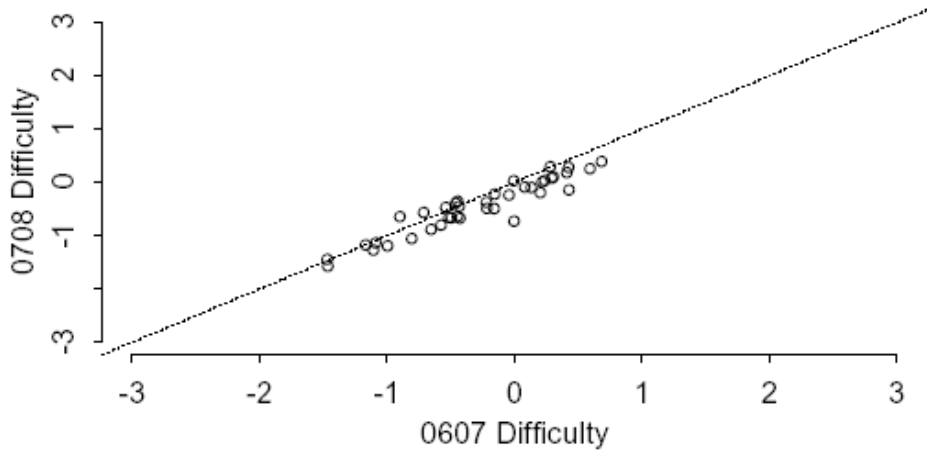
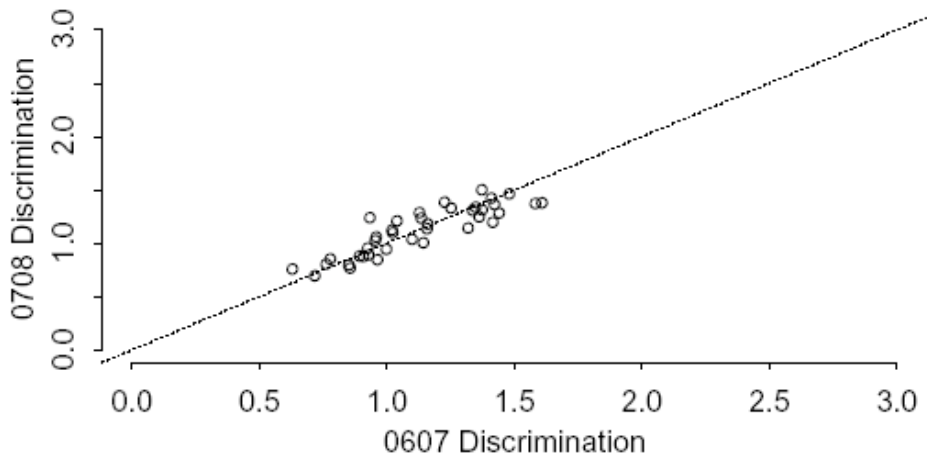


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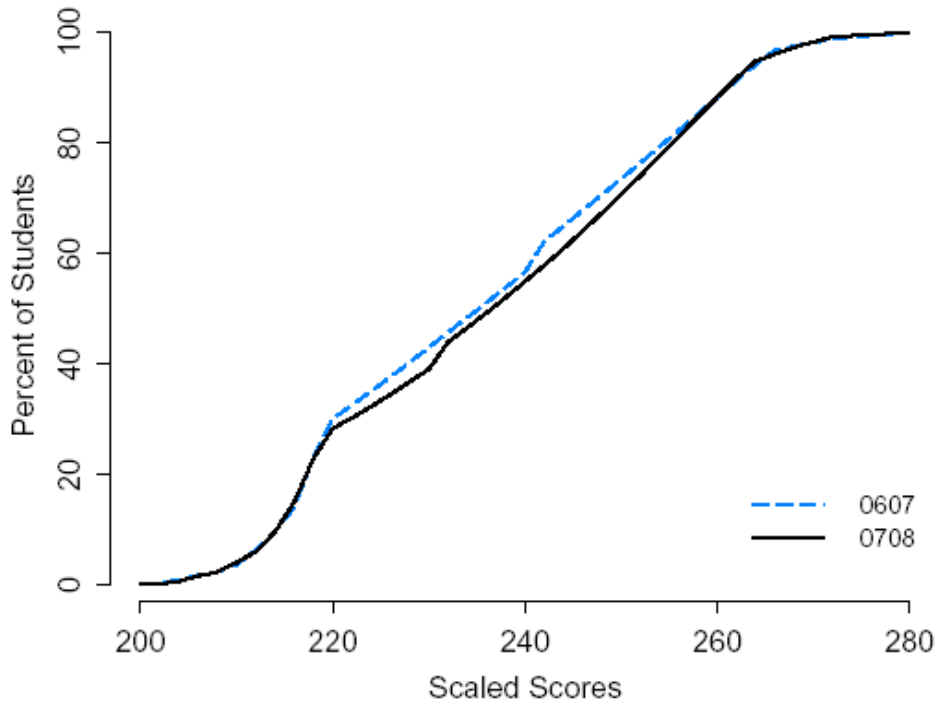
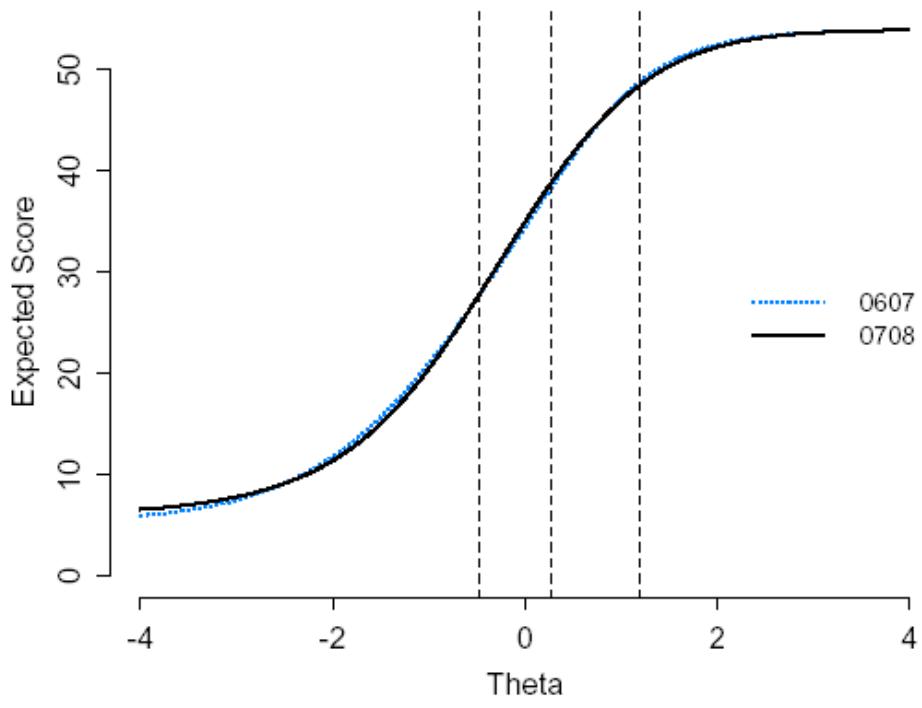


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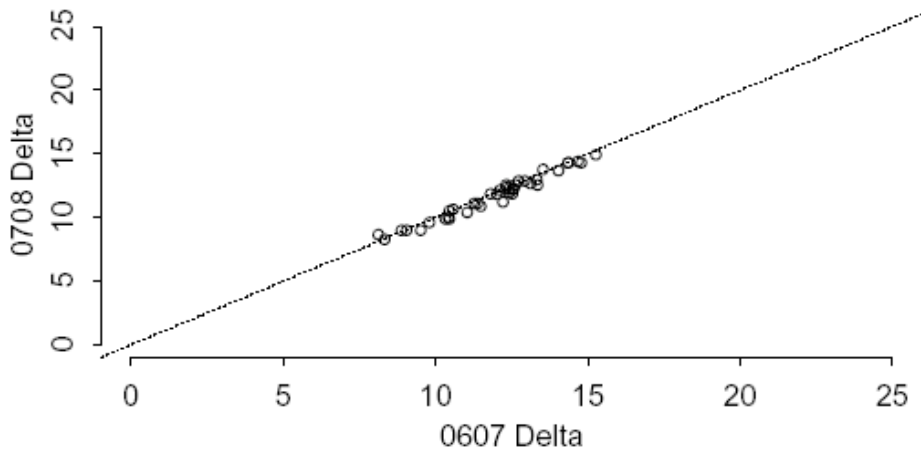
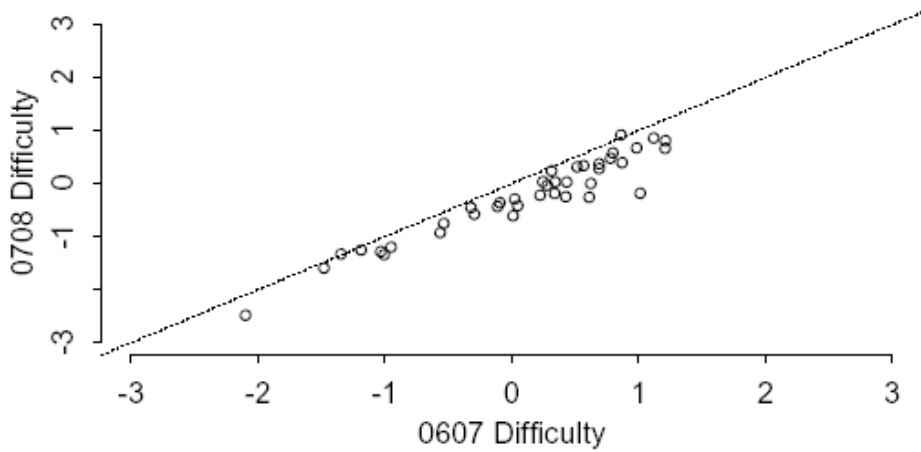
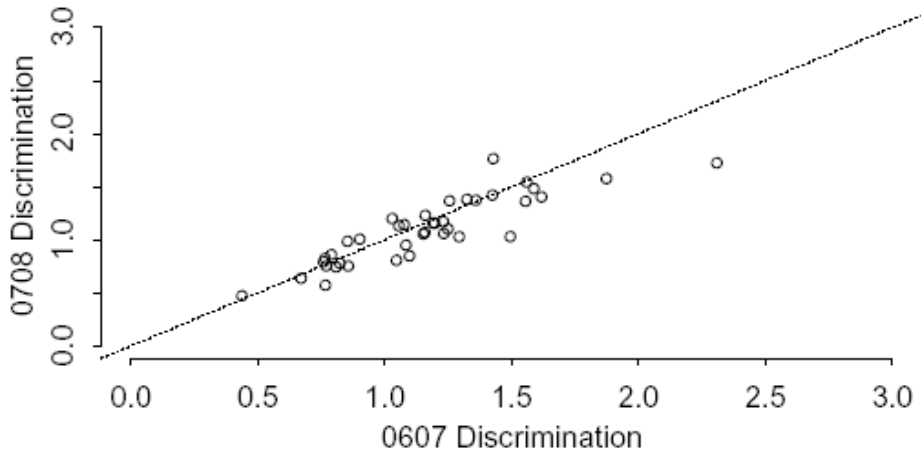


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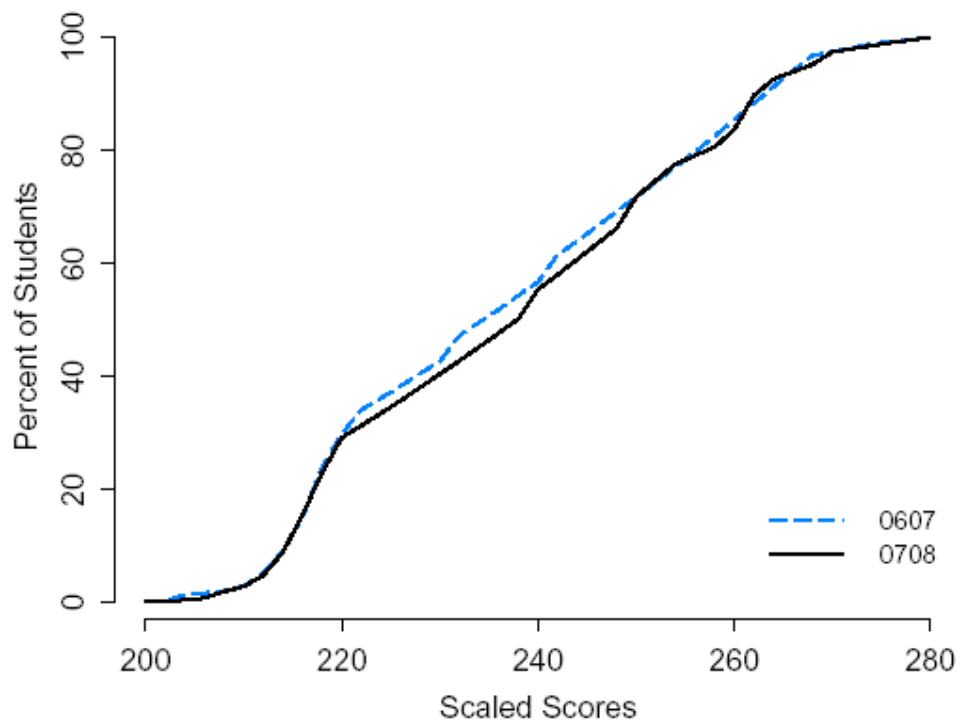
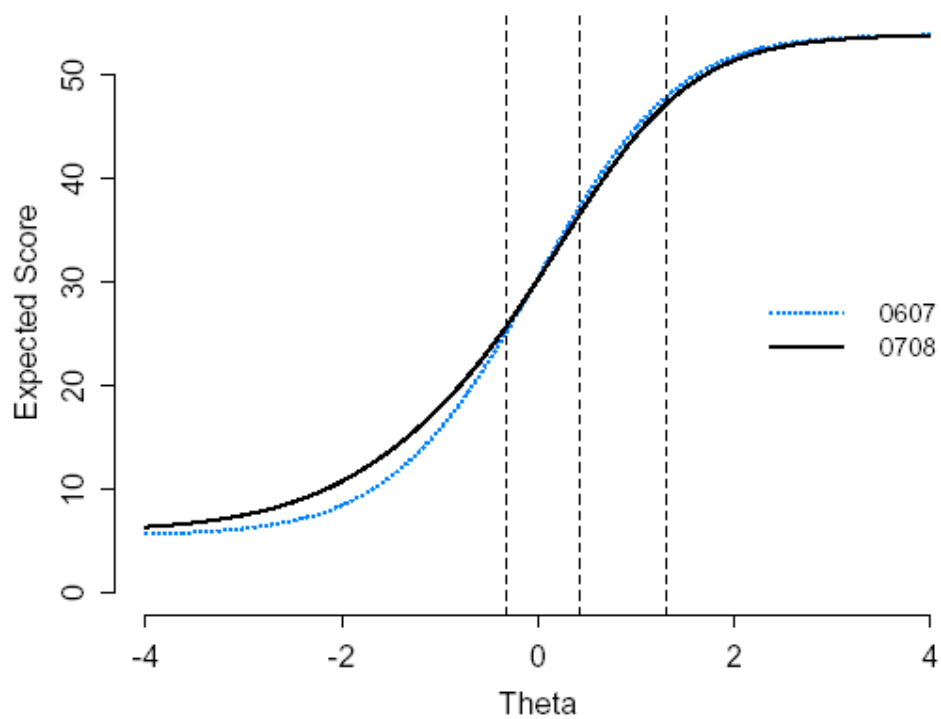
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MCAS 2007–08 Grade 08—Mathematics



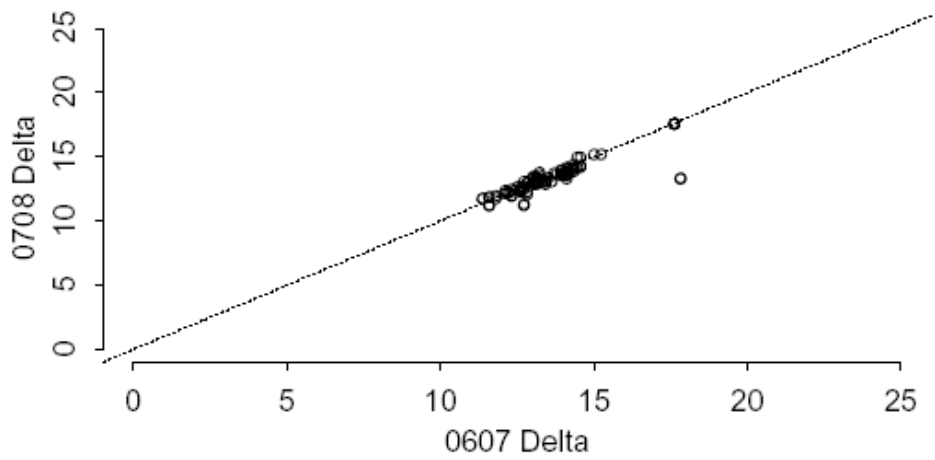
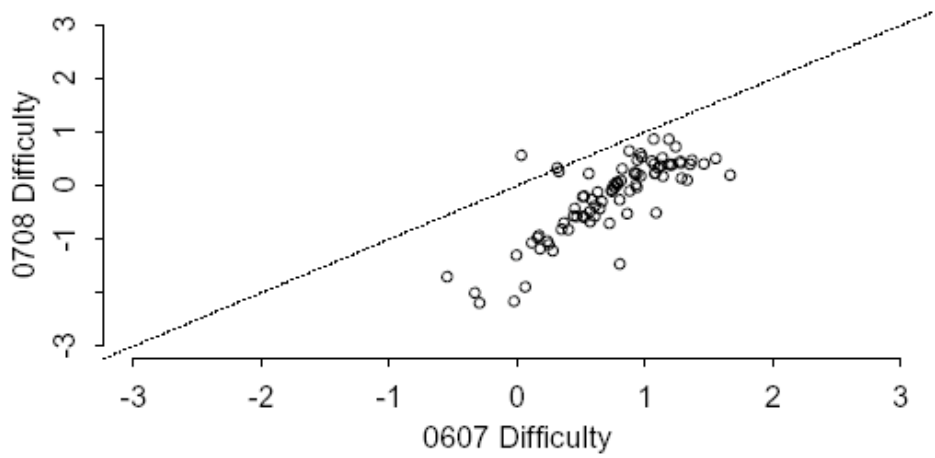
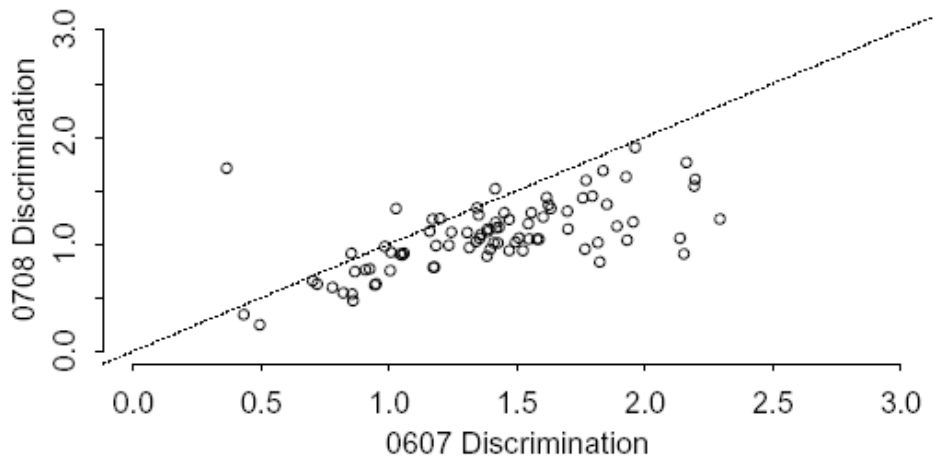
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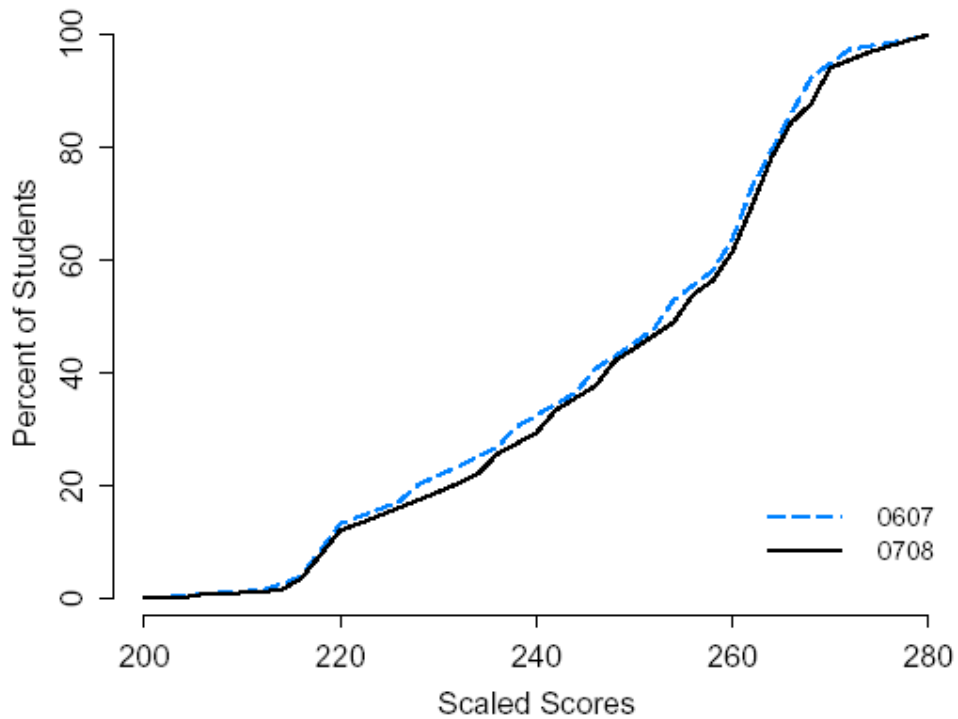
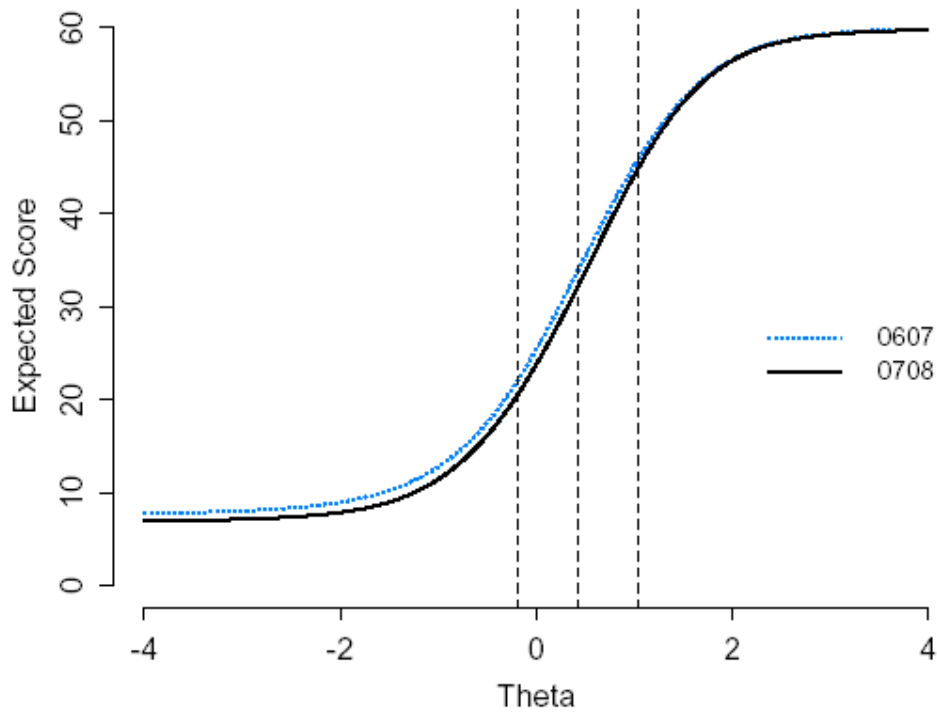


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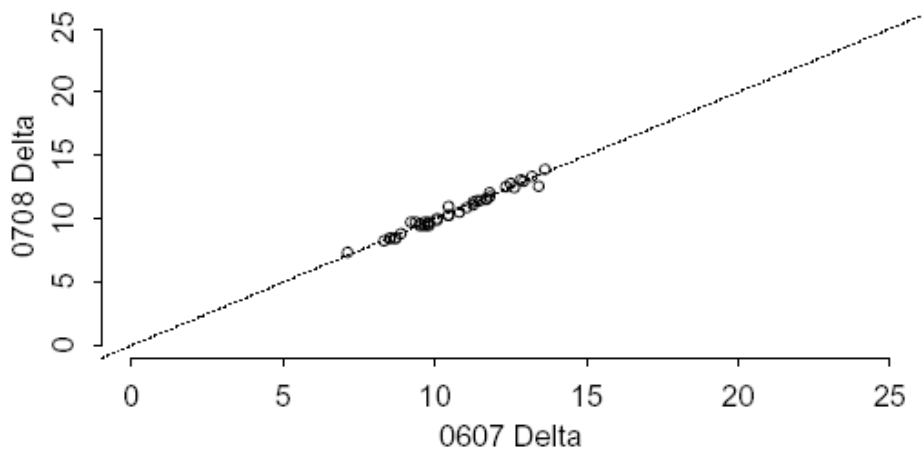
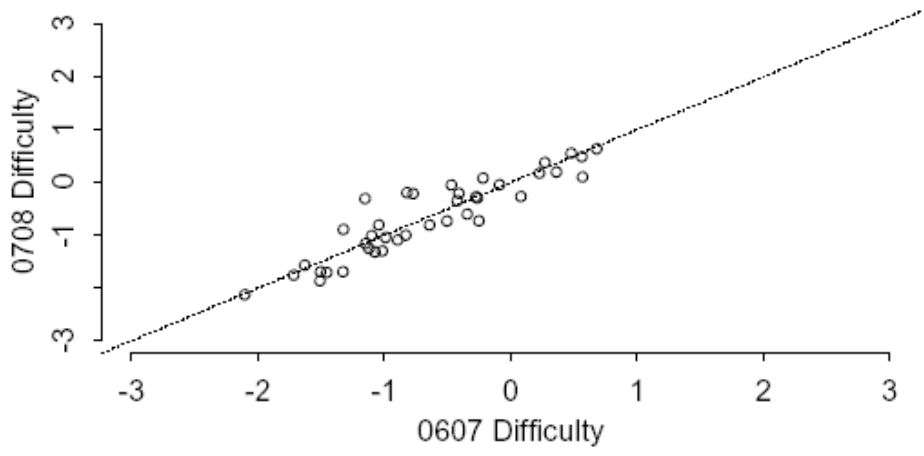
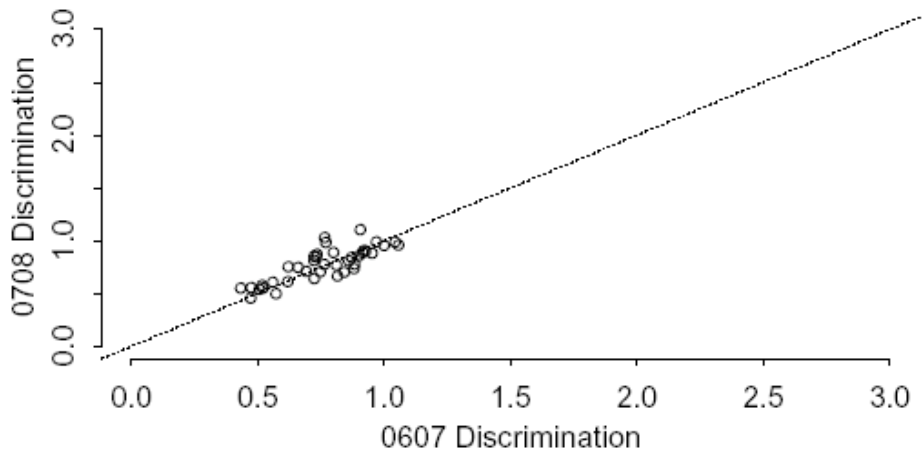


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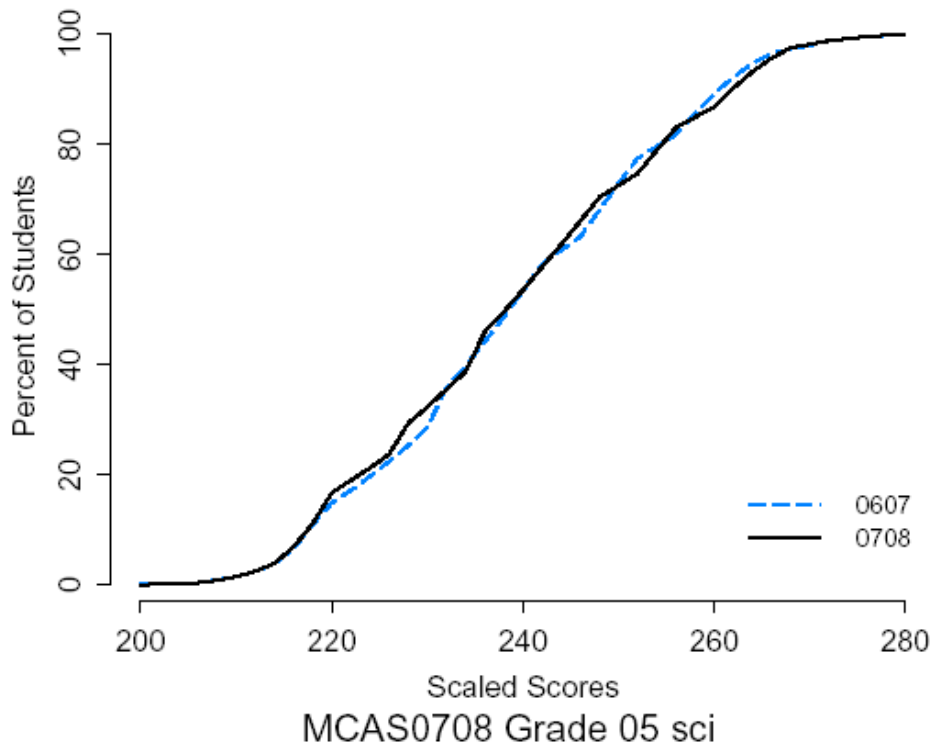
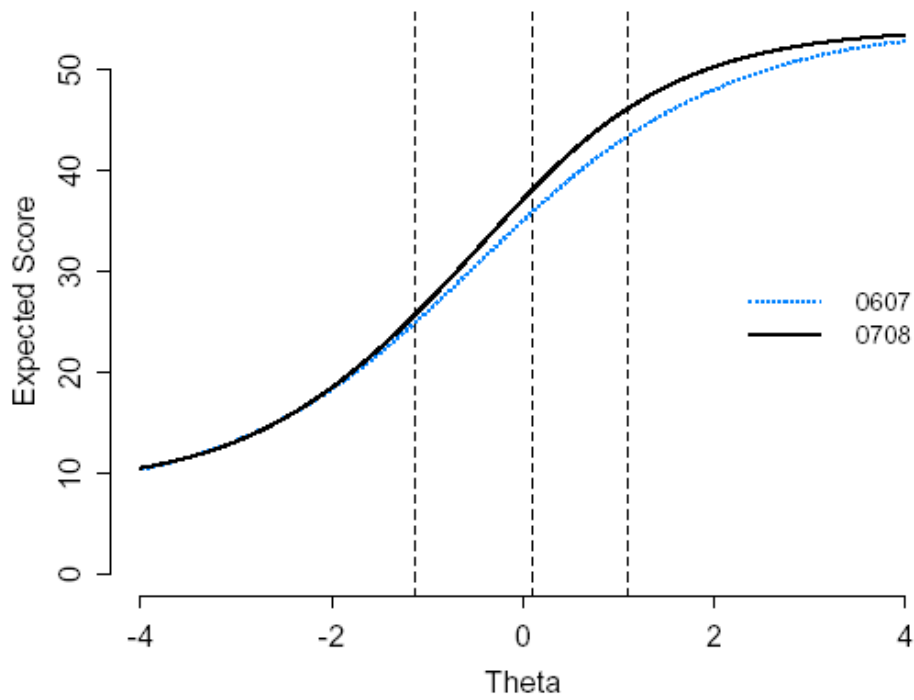


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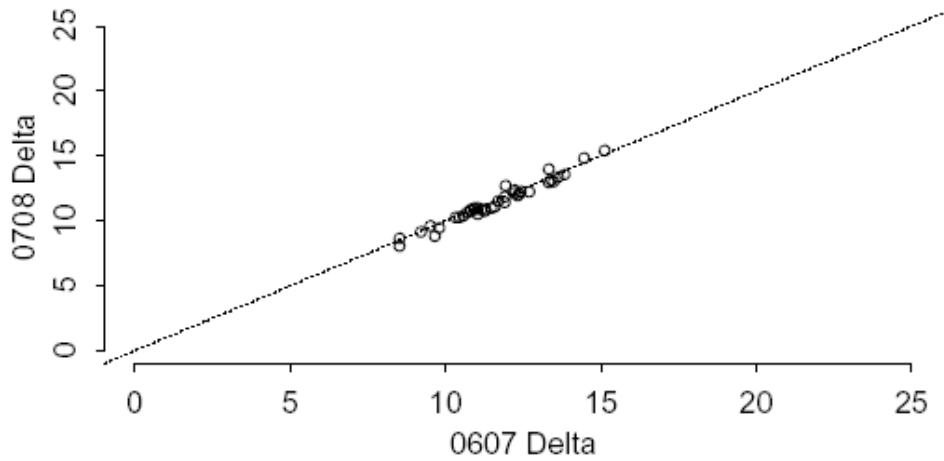
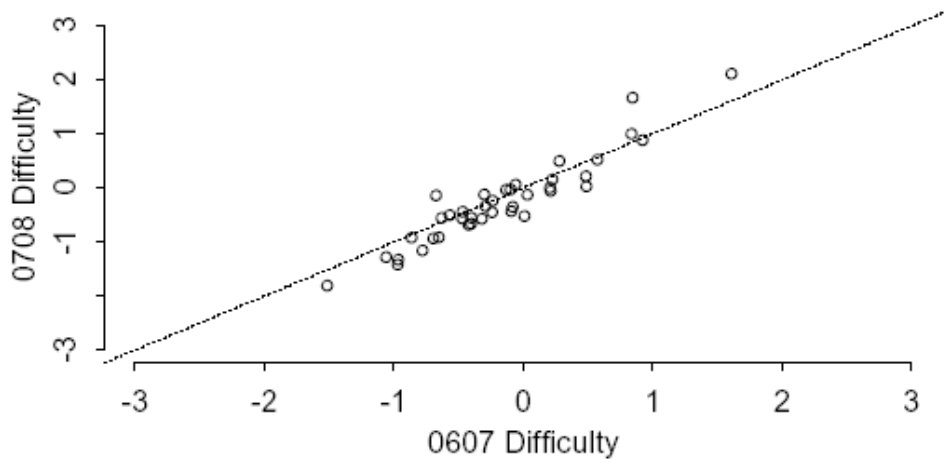
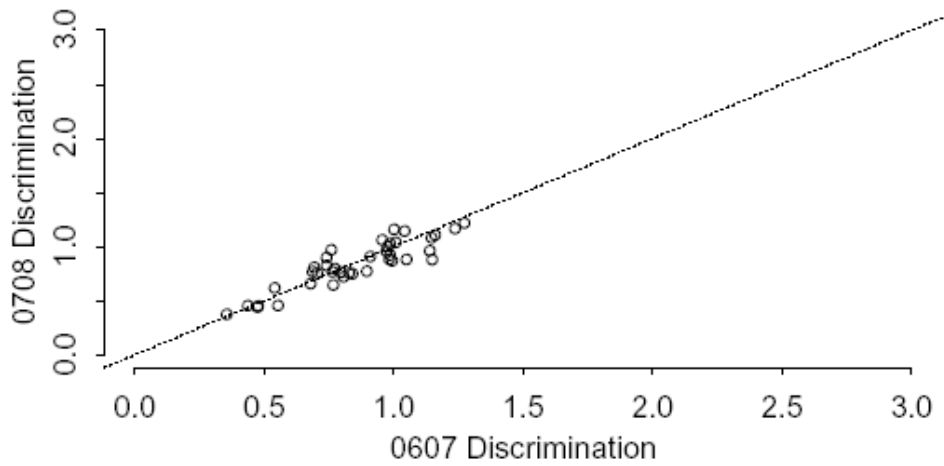
MCAS 2007–08 Grade 05—Science and Technology/Engineering



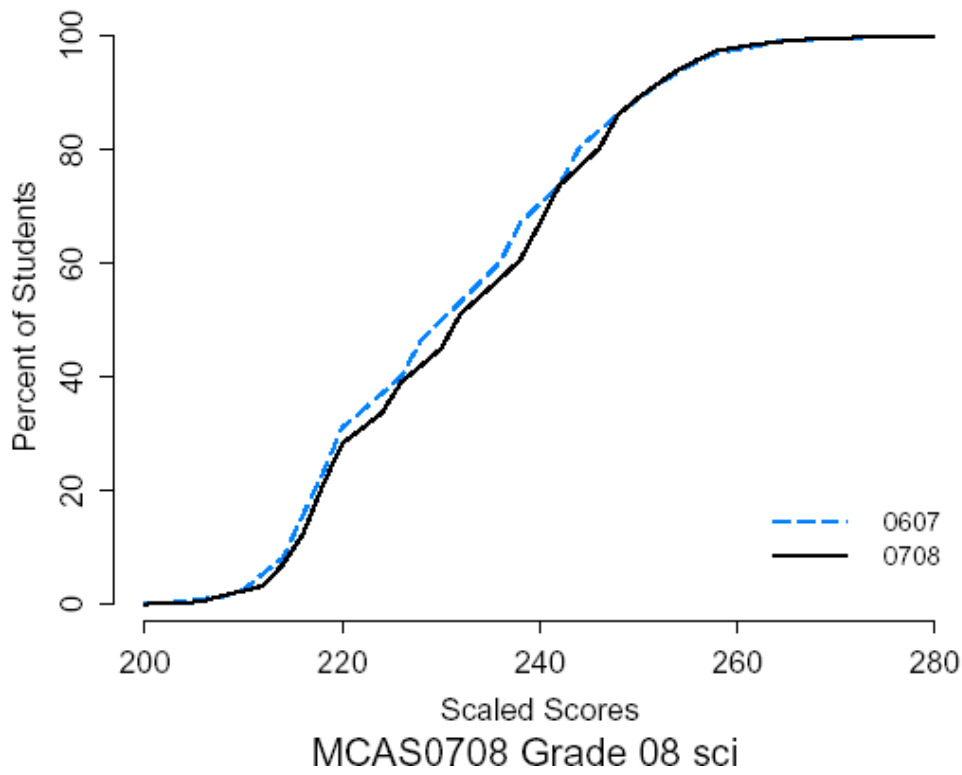
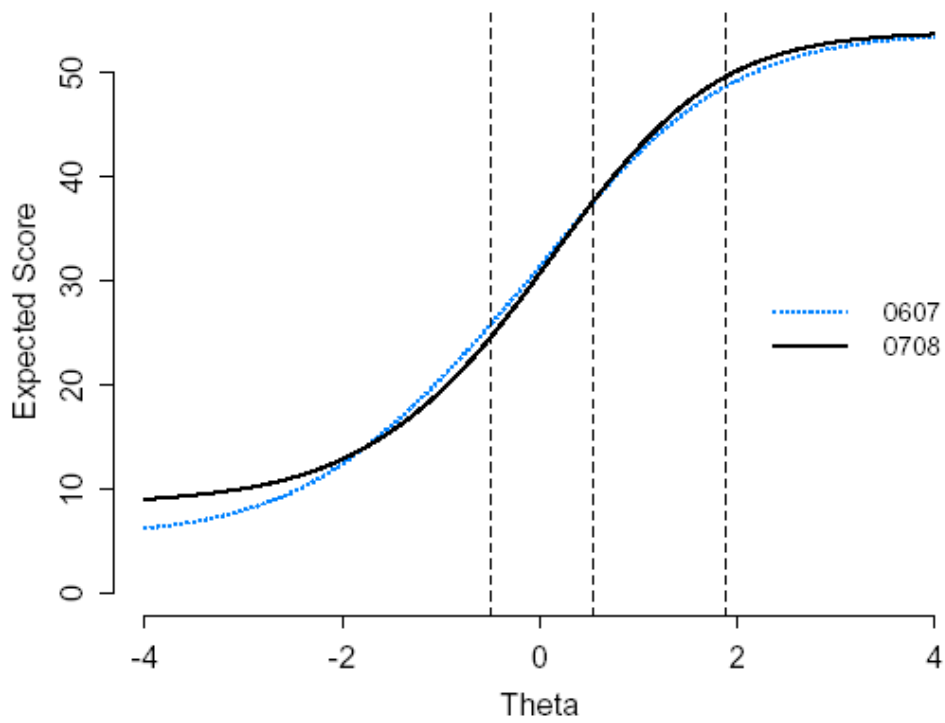
MCAS0708 Grade 05 sci



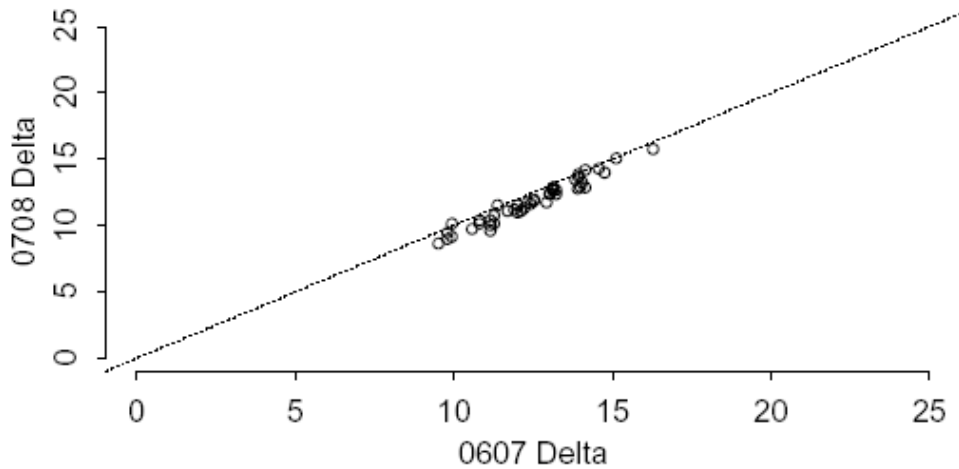
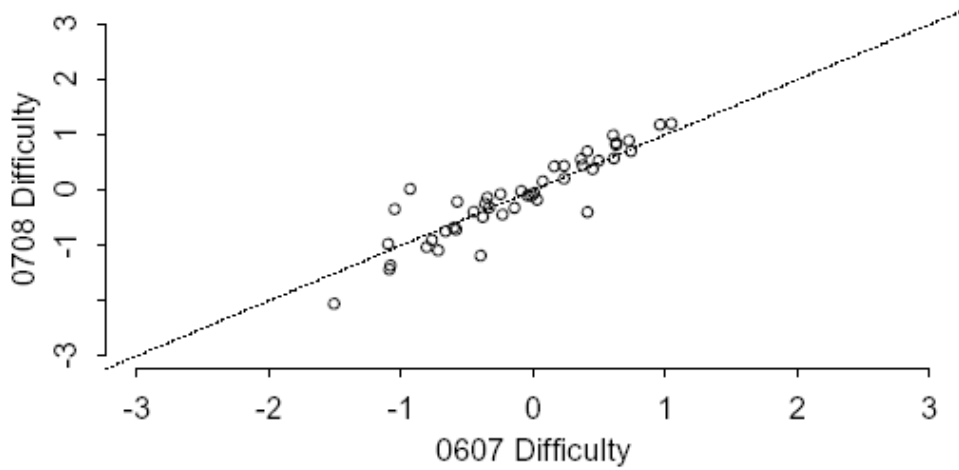
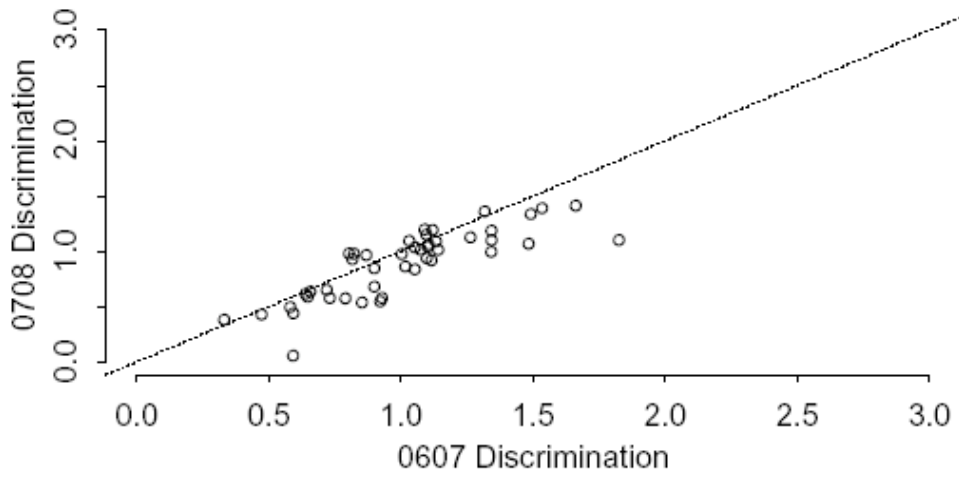
MCAS 2007–08 Grade 08—Science and Technology/Engineering



MCAS0708 Grade 08 sci

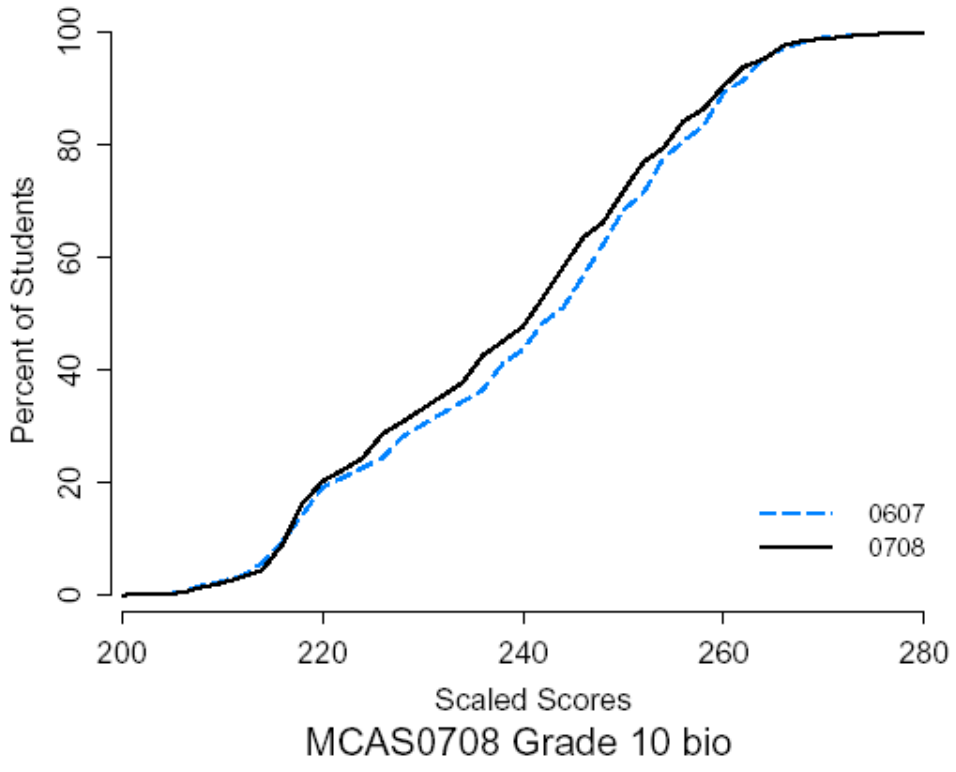
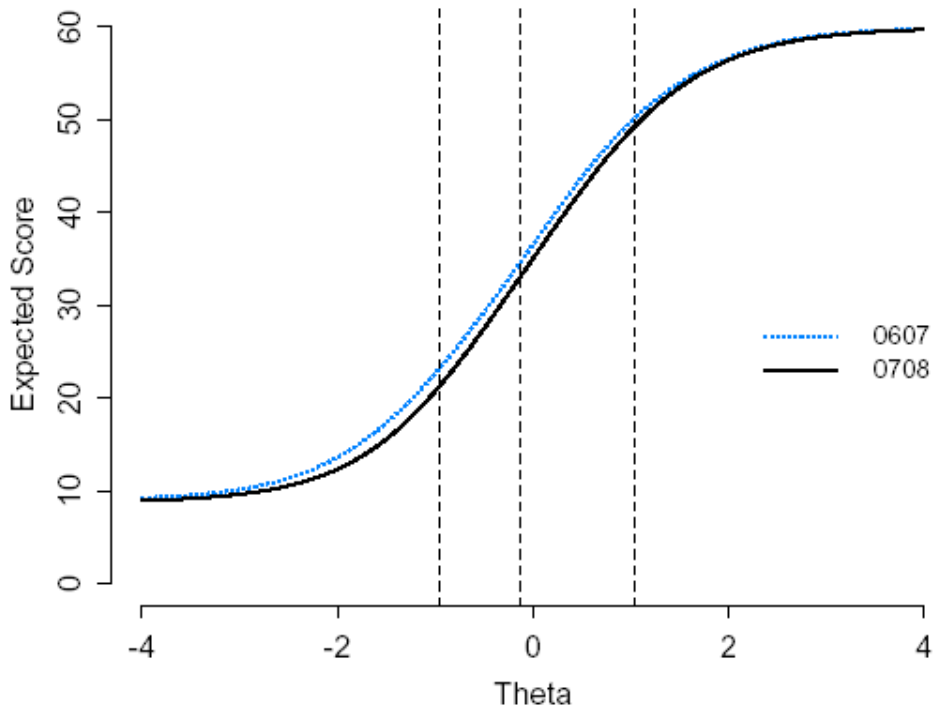


MCAS 2007-08 HS—Biology

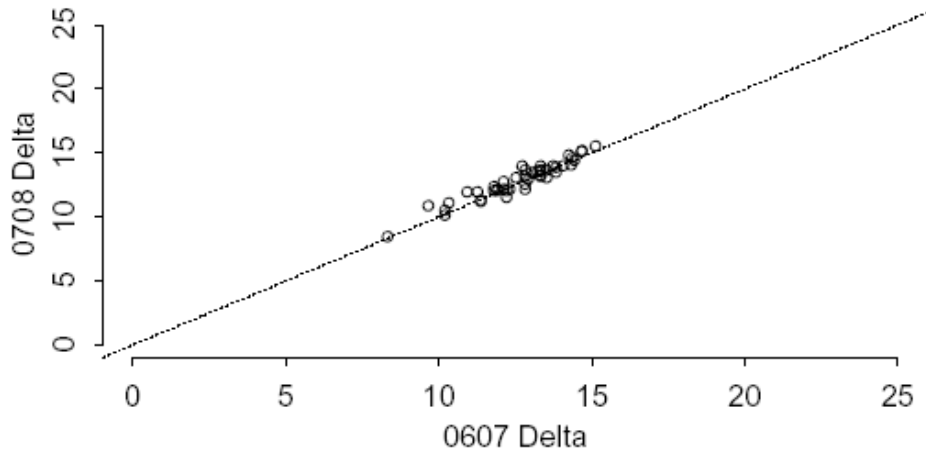
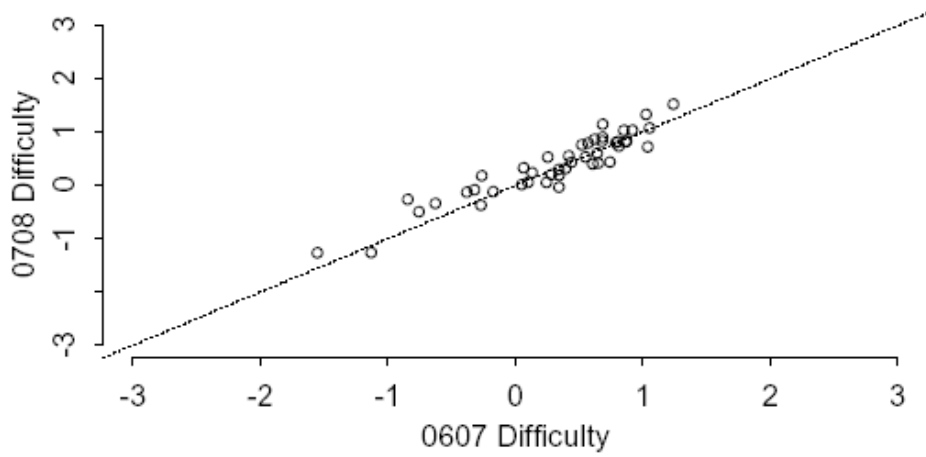
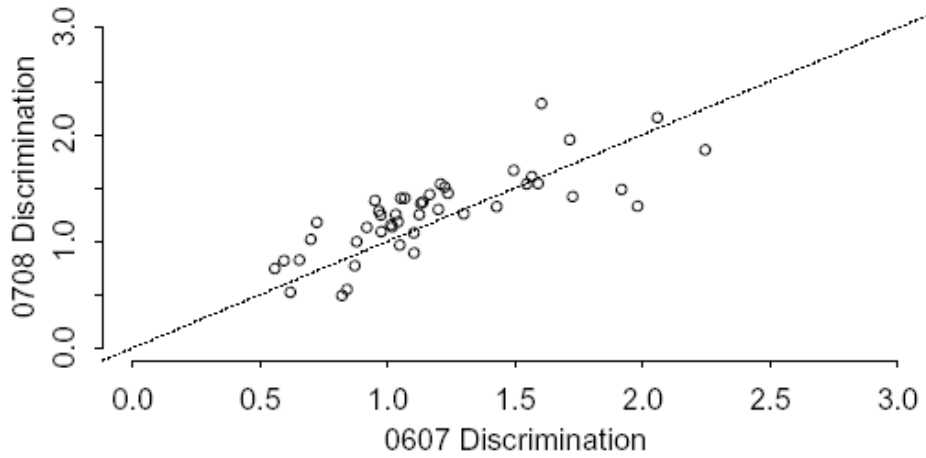


MCAS0708 Grade 10 bio

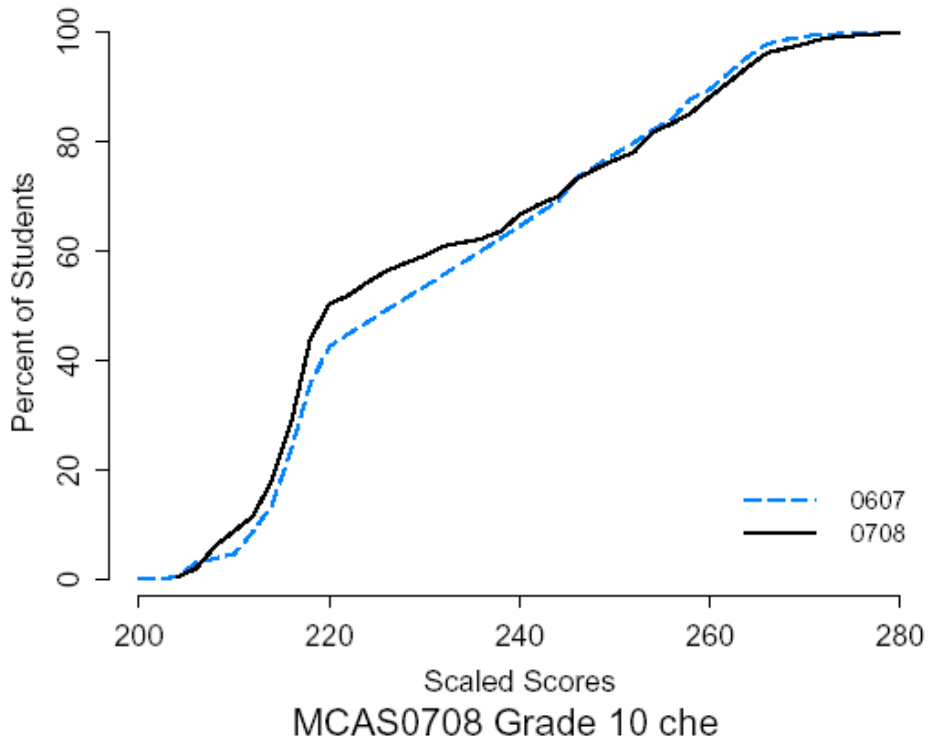
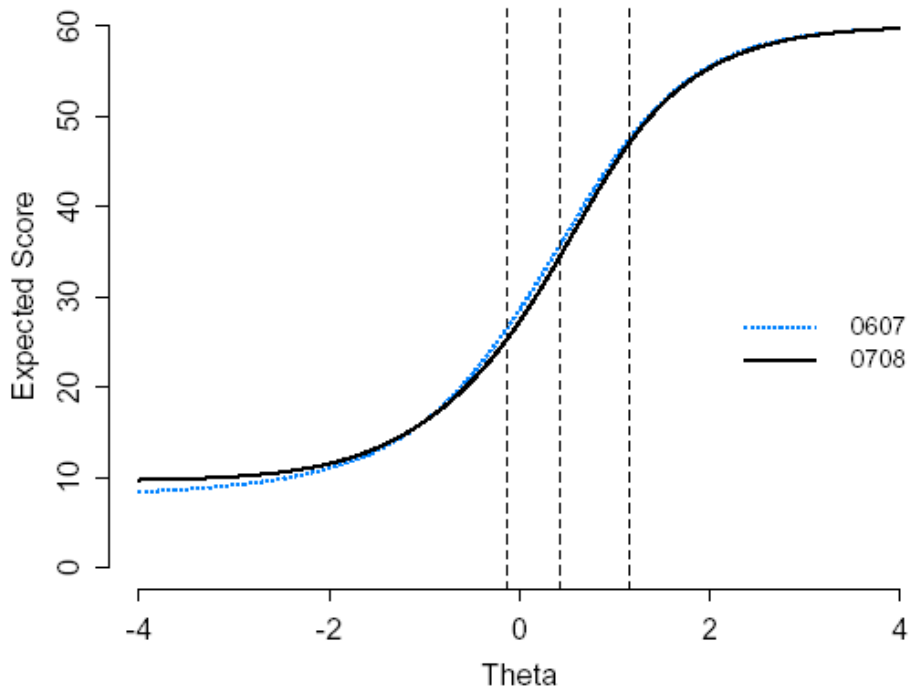




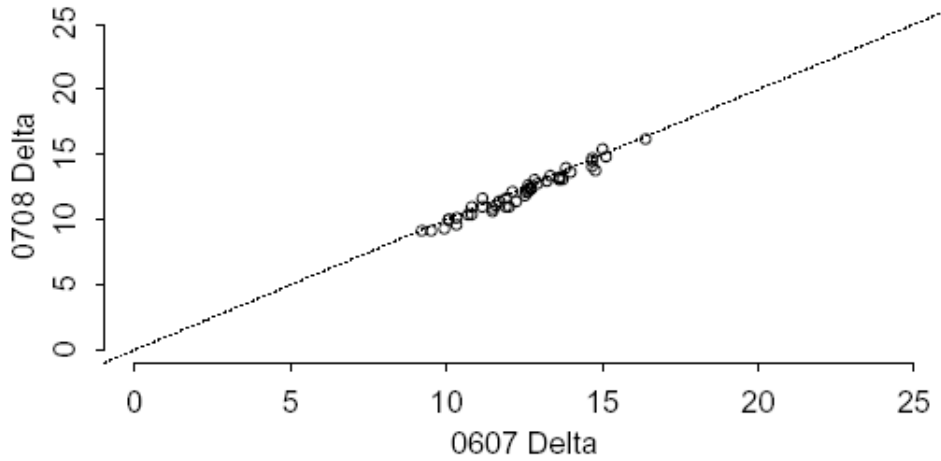
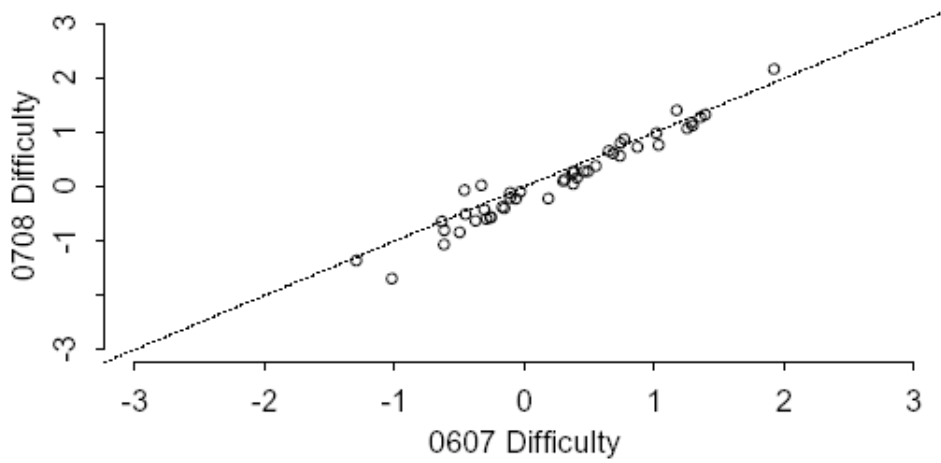
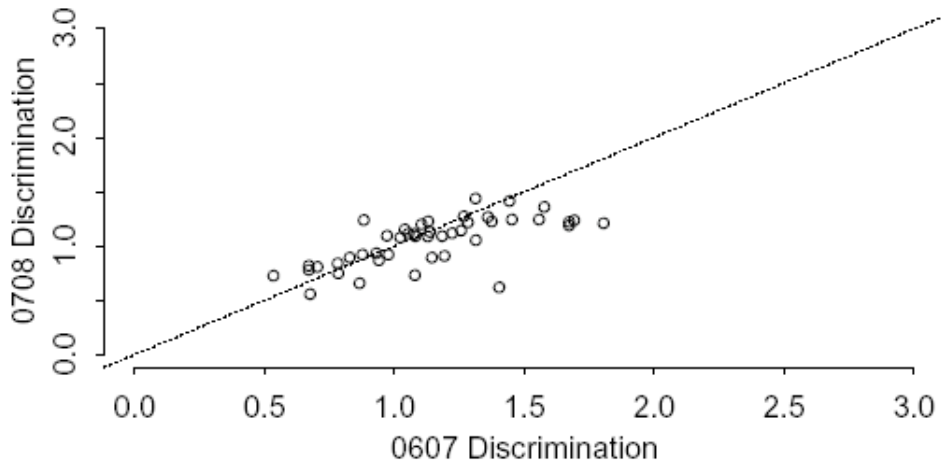
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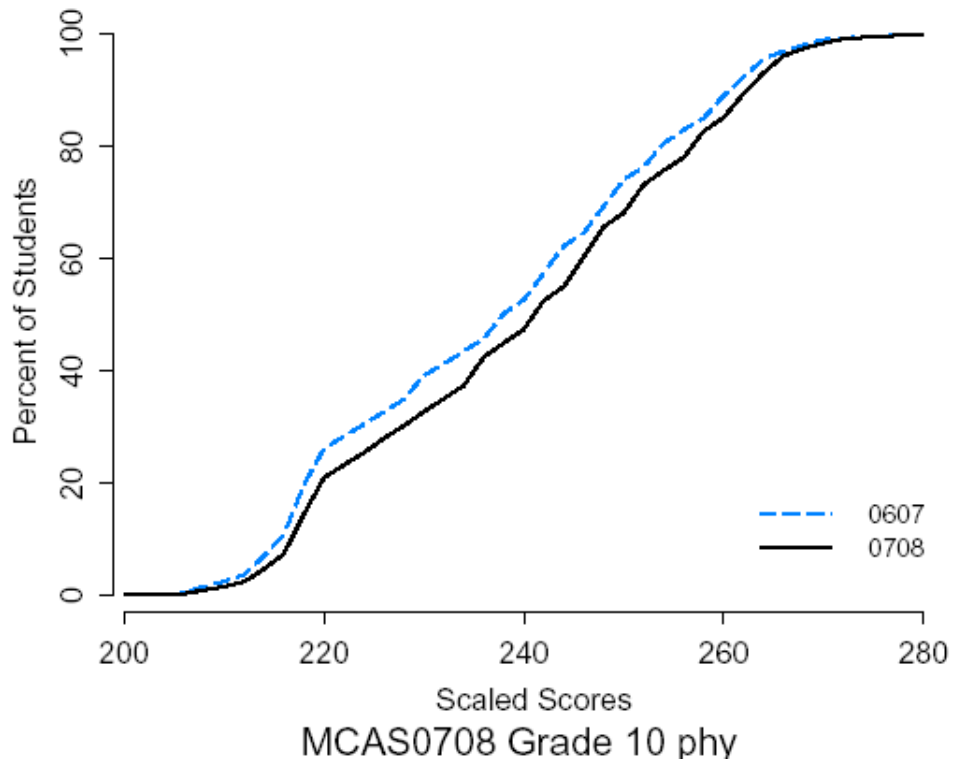
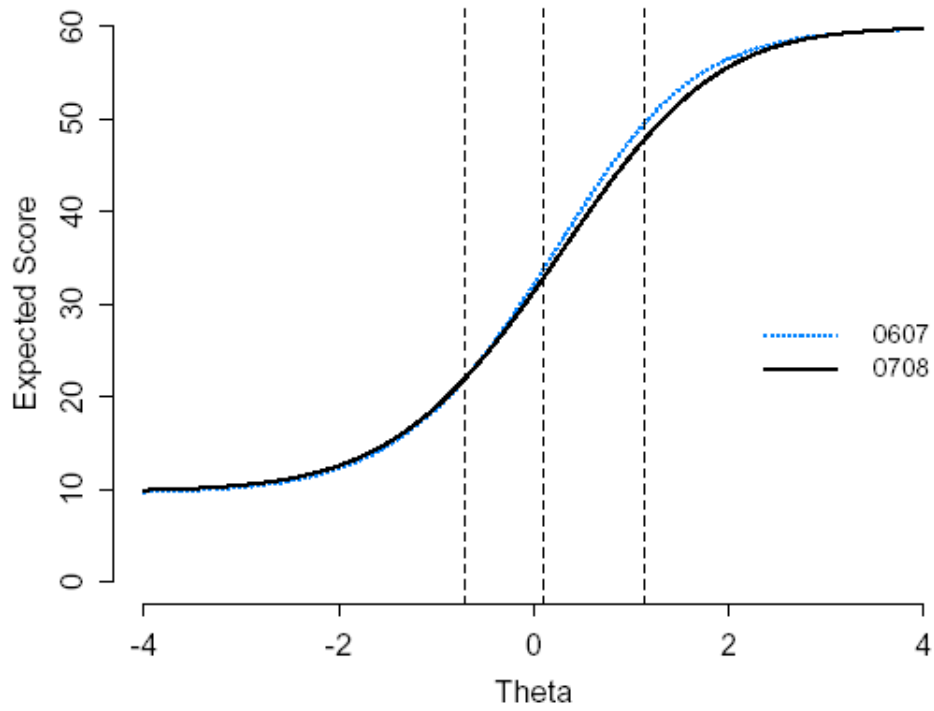
MCAS0708 Grade 10 che



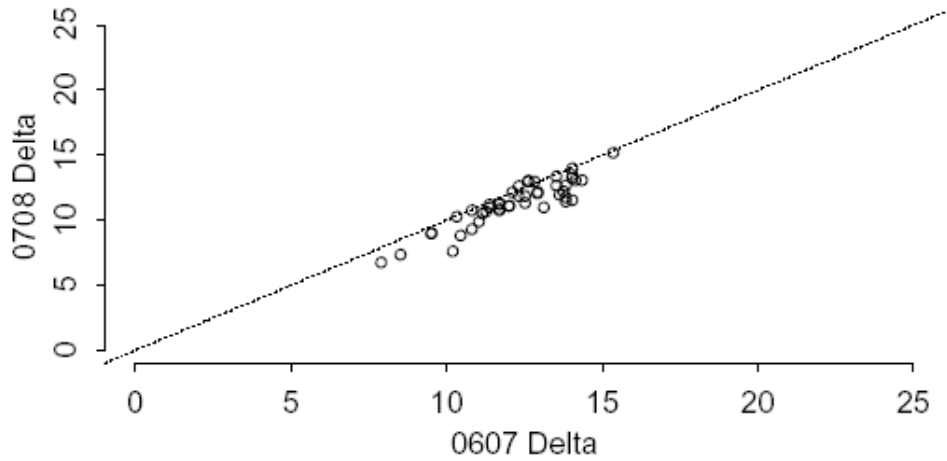
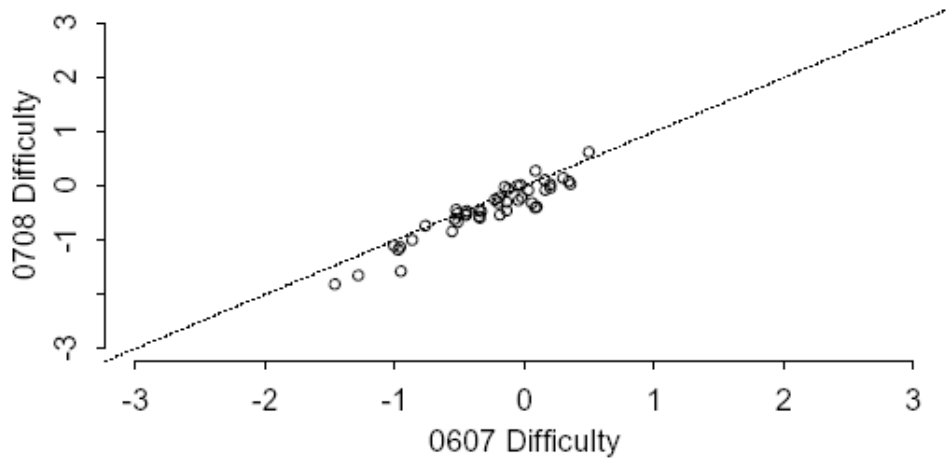
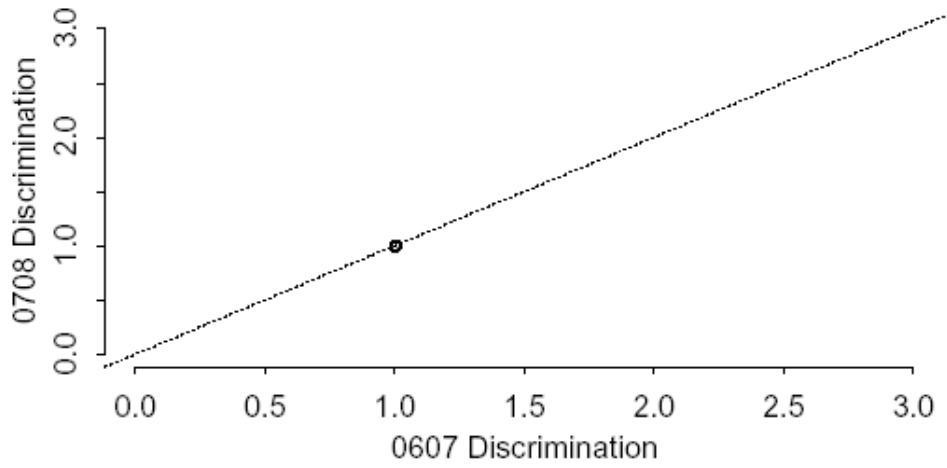
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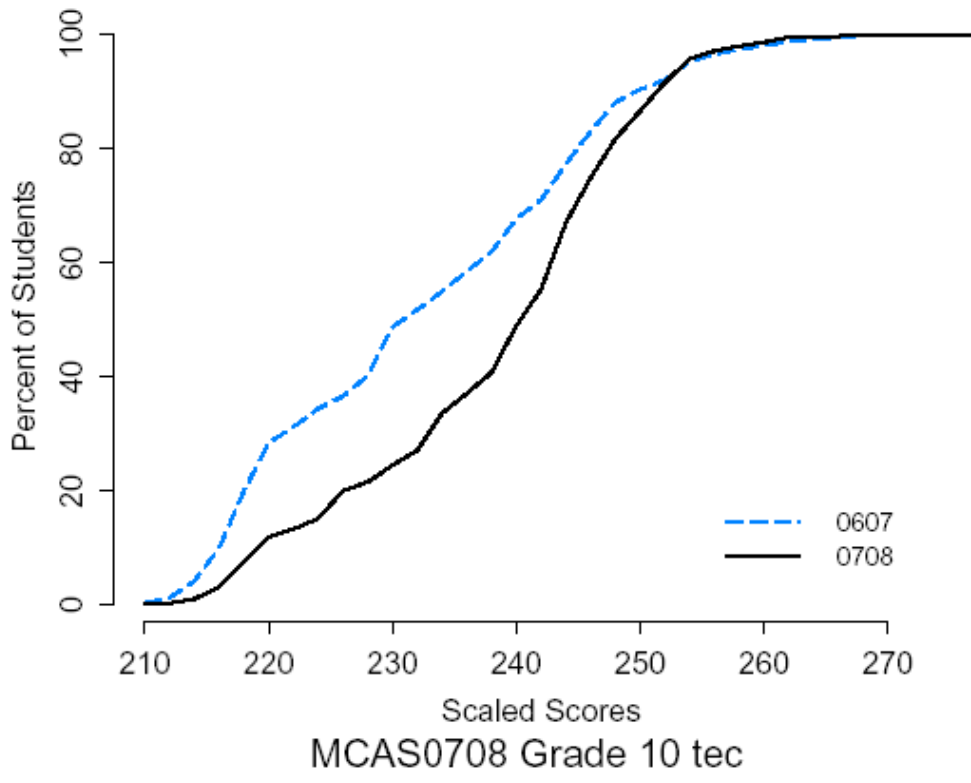
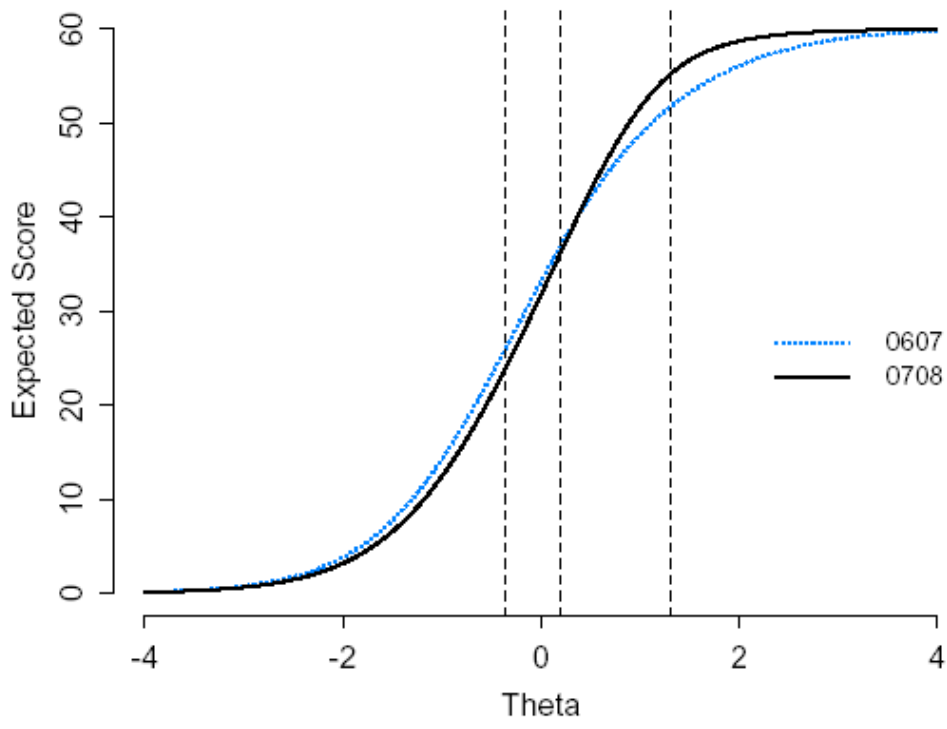
MCAS0708 Grade 10 phv



MCAS 2007–08 HS—Technology/Engineering



MCAS0708 Grade 10 tec



MCAS0708 Grade 10 tec

## 6.2 Assessment Reliability

The *2007 MCAS Technical Report* contains information about the rationale behind assessment reliability and some methods of measuring it, including a description of the split-half method.

### 6.2.1 Reliability and Standard Errors of Measurement

Table 6.2.1 presents descriptive statistics, Cronbach's (1951) alpha ( $\alpha$ ) coefficient, and raw score standard errors of measurement for each 2008 MCAS content area test at each grade. Alpha is computed using the following formula:

$$\alpha \equiv \frac{n}{n-1} \left[ 1 - \frac{\sum_{i=1}^n \sigma^2(Y_i)}{\sigma_x^2} \right]$$

where

$i$  indexes the item,

$n$  is the total number of items,

$\sigma^2(Y_i)$  represents individual item variance, and

$\sigma_x^2$  represents the total test variance.

**Table 6.2.1: MCAS 2008  
Test Reliabilities, Descriptive Statistics, and Standard Errors of Measurement**  
*SD = Standard Deviation / Rel = Reliability / SEM = Standard Error of Measurement*

Content Area	Grade Level	Number of Students	Raw Score Points	Min. Score	Max. Score	Mean Score	SD	Rel	SEM
English Language Arts (Composition not included)	3	69192	48	2	48	34.80	8.19	0.90	2.55
	4	69922	52	2	72	51.33	9.88	0.89	3.25
	5	69460	52	4	52	36.27	8.35	0.89	2.73
	6	70358	52	4	52	36.91	8.04	0.89	2.72
	7	71700	72	5	72	52.13	10.15	0.90	3.22
	8	72295	52	4	52	37.63	8.52	0.89	2.78
	10	70868	72	5	72	52.59	10.10	0.90	3.26
Mathematics	3	69314	40	1	40	30.04	7.18	0.88	2.45
	4	70211	54	3	54	36.83	9.82	0.89	3.33
	5	69510	54	0	54	35.50	11.46	0.91	3.45
	6	70405	54	2	54	38.79	11.66	0.92	3.37
	7	72017	54	1	54	35.52	12.24	0.92	3.53
	8	72311	54	1	54	34.12	12.26	0.92	3.41
	10	70518	60	1	60	39.84	13.57	0.93	3.68
Science and Technology/ Engineering	5	69620	54	1	54	36.24	9.36	0.87	3.41
	8	72257	54	0	54	32.32	10.57	0.88	3.66
Biology	9/10	59177	60	0	60	33.85	12.53	0.91	3.70
Chemistry	9/10	2192	60	4	60	28.90	14.29	0.93	3.86
Physics	9/10	16919	60	1	60	34.23	12.41	0.91	3.79
Tech/Eng	9/10	2182	60	5	60	37.23	10.01	0.87	3.65



### 6.2.2 Stratified Coefficient Alpha ( $\alpha$ )

According to Feldt and Brennan (1989), a prescribed distribution of items over categories (such as different item types) indicates the presumption that at least a small, but important, degree of unique variance is associated with the categories. In contrast, Cronbach's (1951) coefficient  $\alpha$  is built on the assumption that there are no such local or clustered dependencies. A stratified version of coefficient  $\alpha$  corrects for this problem.

Stratified  $\alpha$  is defined as follows:

$$\alpha_{strat} = 1 - \frac{\sum_{j=1}^k \sigma_{x_j}^2 (1 - \alpha)}{\sigma_x^2}$$

where

$j$  indexes the subtests or categories,

$\sigma_{x_j}^2$  represents the variance of the  $k$  individual subtests or categories,

$\alpha$  is the unstratified Cronbach's  $\alpha$  coefficient, and

$\sigma_x^2$  represents the total test variance.

Stratified  $\alpha$  was calculated for each 2008 MCAS grade/content combination, based on item type (multiple-choice v. open-response). Results are provided in table 6.2.2. Note that in table 6.2.2,  $N_{mc}$  refers to the number of multiple-choice items on a given test, while  $N_{or}$  denotes the number of open-response items (with number of possible points on OR items in parentheses).

**Table 6.2.2: MCAS 2008 Test Coefficients  
Cronbach's  $\alpha$  and Stratified  $\alpha$**

Content Area	Grade Level	Cronbach's $\alpha$	Cronbach's $\alpha_{mc}$	N <sub>mc</sub>	Cronbach's $\alpha_{or}$	N <sub>or</sub>	Stratified $\alpha$	
English Language Arts	3	0.90	0.91	40	0.57	2 (8)	0.91	
	4	0.89	0.88	36	0.84	6 (36)	0.91	
	5	0.89	0.89	36	0.75	4 (16)	0.91	
	6	0.89	0.88	36	0.77	4 (16)	0.90	
	7	0.90	0.88	36	0.86	6 (36)	0.92	
	8	0.89	0.88	36	0.84	4 (16)	0.91	
	10	0.90	0.89	36	0.81	4 (16)	0.92	
Mathematics	3	0.88	0.84	25	0.74	10 (15)	0.89	
	4	0.89	0.86	29	0.77	10 (25)	0.89	
	5	0.91	0.89	29	0.79	10 (25)	0.91	
	6	0.92	0.89	29	0.83	10 (25)	0.92	
	7	0.92	0.88	29	0.84	10 (25)	0.92	
	8	0.92	0.89	29	0.84	10 (25)	0.93	
	10	0.92	0.88	32	0.87	10 (28)	0.93	
Science and Technology/Engineering	5	0.87	0.85	34	0.72	5 (20)	0.89	
	8	0.88	0.84	34	0.79	5 (20)	0.90	
	<i>Biology</i>	9/10	0.91	0.88	40	0.85	5 (20)	0.93
	<i>Chemistry</i>	9/10	0.93	0.9	40	0.88	5 (20)	0.94
	<i>Physics</i>	9/10	0.91	0.88	40	0.83	5 (20)	0.92
	<i>Tech/Eng</i>	9/10	0.87	0.84	40	0.71	5 (20)	0.88

### 6.2.3 Reliability of Performance Level Categorization

Details about the determination of statistical accuracy and consistency of classifications are provided in the *2007 Technical Report*, including information regarding the Livingston and Lewis (1995) methods and kappa.

Summaries of the accuracy and consistency analyses for the 2008 MCAS administration are provided in tables 6.2.3-1 through 6.2.3-20.

The first section of each table shows the overall accuracy and consistency indices, as well as kappa ( $\kappa$ ). The overall index is the sum of the diagonal elements of the appropriate contingency table.

The second section of each table shows accuracy and consistency values, conditional upon performance level. For instance, the conditional accuracy value is 0.820 for the *Needs Improvement* category for grade 4 ELA. This indicates that, of the students whose true scores placed them in the *Needs Improvement* category, 82.0 percent would be expected to be in the *Needs Improvement* category if categorized according to their actual scores. The corresponding consistency value of 0.772 indicates that 77.2 percent of the grade 4 students in the *Needs Improvement* category would be expected to score in the *Needs Improvement* category again if a second, parallel test form were administered.

The third section of each table provides data at each of the cut points. These values indicate the accuracy and consistency of the dichotomous decisions, either above or below the associated cut point. In addition, false positive and false negative accuracy rates are provided. These values are estimates of the proportions of students who were categorized above the cut when their true score would place them below the cut, and vice-versa.

**Table 6.2.3-1: 2008 MCAS  
Accuracy and Consistency  
Grade 3 English Language Arts**

Overall Indices	Accuracy		Consistency		Kappa ( $\kappa$ )
		0.758		0.674	
Indices Conditional on Level	Performance Level		Accuracy		Consistency
	<i>Warning</i>		0.834		0.760
	<i>Needs Improvement</i>		0.808		0.747
	<i>Proficient</i>		0.712		0.642
	<i>Above Proficient</i>		0.726		0.570
Indices at Cut Points	Accuracy				Consistency
		Accuracy	False Positives	False Negatives	
	<i>W:NI</i>	0.968	0.015	0.017	0.955
	<i>NI:P</i>	0.914	0.049	0.038	0.880
	<i>P:AP</i>	0.876	0.084	0.040	0.837

**Table 6.2.3-2: 2008 MCAS  
Accuracy and Consistency  
Grade 4 English Language Arts**

Overall Indices	Accuracy		Consistency		Kappa ( $\kappa$ )
		0.803		0.727	
Indices Conditional on Level	Performance Level		Accuracy		Consistency
	<i>Warning</i>		0.815		0.721
	<i>Needs Improvement</i>		0.820		0.772
	<i>Proficient</i>		0.759		0.678
	<i>Advanced</i>		0.854		0.712
Indices at Cut Points	Accuracy				Consistency
		Accuracy	False Positives	False Negatives	
	<i>W:NI</i>	0.958	0.019	0.023	0.941
	<i>NI:P</i>	0.904	0.057	0.040	0.866
	<i>P:A</i>	0.941	0.042	0.017	0.918

**Table 6.2.3-3: 2008 MCAS  
Accuracy and Consistency  
Grade 5 English Language Arts**

Overall Indices	Accuracy		Consistency		Kappa ( $\kappa$ )
		0.814		0.742	
Indices Conditional on Level	Performance Level		Accuracy		Consistency
	<i>Warning</i>		0.784		0.662
	<i>Needs Improvement</i>		0.826		0.778
	<i>Proficient</i>		0.782		0.715
	<i>Advanced</i>		0.872		0.746
Indices at Cut Points	Accuracy			Consistency	
		Accuracy	False Positives		False Negatives
	<i>W:NI</i>	0.976	0.010	0.014	0.966
	<i>NI:P</i>	0.908	0.052	0.040	0.873
<i>P:A</i>	0.930	0.050	0.021	0.903	

**Table 6.2.3-4: 2008 MCAS  
Accuracy and Consistency  
Grade 6 English Language Arts**

Overall Indices	Accuracy		Consistency		Kappa ( $\kappa$ )
		0.807		0.732	
Indices Conditional on Level	Performance Level		Accuracy		Consistency
	<i>Warning</i>		0.774		0.643
	<i>Needs Improvement</i>		0.791		0.727
	<i>Proficient</i>		0.798		0.742
	<i>Advanced</i>		0.868		0.739
Indices at Cut Points	Accuracy			Consistency	
		Accuracy	False Positives		False Negatives
	<i>W:NI</i>	0.976	0.010	0.015	0.965
	<i>NI:P</i>	0.909	0.050	0.041	0.874
<i>P:A</i>	0.922	0.055	0.023	0.893	

**Table 6.2.3-5: 2008 MCAS  
Accuracy and Consistency  
Grade 7 English Language Arts**

Overall Indices	Accuracy		Consistency		Kappa ( $\kappa$ )
		0.836		0.770	
Indices Conditional on Level	Performance Level		Accuracy		Consistency
	<i>Warning</i>		0.797		0.679
	<i>Needs Improvement</i>		0.809		0.747
	<i>Proficient</i>		0.844		0.801
	<i>Advanced</i>		0.870		0.744
Indices at Cut Points	Accuracy			Consistency	
		Accuracy	False Positives		False Negatives
	<i>W:NI</i>	0.979	0.009	0.013	0.970
	<i>NI:P</i>	0.920	0.043	0.038	0.888
<i>P:A</i>	0.937	0.044	0.019	0.913	

**Table 6.2.3-6: 2008 MCAS  
Accuracy and Consistency  
Grade 8 English Language Arts**

Overall Indices	Accuracy		Consistency		Kappa ( $\kappa$ )
		0.836		0.773	
Indices Conditional on Level	Performance Level		Accuracy		Consistency
	<i>Warning</i>		0.779		0.652
	<i>Needs Improvement</i>		0.766		0.687
	<i>Proficient</i>		0.858		0.828
	<i>Advanced</i>		0.868		0.725
Indices at Cut Points	Accuracy			Consistency	
	Accuracy	False Positives	False Negatives		
	<i>W:NI</i>	0.979	0.009	0.012	0.970
	<i>NI:P</i>	0.927	0.039	0.035	0.898
	<i>P:A</i>	0.931	0.051	0.019	0.905

**Table 6.2.3-7: 2008 MCAS  
Accuracy and Consistency  
Grade 10 English Language Arts**

Overall Indices	Accuracy		Consistency		Kappa ( $\kappa$ )
		0.839		0.776	
Indices Conditional on Level	Performance Level		Accuracy		Consistency
	<i>Failing</i>		0.785		0.649
	<i>Needs Improvement</i>		0.813		0.747
	<i>Proficient</i>		0.832		0.788
	<i>Advanced</i>		0.887		0.794
Indices at Cut Points	Accuracy			Consistency	
	Accuracy	False Positives	False Negatives		
	<i>F:NI</i>	0.987	0.005	0.008	0.981
	<i>NI:P</i>	0.930	0.036	0.034	0.902
	<i>P:A</i>	0.923	0.051	0.027	0.893

**Table 6.2.3-8: 2008 MCAS  
Accuracy and Consistency  
Grade 3 Mathematics**

Overall Indices	Accuracy		Consistency		Kappa ( $\kappa$ )
		0.748		0.664	
Indices Conditional on Level	Performance Level		Accuracy		Consistency
	<i>Warning</i>		0.801		0.717
	<i>Needs Improvement</i>		0.695		0.609
	<i>Proficient</i>		0.670		0.587
	<i>Above Proficient</i>		0.891		0.771
Indices at Cut Points	Accuracy			Consistency	
	Accuracy	False Positives	False Negatives		
	<i>W:NI</i>	0.948	0.025	0.027	0.927
	<i>NI:P</i>	0.901	0.059	0.040	0.863
	<i>P:AP</i>	0.899	0.074	0.027	0.865

**Table 6.2.3-9: 2008 MCAS  
Accuracy and Consistency  
Grade 4 Mathematics**

Overall Indices	Accuracy		Consistency		Kappa ( $\kappa$ )
		0.766		0.692	
Indices Conditional on Level	Performance Level		Accuracy		Consistency
	<i>Warning</i>		0.784		0.680
	<i>Needs Improvement</i>		0.818		0.780
	<i>Proficient</i>		0.517		0.414
	<i>Advanced</i>		0.872		0.741
Indices at Cut Points	Accuracy			Consistency	
		Accuracy	False Positives		False Negatives
	<i>W:NI</i>	0.954	0.021	0.025	0.936
	<i>NI:P</i>	0.894	0.068	0.038	0.854
<i>P:A</i>	0.911	0.064	0.025	0.878	

**Table 6.2.3-10: 2008 MCAS  
Accuracy and Consistency  
Grade 5 Mathematics**

Overall Indices	Accuracy		Consistency		Kappa ( $\kappa$ )
		0.769		0.686	
Indices Conditional on Level	Performance Level		Accuracy		Consistency
	<i>Warning</i>		0.826		0.760
	<i>Needs Improvement</i>		0.760		0.686
	<i>Proficient</i>		0.679		0.587
	<i>Advanced</i>		0.867		0.755
Indices at Cut Points	Accuracy			Consistency	
		Accuracy	False Positives		False Negatives
	<i>W:NI</i>	0.949	0.026	0.025	0.929
	<i>NI:P</i>	0.912	0.052	0.036	0.878
<i>P:A</i>	0.907	0.063	0.030	0.874	

**Table 6.2.3-11: 2008 MCAS  
Accuracy and Consistency  
Grade 6 Mathematics**

Overall Indices	Accuracy		Consistency		Kappa ( $\kappa$ )
		0.762		0.679	
Indices Conditional on Level	Performance Level		Accuracy		Consistency
	<i>Warning</i>		0.850		0.798
	<i>Needs Improvement</i>		0.737		0.655
	<i>Proficient</i>		0.682		0.595
	<i>Advanced</i>		0.843		0.727
Indices at Cut Points	Accuracy			Consistency	
		Accuracy	False Positives		False Negatives
	<i>W:NI</i>	0.953	0.025	0.022	0.935
	<i>NI:P</i>	0.920	0.048	0.032	0.890
<i>P:A</i>	0.889	0.074	0.037	0.851	

**Table 6.2.3-12: 2008 MCAS  
Accuracy and Consistency  
Grade 7 Mathematics**

Overall Indices	Accuracy		Consistency		Kappa ( $\kappa$ )
		0.769		0.686	
Indices Conditional on Level	Performance Level		Accuracy		Consistency
	<i>Warning</i>		0.856		0.811
	<i>Needs Improvement</i>		0.740		0.659
	<i>Proficient</i>		0.717		0.639
	<i>Advanced</i>		0.814		0.662
Indices at Cut Points	Accuracy			Consistency	
	Accuracy	False Positives	False Negatives		
	<i>W:NI</i>	0.941	0.032	0.027	0.918
	<i>NI:P</i>	0.917	0.051	0.032	0.885
	<i>P:A</i>	0.910	0.064	0.026	0.880

**Table 6.2.3-13: 2008 MCAS  
Accuracy and Consistency  
Grade 8 Mathematics**

Overall Indices	Accuracy		Consistency		Kappa ( $\kappa$ )
		0.798		0.722	
Indices Conditional on Level	Performance Level		Accuracy		Consistency
	<i>Warning</i>		0.855		0.810
	<i>Needs Improvement</i>		0.742		0.657
	<i>Proficient</i>		0.754		0.677
	<i>Advanced</i>		0.886		0.780
Indices at Cut Points	Accuracy			Consistency	
	Accuracy	False Positives	False Negatives		
	<i>W:NI</i>	0.941	0.032	0.027	0.917
	<i>NI:P</i>	0.926	0.045	0.030	0.896
	<i>P:A</i>	0.932	0.047	0.021	0.907

**Table 6.2.3-14: 2008 MCAS  
Accuracy and Consistency  
Grade 10 Mathematics**

Overall Indices	Accuracy		Consistency		Kappa ( $\kappa$ )
		0.839		0.777	
Indices Conditional on Level	Performance Level		Accuracy		Consistency
	<i>Failing</i>		0.808		0.722
	<i>Needs Improvement</i>		0.769		0.691
	<i>Proficient</i>		0.754		0.675
	<i>Advanced</i>		0.934		0.886
Indices at Cut Points	Accuracy			Consistency	
	Accuracy	False Positives	False Negatives		
	<i>F:NI</i>	0.972	0.014	0.015	0.960
	<i>NI:P</i>	0.941	0.032	0.027	0.918
	<i>P:A</i>	0.926	0.046	0.029	0.897

**Table 6.2.3-15: 2008 MCAS  
Accuracy and Consistency  
Grade 5 Science and Technology/Engineering**

Overall Indices	Accuracy		Consistency		Kappa ( $\kappa$ )
		0.766		0.680	
Indices Conditional on Level	Performance Level		Accuracy		Consistency
	<i>Warning</i>		0.798		0.701
	<i>Needs Improvement</i>		0.791		0.733
	<i>Proficient</i>		0.696		0.608
	<i>Advanced</i>		0.838		0.688
Indices at Cut Points	Accuracy			Consistency	
	Accuracy	False Positives	False Negatives		
	<i>W:NI</i>	0.957	0.020	0.024	0.939
	<i>NI:P</i>	0.897	0.061	0.043	0.857
	<i>P:A</i>	0.913	0.062	0.025	0.880

**Table 6.2.3-16: 2008 MCAS  
Accuracy and Consistency  
Grade 8 Science and Technology/Engineering**

Overall Indices	Accuracy		Consistency		Kappa ( $\kappa$ )
		0.809		0.736	
Indices Conditional on Level	Performance Level		Accuracy		Consistency
	<i>Warning</i>		0.821		0.757
	<i>Needs Improvement</i>		0.787		0.722
	<i>Proficient</i>		0.829		0.774
	<i>Advanced</i>		0.605		0.328
Indices at Cut Points	Accuracy			Consistency	
	Accuracy	False Positives	False Negatives		
	<i>W:NI</i>	0.932	0.036	0.033	0.905
	<i>NI:P</i>	0.909	0.056	0.035	0.874
	<i>P:A</i>	0.968	0.031	0.001	0.957

**Table 6.2.3-17: 2008 MCAS  
Accuracy and Consistency  
High School (Grades 9/10) Biology**

Overall Indices	Accuracy		Consistency		Kappa ( $\kappa$ )
		0.817		0.746	
Indices Conditional on Level	Performance Level		Accuracy		Consistency
	<i>Failing</i>		0.820		0.750
	<i>Needs Improvement</i>		0.774		0.699
	<i>Proficient</i>		0.832		0.775
	<i>Advanced</i>		0.871		0.755
Indices at Cut Points	Accuracy			Consistency	
	Accuracy	False Positives	False Negatives		
	<i>F:NI</i>	0.947	0.027	0.026	0.926
	<i>NI:P</i>	0.924	0.044	0.033	0.894
	<i>P:A</i>	0.946	0.037	0.017	0.925



**Table 6.2.3-18: 2008 MCAS  
Accuracy and Consistency  
High School (Grades 9/10) Chemistry**

Overall Indices	Accuracy		Consistency		Kappa ( $\kappa$ )
		0.829		0.764	
Indices Conditional on Level	Performance Level		Accuracy		Consistency
	<i>Failing</i>		0.900		0.880
	<i>Needs Improvement</i>		0.709		0.597
	<i>Proficient</i>		0.757		0.665
	<i>Advanced</i>		0.901		0.816
Indices at Cut Points	Accuracy			Consistency	
		Accuracy	False Positives		False Negatives
	<i>F:NI</i>	0.929	0.043	0.028	0.900
	<i>NI:P</i>	0.943	0.035	0.022	0.921
<i>P:A</i>	0.957	0.028	0.015	0.940	

**Table 6.2.3-19: 2008 MCAS  
Accuracy and Consistency  
High School (Grades 9/10) Introductory Physics**

Overall Indices	Accuracy		Consistency		Kappa ( $\kappa$ )
		0.800		0.723	
Indices Conditional on Level	Performance Level		Accuracy		Consistency
	<i>Failing</i>		0.784		0.697
	<i>Needs Improvement</i>		0.762		0.687
	<i>Proficient</i>		0.807		0.742
	<i>Advanced</i>		0.879		0.766
Indices at Cut Points	Accuracy			Consistency	
		Accuracy	False Positives		False Negatives
	<i>F:NI</i>	0.944	0.028	0.028	0.922
	<i>NI:P</i>	0.916	0.049	0.035	0.883
<i>P:A</i>	0.940	0.041	0.019	0.917	

**Table 6.2.3-20: 2008 MCAS  
Accuracy and Consistency  
High School (Grades 9/10) Technology/Engineering**

Overall Indices	Accuracy		Consistency		Kappa ( $\kappa$ )
		0.808		0.732	
Indices Conditional on Level	Performance Level		Accuracy		Consistency
	<i>Failing</i>		0.774		0.659
	<i>Needs Improvement</i>		0.782		0.725
	<i>Proficient</i>		0.842		0.777
	<i>Advanced</i>		0.807		0.531
Indices at Cut Points	Accuracy			Consistency	
		Accuracy	False Positives		False Negatives
	<i>F:NI</i>	0.949	0.022	0.029	0.928
	<i>NI:P</i>	0.887	0.068	0.045	0.844
<i>P:A</i>	0.972	0.024	0.005	0.960	

## 6.3 Validity

Evidence is presented in detail throughout this document to support inferences of student achievement of the learning standards of the *Massachusetts Curriculum Frameworks*, as measured by MCAS, including test development, test alignment, test administration, scoring, equating, item analyses, reliability, scaled scores, performance levels, and reporting. The purpose of this section of the document is to discuss how MCAS ensures the validity of its tests and their results.

### 6.3.1 Validity Evidence for Standard MCAS Tests

MCAS tests are rigorously examined in reference to the guidelines provided in the *Standards for Educational and Psychological Testing* (1999), which provide criteria for the evaluation of tests, testing practices, and effects of test use for a broad set of assessments, including alternate assessments.

The *Standards for Educational and Psychological Testing* describes sources of evidence to consider when constructing a validity argument. Examples of standards prescribed by the manual, as well as evidence of how MCAS tests satisfy these standards, are presented below.

- Standard 1.2 (p. 17): “The test developer should set forth clearly how test scores are intended to be interpreted and used.”

For the 2008 MCAS administration, the *Guide to Interpreting the Spring 2008 MCAS Reports for Schools and Districts* (<http://www.doe.mass.edu/mcas/results.html>) provides this information. The *Guide* outlines general guidelines for the interpretation and use of MCAS reports, gives instructions on how to read and interpret specific reports, and provides information on how to make appropriate comparisons and inferences from statistics. Additionally, the *Guide to the 2008 MCAS for Parents/Guardians* (<http://www.doe.mass.edu/mcas/results.html>) provides information on how parents and guardians should interpret MCAS results.

- Standard 1.13 (p. 20): “When validity evidence includes statistical analyses of test results, either alone or together with data on other variables, the conditions under which the data were collected should be described in enough detail that users can judge the relevance of the statistical findings to local conditions. Attention should be drawn to any features of a validation data collection that are likely to differ from typical operational testing conditions and that could plausibly influence test performance.”

This standard concerns the degree to which the data collected for validity evidence may be generalized to operational conditions. Most of the statistical evidence of validity for the 2008 MCAS tests (see section 6.3.1.2 on Internal Structure) was derived from the tests themselves; thus, this evidence is immediately applicable to MCAS. Whenever validity evidence was accrued from a subset of the Massachusetts test-taking population, rather than the entire population (e.g., study of the concordance between MCAS and other instruments, described below), any potential differences between sample and population were thoroughly documented.

- Standard 1.14 (p. 20): “The patterns of association between and among scores on the instrument under study and other variables should be consistent with theoretical expectations.”

Massachusetts has accumulated a substantial amount of evidence of the criterion-related validity of MCAS tests. This evidence shows that MCAS test results are correlated strongly with relevant measures of academic achievement. Specific examples may be found in the *2007 MCAS Technical Report*.

The *Standards for Educational and Psychological Testing* also advocate that evidence in the following three general areas be considered (pp. 11–17):

- test content
- internal structure
- consequences of testing

Although each of the sources may speak to a different aspect of validity, they are not distinct types of validity. Instead, each contributes to a body of evidence about the comprehensive validity of score interpretations.

### **6.3.1.1 Test Content**

Test content validity is the degree to which MCAS items align to the *Massachusetts Curriculum Framework* learning standards for each content area and grade level. Evidence of test content validity is described in greater detail in section 2 of this document, “MCAS 2008 Test Development and Design.”

#### ***Assessment Development Committees***

The primary gauge of the developmental appropriateness of MCAS test items is the review of all MCAS test items by Massachusetts teachers who serve on MCAS Assessment Development Committees (ADCs). All ADC members have experience teaching students in the subject and grade level for which items are being developed (e.g., grade 5 ELA Reading Comprehension items are reviewed by Massachusetts teachers who are currently teaching or have recently taught grade 5 reading), so that all items are reviewed by individuals who are best equipped to evaluate the developmental appropriateness of test material. The following gives a chronological listing of the steps taken to review the content of every operational MCAS item:

- Item is provided by Measured Progress (MP) to Massachusetts Department of Elementary and Secondary Education (ESE) for review 10 days prior to ADC meeting.
- Item is reviewed by ESE for alignment with *Massachusetts Curriculum Framework* and for content accuracy.
- Item is returned to MP with edits.
- Item is reviewed by ADC panelists for alignment, content accuracy, and bias.
- Post-ADC debriefing: Item is reviewed by MP and ESE developers.
- Item is presented to Bias and Sensitivity Review Committee for review.

- Item and comments from Bias and Sensitivity Review Committee are reviewed by ESE; decision is made to field test.
- Item is field-tested.
- Item is sent to expert reviewer for content and alignment review. Expert reviewers are scholars in their respective fields. Their charge is to review items for content accuracy and to recommend that items be kept as is, edited, or deleted. There is a selection/recruitment process for expert reviewers with final approval by ESE.
- Item is reviewed by ADC panelists for statistics (performance), alignment, content, and expert review comments. Panelists make recommendations.
- ESE makes final decision to designate item as a common item, and item becomes part of that year's test.

Additionally, for the English Language Arts tests, each reading passage is subjected to a minimum of two readability tests, and the grade-level appropriateness of vocabulary within test items is checked against a widely used grade-level guide for vocabulary, the *EDL Core Vocabularies in Reading, Mathematics, Science and Social Studies* (Taylor 1989).

Items and reading passages may be rejected and removed from further consideration at any point in the above processes.

#### ***Bias and Sensitivity Review Committee***

Four two- to three-day Bias and Sensitivity Review Committee meetings are held annually to review passages and items in order to ensure that students are not disadvantaged by test materials for reasons that are not educationally relevant. The Bias and Sensitivity Review Committee consists of classroom teachers, school administrators, and other educators from the community. Appendix F provides a list of all 2008 Bias and Sensitivity Review Committee members.

Each item is reviewed two times, once before field testing and again after field testing. Items and passages are checked for conformity to the standards outlined in *Bias Issues in Test Development* (Caporrino and Kerr 1999). Committee members decide whether to recommend that materials be kept as is, edited, or deleted. The decisions of the Bias and Sensitivity Review Committee are reviewed by the ESE for a final determination.

#### **6.3.1.2 Internal Structure**

Standard 1.11 of the *Standards for Educational and Psychological Testing* states (p. 20): “If the rationale for a test use or interpretation depends on premises about the relationships among parts of the test, evidence concerning the internal structure of the test should be provided.”

Evidence of the internal structure of MCAS tests is provided through detailed statistical analyses within this document. Technical characteristics of the internal structures of the assessments are presented in terms of the following:

- classical item statistics (item difficulty and item-to-total-score correlation, section 6.1.1)
- differential item functioning analyses (section 6.1.2)
- item response theory parameters and procedures (section 6.1.3)
- a variety of reliability coefficients and standard errors of measurement (section 6.2.1)

In addition, psychometricians closely examine theoretically derived and empirically derived item characteristic curves. This allows for the evaluation of item model fit as well as a structural evaluation across all MCAS test items. Redundant analysis performed by the University of Massachusetts at Amherst also supports data structure found through item response theory (IRT) analysis. Each test is equated to the same grade and content test from the prior year to preserve the meaning of scores over time. Detailed discussions of equating, scaling, and item analyses are provided in sections 4.3 and 6.1 of this document.

### **6.3.1.3 Comparison of MCAS Dimensionality Analysis Results for 2006–2007 and 2007–2008**

Because tests are constructed with multiple content area subcategories and their associated knowledge and skills, the potential exists for a large number of dimensions being invoked beyond the common primary dimension. Generally, the subcategories are highly correlated with each other; therefore, the primary dimension they share typically explains an overwhelming majority of variance in test scores. In fact, the presence of just such a dominant primary dimension is the psychometric assumption that provides the foundation for the unidimensional item response theory (IRT) models that are used for calibrating, linking, scaling, and equating the MCAS test forms for grades 3 through 8 and high school.

The purpose of dimensionality analysis is to investigate whether violation of the assumption of test unidimensionality is statistically detectable and, if so, (a) the degree to which unidimensionality is violated and (b) the nature of the multidimensionality. Dimensionality analyses were performed on common items for all MCAS tests administered during the spring 2006–07 and the spring 2007–08 administrations. Twenty tests were analyzed for each administration. The results for these analyses are reported and compared below.

The dimensionality analyses were conducted using the nonparametric IRT-based methods DIMTEST (Stout, 1987; Stout, Froelich, & Gao, 2001) and DETECT (Zhang & Stout, 1999). Both of these methods use as their basic statistical building block the estimated average conditional covariances for item pairs. A conditional covariance is the covariance between two items conditioned on total score for the rest of the test, and the average conditional covariance is obtained by averaging over all possible conditioning scores. When a test is strictly unidimensional, all conditional covariances are expected to take on values within random noise of zero, indicating statistically independent item responses for examinees with equal expected scores. Non-zero conditional covariances are essentially violations of the principle of local independence, and such local *dependence* implies multidimensionality. Thus, non-random patterns of positive and negative conditional covariances are indicative of multidimensionality.

DIMTEST is a hypothesis-testing procedure for detecting violations of local independence. The data are first randomly divided into a training sample and a cross-validation sample. Then an exploratory analysis of the conditional covariances is conducted on the training sample data to find the cluster of items that displays the greatest evidence of local dependence. The cross-validation sample is then used to test whether the conditional covariances of the selected cluster of items display local dependence, conditioning on total score on the non-clustered items. The DIMTEST statistic follows a standard normal distribution under the null hypothesis of unidimensionality.

DETECT is an effect-size measure of multidimensionality. As with DIMTEST, the data are first randomly divided into a training sample and a cross-validation sample (these samples are drawn independently of those used with DIMTEST). The training sample is used to find a set of mutually exclusive and collectively exhaustive clusters of items that best fit a systematic pattern of positive conditional covariances for pairs of items from the same cluster and negative conditional covariances from different clusters. Next, the clusters from the training sample are used with the cross-validation sample data to average the conditional covariances: within-cluster conditional covariances are summed, from this sum the between-cluster conditional covariances are subtracted, this difference is divided by the total number of item pairs, and this average is multiplied by 100 to yield an index of the average violation of local independence for an item pair. DETECT values less than 0.2 indicate very weak multidimensionality (or near unidimensionality); values of 0.2 to 0.4, weak to moderate multidimensionality; values of 0.4 to 1.0, moderate to strong multidimensionality; and values greater than 1.0, very strong multidimensionality.

DIMTEST and DETECT were applied to the common items of the MCAS tests administered during spring 2006–07 and spring 2007–08 (a total of 20 tests per administration). The data for each grade were split into a training sample and a cross-validation sample. For grades 3, 4, 5, 6, 7, and 8, each grade had at least 69,000 student examinees. The grade 10 ELA and Mathematics tests each had over 70,000 student examinees for each year. For the four high school (grades 9/10) end-of-course Science and Technology/Engineering tests, Biology had just over 20,000 examinees in 2006–07 and over 60,000 in 2007–08; Chemistry had over 13,000 examinees in 2006–07 but dropped to just over 2,000 examinees in 2007–08; Introductory Physics had over 14,000 examinees in 2006–07 and over 17,000 in 2007–08; and Technology/Engineering had approximately 2,000 examinees in both administrations. Because DIMTEST was limited to using 24,000 students, the training and cross-validation samples for the tests that had over 24,000 students were limited to 12,000 each, randomly sampled from the total sample. DETECT, on the other hand, had an upper limit of 500,000 students, so every training sample and cross-validation sample used all the available data. After randomly splitting the data into training and cross-validation samples, DIMTEST was applied to each dataset to see if the null hypothesis of unidimensionality would be rejected. DETECT was then applied to each dataset for which the DIMTEST null hypothesis was rejected in order to estimate the effect size of the multidimensionality.

### ***DIMTEST Analyses***

The results of the DIMTEST analyses indicated that the null hypothesis was very strongly rejected for nearly every dataset.

- For the 2006–07 tests, the hypothesis testing p-value was less than 0.00005 in 16 out of 20 cases. In the remaining four cases, grades 4 and 6 ELA and high school end-of-course Technology/Engineering rejected at a significance level of 0.01, and grade 7 ELA rejected at a significance level of 0.0001.
- For the 2007–08 tests, the hypothesis testing p-value was less than 0.00005 in 17 out of 20 cases. In the remaining three cases, the grade 6 ELA test rejected at a significance level of 0.0001, the grade 4 ELA test rejected at a significance level of 0.05, and the high school Technology/Engineering test rejected at a significance level of 0.01. Even though all the hypothesis tests rejected at level 0.05 (the typical level used for determining statistical rejection), because multiple hypothesis tests were conducted, one could certainly argue that the result for grade 3 ELA in 2007–08 (or even perhaps the results for grades that had rejections at significance levels of 0.01) could be interpreted as non-rejection.

Overall, there is a strong tendency toward rejection of the hypothesis of unidimensionality for the MCAS tests, although there is some indication of ELA having weaker rejections. Because strict unidimensionality is an idealization that almost never holds exactly for a given dataset, the large number of strong statistical rejections in the DIMTEST results were not surprising. Indeed, because of the very large sample sizes involved in most of the datasets (over 60,000 in 33 of the 40 tests, and over 13,000 in 37), DIMTEST would be expected to be sensitive to even quite small violations of unidimensionality.

### ***DETECT Analyses***

Next, DETECT was used to estimate the effect size for the violations of local independence for the cases where DIMTEST rejection of the hypothesis of unidimensionality occurred. Although no further analysis was strictly necessary for the datasets that could be argued to have had non-rejection (e.g., grade 3 ELA in 2007–08), for the sake of completeness, we also include the reporting of their DETECT results. Table 6.3.1.3 below displays the multidimensionality effect size estimates from DETECT.

**Table 6.3.1.3: Multidimensionality Effect Sizes by Grade and Subject  
MCAS 2006–2007 and 2007–2008**

Grade	Subject	Multidimensionality Effect Size	
		2006–07	2007–08
3	ELA	0.08	0.11
	Mathematics	0.19	0.12
4	ELA	0.10	0.20
	Mathematics	0.17	0.17
5	ELA	0.13	0.13
	Mathematics	0.25	0.18
	Science and Technology/Engineering	0.14	0.16
6	ELA	0.13	0.15
	Mathematics	0.11	0.18
7	ELA	0.12	0.14
	Mathematics	0.16	0.20
8	ELA	0.16	0.15
	Mathematics	0.24	0.10
	Science and Technology/Engineering	0.09	0.18
High School	ELA (grade 10)	0.15	0.18
	Mathematics (grade 10)	0.17	0.11
	Biology (grades 9/10)	0.11	0.10
	Chemistry (grades 9/10)	0.17	0.16
	Introductory Physics (grades 9/10)	0.15	0.14
	Technology/Engineering (grades 9/10)	0.10	0.15

The DETECT values indicated very weak multidimensionality for all but two tests in each testing year: grades 5 and 8 Mathematics for 2006–07; grade 4 ELA and grade 7 Mathematics for 2007–08. For all four of these tests, the DETECT values were on the weak side of the 0.20 to 0.40 weak-to-moderate range.

The way in which DETECT divided the tests into clusters was also investigated to determine whether there were any discernable patterns with respect to the multiple-choice (MC) and constructed-response (CR) item types.

- For both test administrations, most Mathematics and Science and Technology/Engineering tests displayed little or no discernable separation of MC and CR items.
  - For 2006–07, the exceptions were grade 5 Mathematics, grade 5 Science and Technology/Engineering, and high school Chemistry, all of which showed noticeable evidence of MC-CR separation. Only grade 5 Science and Technology/Engineering showed separation that was strong in magnitude.
  - For 2007–08, the exceptions were the grades 3 and 4 Mathematics tests, grade 5 Science and Technology/Engineering, and high school Introductory Physics. Again, the magnitude was strongest for grade 5 Science and Technology/Engineering.
- By contrast, almost all the ELA tests in both 2006–07 and 2007–08 displayed noticeable evidence of separation of MC and CR items, with strong separation for many of the tests.
  - For 2006–07, all the ELA tests except in grade 3 showed noticeable MC-CR separation, with evidence of strong magnitude in grades 5, 7, 8, and 10. The only ELA test to show no discernable separation was the grade 3 test.



- Similarly, for 2007–08, all the ELA tests except grade 3 showed noticeable MC-CR separation, and of strong magnitude for grades 4, 7, 8, and 10.

Thus, a tendency is suggested for MC and CR to sometimes measure statistically separable dimensions, especially in regard to the ELA tests. This was consistent across both administrations. However, it is important to emphasize that the degree of violation of unidimensional local independence is not greater for the ELA tests than for the Mathematics or Science and Technology/Engineering tests. Indeed, the average DETECT value for 2006–07 was actually smaller for ELA (0.12) than for Mathematics (0.18) or Science and Technology/Engineering (0.13); whereas for 2007–08 the average DETECT value was about the same (0.15) for each of the three content areas. Also, the sizes of the violations of local independence are small in all cases. The degree to which these small violations can be attributed to item type differences tends to be greater for ELA than for Mathematics or Science and Technology/Engineering. More investigation by content experts would be required to better understand the violations of local independence that are due to sources other than item type.

In summary, the violations of local independence, as evidenced by the DETECT effect sizes, were weak or very weak in all cases. Thus, these effects do not seem to warrant any changes in test design or scoring. In addition, the magnitude of the violations of local independence were consistently low across both years, and the patterns with respect to the MC and CR items were also consistent, with ELA tending to display more separation than the other two content areas.

#### **6.3.1.4 Consequences of Testing**

Reporting information is provided in chapter 5 of this document, “Reporting of MCAS 2008 Results.” The Commonwealth has ascertained that reporting structures are consistent with the sub-domain structures of its academic content standards, i.e., item interrelationships are consistent with the *Massachusetts Curriculum Frameworks* on which the tests are based. MCAS reporting categories report results for items that are grouped by *Framework* subtopic or content categories. Educators also have the flexibility to customize reports for local needs using a data analysis tool provided to each school system.

The consequences of MCAS testing are consistent with the purposes of the MCAS program, which have been widely documented and have remained unchanged since the introduction of the program in 1998. The Commonwealth has specified the purposes of the assessments, delineating the types of uses and decisions most appropriate to each. The purposes of MCAS examinations, which are common among standard tests and alternate assessments, are to

- evaluate the performance of students, schools, districts, and the state based upon the *Massachusetts Curriculum Framework* content standards and the MCAS performance standards
- improve classroom instruction and student academic achievement by providing data that assist local educators in improving curriculum and instruction
- relate MCAS test scores to AYP requirements, in concert with other evidence, to determine NCLB federal funding

- certify students for eligibility to earn a high school diploma: the state’s high school Competency Determination requirement was first applied to the class of 2003 in English Language Arts and Mathematics; students in the classes of 2010 and beyond will also be required to meet the Science and Technology/Engineering requirement for earning a Competency Determination in order to be eligible for a Massachusetts high school diploma

### **6.3.2 Validity Evidence for the MCAS-Alt**

According to the *2008 Educator’s Manual for MCAS-Alt*, the purposes of the MCAS-Alt are to

- include difficult-to-assess students in assessment and accountability, as required by law
- determine whether students with significant disabilities are receiving a program of instruction based on the state’s academic learning standards
- measure the extent to which students have learned the academic curriculum
- use assessment results to provide challenging academic instruction for students with disabilities
- provide an alternative pathway for some students to earn a Competency Determination in order to be eligible to receive a diploma

Both content and procedural validity are discussed below to demonstrate the validity of the MCAS-Alt.

#### **6.3.2.1 Content Validity**

Content validity is the degree to which an assessment measures the knowledge and skills it was designed to measure. Content validity is generally determined by the expert judgment of content area specialists who review the assessment instrument, and by the judgment of qualified portfolio scorers who are closely monitored during the scoring process.

MCAS-Alt portfolio content is based on the *Massachusetts Curriculum Framework* learning standards that describe the concepts, skills, and knowledge that students are expected to learn by the end of each grade cluster from pre-kindergarten through grade 12.

The *Resource Guide to the Massachusetts Curriculum Frameworks for Students with Disabilities* provides instructional and assessment strategies for teaching students with disabilities the same learning standards as regular education students. The *Resource Guide* is intended to promote “access to the general curriculum,” as required by law, and to assist educators of students with significant cognitive disabilities. The *Resource Guide* was developed by panels of educational experts in each content area, including ESE staff, contractor staff, higher education faculty, panelists, and regular and special educators. Each section was written, reviewed, and validated by panels of content area experts to ensure that each modified standard (entry point) was based on the essence of the grade-level learning standard on which it was based.

Specific guidelines help teachers assemble MCAS-Alt portfolios based on academic outcomes in the subject and strand being assessed, while maintaining the flexibility necessary to meet the needs of diverse learners. The requirements for constructing student portfolios necessitate that challenging skills based on grade-level content standards will be taught in order to produce the needed evidence. It is therefore virtually guaranteed that students will be taught, and will make progress on, academic skills at an appropriate level of complexity. Rigorous scoring procedures include holding scorers to high standards of accuracy and consistency, using monitoring methods that include frequent double-scoring and recalibration to verify and validate portfolio scores. These procedures, along with ESE review of each year's MCAS-Alt results, confirm that the MCAS-Alt is being successfully used for the purposes for which it was intended.

#### **6.3.2.2 Procedural Validity**

Procedural validity is shown by thorough documentation of the process used to develop the assessment instrument and of the processes of scoring, standard setting, and describing and reporting performance. Although procedural evidence does not guarantee validity of assessment results, the lack of procedural evidence can negatively affect credibility of results.

Procedural validity is determined based on a review of the following questions:

- Who participated in the development process?
- How were decisions made during development?
- Was the plan implemented as discussed?
- After implementation, was the plan reviewed at intervals, and revised as needed?
- Was the development process documented?

#### ***Who participated in the development process?***

The MCAS-Alt was developed by a group of diverse stakeholders, including representatives from special education, regular education, and higher education; and administrators from urban and non-urban districts; collaboratives; and approved special education private schools. Also included in the development process were psychometricians, education and assessment policymakers, inclusion specialists, attorneys, special education advocates, and the Northeast Regional Resource Center.

External members of the original MCAS-Alt Development Committee were Dr. Ed Roeber, Dr. Sue Bechard, Dr. Kenneth Warlick, and Dr. Jacqui Kearns, who served in key roles in the development and implementation of large-scale alternate assessments in Colorado, Illinois, Iowa, Kentucky, Maine, Maryland, Massachusetts, Montana, New Hampshire, New Jersey, New Mexico, New York, Puerto Rico, Rhode Island, South Carolina, Tennessee, Washington, Washington D.C., and West Virginia.

As the MCAS-Alt is revised and updated to reflect new mandates and greater efficiencies, ESE staff continue to consult recognized experts in the field of alternate assessment for their views and ideas.

### ***How were decisions made during development?***

Care was taken to include all stakeholder viewpoints during development and revision of the assessment. While making decisions, developers kept the following guidelines in mind:

- The MCAS-Alt should parallel the standard MCAS tests.
- The MCAS-Alt should provide results that can be used to make valid and reliable decisions.
- The MCAS-Alt should be flexible enough for a wide range of students to participate.
- The MCAS-Alt should not unnecessarily burden the state's teachers.

All discussions and recommendations made by the technical and stakeholder advisory committees are documented and maintained in the public minutes of the statewide MCAS-Alt Advisory Committee, Project Leadership Team, and Technical Advisory Committee meetings.

### ***Was the plan implemented as discussed?***

The 2008 MCAS-Alt was administered as stipulated in published materials on implementation, scoring, and reporting of this assessment. Intensive training was provided for teachers during the year, including

- 35 ESE-sponsored training sessions each year
- online publications and training modules
- monthly newsletters
- three Teacher's Network meetings annually (see below for more information about the Teacher's Network)
- a three-week scoring institute emphasizing the professional development of participants

Materials were delivered to schools within the specified time frame. Portfolios were scored as indicated using the scoring rubric from the *2008 Educator's Manual for MCAS-Alt*, disseminated in the fall of 2007, and the *2008 Guidelines for Scoring Student Portfolios* (<http://www.doe.mass.edu/mcas/alt/results.html>). Scores were analyzed using the 2008 decision rules. Reports were generated in accordance with those rules and shipped to schools. Score appeals were received and reviewed using the procedures outlined in the policy that was posted and sent to schools with the materials in spring and fall.

### ***After implementation, was the plan reviewed at intervals, and revised as needed?***

Both the MCAS-Alt Advisory Committee and the MCAS-Alt Teacher's Network meet quarterly to review the status of the MCAS-Alt and to recommend changes, as needed, to the ESE. The Advisory Committee has discussed every change made to the MCAS-Alt since its inception. The Teacher's Network includes about 100 educators directly responsible for administering the MCAS-Alt. This group evaluates the effectiveness of the current policies, and advises on future directions.

***Was the development process documented?***

Minutes of every meeting of the MCAS-Alt Advisory Committee have been recorded and kept on file at the ESE, along with all research reports and other documentation. Additional documentation can be found on the ESE MCAS-Alt web page (<http://www.doe.mass.edu/mcas/alt>), including the following:

- definition and purpose of the assessment (see About the MCAS-Alt/FAQs)
- description of the assessment method and rationale for its choice (see About the MCAS-Alt/FAQs)
- definition of assessment standards (see Resources and Training/Resource Guide)
- selection and training of scorers (see Scoring & Reporting Results/Scoring)
- description of scoring procedures and rubrics used (see Scoring & Reporting Results/Results)
- description of procedures used to determine student-level results, as well as aggregated results (see Scoring & Reporting Results/Results)
- state performance and participation results from 2001 through 2007 (see Scoring & Reporting Results/Results)

## References

**Publications by the  
Massachusetts Department of Elementary and Secondary Education  
(formerly known as “Massachusetts Department of Education”)**

Available Online

*2008 Guidelines for Scoring Student Portfolios.*  
<http://www.doe.mass.edu/mcas/alt/results.html>

*Guides to interpreting reports of MCAS results.*  
<http://www.doe.mass.edu/mcas/results.html>

*Massachusetts Curriculum Frameworks* (English Language Arts, History and Social Science, Mathematics, Science and Technology/Engineering).  
<http://www.doe.mass.edu/frameworks/current.html>

*MCAS Technical Reports, 1998–2007.*  
<http://www.doe.mass.edu/mcas/tech/?section=techreports>

*Resource Guide to the Massachusetts Curriculum Frameworks for Students with Disabilities.*  
<http://www.doe.mass.edu/mcas/alt/resources.html>  
[A print copy of this publication may be ordered online at  
<http://www.mcasservicecenter.com/mcasalt/welcome.asp?ProgramID=6&ServiceID=21.>]

*Spring 2008 MCAS Tests: Summary of State Results.*  
<http://www.doe.mass.edu/mcas/results.html>

*Spring 2008 Principal’s Administration Manual.*  
<http://www.doe.mass.edu/mcas/2008/admin/manual/pam.pdf>

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