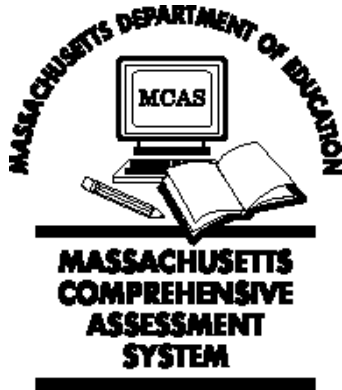


2006 MCAS

Technical Report



Massachusetts Department of Education

This document was prepared by the Massachusetts Department of Education.
Dr. David P. Driscoll, Commissioner of Education

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1. PURPOSE AND OVERVIEW OF THIS REPORT

The Massachusetts Comprehensive Assessment System (MCAS) is Massachusetts' program for student assessment developed in accordance with the *Education Reform Law 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 with respect to the acquisition of skills and knowledge
- to help determine English language arts and mathematics competency at the grade 10 level for the awarding of high-school diplomas

The purpose of this *2006 MCAS Technical Report* is to document the technical quality and characteristics of the 2006 MCAS tests, and to present evidence of the validity and reliability of the intended uses of those tests' results. MCAS tests were administered in the following grades and content areas in 2006:

- grade 3: Reading, 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

Since passing the grade 10 English Language Arts and Mathematics tests is one requirement for receiving a high school diploma, three retest opportunities in those tests were offered throughout the 2005–2006 school year to students in grades 10 and higher who had not yet passed one or both tests.

Pilot end-of-course tests were also administered at the high school level in Biology, Chemistry, Introductory Physics, and Technology/Engineering.

Additionally, the following History and Social Science question tryouts were offered during the 2006 MCAS administration:

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

This *Report* provides detailed information regarding test design and development; scoring; and analysis and reporting at student, school, district, and statewide levels of MCAS 2006 results. 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 2006 MCAS test and its results.

The *2006 MCAS Technical Report* is designed to supplement the technical reports issued for previous MCAS administrations by providing information specific to the 2006 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.

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.

2. MCAS 2006 TEST DEVELOPMENT AND DESIGN

2.1 Standard MCAS Test Development and Design

The 2006 MCAS administration included operational tests in the following grades and content areas:

- Grade 3 Reading
- grades 4–8 and grade 10 English Language Arts
- grades 3–8 and grade 10 Mathematics
- grades 5 and 8 Science and Technology/Engineering

It also included three retest opportunities during the 2005-2006 school year in English Language Arts and Mathematics for students in grades 10 and above who had not previously passed one or both tests; these retests were offered in July 2005, November 2005, and March 2006.

Additionally, high school pilot end-of-course tests in Biology, Chemistry, Introductory Physics, and Technology/Engineering were administered during the 2006 MCAS administration, as well as question tryouts in History and Social Science (grades 5, 7, and high school).

2.1.1 Item Design and Types

2.1.1.1 Common/Matrix-Sampled Item Design

The MCAS tests are constructed based on a *common/matrix-sampled item design*. Each test form contains both common and matrix-sampled items (with the exception of the English Language Arts Composition).

- Common. Individual student test scores and all student-level results are based exclusively on common items. All students in a grade are tested on the same set of common items. Common items comprise roughly 80 percent of items in each test form. These items are released to the public after testing is completed.
- Matrix-Sampled. Approximately 20 percent of the items in each test form are matrix-sampled items. These items differ across test forms, and are used to measure subtopics of the *Curriculum Framework* for that test's content area. Some matrix-sampled items are also used to equate tests across administrations; some are used to field-test new items for future use as common or equating items.

Results of equating items are combined with common and other matrix-sampled item results to report school- and district-level results that are based on the major strands of the *Curriculum Frameworks*.

2.1.1.2 *Item Types*

The four item types used on the MCAS tests are described below. They allow for testing of broad knowledge and skills by the most efficient means.

- Multiple-Choice. Multiple-choice items appear on every MCAS test except the English Language Arts (ELA) Composition. The items require a student to select a single best answer from four response options.

Multiple-choice items are machine-scored. A correct response is assigned a score of 1 raw score point; incorrect, blank, and multiple-response answers are each assigned a score of 0 raw score points.

- Open-Response. Open-response items appear on every MCAS test except the ELA Composition. The items require a student to generate a response rather than selecting a response from a list of options. Response types vary based on the tested content area (e.g., a short written response; creation of a chart, table, diagram, or graph).

Open-response questions are scored from 0 to 4 on the basis of item-specific rubrics and are scored by trained professional scorers. At least 10% of the grades 3 to 8 responses are scored by two scorers (double-scored); 100% of the grade 10 responses are scored by two scorers. If both scorers agree on the score, that score is reported. If the scores assigned by the two scorers are adjacent, the higher score is reported. If the two scorers' scores are discrepant (differ by more than 1), the response goes to the scoring leadership's arbitration queue, and the resolution score is the reported score.

- Short-Answer. Short-answer items appear only on MCAS Mathematics tests. The items require a student to generate a brief response to a prompt (typically a numeric solution prompted by a computation or a short statement).

Short-answer questions are scored by one or two trained professional scorers on a 0–1 scale, based on item-specific rubrics. At least 10% of the grades 3 to 8 short-answer responses are scored by two scorers; 100% of the grade 10 responses are scored by two scorers. If both scorers agree on the score, that score is reported. If the scores from the two independent scorers are different in any way (not exact), then the response goes to the scoring leadership's arbitration queue, and the resolution score is the reported score.

- Writing Prompts. Writing prompts appear only on ELA Composition tests. The prompt requires a student to draft a written composition; then, in a separate administration session, the student writes a final composition based on that draft.

Each composition is scored by at least two professional scorers (100% double-scored) who have been trained to use the MCAS ELA Composition Scoring Guide (Appendix F). The Scoring Guide includes two dimensions for scoring: Topic Development and Standard English Conventions. The range of scores for Topic Development is 1 to 6 points; the range of scores for Standard English Conventions is 1 to 4 points. Each scorer independently assigns a score in each area; the two scorers' scores in each area are combined (added together) to report a total score range from 2 to 12 for Topic

Development and a total score range from 2 to 8 for Standard English Conventions. The score for each dimension is reported separately in MCAS reports.

Each scorer also provides feedback to students regarding their compositions by assigning two Analytic Annotations to each composition, chosen from a list of coded options. The options include both commendations and issues for improvement. Between two and four annotations are reported in the student's Parent/Guardian Report; if both scorers assign the same annotation, it is listed only once in the student's Parent/Guardian Report.

2.1.2 General Test Development Specifications

All MCAS tests have been developed and created in adherence to the principles of sound and ethical test construction set forth in the *Standards for Educational and Psychological Testing* (1985, 1999). It should be noted that MCAS design and development have remained consistent across all test administrations. Listed below are the specifications that have guided the development of the MCAS tests.

2.1.2.1 Alignment with Standards and Performance Levels

Content Standards

All test items are based exclusively on the *Massachusetts Curriculum Framework* learning standards identified as eligible for assessment according to the *Guides to the MCAS* (<http://www.doe.mass.edu/mcas/guides.html>).

MCAS Performance Levels

Each MCAS test is designed to measure the range of performance identified by the four MCAS performance levels: *Warning/Failing*, *Needs Improvement*, *Proficient*, and *Advanced*,¹ which are described in detail in section 5.1.1.1 of this *Report*.

2.1.2.2 Item Clarity

In addition to adhering to the *Standards for Educational and Psychological Testing*, items are reviewed and edited to ensure uniform style in accordance with the *MCAS Style Guide* (based primarily on the *Chicago Manual of Style*, 15th edition). Each MCAS item also meets the following specifications:

- The item reflects correct grammar, punctuation, usage, and spelling.
- The item is written in a clear, concise style.
- The item is unambiguous in explaining to students the nature and scope of the question.

¹ At grade 3, test results in the top performance level are reported as *Above Proficient* rather than *Advanced*. The performance level of *Failing* is used only on grade 10 tests.

2.1.2.3 *Content Accuracy*

All items and, where applicable, scoring guides are subjected to rigorous internal checks for content accuracy by DOE and testing contractor staff. In addition, the DOE contracts with nationally known scholars in each content area (External Content Expert Reviewers). These External Content Expert Reviewers, along with Assessment Development Committees (who are primarily classroom teachers), review test materials to assist in ensuring content accuracy.

2.1.2.4 *Developmental Appropriateness*

Developmental appropriateness guidelines for each tested grade level are provided in each content area's *Curriculum Framework*. The judgments of Assessment Development Committee members (who are primarily classroom teachers) are strongly considered where an interpretation is required about the appropriateness of an item as it relates to the relevant *Framework* and best classroom practice.

2.1.2.5 *Support and Model for Classroom Instruction*

All MCAS items are developed to engage students and to support and model effective classroom instruction. The judgments of Assessment Development Committee members (who are primarily classroom teachers) are strongly considered where an interpretation is required about the appropriateness of an item as it relates to the relevant *Framework* and best classroom practice.

2.1.3 **Test Construction**

The process of assembling test forms is a critical final phase of test development. Each test form includes distinct "positions" for common, equating, and field-test items, as discussed in section 2.1.4. The testing contractor nominates items for common, equating, and field-test positions based upon test specifications and item performance data. The testing contractor also furnishes item comments for consideration by the Department's Assessment Development Committees, Bias Committee, and Content Experts.

To construct the MCAS 2006 tests, Department of Education and testing contractor staff, including content, editorial, and psychometric experts, assembled a common/equating test in each grade and content area that met all test specifications and adhered to sound psychometric parameters. Each proposed common item was checked verbatim against the item as it appeared in field test administration. Nominations for the common test were accompanied by Test Characteristic Curves (TCCs) and Test Information Functions (TIFs) presenting the three projected cut scores for the proposed common test, compared to the previous year's test.

Department of Education content teams and testing contractor staff then selected field-test items that met the annual test development coverage specifications. Field-test items were placed into matrix positions on each common test form; placement considerations included whether the item would clue other matrix or common items within the form. Field test items were also placed to ensure the overall integrity of each test form in terms of content breadth and depth or coverage.

Section 2.1.4 provides construction specifications for test forms used during the 2006 MCAS administration.

Special Test Formats

All MCAS 2006 operational tests were available in the following special formats, which were made available to eligible students with disabilities, as indicated:

- Large-Print. This form contained all common and matrix items found in the first form of each operational test (see Appendix I, accommodation 11).
- Braille. This form contained all common and matrix items found in the first form of each operational test (see Appendix I, accommodation 12).
- Electronic Text Reader CD. This CD contained only common test items for each operational test (see Appendix I, accommodations 18 and 28).

The following special test formats were created only for the grade 10 Mathematics test and retest, and were made available to the students indicated:

- American Sign Language video. This video contained only common test items (see Appendix I, accommodations 17 and 27).
- Spanish/English version. This form of the test contained only common items, each of which was presented twice: once in Spanish on a left-facing page, and once in English on a right-facing page. This form was made available to Spanish-speaking limited English proficient students who had been enrolled in school in the continental United States for **fewer than three years** if they could read and write in Spanish at or near grade-level.

2.1.4 Content-Related Test Specifications

The 2006 MCAS administration included tests in three *Massachusetts Curriculum Framework* content areas:

- English Language Arts/Reading
- Mathematics
- Science and Technology/Engineering

It also included pilot end-of-course tests at the high school level in Biology, Chemistry, Introductory Physics, and Technology/Engineering; and question tryouts at grades 5, 7, and at high school level in History and Social Science.

Information is provided below about the development and design of each content area operational test, pilot end-of-course science test, and question tryout. The *Frameworks* can be found at www.doe.mass.edu/frameworks.

2.1.4.1 English Language Arts/Reading

Test Development

- **Grade 3 Reading test; Grades 4–8 and 10 Language and Literature tests.** The MCAS Grade 3 Reading test and the English Language Arts (ELA) Language and Literature tests in grades 4–8 and 10 measured the following learning standards of the *Massachusetts English Language Arts Curriculum Framework*:
 - Language strand standards 4, 5, and 6
 - Reading and Literature strand standards 8–17

Passages

Test sessions presented either two or three reading passages; each passage was followed by a group of associated assessment items. Each passage and its associated items were always assessed as an intact unit. The Grade 3 Reading test included 50 percent literary and 50 percent informational passages. The ELA Language and Literature tests for all grades included 60 percent literary and 40 percent informational passages. Approximately 50 percent of the authors of test passages are listed in the *Framework*.

- **Grades 4, 7, and 10 Composition.** The Composition portion of the ELA tests at grades 4, 7, and 10 and the grade 10 retest measured the learning standards of the Composition strand of the *Massachusetts English Language Arts Curriculum Framework*.

Learning standards 1, 2, 3, 7, 18, and 24–27 of the *Framework*, which were not feasible to incorporate into a large-scale state assessment program such as MCAS, were locally assessed instead (e.g., Language Standard 3, “Students will make oral presentations that demonstrate appropriate consideration of audience, purpose, and the information to be conveyed”).

Table 2.1.4.1.1 shows the test specifications regarding distribution of common items across *Framework* strands for the MCAS 2006 English Language Arts/Reading tests.

**Table 2.1.4.1.1: MCAS 2006 Tests
Common Item Distribution across *Framework* Strands:
Grade 3 Reading and Grades 4–8 and 10 English Language Arts**

<i>Framework Strand</i>	Grade						
	3	4	5	6	7	8	10
Language	18%	8%	12%	12%	8%	12%	8%
Reading and Literature	82%	64%	88%	88%	64%	88%	64%
Composition		28%			28%		28%
Total	100%	100%	100%	100%	100%	100%	100%

Test Design

Table 2.1.4.1.2 shows the test design for each ELA/Reading test by grade level and item type.

**Table 2.1.4.1.2: 2006 MCAS Administration
Test Design:
Grade 3 Reading and Grades 4–8 and 10 English Language Arts**

Grade and Test Re1 and Re2 = Retests			Types of Items MC = Multiple-choice SA = Short-answer OR = Open-response WP = Writing prompt																			
			Items per Form								Matrix Items Across Forms											
			Common				Matrix				Total Positions				Equating Positions				Field-Test Positions			
Grade	Test Name	Number of Forms	MC	SA	OR	WP	MC	SA	OR	WP	MC	SA	OR	WP	MC	SA	OR	WP	MC	SA	OR	WP
3	Reading	24	40		2		8		1		192		24		32		4		160		20	
4	Language/Literature	19	36		4		12		2		228		38		36		6		192		32	
4	Composition	2			1																	10
5	Language/Literature	19	36		4		12		2		228		38		36		6		192		32	
6	Language/Literature	19	36		4		12		2		228		38		36		6		192		32	
7	Language/Literature	19	36		4		12		2		228		38		36		6		192		32	
7	Composition	2			1																	10
8	Language/Literature	19	36		4		12		2		228		38		36		6		192		32	
10	Language/Literature	48	36		4		12		2		576		96		96		16		480		80	
10	Composition	2			1																	30
10Re1	Language/Literature	1	36		4																	
10Re1	Composition	1			1																	
10Re2	Language/Literature	1	36		4																	
10Re2	Composition	1			1																	

COMPOSITION TESTS:

"# of Forms" includes makeup operational forms.

The ELA Composition is field tested out-of-state (rather than by an embedded field test).

GRADE 3 READING TEST:

Each long passage has 8 MC, 1 OR; each short passage has 4 MC, 1 OR.

Common forms consist of 3 long and 4 short passages; 2 passages have one OR each.

Matrix forms include either one long passage (with 8 MC, 1 OR) or two short passages (one with 8 MC; one with 8 MC, 1 OR).

For equating, passages and their associated items appear in only one form. The 4 OR items in the equating positions are not actually used for equating.

All passages are field tested in 2 versions that appear on different forms; short passages include an OR on one form but not on the other.

LANGUAGE AND LITERATURE TESTS:

All Grades

Each long passage typically has 8 MC, 1 OR; each short passage typically has 4 MC, 1 OR.

All passages are field tested in two versions that appear on different forms.

Each common form includes 3 long passages and 3 short passages. Each long passage has an OR item. Only one of the short passages has an OR item.

Each matrix form includes 1 long passage and 1 short passage. Each passage has 1 OR item.

Grades 4–8

Equating items are divided among 3 forms; each passage and associated items appear on one form only.

Field test consists of 8 long passages (each with 16 MC, 2 OR) and 8 short passages (each with 8 MC, 2 OR).

Grade 10

Equating consists of 4 long passages and 4 short passages; each passage appears on two different test forms.

Field test consists of 20 long passages (each with 16 MC, 2 OR) and 20 short passages (each with 8 MC, 2 OR).

Grade 10 RETESTS

The grade 10 Retests were administered 3 times during the 2005-2006 school year: in July 2005 (Re1) in November 2005 (Re1), and in March 2006 (Re2).

2.1.4.2 Mathematics

Test Development

Operational Tests

The MCAS Mathematics tests at grades 3 through 8 and at grade 10 measured the learning standards of the five strands of the *Massachusetts Mathematics Curriculum Framework*:

- Number Sense and Operations
- Patterns, Relations, and Algebra
- Geometry
- Measurement
- Data Analysis, Statistics, and Probability

Table 2.1.4.2.1 shows the test specifications regarding distribution of common items across *Framework* strands and across mathematics thinking skills outlined in the *Framework* for the MCAS 2006 Mathematics tests.

**Table 2.1.4.2.1: MCAS 2006 Tests
Common Item Distribution across
Framework Strands and Thinking Skills:
Mathematics**

		Grade													
		# = number of points per form % = percent per form													
		3		4		5		6		7		8		10	
Framework Strand		%	#	%	#	%	#	%	#	%	#	%	#	%	#
Number Sense and Operations		35%	14	35%	19	33%	18	33%	18	26%	14	26%	14	20%	12
Patterns, Relations, and Algebra		20%	8	20%	11	26%	14	26%	14	28%	15	28%	15	30%	18
Geometry		12.5%	5	12.5%	7	13%	7	13%	7	13%	7	13%	7	15%	9
Measurement		12.5%	5	12.5%	6	13%	7	13%	7	13%	7	13%	7	15%	9
Data Analysis, Statistics, and Probability		20%	8	20%	11	15%	8	15%	8	20%	11	20%	11	20%	12
Total		100%	40	100%	54	100%	54	100%	54	100%	54	100%	54	100%	60

		Grade							
Thinking Skill		3	4	5	6	7	8	10	
Procedural		41%	41%	37%	37%	26%	26%	25%	
Conceptual		41%	41%	37%	37%	30%	30%	30%	
Application/Problem-Solving		18%	18%	26%	26%	44%	44%	45%	
Total		100%	100%	100%	100%	100%	100%	100%	

Test Design

Table 2.1.4.2.2 shows the test design for each Mathematics test by grade level and item type.

**Table 2.1.4.2.2: 2006 MCAS Administration
Test Design: Mathematics**

		Types of Items																			
		Items per Form								Matrix Items Across Forms											
		Common				Matrix				Total Positions				Equating Positions				Field-Test Positions			
Grade Tested	# of Forms	MC	SA	OR	WP	MC	SA	OR	WP	MC	SA	OR	WP	MC	SA	OR	WP	MC	SA	OR	WP
3	15	25	5	5		5	1	1		105	15	15		25	5	5		70	10	10	
4	15	29	5	5		7	1	1		105	15	15		29	5	5		76	10	10	
5	15	29	5	5		7	1	1		105	15	15		29	5	5		76	10	10	
6	15	29	5	5		7	1	1		105	15	15		29	5	5		76	10	10	
7	16	29	5	5		7	1	2		112	16	32		29	5	5		83	11	27	
8	16	29	5	5		7	1	2		112	16	32		29	5	5		83	11	27	
10	32	32	4	6		7	1	2		224	32	64		64	8	12		160	24	52	
10 Retest 1	1	32	4	6																	
10 Retest 2	1	32	4	6																	

Grade 3

OR are only 2 points (rather than 4 points).
Each equating item appears in only one form.
Each field test item is unique.

Grades 4–6

Each field test item is unique.

Grades 7–8

Each equating item appears in only one form.
For field tests, 14 unique OR items (7 non-calculator; 7 calculator-allowed) fill the 27 OR field-test positions.

Grade 10

Each equating item appears in two forms.
Only 24 unique OR items (17 non-calculator; 12 calculator-allowed) fill the 52 OR field-test positions.

Grade 10 RETESTS

The Mathematics Retest was administered 3 times during the 2005–2006 school year: July 2005 (Retest 1); November 2005 (Retest 1); and March 2006 (Retest 2).

2.1.4.3 Science and Technology/Engineering

Test Development

Operational Tests

The MCAS Science and Technology tests at grades 5 and 8 measured the learning standards of the four strands of the *Massachusetts Science and Technology/Engineering Curriculum Framework*:

- Earth and Space Science
- Life Science
- Physical Sciences
- Technology/Engineering

Table 2.1.4.3.1 shows the test specifications regarding distribution of common items across *Framework* strands for the operational MCAS 2006 Science and Technology/Engineering tests.

**Table 2.1.4.3.1: MCAS 2006 Tests
Common Item Distribution across *Framework* Strands:
Science and Technology/Engineering
Grades 5 and 8**

<i>Framework Strand</i>	Grade	
	5	8
Earth Science	25%	25%
Life Science	25%	25%
Physical Sciences	25%	25%
Technology/Engineering	25%	25%
Total	100%	100%

Pilot End-of-Course Tests

During the 2006 MCAS administration, four high school pilot end-of-course tests were administered to students in grades 9 and 10:

- Biology
- Chemistry
- Introductory Physics
- Technology/Engineering

Students took one pilot test in the discipline in which they were enrolled. If a student had taken or was in enrolled in courses in more than one discipline, he or she was given the option of taking up to two pilot tests.

Each pilot test measured the *Framework* learning standards outlined for its specific discipline. The pilot tests served two purposes: 1) to produce item tryout classical statistics that would inform selection of common and equating items for the 2006/2007 operational assessments; and 2) to release a common set of items for each pilot test, for which only Test Item Analysis Reports

were generated. No scaled score or performance level results were reported for pilot tests. Test Item Analysis Reports were distributed only to schools and districts.

Biology Modules

For the Biology pilot end-of-course test only, the test utilized modules that were comprised of a stimulus (e.g., graphic, scenario) and a group of associated assessment items. Each stimulus and its associated items were always assessed as an intact unit.

Tables 2.1.4.3.2 through 2.1.4.3.5 show the test specifications regarding distribution of common items across subtopics of the relevant *Framework* strand for each MCAS 2006 Science and Technology/Engineering pilot end-of-course test.

**Table 2.1.4.3.2: MCAS 2006
High School Biology
Pilot End-of-Course Test
Common Item Distribution
Across Framework Subtopics**

Framework Subtopic	%
Chemistry of Life	15%
Cells	25%
Genetics	20%
Evolution and Biodiversity	20%
Ecology	20%
Total	100%

**Table 2.1.4.3.4: MCAS 2006
High School Introduction to
Physics
Pilot End-of-Course Test
Common Item Distribution
Across Framework Subtopics**

Framework Subtopic	%
Motion and Forces	25%
Conservation of Energy	20%
Heat	20%
Waves	15%
Electromagnetism	10%
Electromagnetic Radiation	10%
Total	100%

**Table 2.1.4.3.3: MCAS 2006
High School Chemistry
Pilot End-of-Course Test
Common Item Distribution
Across Framework Subtopics**

Framework Subtopic	%
Properties of Matter	15%
Atomic Structure	15%
Periodicity	10%
Bonding	10%
Chemical Reactions	15%
Gases and Kinetic Molecular Theory	15%
Solutions	10%
Acids and Bases	5%
Equilibrium and Kinetics	5%
Total	100%

**Table 2.1.4.3.5: MCAS 2006
High School
Technology and Engineering
Pilot End-of-Course Test
Common Item Distribution
Across Framework Subtopics**

Framework Subtopic	%
Engineering Design	20%
Construction Technology	20%
Fluid Systems	10%
Thermal Systems	20%
Electrical Systems	15%
Communication Technology	10%
Manufacturing	5%
Total	100%

Test Design

Table 2.1.4.3.6 shows the test design for each Science and Technology/Engineering test and pilot end-of-course test by grade level and item type.

**Table 2.1.4.3.6: 2006 MCAS Administration
Test Design: Science and Technology/Engineering**

Test Grade and Type ST = Science and Technology/Engineering HS = High School Bio = Biology Chem = Chemistry Phy = Introductory Physics T/E = Technology/Engineering			Types of Items MC = Multiple-choice SA = Short-answer OR = Open-response WP = Writing prompt																				
			Items per Form								Matrix Items Across Forms												
			Common				Matrix				Total Positions				Equating Positions				Field-Test Positions				
			<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>
5 ST	Operational	17	34		5		7		1		119		17		34		5		85		12		
8 ST	Operational	17	34		5		7		1		119		17		34		5		85		12		
HS Bio	Pilot	12	40		5		12		2		144		24		40		5		104		19		
HS Chem	Pilot	12	40		5		12		2		144		24		40		5		104		19		
HS Phy	Pilot	10	40		5		12		2		120		20		40		5		80		15		
HS T/E	Pilot	6	40		5		12		2		72		12		40		5		32		7		

All Tests and Pilot End-of-Course Tests
 Each equating item appears in only one form.

2.1.4.4 History and Social Science (Question Tryouts)

Question Tryout Development

During the 2006 MCAS administration, question tryouts in History and Social Science were administered at grades 5 and 7, and an end-of-course question tryout in U.S. History was administered at the high school level (grades 10/11).

These question tryouts were based on the learning standards of the *Massachusetts History and Social Science Curriculum Framework*.

The sole purpose of question tryouts is to field test item effectiveness in measuring *Framework* learning standards, and to thereby identify those items suitable for future use in operational tests by scoring a sample of responses. Therefore no results were reported for the 2006 History and Social Science question tryouts.

Modules

The question tryouts utilized modules that were comprised of a stimulus (e.g., graphic, map, historical document, scenario) and a group of associated assessment items. Each stimulus and its associated items were always assessed as an intact unit.

Question Tryout Design

Table 2.1.4.4 shows the design for each History and Social Science question tryout by grade level and item type.

**Table 2.1.4.4: 2006 MCAS Administration
Question Tryout Design: History and Social Science**

Grade HS = High School			Types of Items MC = Multiple-choice SA = Short-answer OR = Open-response MOD = Module																			
			Items per Form								Matrix Items Across Forms											
Tryout Name HSS = History and Social Science USH = End-of-Course U.S. History			Common				Matrix				Total Positions				Equating Positions*				Field-Test Positions			
			MC	SA	OR	MOD	MC	SA	OR	MOD	MC	SA	OR	MOD	MC	SA	OR	MOD	MC	SA	OR	MOD
Grade	Test Name	# of Forms	MC	SA	OR	MOD	MC	SA	OR	MOD	MC	SA	OR	MOD	MC	SA	OR	MOD	MC	SA	OR	MOD
5	HSS	12	38			2	9			1	108			12	38			2	70			10
7	HSS	12	38			2	9			1	108			12	38			2	70			10
HS	USH	10	38		1	2					102		6	14	38		1	2	64		5	12

***EQUATING POSITIONS**

Equating positions on the question tryout form were filled with field-test items.

GRADES 5 AND 7

There are 50 points in common.

Each matrix item (equating or field-test) appears in only one form.

Each module has 2 MC and 1 OR.

Two versions of each module are field-tested.

HIGH SCHOOL

There are 54 points in common.

Each matrix item (equating or field-test) appears in only one form.

Two versions of each module are field-tested.

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 (see table 3.2.1.1), 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 (see section 2.1.4 and table 2.2.1 below).

Evidence of student performance is submitted in an MCAS-Alt portfolio, as outlined in the sections below.

2.2.1 Evidence of Student Performance

The MCAS-Alt portfolio indicates evidence of student performance in required strands within each content area assessed in that grade.

Table 2.2.1: Content Areas and Strands Required on the 2006 MCAS-Alt, in Each Grade

Grade	English Language Arts Strands Required	Mathematics Strands Required	Science and Technology/Engineering Strands Required
3	Language (General Standard 4); Reading and Literature (General Standard 8)	Number Sense and Operations; Patterns Relations, and Algebra	
4	Language (General Standard 4); Reading and Literature (General Standard 8); Composition	Number Sense and Operations; Data Analysis, Statistics, and Probability	
5	Language (General Standard 4); Reading and Literature (General Standard 8)	Number Sense and Operations; Measurement	Any three of the four Science and Technology/ Engineering strands
6	Language (General Standard 4); Reading and Literature (General Standard 8)	Number Sense and Operations; Patterns Relations, and Algebra	
7	Language (General Standard 4); Reading and Literature (General Standard 8); Composition	Number Sense and Operations; Data Analysis, Statistics, and Probability	
8	Language (General Standard 4); Reading and Literature (General Standard 8)	Number Sense and Operations; Geometry	Any three of the four Science and Technology/ Engineering strands
10	Language (General Standard 4); Reading and Literature (General Standard 8); Composition	Any three of the five Mathematics strands	Any three learning standards in either Biology, Chemistry, Physics, or Technology and Engineering

Portfolios must include three or more pieces of primary evidence in each strand being assessed. Each piece of primary evidence must be labeled with the following:

- the student's name
- the date of the student performance
- the percentage of accuracy for the performance
- the percentage of independence for the performance

Accuracy refers to the percentage of correct responses or the score given the student’s work. Independence refers to the level of assistance the student received during the activity.

2.2.1.1 Core Set of Evidence

One of the three required pieces of primary evidence must be a data chart (e.g., field data chart, line graph, bar graph) that shows the following information, at minimum:

- the targeted skill based on the learning standard being assessed
- five tasks performed by the student on five distinct dates
- percentage of accuracy for each performance
- percentage of independence for each performance

Two or more additional pieces of primary evidence must document the student’s performance of the same skill or outcome identified on the data chart. The data chart plus at least two additional pieces of primary evidence form the “core set of evidence” required in each portfolio strand.

2.2.1.2 Examples of Portfolio Evidence

Table 2.2.1.2.1 gives examples of primary evidence in a sample mathematics portfolio, organized by strand.

Table 2.2.1.2.1: Examples of Evidence in a Grade 10 Mathematics Portfolio

Mathematics Strands								
Number Sense and Operations			Patterns, Relations, and Algebra			Geometry		
Possible Evidence			Possible Evidence			Possible Evidence		
Line Graph	Field Data Chart	Worksheet	Data Chart	Worksheet	Line Graph	Bar Graph	Work Sample	Work Sample

Table 2.2.1.2.2 lists examples of different types of primary evidence that could be provided in a portfolio.

Table 2.2.1.2.2: Sample Primary Evidence in MCAS-Alt Portfolios for Different Grades

Type of Evidence	Evidence Provided in Portfolio (L.S. = learning standard)
Data Chart	Bar graph showing percentages of accuracy and independence on 8 trials of “using a dictionary to determine the meanings of unfamiliar words.” (ELA, Language, grade 4, L.S. 4.25)
	Line graph showing percentages of accuracy and independence on 10 trials of “identifying community access words.” (ELA, Language, grade 4, L.S. 4.13)
	Field data chart showing the student’s responses to yes or no questions to distinguish between fact and opinion of a story that was read aloud. (ELA, Reading and Literature, grade 8, L.S. 8.17)
Work Sample (open responses by the student)	Student-created story using figurative language. (ELA, Reading and Literature, grade 8, L.S. 8.12)
	Student’s journal entry describing their favorite part of a story. (ELA, Reading and Literature, grade 8, L.S. 8.22)
	Student-created list of substances, sorted in categories of acid or base. (STE, Physical Sciences, grade 8, L.S. 8.1)
Worksheet (simple activities with one correct response)	Completed worksheet on which student has matched the name of a shape to its corresponding picture. (Mathematics, Geometry, grade 10, L.S. 10.G.1)
	Completed worksheet on which student has matched earth science vocabulary words to their definitions. (STE, Earth and Space Science, grade 6, L.S. 7)
	Completed worksheet identifying different parts of a plant. (STE., Life Science, grade 7, L.S. 3)
Video	Video of a student using a spring balance to measure selected items, accompanied by a description of the activity indicating the percentages of accuracy and independence. (STE, Technology and Engineering, grade 8, L.S. 1.3)
Photo	Photograph of a student-created relief map, accompanied by a product description of the activity, and percentages of accuracy and independence. (STE, Earth and Space Science, grade 6, L.S. 1)

In addition to the required primary evidence, secondary evidence may be included, at the discretion of the teacher. Secondary evidence shows the context of the activity and may include, for example

- notes from teachers or peers describing the activity
- a photograph showing the context of the learning activity
- a self-evaluation or reflection sheet
- a work description label

2.2.2 Required Documentation

In addition to evidence of student performance in the content area being assessed, the MCAS-Alt portfolio must include the following:

- Portfolio Cover Sheet. Provides basic demographic information on the student and information about the contents of the portfolio
- Required Portfolio Contents Checklist. Ensures that all required elements of the portfolio have been included

- Student Introduction. The student introduces the portfolio and expresses what he or she wants others to know about him or her as a learner
- Verification Letter. Assurance that parents have viewed the contents of their child's portfolio or, at minimum, have been invited by the school to do so
- Weekly Schedule. Demonstrates that the student is participating in the general education academic curriculum
- Strand Cover Sheet. Lists the strand and learning standard documented by the evidence, and how the student addressed the measurable goal; also helps educators make certain all required information and evidence are included
- Principal's Certification of Proper Administration of MCAS-Alt (PCPA). Requires the principal to certify that the work in the portfolio reflects that of the participating student and that all proper MCAS-Alt procedures have been followed

2.2.3 MCAS-Alt Competency Portfolios for Students in Grade 10 and Beyond

In order to meet the Competency Determination standard for high school graduation, all publicly funded students in Massachusetts, including students with disabilities, must participate in MCAS and earn a score of *Needs Improvement* or higher on both the English Language Arts (ELA) assessment and the Mathematics grade 10 MCAS assessments. When a student has met both the Competency Determination standard and all local graduation requirements, the student is eligible to receive a high school diploma. Students are given multiple opportunities beyond grade 10 to pass these assessments.

When the IEP Team determines that a student requires an alternate assessment, an MCAS-Alt portfolio must be submitted in place of taking the standard MCAS test in that subject. If the student is able to demonstrate a level of performance in his or her portfolio **comparable to or higher than** that of a student who has received scores of *Needs Improvement* or higher on the grade 10 MCAS tests in ELA and Mathematics, the student will be awarded a Competency Determination. The requirements for the competency portfolio are described in detail in the section of the *Educator's Manual* entitled "Requirements in Each Subject to Earn a Competency Determination." The Department strongly encourages collaboration between general and special educators on the development of these portfolios.

A panel of ELA and mathematics experts reviews the work samples in each portfolio and makes individual determinations regarding scores in each subject.

3. TEST ADMINISTRATION AND PARTICIPATION REQUIREMENTS

3.1 MCAS 2006 Test Administration Schedule

MCAS tests were administered during two periods in the spring of 2006:

- In March–April
 - the Grade 3 Reading Test
 - the Composition portion of the English Language Arts tests for grades 4, 7, and 10
 - the English Language Arts Language and Literature tests for grades 4 through 8 and 10
- In May–June
 - Mathematics tests in grades 3 through 8 and 10
 - Science and Technology/Engineering tests for grades 5 and 8
 - pilot end-of-course tests in high school science
 - question tryouts in History and Social Science in grades 5, 7, and high school

The grade 10 MCAS Retests in English Language Arts and Mathematics were administered three times during the 2005–2006 school year: July 2005, November 2005, and March 2006.

MCAS Alternate Assessment (MCAS-Alt) portfolios were required to be submitted no later than May 6, 2006.

Table 3.1 shows the complete 2005–2006 MCAS test administration schedule.

Table 3.1: 2005–2006 MCAS Test Administration Schedule

Test Grade and Content Area	Test Administration Date(s)	Deadline for Return of Materials to Contractor	Deadline for Receipt of Returned Materials by Contractor
Retest Administration Windows			
August 2–4, 2005			
Mathematics Retest	August 2	August 4	August 6
English Language Arts Retest Composition Language and Literature	August 3 August 4		
November 14–18, 2005			
Mathematics Retest Session 1 Session 2	November 14 November 15	November 22	November 29
English Language Arts Retest Composition Language and Literature Session 1 and 2 Session 3	November 16 November 17 November 18		
March 6–10, 2006			
Mathematics Retest, Session 1	March 6	March 14	March 17
Mathematics Retest, Session 2	March 7		
ELA Composition Retest	March 8		
ELA Language and Literature Retest, Sessions 1 & 2	March 9		
ELA Language and Literature Retest, Session 3	March 10		
March–April 2006 Standard Test Administration Window			
Grade 3 Reading	March 27–April 7	April 11	April 20
Grades 4–8 ELA Language and Literature			
Grades 4 and 10 ELA Composition	March 28		
Grade 7 ELA Composition	March 29		
Grades 4, 7, 10 ELA Composition Make-Up	April 5		
Grade 10 ELA Language and Literature, Sessions 1 and 2	March 29		
Grade 10 ELA Language and Literature, Session 3	March 30		
May–June 2006 Test Administration Window			
Standard Tests and Question Tryouts			
Grades 3–8 Mathematics	May 15–June 2	June 6	June 14
Grades 5 and 8 Science and Technology/ Engineering			
Grades 5, 7, and High School (grades 10/11) History and Social Science Question Tryouts			
Grade 10 Mathematics, Session 1			
Grade 10 Mathematics, Session 2	May 24		
Pilot End-of-Course High School (Grades 9/10) Science Tests			
Biology Pilot End-of-Course Test	May 25–June 2	June 6	June 14
Chemistry Pilot End-of-Course Test			
Introductory Physics Pilot End-of-Course Test			
Technology/ Engineering Pilot End-of-Course Test			

Administration windows included time for makeup testing except for retest windows. The *Principal's Administration Manual* was provided to each school prior to the testing windows; this document gave written guidelines for test scheduling, student participation, test security, and test administration. In addition, the Massachusetts Department of Education provided guidance on test administration procedures through regional workshops conducted prior to testing, and toll-free telephone support throughout the test administration period.

MCAS tests are administered in untimed sessions. Tests are designed so that each individual session can be completed in approximately 45 or 60 minutes. Schools were instructed to schedule a two-hour block of time for each test session to allow sufficient time for all students to complete each test session. However, schools were allowed to provide additional time to students who required more time to complete a session, provided that no test session could extend beyond the school day and that both ELA Composition sessions were completed on the same day.

Testing spaces were required to meet the following conditions:

- be free from noise or distractions
- be adequately lit and ventilated
- be furnished so that students can work comfortably and without disruption
- provide adequate individual work space so that each student is sufficiently separated from other students, ensuring test security
- be free from any and all materials containing content in the subject areas being tested, including classroom support materials (e.g., posters, maps, charts) and, when administering the ELA Language and Literature test, English-language dictionaries

3.2 MCAS Participation Requirements

All students educated in publicly funded Massachusetts schools must participate in MCAS, including

- students enrolled in public schools
- students enrolled in charter schools
- students enrolled in educational collaboratives
- students enrolled in approved and unapproved private special education schools and programs within and outside of Massachusetts
- students receiving educational services in institutional settings
- students in the custody of the Department of Social Services
- students in the custody of the Department of Youth Services

This policy of measuring the performance of all students and holding schools and districts accountable for the performance of all students increases the likelihood that all Massachusetts students educated with public funds are provided an opportunity to acquire the content knowledge and skills identified by the *Massachusetts Curriculum Framework* learning standards. Additionally, the participation of all students in MCAS is crucial because all students educated with public funds must earn a Competency Determination, which is awarded based on MCAS test results, as one condition for receiving a high school diploma.

3.2.1 Requirements for Participation of Students with Disabilities

As stated in the Purpose and Overview section of this document (section 1), MCAS fulfills the requirements of the *Education Reform Law of 1993*. The fundamental goal of education reform is to improve the performance of all students. Therefore, all students, including students with disabilities, are required to participate in MCAS.

For purposes of MCAS, a student with a disability has either an Individualized Education Program (IEP) provided under the Individuals with Disabilities Education Act or a plan provided under Section 504 of the Rehabilitation Act of 1973. All students with disabilities must be engaged in an instructional program guided by the standards in the *Massachusetts Curriculum Frameworks*. Students with disabilities must participate in grade-level tests that correspond with the grades in which they are enrolled as reported to the Department's Student Information Management System (SIMS); students with significant disabilities who are unable to take the standard MCAS tests, even with accommodations, must take the MCAS Alternate Assessment (MCAS-Alt).

During its annual meeting, a student's IEP or 504 team must determine how the student will participate in MCAS for each subject scheduled for assessment. This information, including any accommodations that a student will use (see Appendix I), must be documented in the student's IEP and should also be documented, when appropriate, in the student's 504 plan.

Table 3.2.1.1 describes which students should be considered for the standard tests, with or without accommodations, and which students should take the MCAS-Alt.

Table 3.2.1.1: MCAS Participation Options for Students with Disabilities

Characteristics of Student's Instructional Program and Local Assessment	Recommended Participation in MCAS
<p>OPTION 1</p> <p><i>If the student is</i></p> <ul style="list-style-type: none"> a) Generally able to demonstrate knowledge and skills on a paper-and-pencil test, either with or without test accommodations; and is b) Working on learning standards at or near grade-level expectations or is c) Working on learning standards that have been modified and are somewhat below grade-level expectations due to the nature of the student's disability 	<p><i>Then</i></p> <p>The student should take the standard MCAS test, either with or without accommodations that are consistent with the instructional accommodation(s) used in the student's educational program. (see Appendix I for a list of MCAS test accommodations)</p>
<p>OPTION 2</p> <p><i>If the student is</i></p> <ul style="list-style-type: none"> a) generally unable to demonstrate knowledge and skills on a paper-and-pencil test, even with accommodations, and is b) working on learning standards that have been substantially modified due to the nature and severity of his or her disability, and is c) receiving intensive, individualized instruction in order to acquire, generalize, and demonstrate knowledge and skills 	<p><i>Then</i></p> <p>The student should take the MCAS Alternate Assessment in this subject.</p>

OPTION 3

If the student is

- a) working on learning standards at or near grade-level expectations,
and is
- b) **sometimes able** to take a paper-and-pencil test, either without or with one or more test accommodations(s),
but is
- c) presented with **unique and significant challenges** in demonstrating knowledge and skills on a test of this format and duration

Then

The student should take the **standard MCAS test** with necessary accommodations (see Appendix I), if possible.

However

The Team may recommend the **MCAS Alternate Assessment** when the nature and complexity of the disability prevent the student from demonstrating knowledge and skills on the test.

(Instances in which a student in this category may take an alternate assessment are provided below.)

The following examples of unique circumstances are provided to expand a Team’s understanding of the appropriate use of the MCAS-Alt. The MCAS-Alt may be administered if any of the following conditions exist:

- a student, as a consequence of either severe emotional or behavioral impairment or other disability(ies), is unable to maintain sufficient concentration to participate in standard testing, even with test accommodations
- a student with a severe health-related disability, neurological disorder, or other complex disability(ies) cannot meet the demands of a prolonged test administration
- a student with a significant motor, communication, or other disability would require more time than is reasonable or available for testing, even with the allowance of extended time

3.2.2 Requirements for Participation of Limited English Proficient Students

A student who is limited English proficient (LEP) is defined as “a student whose first language is a language other than English and who is unable to perform ordinary classroom work in English.”

Spanish/English versions of the 2006 grade 10 MCAS Mathematics test and retest were available for Spanish-speaking LEP students who were eligible (see section 2.1.3).

MCAS participation requirements for LEP students are as follows:

- **All** LEP students, regardless of the number of years enrolled in U.S. schools, are required to participate in MCAS Mathematics and Science and Technology/Engineering tests scheduled for their grades.
- LEP students in their **first year** of enrollment in U.S. public schools (i.e., for 2006, students not enrolled prior to the 2005 school year) have the option to take the Grade 3 Reading and grades 4, 7, and 10 English Language Arts MCAS tests, but are not required to do so. Students who opt not to take these assessments are excused from MCAS examination in only these content areas for these grades. These students are required to take the Massachusetts English Proficiency Assessment (MEPA) tests in ELA.
 - Results for tests taken by first-year LEP students were reported to the individual students' parents/guardians (see section 5.6 for a description of the report and Appendix J for a sample report). However, results for these students were not included in performance level or scaled-score aggregated 2006 school, district, or statewide results.
- LEP students in their **second year** of enrollment or beyond (i.e., for 2006, students who were enrolled in U.S. schools in 2003–2004 or before) are required to participate in **all** testing scheduled for their grades.

Additional information on the participation of LEP students is available in the publication *Requirements for the Participation of Students with Limited English Proficiency in MCAS and MEPA*, posted on the Department's Web site at http://www.doe.mass.edu/mcas/part_req.html.

4. MCAS 2006 SCORING

4.1 Scoring of Standard Test Items

Upon receipt of used MCAS answer booklets following testing, the testing contractor scanned all student responses, along with student identification and demographic information. Imaged data for multiple-choice responses were machine-scored. Images of short-answer items, open-response items, and ELA Compositions were processed and organized by iScore, a secure, server-to-server electronic scoring software designed by Measured Progress, for hand-scoring.

Student responses that could not be physically scanned (e.g., answer documents damaged during shipping) were physically reviewed and scored on an individual basis by trained, qualified scorers. These scores were linked to the student's demographic data and merged with the student's scoring file by Measured Progress's data processing department.

4.1.1 Machine-Scored Items

Multiple-choice item responses were compared to scoring keys using item analysis software. Correct answers were assigned a score of one point; incorrect answers were assigned a score of zero points. Student responses with multiple marks and blank responses were also assigned zero points.

The hardware elements of the scanners monitor themselves continuously for correct read, and the software which drive these scanners monitor correct data reads. Standard checks include recognition of a sheet that does not belong, is upside down, or is backwards; and identification of critical data that is missing, including a student ID number or test form that is out of range or missing, and of page/document sequence errors. When a problem is detected, the scanner stops and displays an error message directing the operator to investigate and to correct the situation.

4.1.2 Hand-Scored Items

The images of student responses to short-answer and open-response items and to writing prompts were hand-scored. Imaged responses from all answer booklets were sorted into item-specific groups for scoring purposes. Readers reviewed responses from only one item at a time; however, if necessary for scoring purposes, imaged responses from a student's entire booklet were always available for viewing, and the actual physical booklet was also available onsite.

In addition to operational student responses, at least 200 responses to items from previous MCAS administrations were included among all 2006 MCAS 4- and 6-point items (open-response items and ELA Compositions) for scaling and equating purposes (see section 4.3 for further information about scaling and equating). These responses were "seeded" within the 2006 responses.

During scoring, use of iScore minimized the need for scorers to physically handle actual answer booklets and related scoring materials. Student confidentiality was easily maintained, as all MCAS scoring was "blind" (i.e., district, school, and student names were not visible to readers).

Scorers had access to answer booklet numbers, which were readily linked within iScore to student scores. The use of iScore also ensured that access to student response images was limited to only those who were scoring or who were working for Measured Progress in a scoring management capacity.

4.1.2.1 *Scoring Locations and Staff*

Scoring Locations

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

- Troy, NY
 - grade 4 English Language Arts Composition
- Longmont, CO
 - grade 7 English Language Arts Composition
 - Grade 3 Reading
 - grades 7 and 8 English Language Arts Language and Literature
 - grades 3–8 Mathematics
- Dover, NH
 - grade 10 English Language Arts Composition
 - grades 4–6 and 10 English Language Arts Language and Literature
 - grade 10 Mathematics

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 Web sites, to ensure that critical information and scoring modifications were shared/implemented across all scoring sites.

Staff Positions

The following staff members were involved with scoring MCAS responses:

- The **MCAS Scoring Manager** in Dover, NH oversaw communication and coordination of scoring across all scoring sites.
- The **iScore administrator and assistant administrator** in Dover, NH coordinated technical communication across all scoring sites.
- A **Site Manager (SM)** at each scoring site provided logistical coordination for his or her scoring site.
- A **Chief Reader (CR)** in each content area (Mathematics, Science and Technology/Engineering, and, for English Language Arts, two CRs, one for Reading/Language and Literature and one for Writing/Composition) ensured consistency of scoring across all scoring sites for all grades tested in that content area.

- An **Assistant Chief Reader (ACR)** or **Senior Quality Assurance Coordinator (QAC)** in each content area for each grade tested participated in benchmarking activities for that grade and content area. ACRs provided read-behind activities for QACs at their sites.
- Numerous **Senior Readers (SRs)** at the scoring sites provided read-behind activities for scorers. With QACs, they were trained immediately prior to scorer training.
- **Scorers** at each scoring site scored the operational MCAS 2006 student responses.

4.1.2.2 Scorer Recruitment and Qualifications

Measured Progress actively sought a diverse scoring pool that was representative of the local population at scoring sites. The broad range of scorer backgrounds included scientists, editors, business professionals, authors, teachers, graduate school students, and retired educators. Demographic information for scorers (e.g., gender, race, educational background) was electronically captured and reported.

A Bachelor of Arts or a Bachelor of Science degree was required for scorers (also referred to as *readers*) of grade 10 student responses. A four-year college degree was preferred for all other scorers. Scorers of the responses of grade 3 through grade 8 students were required to have completed at least two years of college and to have demonstrated knowledge of the particular subject they scored. Potential scorers submitted documentation (e.g., resume and/or transcripts) of their qualifications.

Scorers were either permanent employees of the testing contractor or were hired through temporary employment services. Due to confidentiality and test security concerns, teachers and administrators (principals, guidance counselors, etc.) employed by Massachusetts schools were not eligible to be MCAS scorers. All scorers signed a nondisclosure/confidentiality agreement.

4.1.2.3 Methodology for Scoring Constructed-Response Items

Constructed-response items were scored based on the following possible score points and scoring procedures.

Possible Score Points

Table 4.1.2.3.1: Possible Score Points for MCAS Constructed-Response Item Types

Constructed-Response Item Type	Possible Score Points	Possible Highest Score
Open-Response	0–4	4
Short-Answer	0–2	2
English Language Arts Composition Topic Development	1–6	12*
English Language Arts Composition Standard English Conventions	1–4	8*
Non-Scorable Items	0	0

*Each English Language Arts Composition was scored by two scorers. Each scorer assigned two scores: one for Topic Development and one for Standard English Conventions. The total of the scores in each area became the student's reported score in that area. (For additional details, see section 2.1.1.2.)

- ELA Compositions. Scorers also provided feedback to students regarding their compositions by assigning two Analytic Annotations to each composition, chosen from a list of coded options. The options included both commendations and issues for improvement. If both scorers assigned the same annotation, it was listed only once in the student’s Parent/Guardian Report. Non-scorable ELA Compositions did not receive Analytic Annotations.
- Non-Scorable Items. Scorers could designate a response as non-scorable for any of the following reasons:
 - response was blank (no attempt to respond to the question)
 - response was unreadable (illegible, too faint to see, or only partially legible/visible)
 - response was written in the wrong location (seemed to be a legitimate answer to a different question)
 - response was written in a language other than English
 - response was completely off-task or off-topic
 - response included an insufficient amount of material to make scoring possible
 - response was an exact copy of the assignment
 - response was incomprehensible
 - student made a statement refusing to write a response to the question

“Unreadable” and “wrong location” responses were eventually resolved, whenever possible, by researching the actual answer document to identify the correct location or to more closely examine the response and then assign a score.

Scoring Procedures

Scoring procedures for constructed-response items included both single-scoring and double-scoring. Single-scored items were scored by one scorer. Double-scored items were scored independently by two scorers, whose scores were tracked for agreement (“inter-rater agreement”); for further discussion of double-scoring and inter-rater agreement, also see section 4.1.2.6 and Appendix H).

Table 4.1.2.3.2 below shows by which method(s) common and equating constructed-response item responses for each operational test were scored.

**Table 4.1.2.3.2: MCAS 2006 Methods of Scoring
Common and Equating Constructed-Response Items
by Grade and Test**

Grade	Test/Question Tryout Name	Responses Single-Scored (per grade and test/question tryout)	Responses Double-Scored (per grade and test/question tryout)
3	Reading	100%	10% randomly
4–8	ELA Language and Literature	100%	10% randomly
	Mathematics	100%	10% randomly
5 and 8	Science and Technology/Engineering	100%	10% randomly
10	ELA Language and Literature		100%
	Mathematics		100%
4, 7, and 10	ELA Composition		100%
All	Unreadable responses		100%
	Blank responses		100%

For each pilot end-of-course high school science test, and for each History and Social Science question tryout, at least 1500 responses were single-scored; of these responses, at least 150 were randomly double-scored.

4.1.2.4 Scorer Training

Scorer training began with an introduction of onsite scoring staff, and an overview of the MCAS program's purpose and goals, including a discussion about the security, confidentiality, and proprietary nature of testing and scoring materials and procedures.

Next, scorers thoroughly reviewed and discussed the scoring guide for the item to be scored. Each item-specific scoring guide included the item itself and score point descriptions. The MCAS ELA Composition Scoring Guide also includes Analytic Annotation descriptions.

Following review of the item-specific scoring guide for any 3-, 4-, or 6-point open-response item, scorers began reviewing or scoring response sets that were organized for specific training purposes:

- Anchor Set
- Training Set
- Qualifying Set

During training, scorers were able to highlight or mark up hard copies of the Anchor, Training, and first Qualifying Sets, even if all or part of the set was also presented online via computer.

Anchor Set

Scorers first reviewed an Anchor Set of exemplary responses, approved by the DOE, for the item to be scored. Responses in Anchor Sets were typical, rather than unusual or uncommon; solid, rather than controversial or borderline; and true, meaning that they had scores that could not be changed by anyone other than DOE test development staff.

The item-specific Anchor Set contained the following:

- at least two responses representing the scoring guide's high score point
- at least two responses representing the scoring guide's low score point
- three responses representing each middle score point (one response representing the mid-high to high range for that score point; one response representing the middle range for that score point; and one response representing the mid-low to low range for that score point)

Responses were read aloud to the room of scorers and presented in either ascending or descending score order, at the discretion of the Chief Reader. Trainers then announced the true score of each anchor response and facilitated a group discussion of the response in relation to the score point descriptions and, for ELA Compositions, Analytic Annotations, to allow scorers to internalize typical characteristics of each score point.

This Anchor Set served as a reference for scorers as they continued with calibration, scoring, and recalibration activities for that item.

Training Set

Next, scorers practiced applying the scoring guide to responses in the Training Set. The Training Set included 10 to 15 student responses designed to help establish the score point range and the range of responses within each score point. The Training Set often included unusual responses that were less clear or solid (e.g., were shorter than normal, employed atypical approaches, contained both very low and very high attributes, or were written in writing that was difficult to decipher). Responses in the Training Set were also presented in randomized score point order. After scorers had independently read and scored a Training Set response, trainers would poll scorers or use online training system reports to record the initial range of scores. Then they would lead a group discussion of one or two responses, directing scorer attention to scoring issues that were particularly relevant to the specific scoring group, such as the line between two score points. Trainers modeled for scorers how to discuss scores by referring to the official Anchor papers and scoring guides.

- Training Sets for ELA Compositions (Writing): A separate training set was used for each of the two scoring dimensions, Topic Development and Standard English Conventions; during training using these sets, scorers issued only a score for the appropriate dimension. Next, scorers trained using a “mixed” Training Set, for which they assigned both a Topic Development and a Standard English Convention score to each composition in the set.
- Training Set for Mathematics Short-Answer Items: In cases in which there was only one correct response to a short-answer item, no Training Set was provided. When there was more than one correct response to a short-answer item, the Training Set included only the number of correct-response samples necessary to illustrate all possible correct solutions (e.g., when there were two possible correct responses, two samples were included in the Training Set).

Qualifying Set

After the Training Set had been completed, for all items except Mathematics short-answer items, scorers were required to measurably demonstrate their ability to accurately and reliably score the item according to its scoring rubric by scoring responses in the Qualifying Set. The ten responses in the Qualifying Set were selected by the Department from an array of responses provided by Measured Progress to illustrate the range of score points for that item. Hard copies of the responses were also available to scorers so that they could make notes and refer back to specific responses during the post-qualifying discussion.

To be eligible to score operational 2006 MCAS responses, scorers of all items other than Mathematics short-answer items were required to demonstrate scoring accuracy rates of minimum 70 percent exact agreement and at least 90 percent exact-or-adjacent agreement. In other words, exact scores were required on at least seven of the Qualifying Set responses and either exact or adjacent scores were required on a total of nine of the 10 responses; scorers were allowed one discrepant score, as long as they had at least seven exact scores. ELA Composition (Writing) scorers had to qualify at the 70/90 percent threshold for both Topic Development and

Standard English Conventions in the same Qualifying Set before they were allowed to score any operational responses.

Scorers who met the percentage requirements were allowed to score operational student responses. There were no specific Qualifying Sets for Mathematics short-answer items; to be eligible to score Mathematics short-answer items, scorers must have successfully met the minimum accuracy requirements for one or more of the Mathematics open-response items for that grade.

- **Retraining:** Scorers who did not pass the first Qualifying Set were retrained as a group by reviewing their performance with scoring leadership and scored a second Qualifying Set of responses. If they achieved a scoring accuracy rate of minimum 70 percent exact and at least 90 percent exact-or-adjacent agreement on this second Qualifying Set (100 percent exact agreement for Mathematics short-answer items), they were allowed to score operational responses.
If scorers did not achieve the required scoring accuracy rates on the second Qualifying Set, they were not allowed to score responses for that item; they instead either began training on a different item or were dismissed.

4.1.2.5 Senior Quality Assurance Coordinator (QAC) and Senior Reader (SR) Training

QACs and select SRs were trained in a separate training session that occurred immediately prior to scorer training. QAC and SR training was identical to scorer training, except that, on Qualifying Sets for grade 10 items, QACs and SRs were required to achieve a scoring accuracy rate of minimum 80 percent exact agreement with at least 100 percent exact-or-adjacent agreement (no discrepant scores). A QAC or SR who did not achieve this accuracy rate was removed from leadership responsibilities for that item, and either served as a regular scorer for the item (if his or her accuracy rate was equal to the required eligibility rate) or began training on a different item.

4.1.2.6 Monitoring of Scoring Quality Control and Consistency

Scorers were monitored for continued accuracy rates and scoring consistency throughout the scoring process, using the following methods and tools:

- Calibration Assessments
- Embedded Committee-Reviewed Responses (CRRs)
- “Read-Behind” Procedures
- Double-Scoring
- Scoring Reports

Any scorer whose accuracy rate fell below the required rate for the particular item and monitoring method was retrained on that item and, upon approval by the QAC or CR, as appropriate (see below), allowed to resume scoring.

Scorers were given only two opportunities to be retrained on a particular item. If they fell below the required accuracy rate a third time on a Compilation Report, they were dismissed from scoring that MCAS item.

Calibration Assessments

Each scoring shift began with an individual or group review of the item, scoring guide, training notes, and Anchor Set. After scoring leadership confirmed that each scorer had completed this review, scorers took an online Calibration Assessment to determine whether they were still calibrated to the scoring standard. The Calibration Assessment consisted of five responses representing the entire range of possible scores, including responses with a score point of “0.”

For grades 3–8 and 10, except for Mathematics short-answer items, if scorers were exact on 4 of the 5 responses, and at least adjacent on the fifth response, they began scoring operational responses.

Scorers who did not meet the appropriate grade’s accuracy requirement were retrained by discussing the Calibration Assessment responses in terms of the score point descriptions and the original Anchor Set. The QAC determined whether or when scorers received enough retraining to begin scoring operational responses. Scoring leadership also carefully monitored any scorer who did not pass a Calibration Assessment by significantly increasing the number of read-behinds for that scorer.

Embedded Committee-Reviewed Responses (CRRs)

Previously scored “embedded” CRRs were selected and loaded into iScore for “blind” distribution to scorers as a way to monitor scorer accuracy. CRRs, either chosen before scoring began or selected by scoring leadership during scoring, were formatted to appear identical to operational student responses so that scorers could not perceive any difference.

Between 5 and 30 CRRs were distributed at random points throughout the first full day of scoring to ensure that scorers were sufficiently calibrated at the beginning of the scoring period. Individual scorers often received up to 20 CRRs within the first 100 responses scored, and up to 10 additional responses within the next 100 responses scored on that first day of scoring.

The required scoring accuracy rate for CRRs (except for Mathematics short-answer item responses, which required 100 percent exact agreement) was minimum 70 percent exact and at least 90 percent exact-or-adjacent agreement. If scorers met or exceeded those accuracy rates, they continued scoring operational responses. If any scorer fell below 70/90 percent accuracy for CRRs, no new responses were sent to his or her computer screen and he or she was retrained before being allowed by the QAC to continue scoring. Once allowed to resume scoring, scoring leadership carefully monitored these scorers by increasing the number of read-behinds.

“Read-Behind” Procedures

Read-behind scoring refers to the practice of having scoring leadership, usually an SR, score a response after another scorer has already scored the same response. QACs performed read-behinds for SRs.

Responses to be placed into the read-behind queue were randomly selected by scoring leadership. The iScore system allowed 1, 2, or 3 responses per scorer to be placed into the read-behind queue at a time. CRRs scored by a scorer for whom a read-behind was being performed were automatically placed into the read-behind queue.

The SR entered his or her score into iScore before being allowed to see the score assigned by the scorer for whom the read-behind was being performed. The SR then compared scores and the reported score was determined as follows:

- If there was exact agreement between the scores, no action was taken; the regular scorer’s score remained.
- If the scores were adjacent (i.e., the difference was not greater than 1), the SR’s score became the score of record; if there were a significant number of adjacent scores for this scorer, an individual scoring consultation was held with the scorer and the QAC determined whether or when the scorer could resume scoring.
- If there was a discrepant difference between the scores (a difference greater than 1 point), the SR’s score became the score of record (see table 4.1.2.6.1 below). An individual consultation was held with the scorer, with the QAC determining whether or when the scorer could resume scoring.

Table 4.1.2.6.1: Examples of MCAS Read-Behind Scoring Resolutions

Reader	QAC/SR Resolution	Final*
4	4	4
4	3	3
4	2	2
* QAC score is score of record.		

The required scoring accuracy rate for read-behinds (except Mathematics short-answer item responses) was minimum 70 percent exact and at least 90 percent exact-or-adjacent agreement. The required scoring accuracy rate for read-behinds of Mathematics short-answer item responses was 100 percent exact agreement.

A minimum of 5 read-behinds per scorer was conducted throughout each half-scoring day, with a minimum of 10 read-behinds per scorer conducted throughout each full-scoring day. If a scorer’s scoring rate fell below the required accuracy percentage, additional read-behinds were performed.

In addition to the minimum daily read-behinds and read-behinds performed to maintain scoring accuracy percentages, scoring leadership could choose to do read-behinds on any scorer at any point during the scoring process, thereby providing an immediate, real-time “snapshot” of a scorer’s accuracy.

Double-Scoring

Double-scoring refers to the practice of having two readers independently score a response, without knowing either the identity of the other scorer or the score assigned to the response by the other scorer. Section 4.1.2.3 provides information about which responses were double-scored.

If there was a discrepancy (a difference greater than 1 for items with 3 or more possible score points; a difference of 1 for 2-point, dichotomous, or correct/not correct items) between scores, the response was placed into an arbitration queue. Arbitration responses were reviewed by the QAC or ACR without any background knowledge of scores assigned by the two previous

readers, and were resolved according to table 4.1.2.6.2 below. Appendix H provides the MCAS 2006 percentages of agreement between scorers for each grade and content area test.

Table 4.1.2.6.2: Examples of MCAS Double-Scoring Resolutions

English Language Arts Composition Topic Development*				
Reader #1	Reader #2	Resolution #1	Chief	Final #1
6	6			12
6	5			11
6	4	4		8
6	4	5		11
6	2	4	4	8
6	2	4	3	6
6	2	3		5
*Identical or adjacent reader scores are summed to obtain final score. If needed, resolution score is summed with identical reader score; or, if resolution score is adjacent to reader #1 and/or #2 but not identical with either, final score sums two highest adjacent scores. If resolution score is still discrepant, a Chief Reader (only) assigns a fourth score, which is doubled to obtain a final score.				
English Language Arts Composition Standard English Conventions*				
Reader #1	Reader #2	Resolution #1		Final
4	4			8
4	4			8
4	3			7
4	2	4		8
4	2	3		7
4	1	3		7
4	1	2		3
*Identical or adjacent reader scores are summed to obtain final score. If needed, resolution score is summed with identical reader score; or, if resolution score is between readers #1 and #2, or is adjacent but not identical to either, then final score sums two highest scores.				
Open-Response and Short-Answer Items*				
Reader #1	Reader #2	QAC/SR Resolution		Final
4	4			4
4	3			4
3	4			4
4	2	3		3
4	1	2		2
3	1	1		1
*If reader scores are identical or adjacent, highest score is used as final. If reader scores are neither identical nor adjacent, resolution score is used as final.				

The required scoring accuracy rate for double-scoring was (for responses to all items except Mathematics short-answer items) minimum 70 percent exact agreement and at least 90 percent exact-or-adjacent agreement. The required scoring accuracy rate for double-scoring of responses to Mathematics short-answer items was 100 percent exact agreement. Scoring leadership consulted individually with any scorer whose scoring rate fell below the required accuracy percentage and the QAC determined whether or when the scorer could resume scoring. Once

allowed to resume scoring, scoring leadership carefully monitored these scorers by increasing the number of read-behinds.

Scoring Reports

Measured Progress’s electronic scoring software, iScore, generated multiple reports that were used by scoring leadership to measure and monitor readers for scoring accuracy and consistency. These reports are further discussed in section 4.1.2.7 below.

4.1.2.7 Reports Generated During Scoring

The 2006 MCAS administration was complex; computer-generated reports were necessary to ensure the following:

- that overall group-level accuracy, consistency, and reliability of scoring were maintained and acceptable
- that immediate, real-time individual scorer data were available to allow early scorer intervention when necessary
- that scoring schedules were maintained

The following reports were produced by iScore:

- The **Read-Behind Summary** report showed the total number of read-behind responses for each scorer, and noted the numbers and percentages of scores that were exact, adjacent, and discrepant between that scorer and the SR/QAC. Scoring leadership could choose to generate this report at pre-set times by choosing options (such as every 15 minutes, 30 minutes, or cumulatively for the day) from a pull-down menu. The report could also be filtered to select data for a particular item or across all items.
- The **Double-Blind Summary** report showed the total number of double-score responses scored by each scorer, and noted the numbers and percentages of scores that were exact, adjacent, and discrepant between that scorer and the SR/QAC.
- The **Accuracy Summary** report combined read-behind and double-score data, showing the total number of double-score and read-behind responses scored for each scorer, and noting his or her accuracy percentages and score point distributions.
- The **Embedded CRR Summary** showed, for each scorer and for either a particular item or across all items, the total number of responses scored, the number of CRRs scored, and the numbers and percentages of scores that were exact, adjacent, and discrepant between the scorer and the SR/QAC.
- **Compilation Reports** were generated multiple times during each scoring day. Each Compilation Report showed, for each item and all scorers, each scorer’s Calibration Assessment results and combined read-behind statistics (a minimum of either 5 read-behinds per scorer for each half-scoring day or 10 read-behinds for each full scoring day). Compilation Reports highlighted scorers who fell below the minimum scoring accuracy percentages, and included one column noting any action taken by scoring leadership as a result (e.g., “retrained,” “scores voided”).

The required scoring accuracy rate for Compilation Reports was minimum 70 percent exact and at least 90 percent exact-or-adjacent agreement for all responses except those for Mathematics short-answer items. Any scorer who fell below the required accuracy percentage after ten read-behinds was directed by his or her computer monitor to report to the SR for retraining. The CR determined, on QAC recommendation, when and if the scorer could resume scoring, and read-behinds for this scorer were increased significantly.

At the end of each scoring shift, a final Compilation Report was generated, rank-ordered so that the lowest exact percentage was listed first, and continuing lowest to highest. This report showed, for each scorer and for a particular item, the following:

- total number of responses scored
- total number of read-behind responses
- total number of Calibration Assessment responses scored (at least 5 per shift), and, of this number, the percentages of scores that were exact, adjacent, and discrepant between the scorer and the SR/QAC

If any scorer's scoring rate did not meet the required accuracy percentage, all scores assigned for that shift by that scorer were voided and sent back out on the floor to be scored by other scorers during a subsequent scoring shift. Only this end-of-shift report was used to determine whether a scorer's scores would be voided.

- The **Qualification Statistics Report** listed each scorer by name and ID number, identified which Qualifying Set(s) they did and did not take and, for the ones they did take, whether they passed or failed. The total number of qualifications passed and failed was noted for each reader, as was the total number of individuals passing or failing a particular Qualifying Set.

The QAC could use this report to determine how the scorers within their specific scoring group performed on a specific Qualifying Set. QACs were able to highlight the word "passed" or "failed" in the report on a screen that described how a scorer performed on each question within that Qualifying Set. Each response within the set was identified by a booklet number. QACs could view an individual scorer's response by double-clicking the response's booklet number and could conference with the scorer as needed.

- The **Summary Report** showed the total number of student responses for an item, and identified, for the time at which the report was generated, the following:
 - the number of single and double-scorings that had been performed
 - the number of single and double-scorings yet to be performed

The following reports were electronically sent to the Department of Education each day:

- Compilation Report (by item)
- Summary Report (by field)

All other reports were also available to the Department. On reports provided to the Department, scorers were identified by unique ID numbers, rather than by name.

4.2 Scoring of MCAS-Alt Portfolios

All MCAS-Alt portfolios were reviewed and hand-scored by trained scorers according to the procedures described in this section and in Appendix E. Scores were entered onto score forms designed by Measured Progress and the DOE; score forms were scanned for accuracy and completeness.

About 10 percent of all portfolios were submitted electronically, using proprietary software (MCAS-Alt EV). These EV-submitted portfolios were scored electronically by scorers who viewed the on-screen portfolio images.

Security was maintained at the scoring site, with access to unscored portfolios and completed score forms restricted to DOE and Measured Progress staff. MCAS-Alt scoring leadership staff at each site included a Floor Manager (FM) and Table Leaders (TLs). Each Table Leader managed a table with four scorers. The FM managed all tables in a room of scorers.

Communication and coordination among scorers were maintained through daily meetings with TLs to ensure that critical information and scoring rules were implemented across all grade clusters.

4.2.1 MCAS-Alt Scoring Methodology

All portfolios in grades 3–8 were single-scored by one qualified scorer, with at least 20 percent double-scored (every fifth portfolio, or more frequently at the table leader’s discretion; see section 4.1.2.6 for discussion of double-scoring).

All grade 10 portfolios were double-scored. In addition, any portfolio that received a score of “M” in any rubric area (i.e., missing or insufficient information submitted) was double-scored.

If scoring discrepancies were found on a double-scored portfolio, the portfolio was sent to the table leader, who assigned a resolution score that became the score of record.

4.2.1.1 Portfolio Completeness

Scorers ensured that each portfolio contained all required forms; that evidence was submitted for all required strands in each content area; and that all required evidence (i.e. one data chart and two related pieces of evidence) was submitted in each strand. If these requirements were not met, the portfolio received scores of M in Demonstration of Skills and Concepts and Independence (see sections B and C of section 4.2.1.2 below).

4.2.1.2 Scoring Dimensions

Once the completeness of the portfolio was ascertained, each strand was scored in all of the following scoring dimensions, in the order listed:

- A. Level of Complexity
- B. Demonstration of Skills and Concepts
- C. Independence
- D. Self-Evaluation
- E. Generalized Performance

MCAS-Alt 2006 score distributions for all scoring dimensions are provided in section 5.4 of this *Report*.

A. Level of Complexity

The score for Level of Complexity indicates how the student addressed *Curriculum Framework* learning standards. MCAS-Alt 2006 score distributions for individual strand and composite Level of Complexity are provided in section 5.4.1 of this *Report*.

- Level of Complexity Score for Each Strand
Each strand was given a Level of Complexity score based on the scoring rubric for Level of Complexity (table 4.2.1.2.A1). Scorers assigned a Level of Complexity score based on the following:
 - whether or not the evidence was aligned with a learning standard in the required strand
 - whether the evidence met grade-level performance expectations, was modified below grade-level expectations, or addressed “access skills”

Table 4.2.1.2.A1: Scoring Rubric for Level of Complexity

Score Point				
1	2	3	4	5
Portfolio reflects little or no basis on <i>Curriculum Framework</i> learning standards in this strand.	Student primarily addresses social, motor, and communication “ access skills ” during instruction based on <i>Curriculum Framework</i> learning standards in this strand.	Student addresses “ entry points ,” or modified (i.e., less difficult) <i>Curriculum Framework</i> learning standards below grade-level expectations in this strand.	Student addresses a narrow sample of <i>Curriculum Framework</i> learning standards (1 or 2) at grade-level expectations in this strand.	Student addresses a broad range of <i>Curriculum Framework</i> learning standards (3 or more) at grade-level expectations in this strand.

- Composite Level of Complexity Score
A Composite Level of Complexity (CLC) score was determined for each assessed content area by averaging the three individual strand scores for Level of Complexity, according to table 4.2.1.2.A2 or, in the case of a two-strand content area, by combining the strand scores according to table 4.2.1.2.A3. This Composite score was used to determine whether the student’s work would be measured against alternate achievement standards (ALT), indicating that the student had a significant cognitive disability; modified achievement standards (MOD); or grade-level achievement standards (GL).

**Table 4.2.1.2.A2: Determination of Score
for Composite Level of Complexity in Each Content Area:
3-Strand Portfolio**

Strand 1 Level of Complexity Score	Strand 2 Level of Complexity Score	Strand 3 Level of Complexity Score	Composite Level of Complexity Standard
3, 2, or 1	3, 2, or 1	3, 2, or 1	ALT
3 (at or near grade level)	3	3	MOD
3, 2, or 1	3, 2, or 1	4 or 5	MOD
3, 2, or 1	4	4	MOD
3, 2, or 1	4	5	MOD
3, 2, or 1	5	5	GL
4	4	4	GL
4	4	5	GL
4	5	5	GL
5	5	5	GL

**Table 4.2.1.2.A3: Determination of Score
for Composite Level of Complexity in Each Content Area:
2-Strand Portfolio**

Strand 1 Level of Complexity Score	Strand 2 Level of Complexity Score	Composite Level of Complexity Standard
3, 2, or 1	3, 2, or 1	ALT
3 (at or near grade level)	3	MOD
3, 2, or 1	4	MOD
3, 2, or 1	5	MOD
4	4	GL
4	5	GL
5	5	GL

B. Demonstration of Skills and Concepts

Each strand is given a score for Demonstration of Skills and Concepts that indicates the degree to which a student gave a correct (accurate) performance or response in demonstrating the targeted skill. The MCAS-Alt 2006 score distributions for Demonstration of Skills and Concepts are provided in section 5.4.2 of this *Report*.

Scorers confirmed that all portfolio evidence was correctly labeled with the following information:

- student's name
- date of performance
- percentage of accuracy
- percentage of independence

If any piece of evidence was not labeled correctly, that piece was not scorable and, if at least two other pieces of correctly labeled primary evidence were not submitted, the strand received scores of M in both Demonstration of Skills and Concepts and Independence (see section C below).

Scorers assigned a score to the strand for Demonstration of Skills and Concepts based on the average percentage of accuracy found in the data points in the final one-third time frame of the

data chart, as described in section 5.1.2 of this document. Scores ranged from M (“Missing”) to 4, based on the scoring rubric in table 4.2.1.2.B1.

Table 4.2.1.2.B1: Scoring Rubric for Demonstration of Skills and Concepts

Score Point				
M	1	2	3	4
The portfolio strand contains insufficient information to determine a score.	Student's performance is primarily inaccurate and demonstrates minimal understanding in this strand.	Student's performance is limited and inconsistent with regard to accuracy and demonstrates limited understanding in this strand.	Student's performance is mostly accurate and demonstrates some understanding in this strand.	Student's performance is accurate and of consistently high quality in this strand.

C. Independence

The score for Independence shows the degree to which the student performed independently (i.e., without cues or prompts) during tasks or activities based on the learning standards being assessed. The MCAS-Alt 2006 score distributions for Independence are provided in section 5.4.3 of this *Report*.

Scorers assigned a score for Independence to each strand. If the percentage of independence was not indicated on at least three pieces of evidence, the strand was considered incomplete, and received scores of M in both Demonstration of Skills and Concepts and Independence. Scores ranged from M to 4 based on the scoring rubric for Independence (table 4.2.1.2.C1).

The procedure for determining a score for Independence in each strand was identical to that used to determine Demonstration of Skills and Concepts. For a more detailed explanation, including examples and exceptions to the standard procedures, see Appendix E.

Table 4.2.1.2.C1: Scoring Rubric for Independence

Score Point				
M	1	2	3	4
The portfolio strand contains insufficient information to determine a score.	Student requires extensive verbal, visual, and physical assistance to demonstrate skills and concepts in this strand. (0-25% independent)	Student requires frequent verbal, visual, and physical assistance to demonstrate skills and concepts in this strand. (26-50% independent)	Student requires some verbal, visual, and physical assistance to demonstrate skills and concepts in this strand. (51-75% independent)	Student requires minimal verbal, visual, and physical assistance to demonstrate skills and concepts in this strand. (76-100% independent)

D. Self-Evaluation

The score for Self-Evaluation shows the frequency of self-correction, self-monitoring, goal-setting, reflection, and overall awareness by the student of his or her own learning. The MCAS-Alt 2006 overall score distributions for Self-Evaluation are provided in section 5.4.4 of this *Report*.

- **Self-Evaluation Score in Each Strand**

Each strand was given a score ranging from M to 2+ based on the scoring rubric shown in table 4.2.1.2.D1.

**Table 4.2.1.2.D1: Scoring Rubric for Self-Evaluation,
Individual Strand Score**

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

▪ Combined Self-Evaluation Score

A final score for Self-Evaluation in the content area was determined by combining the three individual strand scores according to table 4.2.1.2.D2 or, in the case of a two-strand portfolio, by combining the two individual strand scores according to table 4.2.1.2.D3. Descriptors of the overall content area scores are shown in table 4.2.1.2.D4.

**Table 4.2.1.2.D2: Determination of
Combined Self-Evaluation Score for Each Content Area:
3-Strand Portfolio**

Strand Score 1	Strand Score 2	Strand Score 3	Combined Content Area Score
M	M	M	M
M	M	1	1
M	M	2+	1
M	1	1	2
M	1	2+	2
M	2+	2+	2
1	1	1	3
1	1	2+	3
1	2+	2+	3
2+	2+	2+	4

**Table 4.2.1.2.D3: Determination of
Combined Self-Evaluation Score for Each Content Area:
2-Strand Portfolio**

Strand Score 1	Strand Score 2	Combined Content Area Score
M	M	M
M	1	1
M	2+	1
1	1	2
1	2+	3
2+	2+	4

Table 4.2.1.2.D4: Rubric for Combined Self-Evaluation Score in Each Content Area

Score Point				
M	1	2	3	4
Evidence of self-correction, monitoring, goal-setting, and reflection does not exist in the student's portfolio in this subject.	Student infrequently self-corrects, monitors, sets goals, and reflects in this subject (i.e., evidence of Self-Evaluation was found in only one portfolio strand).	Student occasionally self-corrects, monitors, sets goals, and reflects in this subject (i.e., evidence of Self-Evaluation was found in two portfolio strands).	Student frequently self-corrects, monitors, sets goals, and reflects in this subject (i.e., evidence of Self-Evaluation was found either in three portfolio strands or two or more examples were found in only one strand).	Student self-corrects, monitors, sets goals, and reflects all or most of the time in this subject (i.e., two or more examples of Self-Evaluation were found in each portfolio strand).

E. Generalized Performance

The score for Generalized Performance shows the numbers of contexts and instructional approaches in which knowledge and skills were demonstrated in the portfolio strand. The MCAS-Alt 2006 score distributions for Generalized Performance in each content area are provided in section 5.4.5 of this *Report*.

- **Generalized Performance Score in Each Strand**
Scorers totaled the numbers of contexts and approaches in each strand to determine the score of either 1 or 2+, based on the rubric shown in table 4.2.1.2.E1.

Table 4.2.1.2.E1: Scoring Rubric for Generalized Performance

Score Point	
1	2+
Student uses a single context or instructional approach to demonstrate knowledge and skills in this strand.	Student uses multiple contexts or instructional approaches to demonstrate knowledge and skills in this strand.

- **Combined Generalized Performance Score**
A final Generalized Performance score was determined in the content area by combining the three scores for individual strands, as shown in table 4.2.1.2.E2 or, in the case of a two-strand portfolio, by combining the two individual strand scores as shown in table 4.2.1.2.E3. Descriptors for the Combined Generalized Performance scores are shown in table 4.2.1.2.E4.

Table 4.2.1.2.E2: 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+	4

**Table 4.2.1.2.E3: 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
1	3+	2
2	2	3
3+	2	3
3+	3+	4

**Table 4.2.1.2.E4: Rubric for Combined Generalized Performance Score
in Each Content Area**

Score Point			
1	2	3	4
Student demonstrates knowledge and skills in one context; or uses one instructional approach and/or method of response and participation in each strand.	Student demonstrates knowledge and skills in two or more contexts; or uses two or more instructional approaches and/or methods of response and participation in only one strand.	Student demonstrates knowledge and skills in two contexts; or uses two instructional approaches and/or methods of response and participation in each strand.	Student demonstrates knowledge and skills in three or more contexts; or uses three or more instructional approaches and/or methods of response and participation in each strand.

4.2.1.3 Scoring of “Competency Portfolios” for Grade 10 and Beyond

A student may earn a Competency Determination by submitting an MCAS-Alt portfolio that demonstrates knowledge and skills at levels comparable to a student who has earned a score of *Needs Improvement* or higher on the standard grade 10 MCAS tests in English Language Arts (ELA) and Mathematics. Specific requirements for submission of competency portfolios are described in the *2006 Educator’s Manual for MCAS-Alt*.

Each 2006 competency portfolio was evaluated by a panel of content area experts to determine whether it met grade 10 *Needs Improvement* performance level requirements. To receive a score of *Needs Improvement* or higher on a portfolio, the portfolio was required to demonstrate the following:

- knowledge and skills at the levels of a student who received scores of *Needs Improvement* or higher on the grade 10 ELA and Mathematics tests
- that the student had independently and accurately addressed all required learning standards and strands described in the portfolio requirements for ELA and mathematics

If the student’s portfolio demonstrated a level of performance comparable to or higher than that of students who passed the standard grade 10 MCAS tests in ELA and Mathematics, the student was awarded a Competency Determination.

In 2006, of a total of 39 ELA and 48 Mathematics portfolios submitted for consideration to earn a Competency Determination, two ELA portfolios and five Mathematics portfolios earned the Competency Determination.

4.2.2 MCAS-Alt Scorer Recruitment, Qualifications, Training, and Monitoring

4.2.2.1 Scorer Recruitment and Qualifications

The Department invited licensed Massachusetts educators to apply to participate in the three-week summer MCAS-Alt Scoring Institute. Prospective scorers were required to meet all of the following conditions:

- must be a licensed educator or related-service provider in Massachusetts
- must have familiarity and experience with the following:
 - the MCAS-Alt
 - students with significant disabilities who take the MCAS-Alt
 - the *Massachusetts Curriculum Frameworks*
 - curriculum alignment for students with significant disabilities
- must be directly involved either with students taking the MCAS-Alt or their teachers

After a selection process conducted by the Department of Education, scorers were assigned to either a one- or a two-week session, based on scorer preference, experience, and level of responsibility. All scoring personnel participated in intensive training and signed a confidentiality agreement before reviewing actual student portfolios.

4.2.2.2 Selection of Training Materials Used to Train Scorers

The MCAS-Alt Project Leadership Team (i.e., DOE and Measured Progress staff, plus five Teacher Consultants) met for two days in order to accomplish the following:

- select sample portfolio strands to use for training, calibration, and qualification of scorers
- field test the *2006 Guidelines for Scoring Student Portfolios* (Appendix E)

On the first day, the group reviewed and scored approximately 200 portfolios using the draft of the *2006 Guidelines*, noting any scoring problems that arose during the review. All concerns were resolved either using the *Educator's Manual* or through additional scoring rules agreed upon by the Project Leadership Team and subsequently addressed in the final *2006 Guidelines*.

Of the 200 portfolios reviewed, 77 sample strands were set aside as possible exemplars to train and calibrate scorers. These strands consisted of “solid” examples of each score point on the scoring rubric.

Each of these samples was double-scored. Of the 77 double-scores, 49 were in exact agreement in all five scoring dimensions: Level of Complexity, Demonstration of Skills and Concepts, Independence, Self-Evaluation, and Generalized Performance.

These 49 samples were set aside, scanned, and rescored. Scoring rationale sheets were developed and printed for scorer training. Of these 49 sample strands, the PLT decided to use 34, including several complete content areas, for scorer training and calibration. These 34 portfolio samples became the scorers’ “sample set.”

4.2.2.3 *Review and “Mock Scoring”*

Scorers were thoroughly trained in all rubric areas and score points through review and “mock scoring” of a sample set of student portfolios selected to illustrate clear examples of each rubric score point. Trainers reviewed portfolio samples with scorers, discussing each piece of evidence and the score it should receive in each dimension. Trainers facilitated discussion and review among scorers to clarify the characteristics of each score point.

4.2.2.4 *Qualification of Prospective Scorers*

Prior to scoring actual student portfolios, each scorer was required to demonstrate the ability to score by taking a qualifying assessment of 24 questions and scoring a sample portfolio of four strands. The qualifying score on the assessment was 80 (20 correct of 24 total questions). The qualifying rate of accuracy on the sample portfolio was 80 percent exact agreement overall for the five scoring dimensions (Level of Complexity, Demonstration of Skills and Concepts, Independence, Self-Evaluation, and Generalized Performance; i.e., exact agreement on 16 of 20 total scorable dimensions for the four strands).

Scorers who did not achieve the required accuracy rate on the qualifying assessment were retrained before taking another qualifying assessment. If they achieved an accuracy rate of at least 80 percent exact agreement, they were authorized to begin scoring student portfolios.

If a scorer did not meet the required accuracy rate on the second qualifying assessment, he or she was either retrained and given a third opportunity, or was released from scoring, at the discretion of the DOE. Virtually all scorers who had taken one, two, or three qualifying assessments met the required accuracy rate.

4.2.2.5 *Training for Table Leaders and Floor Managers*

Table Leaders (TLs) and Floor Managers (FMs) were trained and qualified prior to scorers by the DOE using the same methods and criteria used for scorers. TLs and FMs also received training in logistical, management, and security procedures.

4.2.2.6 *Monitoring of Scorers and Quality Control for Scoring*

The TL ensured that scorers at his or her table were consistent and accurate in their scoring. The FM monitored scoring consistency and the general flow of work in the room. TLs who had questions were referred to the FM.

Scorers were required to maintain a 75 percent exact agreement rate on all double-scored portfolios. When a scorer’s rate of accuracy fell below this rate, the scorer was retrained. The FM determined whether a scorer could resume scoring. The TL regulated the number of double-scored portfolios for each scorer; on average, every fifth portfolio was double-scored.

Scoring consistency and accuracy were maintained using the following methods, described below:

- Calibration Assessments
- Read-Behind Scoring
- Double-Scoring
- Scorer Tracking Forms

Calibration Assessments

At the beginning of each scoring week, and at least one during the week, all scorers, TLs, and FMs scored a sample portfolio strand to determine whether they were calibrated to continue scoring actual MCAS-Alt student portfolios. Exact score agreement on 4 of the 5 responses was required in order score portfolios.

Scorers who achieved less than 75 percent exact agreement were retrained and recalibrated by staff, who determined when a scorer, TL, or FM could resume scoring. The DOE monitored scorers, TLs, and FMs who required retraining, and increased the number of read-behinds for these individuals.

Read-Behind Scoring

Read-behind scoring refers to the practice of a TL rescoreing a portfolio and comparing his or her score with the one assigned by the previous scorer. If there was exact score agreement, the first scorer's score was retained as the score of record. If the scores differed, the TL's score became the score of record.

Read-behinds were performed on every scorer's first three portfolios. If those scores were consistent with the TL's resolution scores, a read-behind was performed on every fifth subsequent portfolio per scorer.

If a scorer's first three portfolio scores were inconsistent with the TL's resolution scores, the scorer was retrained. The TL determined when a retrained scorer could resume scoring. Additionally, a read-behind was performed on each subsequent portfolio for any scorer permitted to resume scoring, until consistency with the TL's scores was established.

The required rate of agreement for read-behinds (after the first 3 portfolios) was 75 percent exact agreement.

Double-Scoring

Double-scoring refers to a single portfolio being scored by two scorers at the same table, without knowledge by either scorer of the score assigned to the portfolio by the other.

All portfolios for students in grades 10–12 were double-scored. At least 20 percent of portfolios for students in grades 3–8 were double-scored.

The required rate of scoring accuracy for double-scored portfolios was 75 percent exact agreement. When there was a discrepancy between scores, the TL scored the portfolio a third

time and the TL's score became the score of record. The TL discussed discrepant areas with the responsible scorers and determined when they could resume scoring.

Tables showing the percentages of inter-scorer agreement for the 2006 MCAS-Alt are provided in section 4.2.3 below.

Scorer Tracking Forms

The TL maintained both a daily and a cumulative Scorer Tracking Form for each scorer. The daily form showed the number of portfolios scored by that scorer each day, along with the scorer's percentage of accuracy on read-behinds and double-scores.

Scoring leadership monitored scorers for output, with slower scorers remediated to increase their production.

4.2.3 MCAS-Alt Inter-Scorer Consistency

Table 4.2.3.1 shows the 2006 MCAS-Alt number and percentage of exact agreements on two or more scores in every scoring dimension area for each content area strand. **Note:** Only records with at least two scores for the content area/strand/scoring dimension area were used.

Table 4.2.3.1: 2006 MCAS-Alt Inter-Scorer Consistency by Strand and Scoring Dimension

Strand	Dimension	Number of Portfolios with at least Two Scores	Number of Exact Scores	Percent of Exact Scores
English Language Arts/Reading				
General Standard 4	Complexity	1858	1766	95.05
	Skills	2125	2024	95.25
	Independence	2124	2006	94.44
	Self-Evaluation	2180	2048	93.94
	Generalized Performance	1837	1280	69.68
General Standard 8	Complexity	1875	1784	95.15
	Skills	2139	2020	94.44
	Independence	2137	2002	93.68
	Self-Evaluation	2215	2071	93.50
	Generalized Performance	1856	1281	69.02
Composition	Complexity	1149	1069	93.04
	Skills	1234	1159	93.92
	Independence	1234	1155	93.60
	Self-Evaluation	1255	1175	93.63
	Generalized Performance	1142	804	70.40
Mathematics				
Number Sense and Operations	Complexity	1829	1730	94.59
	Skills	2066	1937	93.76
	Independence	2066	1927	93.27
	Self-Evaluation	2175	2034	93.52
	Generalized Performance	1812	1249	68.93
Patterns, Relations, and Algebra	Complexity	824	761	92.35
	Skills	905	850	93.92
	Independence	905	849	93.81
	Self-Evaluation	954	895	93.82
	Generalized Performance	821	556	67.72
Geometry	Complexity	594	526	88.55
	Skills	641	592	92.36
	Independence	641	588	91.73
	Self-Evaluation	639	610	95.46
	Generalized Performance	585	404	69.06
Measurement	Complexity	664	624	93.98
	Skills	739	689	93.23
	Independence	739	687	92.96
	Self-Evaluation	729	677	92.87
	Generalized Performance	662	445	67.22
Data Analysis, Statistics, and Probability	Complexity	779	727	93.32
	Skills	865	817	94.45
	Independence	865	809	93.53
	Self-Evaluation	886	832	93.91
	Generalized Performance	772	558	72.28
Science and Technology/Engineering				
Earth and Space Science (or Science 1)	Complexity	1019	968	95.00
	Skills	1127	1068	94.76
	Independence	1127	1058	93.88
	Self-Evaluation	1124	1052	93.59
	Generalized Performance	1012	773	76.38
Life Science (or Science 2)	Complexity	948	895	94.41
	Skills	1065	1008	94.65
	Independence	1065	996	93.52
	Self-Evaluation	1065	997	93.62
	Generalized Performance	942	712	75.58
Physical Sciences (or Science 3)	Complexity	845	790	93.49
	Skills	913	854	93.54
	Independence	913	860	94.19
	Self-Evaluation	920	877	95.33
	Generalized Performance	836	602	72.01
Technology/ Engineering (or Science 4)	Complexity	152	142	93.42
	Skills	202	192	95.05
	Independence	202	192	95.05
	Self-Evaluation	202	190	94.06
	Generalized Performance	147	118	80.27

Table 4.2.3.2 shows 2006 MCAS-Alt inter-scorer consistency data for each content area overall.

**Table 4.2.3.2: 2006 MCAS-Alt Inter-Scorer Consistency
By Content Area**

Content Area	Number of Portfolios with At Least Two Scores	Number of Portfolios with Two Scores in Exact Agreement	Percentage of Portfolios with Two Scores in Exact Agreement
English Language Arts/Reading	23644	26360	89.70
Mathematics	22373	25157	88.93
Science and Technology/Engineering	14344	15826	90.64

Table 4.2.3.3 shows 2006 MCAS-Alt inter-rater consistency data for each scoring dimension over all strands. The percentage of exact agreement exceeded 90 percent for all dimension scores except Generalized Performance, indicating that in at least 9 of 10 dimensions that were double-scored, two scorers agreed. This rate of agreement has risen steadily since 2001 due to increased clarity in scoring dimension rubrics, improved training of scorers, and scoring rules that minimize errors.

**Table 4.2.3.3: 2006 MCAS-Alt
Inter-Rater Consistency by Scoring Dimension**

Scoring Dimension	Number of Portfolios with At Least Two Scores	Number of Portfolios with Two Scores in Exact Agreement	Percentage of Portfolios with Two Scores in Exact Agreement
Level of Complexity	11782	12536	93.99
Demonstration of Skills and Concepts	13210	14021	94.22
Independence	13129	14018	93.66
Self-Evaluation*	13458	14344	93.82
Generalized Performance*	8782	12424	70.69

*Note: Generalized Performance and Self-Evaluation are not calculated in the final performance level.

Table 4.2.3.4 shows the overall inter-scorer consistency rate for the 2006 MCAS-Alt in all scoring dimension areas combined.

**Table 4.2.3.4: 2006 MCAS-Alt
Aggregate Inter-Scorer Consistency
in All Scoring Dimension Areas Combined**

Double-Scores	Exact Agreement	Inter-Scorer Consistency
60361	67343	89.63

4.3 MCAS Equating and Scaling Procedures

4.3.1 Equating

The purpose of equating is to ensure that scores obtained from different forms of a test are equivalent to one another. Equating may be used when multiple test forms are administered in the same year and/or to equate one year's forms to those given in the previous year. Equating ensures that students are not given an unfair advantage or disadvantage because the items on the test form they took are easier or harder than items on forms taken by other students.

The data and rigorous procedures used to equate 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 (also see section 4.3.2). Delta analysis results are included as Appendix A, and item parameter values are included in Appendix B.

A raw-score-to-theta equating procedure was used to equate the MCAS 2006 tests. In each year of MCAS administration, every new form is equated back to the theta scale of the previous year's test form in a "chained linking design." Because the chain originates from the reference form, the theta scale of every new test form can be assumed to be the same as the theta scale of the reference form. Therefore, the following equating activities were involved for the MCAS 2006 administration:

- grades 4 and 8 Mathematics test scores were equated to the 1998 theta scale
- grades 4 and 7 English Language Arts (ELA), Grade 3 Reading, and grade 6 Mathematics test scores were equated to the 2001 theta scale
- grades 5 and 8 Science and Technology/Engineering test scores were equated to the 2003 theta scale

This method of equating has been used for MCAS tests since the 1998 scale was established, and it has been reviewed and approved by the MCAS Technical Advisory Committee.

Previous equating for MCAS tests used the *anchor-test-nonequivalent-groups* design described by Petersen, Kolen, and Hoover (1989). In this equating design, no assumption is made about the equivalence of the examinee groups taking different test forms (i.e., naturally occurring groups). Instead, the comparability of the groups is evaluated through utilization of a set of anchor items (i.e., linking items). Equating for the MCAS 2006 administration used an external anchor test design in which linking items are not counted toward students' test scores.

For MCAS 2006 item calibration, the three-parameter logistic (3PL) model was used for dichotomous items, and the graded response model (GRM) was used for polytomous items. Calibration of parameter estimates in 2006 placed items on the 2004–05 scale by fixing the parameters for the anchor items to 2004–2005 calibration values. Note that the students who took the field test in 2004–2005 and those who took the operational test in 2006 are not equivalent groups. Item Response Theory (IRT) is particularly useful in equating for nonequivalent groups (Allen and Yen, 1979). The item parameters are provided in Appendix B.

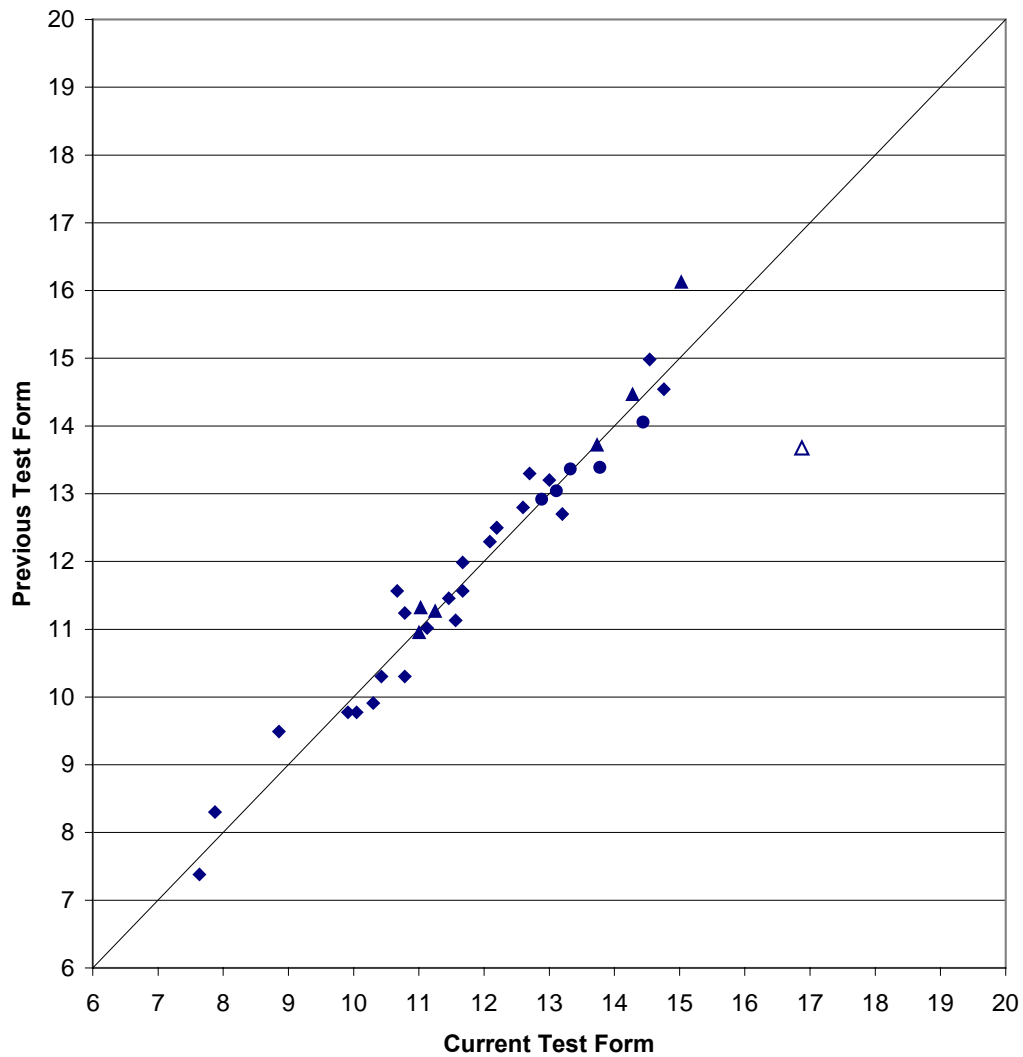
Prior to fixing the values of the parameters of the anchor items, the items were evaluated for use as equating items using the delta method. The p-values of each dichotomous item were transformed to the delta metric. Each item has two p-values, one for the previous year administration and one for the current year administration. The delta scale is an inverse normal transformation of percentage correct to a linear scale with a mean of 13 and standard deviation of 4 (Holland and Wainer, 1993). A high delta value indicates a difficult item. For open-response items, the adjusted p-value (the average score divided by the maximum possible score) was transformed to the delta metric. The delta values were computed for the potential equating items for each grade-content category.

Figure 4.3.A is an example of a delta plot for equating items. Different shapes are used to identify different item types:

- ◆ = multiple-choice items
- ▲ = short-answer items
- = open-response items

The perpendicular distance of each item to the regression line is computed. (Note that the line shown in Figure 4.3.A is the identity line, not the regression line.) The un-shaded (in this case, triangular) shape indicates the item with the greatest perpendicular distance from the regression line. Items that were not more than three standard deviations away from the regression line were used as equating items. For the 2006 MCAS administration, for grade 4 ELA and Mathematics, grade 6 Mathematics, and grade 8 Mathematics, one item from each test was excluded from use as an equating item as a result of the delta analysis; no items were excluded for use in equating for Grade 3 Reading, grade 5 Science and Technology/Engineering, grade 7 ELA, grade 8 Science and Technology/Engineering, or grade 10 ELA. The 2006 MCAS delta analyses tables are provided in Appendix A.

Figure 4.3.A: Sample Delta Plot
 (◆ MC ▲ SA ● OR)



4.3.2 Scaling

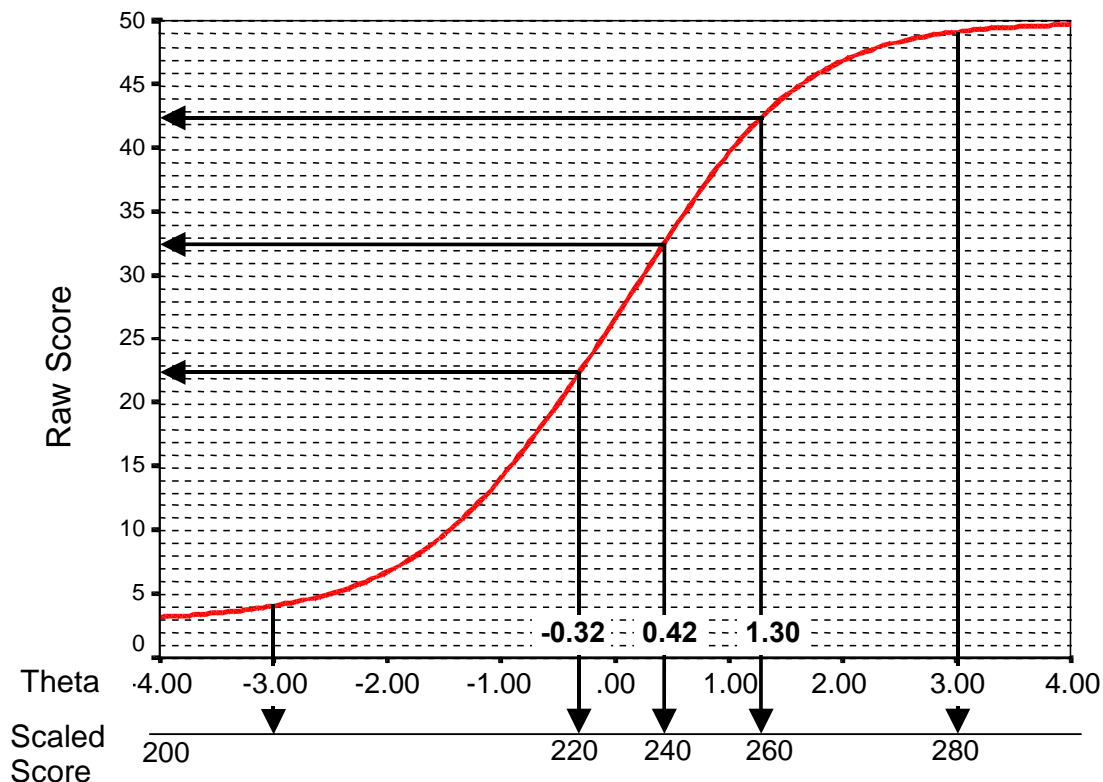
In the same way that the same temperature can be expressed on either the Fahrenheit or Celsius scale, and the same distance can be expressed in miles or kilometers, student scores on the MCAS tests can be expressed as either raw scores or scaled scores. Scaled scores supplement the MCAS proficiency-level results by providing information about the position of a student’s results within a proficiency level. It is important to note that converting from raw scores to scaled scores does not change students’ proficiency-level classifications.

With the exception of the Grade 3 Reading and Mathematics tests, for which results are reported only as raw scores (i.e., number correct), a student’s MCAS 2006 test score in each content area is reported as an even-integer value on a scale that ranges from 200 to 280. The student’s raw score, or total number of points, on the test is converted to a scaled score using the test characteristic curve (TCC). School- and district-level scaled scores are calculated by computing the averages of student-level scaled scores.

Scaled scores offer the advantage over raw scores of simplifying the reporting of results across content areas and subsequent years. Because the standard-setting process typically results in different cut scores across content areas on a raw score basis, it is useful to transform these raw cut scores to a scale that is more easily interpretable. For the MCAS tests, a scaled score of 240 is the cut score between the *Needs Improvement* and *Proficient* performance levels, regardless of the content area or year of testing, whereas the raw cut score between those two levels could be 35 in Mathematics but 33 in ELA. Using scaled scores greatly simplifies the task of understanding how a student performed.

Figure 4.3.B depicts the mechanics of the scaling procedure used for all grades and content areas in the MCAS program.

Figure 4.3.B: Illustration of the Raw Score-Theta-Scaled Score Transformation Using TCC



The scaled scores of 220, 240, and 260 represent the cut scores between performance levels. Therefore, scaled scores for the four performance levels include the following scores:

- *Warning/Failing* = 200–218
- *Needs Improvement* = 220–238
- *Proficient* = 240–258
- *Advanced* = 260–280

Scaled scores are obtained by a simple translation of ability estimates ($\hat{\theta}$ s) using the linear relationship between threshold values on the θ metric and their equivalent values on the scaled score metric. Students' ability estimates are based on their responses to test items. Scaled scores are calculated using the linear equation

$$SS = m\hat{\theta} + b$$

where m is the slope and b is the intercept. A separate linear transformation was used for each performance level.

4.3.2.1 Scaled Scores for Low-Scoring and High-Scoring Students

In the performance level of *Warning/Failing*, the upper threshold on the theta metric was established via standard setting, but there is no corresponding lower threshold. This is also true for the upper threshold of the *Advanced* performance level. Therefore, a modified procedure was necessary to calculate the scaling coefficients for the *Warning/Failing* and *Advanced* performance levels. Details of this procedure can be found in the *2001 MCAS Technical Report*.

4.3.2.2 Scaled-Score Error Band

In addition to an overall scaled score, an error band was also reported for each student. It was estimated by using the inverse of the square root of the test information function (Hambleton, Swaminathan, & Rogers, 1991).

$$SEM(\hat{\theta}_j) = \frac{1}{\sqrt{I(\theta_j)}}$$

where $SEM(\hat{\theta}_j)$ is standard error of measurement (SEM) and $I(\theta_j)$ is the test information at given θ_j .

The obtained SEMs were used to determine the confidence intervals of the students' scaled scores. The interval of ± 1 SEM was used to construct confidence intervals around the scaled-score estimates for each MCAS 2006 test. Transformation of the confidence interval from the theta metric onto the MCAS scaled-score metric was carried out by applying the same linear transformations used to convert student scores from the theta scale onto the MCAS scale.

5. REPORTING OF MCAS 2006 RESULTS

5.1 Standard Setting

The thresholds that define each performance level category are determined through the process of *standard setting*. Standard setting is a means of examining student performance in relation to a set of common, well-defined standards and determining what specific test scores define the boundaries of each performance category.

5.1.1 Standard Setting for the Standard MCAS Tests

MCAS results are reported in the form of performance levels (except for results of any tests taken by first-year LEP students) and (except for grade 3 test results, which are reported only as raw scores) as scaled scores for individual students, schools, districts, and the state. Detailed standard-setting procedures are described in the *2006 MCAS Standard Setting Report* (Appendix G). Descriptions of the reports that provide MCAS 2006 results are provided in section 5.6; sample reports are provided in Appendices J, K, and L.)

5.1.1.1 Performance Levels

MCAS results for standard MCAS tests are reported in four performance level categories:

- *Advanced/Above Proficient*: Students at this level demonstrate a comprehensive and in-depth understanding of rigorous subject matter, and provide sophisticated solutions to complex problems. The performance level of *Above Proficient* is used only at grade 3.
- *Proficient*: Students at this level demonstrate a solid understanding of challenging subject matter and solve a wide variety of problems.
- *Needs Improvement*: Students at this level demonstrate a partial understanding of subject matter and solve some simple problems.
- *Warning/Failing*: Students at this level demonstrate a minimal understanding of subject matter and do not solve simple problems. The performance level category of *Failing* is used only at grade 10.

5.1.1.2 Scaled-Score Cut Scores

The total range of MCAS scaled scores (which are reported as even integers from 200–280) is equally divided among the four performance categories, as shown in table 5.1.1.2.1:

Table 5.1.1.2.1: MCAS Performance Levels and Scaled Score Ranges

Performance Level	Scaled Score Range
<i>Advanced</i>	260–280
<i>Proficient</i>	240–258
<i>Needs Improvement</i>	220–238
<i>Warning/Failing</i>	200–218

The scaled scores of 220, 240, and 260 represent the cut scores between performance levels. It should be noted that scaled scores indicate comparable student position information *within* a performance level but not *across* performance levels. That is, the units of the scale can be assumed to be identical for a given performance level, though this assumption does not necessarily hold when compared to scale units within another performance level.

The steps for developing initial MCAS scaled scores are described in detail in the *1998 MCAS Technical Report* (www.doe.mass.edu/mcas/tech_rpt.html). These steps were substantially changed in 2001 to reduce error and enhance reporting of the lowest and highest test scores. Details of these changes can be found in the *2001 MCAS Technical Report* and are summarized in the *2002 MCAS Technical Report*.

5.1.1.3 Raw-Score Cut Scores

Table 5.1.1.3 presents the raw scores relating to the various cuts for each grade/content area combination. For example, in Grade 3 Reading, the raw score cuts for *Warning: Needs Improvement*, *Needs Improvement: Proficient*, and *Proficient: Above Proficient* are 21, 37, and 44 out of a total possible score point of 48, so students with raw scores of 0–20, 21–36, 37–43, and 44–48 are classified as *Warning*, *Needs Improvement*, *Proficient*, and *Above Proficient*, respectively.

**Table 5.1.1.3:
MCAS 2006 Performance Level Raw Cut Scores**

Content Area	Grade Level	Cut Score W = Warning/Failing NI = Needs Improvement P = Proficient A = Advanced (Above Proficient at grade 3)			Maximum Score
		W:NI	NI:P	P:A	
Reading	3	21	37	44	48
English Language Arts	4	37	52	62	72
	5	22	36	45	52
	6	21	34	46	52
	7	35	49	63	72
	8	21	33	47	52
	10	35	51	63	72
Mathematics	3	24	33	40	40
	4	27	43	49	54
	5	25	42	48	54
	6	26	40	49	54
	7	28	41	49	54
	8	26	39	49	54
Science and Technology/Engineering	10	20	33	45	60
	5	25	37	44	54
	8	27	40	49	54

For details regarding the method by which raw scores are converted to scaled scores, see section 4.3.2.

5.1.2 Standard Setting for the MCAS-Alt

5.1.2.1 MCAS-Alt Performance Level Descriptors

MCAS-Alt performance levels and their descriptors are as follows:

- *Incomplete*: The portfolio contains insufficient evidence and information to permit determination of a performance level in the content area.
- *Awareness*: Students at this level demonstrate very little understanding of learning standards and core knowledge topics contained in the *Massachusetts Curriculum Framework* in the content area. Students require extensive prompting and assistance, and their performance is primarily inaccurate.
- *Emerging*: Students at this level demonstrate a simple understanding at below-grade-level expectations of a limited number of learning standards and core knowledge topics contained in the *Massachusetts Curriculum Framework* in the content area. Students require frequent prompting and assistance, and their performance is limited and inconsistent.
- *Progressing*: Students at this level demonstrate a partial understanding at below-grade-level expectations of some learning standards and core knowledge topics contained in the *Massachusetts Curriculum Framework* in the content area. Students appear to be receiving challenging instruction, and are steadily learning new knowledge, skills, and concepts. Students require minimal prompting and assistance, and their performance is fundamentally accurate.
- *Needs Improvement*: Students at this level demonstrate a partial understanding at grade-level expectations of subject matter and solve some simple problems.
- *Proficient*: Students at this level demonstrate a solid understanding of challenging grade-level subject matter and solve a wide variety of problems.
- *Advanced*: Students at this level demonstrate a comprehensive understanding of challenging grade-level subject matter and provide sophisticated solutions to complex problems.

The MCAS-Alt performance levels of *Incomplete*, *Awareness*, *Emerging*, and *Progressing* are included in the *Warning/Failing* performance level category figures on MCAS reports of school and district results, as shown in Figure 5.1.2.A.

5.1.2.2 *Standard Setting for the MCAS-Alt*

The standard-setting process used for the MCAS-Alt was described in a National Center on Educational Outcomes (NCEO) publication entitled “Massachusetts: One State’s Approach to Setting Performance Levels on the Alternate Assessment (Synthesis Report 48) 2002” ([http://education.umn.edu/NCEO/OnlinePubs/Synthesis 48.html](http://education.umn.edu/NCEO/OnlinePubs/Synthesis%2048.html)). Following is a summary of the process:

Staff from the Department’s offices of Student Assessment, Special Education, and Instruction and Curriculum, together with Measured Progress, its subcontractors, and the MCAS-Alt Statewide Advisory Committee began discussing performance levels in 1998. In order to define the MCAS-Alt performance levels, several important questions had to be answered:

- What will each performance level be called; how many performance levels will there be; and how will each be defined?
- Which numerical scores in which rubric areas will be counted in determining the overall performance level?
- How will numerical scores in those rubric areas be combined to yield a performance level?
- What range or combination of scores will yield a particular performance level?

What will each performance level be called; how many performance levels will there be; and how will each be defined?

A stakeholder technical advisory group recommended that performance levels be identical to performance levels on standard MCAS tests, but that the lowest performance level, called *Warning/Failing* for results on standard tests, be subdivided into three distinct levels to provide more meaningful descriptions of performance at these lower levels. Figure 5.1.2.A illustrates the performance levels and definitions used to report MCAS results for the standard tests and the alternate assessment, and the relationship between the two reporting scales.

Figure 5.1.2.A: Method Used to Aggregate Results of MCAS-Alt with Standard MCAS Tests

Standard MCAS Tests					
Warning (Failing at Grade 10)		Needs Improvement	Proficient	Advanced	
Students at this level demonstrate a minimal understanding of the subject matter and do not solve even simple problems.		Students at this level demonstrate a partial understanding of the subject matter and solve some simple problems.	Students at this level demonstrate a solid understanding of challenging subject matter and solve a wide variety of problems.	Students at this level demonstrate a comprehensive and in-depth understanding of subject matter and provide sophisticated solutions to complex problems.	

MCAS Alternate Assessment					
Awareness	Emerging	Progressing	Needs Improvement	Proficient	Advanced
Students at this level demonstrate very little understanding of learning standards in the content area.	Students at this level demonstrate a rudimentary understanding of a limited number of learning standards in the content area and have addressed these at below-grade-level expectations.	Students at this level demonstrate a partial understanding of some learning standards in the content area and have addressed these at below-grade-level expectations.	(Same as above)	(Same as above)	(Same as above)

Which numerical scores in which rubric areas will be counted in determining the overall performance level?

Although different approaches were discussed between 1998 and 2001 (when performance levels were first reported), it was decided to use an “analytical rubric” based on reasoned perceptions of every score combination to determine performance levels. The following three scoring dimensions are included in the calculation of a performance level for each strand:

- Level of Complexity
- Demonstration of Skills and Concepts
- Independence

How will numerical scores in those rubric areas be combined to yield a performance level?

There are 80 possible score combinations for the three scoring dimensions. Each score combination was discussed, and a performance level was assigned to it on the basis of reasoned perceptions of what that score combination revealed about a student’s performance (i.e., how complex, how accurate, and how independent). Figure 5.1.2.B shows the rationale for assigning the performance level for each score combination.

Figure 5.1.2.B: 2006 MCAS-Alt Rationale of the Different Possible Strand Score Combinations

Performance Level 1 = *Awareness*
 Performance Level 2 = *Emerging*
 Performance Level 3 = *Progressing*
 Performance Level 4 = *Needs Improvement* (and higher)

Level of Complexity	Demonstration of Skills and Concepts	Independence	Performance Level	Rationale
1	1	1	1	Student is working on skills that are not related to the general curriculum, with little to no accuracy and with extensive verbal, visual, and physical assistance.
1	1	2	1	Student is working on skills that are not related to the general curriculum, with little to no accuracy and with frequent verbal, visual, and physical assistance.
1	1	3	1	Student is working on skills that are not related to the general curriculum, with little to no accuracy and with some verbal, visual, and physical assistance.
1	1	4	1	Student is working on skills that are not related to the general curriculum, with little to no accuracy and with minimal verbal, visual, and physical assistance.
1	2	1	1	Student is working on skills that are not related to the general curriculum, with limited and inconsistent accuracy and with extensive verbal, visual, and physical assistance.
1	2	2	1	Student is working on skills that are not related to the general curriculum, with limited and inconsistent accuracy and with frequent verbal, visual, and physical assistance.
1	2	3	1	Student is working on skills that are not related to the general curriculum, with limited and inconsistent accuracy and with some verbal, visual, and physical assistance.
1	2	4	1	Student is working on skills that are not related to the general curriculum, with limited and inconsistent accuracy and with minimal verbal, visual, and physical assistance.
1	3	1	1	Student is working on skills that are not related to the general curriculum, with a mostly accurate performance and with extensive verbal, visual, and physical assistance.
1	3	2	1	Student is working on skills that are not related to the general curriculum, with a mostly accurate performance and with frequent verbal, visual, and physical assistance.
1	3	3	1	Student is working on skills that are not related to the general curriculum, with a mostly accurate performance and with some verbal, visual, and physical assistance.
1	3	4	1	Student is working on skills that are not related to the general curriculum, with a mostly accurate performance and with minimal verbal, visual, and physical assistance.

Figure 5.1.2.B: 2006 MCAS-Alt Rationale of the Different Possible Strand Score Combinations

Performance Level 1 = *Awareness*
 Performance Level 2 = *Emerging*
 Performance Level 3 = *Progressing*
 Performance Level 4 = *Needs Improvement* (and higher)

Level of Complexity	Demonstration of Skills and Concepts	Independence	Performance Level	Rationale
1	4	1	1	Student is working on skills that are not related to the general curriculum, with an accurate performance and with extensive verbal, visual, and physical assistance.
1	4	2	1	Student is working on skills that are not related to the general curriculum, with an accurate performance and with frequent verbal, visual, and physical assistance.
1	4	3	1	Student is working on skills that are not related to the general curriculum, with an accurate performance and with some verbal, visual, and physical assistance.
1	4	4	1	Student is working on skills that are not related to the general curriculum, with an accurate performance and with minimal verbal, visual, and physical assistance.
2	1	1	1	Student is working on Access Skills, with little to no accuracy and with extensive verbal, visual, and physical assistance.
2	1	2	1	Student is working on Access Skills, with little to no accuracy and with frequent verbal, visual, and physical assistance.
2	1	3	1	Student is working on Access Skills, with little to no accuracy and with some verbal, visual, and physical assistance.
2	1	4	1	Student is working on Access Skills, with little to no accuracy and with minimal verbal, visual, and physical assistance.
2	2	1	1	Student is working on Access Skills, with limited and inconsistent accuracy and with extensive verbal, visual, and physical assistance.
2	2	2	1	Student is working on Access Skills, with limited and inconsistent accuracy and with frequent verbal, visual, and physical assistance.
2	2	3	1	Student is working on Access Skills, with limited and inconsistent accuracy and with some verbal, visual, and physical assistance.
2	2	4	1	Student is working on Access Skills, with limited and inconsistent accuracy and with minimal verbal, visual, and physical assistance.
2	3	1	1	Student is working on Access Skills, with a mostly accurate performance and with extensive verbal, visual, and physical assistance.

Figure 5.1.2.B: 2006 MCAS-Alt Rationale of the Different Possible Strand Score Combinations

Performance Level 1 = *Awareness*
 Performance Level 2 = *Emerging*
 Performance Level 3 = *Progressing*
 Performance Level 4 = *Needs Improvement* (and higher)

Level of Complexity	Demonstration of Skills and Concepts	Independence	Performance Level	Rationale
2	3	2	1	Student is working on Access Skills, with a mostly accurate performance and with frequent verbal, visual, and physical assistance.
2	3	3	2	Student is working on Access Skills, with a mostly accurate performance and with some verbal, visual, and physical assistance.
2	3	4	2	Student is working on Access Skills, with a mostly accurate performance and with minimal verbal, visual, and physical assistance.
2	4	1	1	Student is working on Access Skills, with an accurate performance and with extensive verbal, visual, and physical assistance.
2	4	2	1	Student is working on Access Skills, with an accurate performance and with frequent verbal, visual, and physical assistance.
2	4	3	2	Student is working on Access Skills, with an accurate performance and with some verbal, visual, and physical assistance.
2	4	4	2	Student is working on Access Skills, with an accurate performance and with minimal verbal, visual, and physical assistance.
3	1	1	1	Student is working on Entry Points, with little to no accuracy and with extensive verbal, visual, and physical assistance.
3	1	2	1	Student is working on Entry Points, with little to no accuracy and with frequent verbal, visual, and physical assistance.
3	1	3	1	Student is working on Entry Points, with little to no accuracy and with some verbal, visual, and physical assistance.
3	1	4	1	Student is working on Entry Points, with little to no accuracy and with minimal verbal, visual, and physical assistance.
3	2	1	1	Student is working on Entry Points, with limited and inconsistent accuracy and with extensive verbal, visual, and physical assistance.
3	2	2	1	Student is working on Entry Points, with limited and inconsistent accuracy and with frequent verbal, visual, and physical assistance.
3	2	3	2	Student is working on Entry Points, with limited and inconsistent accuracy and with some verbal, visual, and physical assistance.
3	2	4	2	Student is working on Entry Points, with limited and inconsistent accuracy and with minimal verbal, visual, and physical assistance.
3	3	1	1	Student is working on Entry Points, with a mostly accurate performance and with extensive verbal, visual, and physical assistance.

Figure 5.1.2.B: 2006 MCAS-Alt Rationale of the Different Possible Strand Score Combinations

Performance Level 1 = *Awareness*
 Performance Level 2 = *Emerging*
 Performance Level 3 = *Progressing*
 Performance Level 4 = *Needs Improvement* (and higher)

Level of Complexity	Demonstration of Skills and Concepts	Independence	Performance Level	Rationale
3	3	2	2	Student is working on Entry Points, with a mostly accurate performance and with frequent verbal, visual, and physical assistance.
3	3	3	3	Student is working on Entry Points, with a mostly accurate performance and with some verbal, visual, and physical assistance.
3	3	4	3	Student is working on Entry Points, with a mostly accurate performance and with minimal verbal, visual, and physical assistance.
3	4	1	1	Student is working on Entry Points, with an accurate performance and with extensive verbal, visual, and physical assistance.
3	4	2	2	Student is working on Entry Points, with an accurate performance and with frequent verbal, visual, and physical assistance.
3	4	3	3	Student is working on Entry Points, with an accurate performance and with some verbal, visual, and physical assistance.
3	4	4	3	Student is working on Entry Points, with an accurate performance and with minimal verbal, visual, and physical assistance.
4	1	1	1	Student is addressing a narrow sample of learning standards at grade-level expectations, with little to no accuracy and with extensive verbal, visual, and physical assistance.
4	1	2	1	Student is addressing a narrow sample of learning standards at grade-level expectations, with little to no accuracy and with frequent verbal, visual, and physical assistance.
4	1	3	1	Student is addressing a narrow sample of learning standards at grade-level expectations, with little to no accuracy and with some verbal, visual, and physical assistance.
4	1	4	1	Student is addressing a narrow sample of learning standards at grade-level expectations, with little to no accuracy and with minimal verbal, visual, and physical assistance.
4	2	1	1	Student is addressing a narrow sample of learning standards at grade-level expectations, with limited and inconsistent accuracy and with extensive verbal, visual, and physical assistance.
4	2	2	1	Student is addressing a narrow sample of learning standards at grade-level expectations, with limited and inconsistent accuracy and with frequent verbal, visual, and physical assistance.

Figure 5.1.2.B: 2006 MCAS-Alt Rationale of the Different Possible Strand Score Combinations

Performance Level 1 = *Awareness*
 Performance Level 2 = *Emerging*
 Performance Level 3 = *Progressing*
 Performance Level 4 = *Needs Improvement* (and higher)

Level of Complexity	Demonstration of Skills and Concepts	Independence	Performance Level	Rationale
4	2	3	2	Student is addressing a narrow sample of learning standards at grade-level expectations, with limited and inconsistent accuracy and with some verbal, visual, and physical assistance.
4	2	4	2	Student is addressing a narrow sample of learning standards at grade-level expectations, with limited and inconsistent accuracy and with minimal verbal, visual, and physical assistance.
4	3	1	1	Student is addressing a narrow sample of learning standards at grade-level expectations, with a mostly accurate performance and with extensive verbal, visual, and physical assistance.
4	3	2	2	Student is addressing a narrow sample of learning standards at grade-level expectations, with a mostly accurate performance and with frequent verbal, visual, and physical assistance.
4	3	3	3	Student is addressing a narrow sample of learning standards at grade-level expectations, with a mostly accurate performance and with some verbal, visual, and physical assistance.
4	3	4	3	Student is addressing a narrow sample of learning standards at grade-level expectations, with a mostly accurate performance and with minimal verbal, visual, and physical assistance.
4	4	1	1	Student is addressing a narrow sample of learning standards at grade-level expectations, with an accurate performance and with extensive verbal, visual, and physical assistance.
4	4	2	2	Student is addressing a narrow sample of learning standards at grade-level expectations, with an accurate performance and with frequent verbal, visual, and physical assistance.
4	4	3	3	Student is addressing a narrow sample of learning standards at grade-level expectations, with an accurate performance and with some verbal, visual, and physical assistance.
4	4	4	3	Student is addressing a narrow sample of learning standards at grade-level expectations, with an accurate performance and with minimal verbal, visual, and physical assistance.

Figure 5.1.2.B: 2006 MCAS-Alt Rationale of the Different Possible Strand Score Combinations

Performance Level 1 = *Awareness*
 Performance Level 2 = *Emerging*
 Performance Level 3 = *Progressing*
 Performance Level 4 = *Needs Improvement* (and higher)

Level of Complexity	Demonstration of Skills and Concepts	Independence	Performance Level	Rationale
5	1	1	1	Student is addressing a broad range of learning standards at grade-level expectations, with little to no accuracy and with extensive verbal, visual, and physical assistance.
5	1	2	1	Student is addressing a broad range of learning standards at grade-level expectations, with little to no accuracy and with frequent verbal, visual, and physical assistance.
5	1	3	2	Student is addressing a broad range of learning standards at grade-level expectations, with little to no accuracy and with some verbal, visual, and physical assistance.
5	1	4	2	Student is addressing a broad range of learning standards at grade-level expectations, with little to no accuracy and with minimal verbal, visual, and physical assistance.
5	2	1	1	Student is addressing a broad range of learning standards at grade-level expectations, with limited and inconsistent accuracy and with extensive verbal, visual, and physical assistance.
5	2	2	2	Student is addressing a broad range of learning standards at grade-level expectations, with limited and inconsistent accuracy and with frequent verbal, visual, and physical assistance.
5	2	3	3	Student is addressing a broad range of learning standards at grade-level expectations, with limited and inconsistent accuracy and with some verbal, visual, and physical assistance.
5	2	4	3	Student is addressing a broad range of learning standards at grade-level expectations, with limited and inconsistent accuracy and with minimal verbal, visual, and physical assistance.
5	3	1	1	Student is addressing a broad range of learning standards at grade-level expectations, with a mostly accurate performance and with extensive verbal, visual, and physical assistance.
5	3	2	2	Student is addressing a broad range of learning standards at grade-level expectations, with a mostly accurate performance and with frequent verbal, visual, and physical assistance.
5	3	3	3	Student is addressing a broad range of learning standards at grade-level expectations, with a mostly accurate performance and with some verbal, visual, and physical assistance.

Figure 5.1.2.B: 2006 MCAS-Alt Rationale of the Different Possible Strand Score Combinations

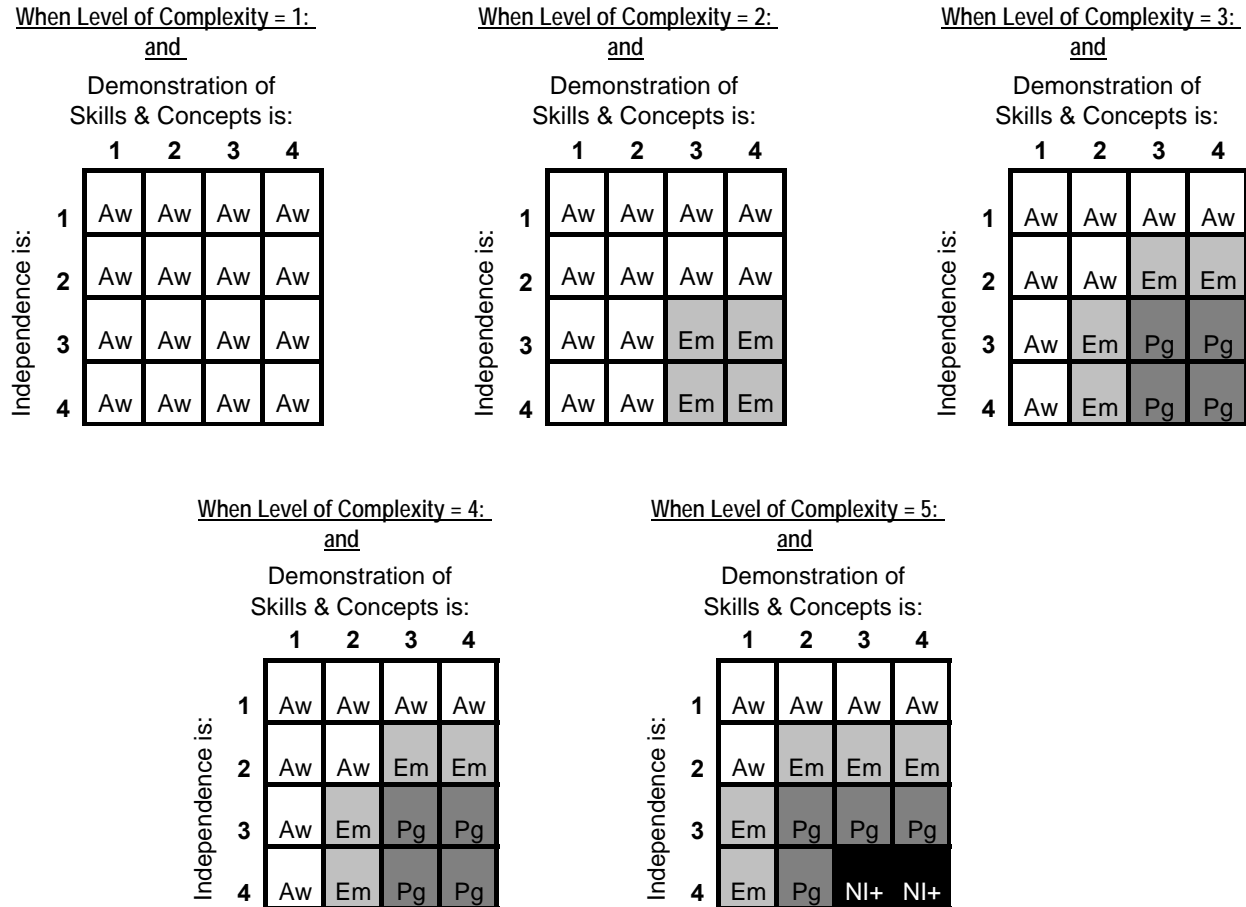
Performance Level 1 = *Awareness*
 Performance Level 2 = *Emerging*
 Performance Level 3 = *Progressing*
 Performance Level 4 = *Needs Improvement* (and higher)

Level of Complexity	Demonstration of Skills and Concepts	Independence	Performance Level	Rationale
5	3	4	4	Student is addressing a broad range of learning standards at grade-level expectations, with a mostly accurate performance and with minimal verbal, visual, and physical assistance.
5	4	1	1	Student is addressing a broad range of learning standards at grade-level expectations, with an accurate performance and with extensive verbal, visual, and physical assistance.
5	4	2	2	Student is addressing a broad range of learning standards at grade-level expectations, with an accurate performance and with frequent verbal, visual, and physical assistance.
5	4	3	3	Student is addressing a broad range of learning standards at grade-level expectations, with an accurate performance and with some verbal, visual, and physical assistance.
5	4	4	4	Student is addressing a broad range of learning standards at grade-level expectations, with an accurate performance and with minimal verbal, visual, and physical assistance.

Figure 5.1.2.C (taken from the *2006 Educator’s Manual for MCAS-Alt*) offers a different presentation of how raw scores in these three dimensions were analyzed to yield a performance level.

Figure 5.1.2.C: 2006 MCAS-Alt Performance Level Calculation Charts

Aw = Awareness ; Em = Emerging; Pr = Progressing



What range or combination of scores will yield a particular performance level?

A performance level was calculated for each of the required strands in each content area. The performance level scores for the strands of the content area were then averaged to yield an overall performance level for that content area.

Overall content area performance levels are aggregated with standard MCAS results as shown in Figure 5.1.2.A.

5.2 Performance Level Results

5.2.1 Standard MCAS Test Performance Level Results

Tables 5.2.1.1.1 through 5.2.1.4.2 include results in each category for *all* students educated with Massachusetts public funds. All tables in this section were taken from the document, *Spring 2006 MCAS Tests: Summary of State Results* (www.doe.mass.edu/mcas/2006/results/summary.doc).

Statewide performance level results are disaggregated in the following categories:

- content area, by grade (section 5.2.1.1)
- student status, by grade and content area test (section 5.2.1.2)
 - non-disabled students
 - students with disabilities
 - limited English proficient (LEP), **not** including first-year LEP students
 - formerly limited English proficient (formerly LEP)
 - LEP and formerly LEP
 - low income
- race/ethnicity (section 5.2.1.3)
 - African American/Black
 - Asian/Pacific Islander
 - Hispanic
 - Native American
 - White
- gender (section 5.2.1.4)

Content area (5.2.1.1), race/ethnicity (5.2.1.3), and gender (5.2.1.4) results include results for all of the following students:

- students with disabilities who took the tests *with* accommodations
- students with disabilities who took the tests *without* accommodations
- students with disabilities who participated in MCAS through the MCAS-Alt
- limited English proficient students, including, for grade 10 Mathematics, those LEP students who took the Spanish/English version of the test (but excluding results for first-year LEP students)
- formerly limited English proficient students

MCAS-Alt performance level results are further discussed in section 5.2.2.

5.2.1.1 Percentages by Content Areas

**Table 5.2.1.1.1: Statewide MCAS Results, Grade 3;
English Language Arts 2001–2006
and Mathematics 2006;
Percentage of Students at Each Performance Level¹**

Content Area and Year	Performance Level			
	<i>Above Proficient</i> ²	<i>Proficient</i>	<i>Needs Improvement</i>	<i>Warning</i>
READING				
2006	18	40	33	8
2005	--	62	31	7
2004	--	63	30	7
2003	--	63	31	6
2002	--	67	27	6
2001	--	62	31	7
MATHEMATICS				
2006	4	48	32	16

1. Percentages may not total 100 due to rounding. For the purpose of computing school, district, and state results, students who were absent with or without a medically documented excuse from any subject area MCAS test were not included in performance results but were counted as non-participants for that subject area.

2. To comply with NCLB, Massachusetts added the “*Above Proficient*” performance level for Grade 3 Reading in 2006. To compare 2006 student performance in Grade 3 Reading to prior years, the percent of students scoring *Above Proficient* and *Proficient* in 2006 can be compared to the percent scoring *Proficient* in 2001–2005.

**Table 5.2.1.1.2: Statewide MCAS Results, Grade 4;
English Language Arts 2001–2006
and Mathematics 1998–2006;
Percentage of Students at Each Performance Level¹**

Content Area and Year	Performance Level			
	<i>Advanced</i>	<i>Proficient</i>	<i>Needs Improvement</i>	<i>Warning</i>
ENGLISH LANGUAGE ARTS				
2006	8	42	39	11
2005	10	40	40	11
2004	11	45	35	10
2003	10	46	34	9
2002	8	46	37	10
2001	7	44	38	11
MATHEMATICS				
2006	15	25	45	15
2005	14	26	44	15
2004	14	28	44	14
2003	12	28	44	16
2002	12	27	42	19
2001	10	24	46	19
2000	12	28	42	18
1999	12	24	44	19
1998	11	23	44	23

1. Percentages may not total 100 due to rounding. For the purpose of computing school, district, and state results, students who were absent with or without a medically documented excuse from any subject area MCAS test were not included in performance results but were counted as non-participants for that subject area.

**Table 5.2.1.1.3: Statewide MCAS Results, Grade 5;
English Language Arts and Mathematics 2006
and Science and Technology/Engineering 2003–2006;
Percentage of Students at Each Performance Level¹**

Content Area and Year	Performance Level			
	<i>Advanced</i>	<i>Proficient</i>	<i>Needs Improvement</i>	<i>Warning</i>
ENGLISH LANGUAGE ARTS				
2006	15	44	31	9
MATHEMATICS				
2006	17	26	34	23
SCIENCE AND TECHNOLOGY/ENGINEERING				
2006	17	33	39	11
2005	16	35	38	12
2004	20	35	33	13
2003	19	33	34	14

1. Percentages may not total 100 due to rounding. For the purpose of computing school, district, and state results, students who were absent with or without a medically documented excuse from any subject area MCAS test were not included in performance results but were counted as non-participants for that subject area.

**Table 5.2.1.1.4: Statewide MCAS Results, Grade 6;
English Language Arts 2006
and Mathematics 2001–2006;
Percentage of Students at Each Performance Level¹**

Content Area and Year	Performance Level			
	<i>Advanced</i>	<i>Proficient</i>	<i>Needs Improvement</i>	<i>Warning</i>
ENGLISH LANGUAGE ARTS				
2006	10	54	28	8
MATHEMATICS				
2006	17	29	29	25
2005	17	29	30	23
2004	17	26	32	25
2003	16	26	32	26
2002	13	28	29	30
2001	13	23	30	33

1. Percentages may not total 100 due to rounding. For the purpose of computing school, district, and state results, students who were absent with or without a medically documented excuse from any subject area MCAS test were not included in performance results but were counted as non-participants for that subject area.

**Table 5.2.1.1.5: Statewide MCAS Results, Grade 7;
English Language Arts 2001–2006
and Mathematics 2006;
Percentage of Students at Each Performance Level¹**

Content Area and Year	Performance Level			
	<i>Advanced</i>	<i>Proficient</i>	<i>Needs Improvement</i>	<i>Warning</i>
ENGLISH LANGUAGE ARTS				
2006	10	55	26	9
2005	10	56	27	8
2004	9	59	25	7
2003	8	58	28	7
2002	9	55	28	9
2001	6	49	32	12
MATHEMATICS				
2006	12	28	33	28

1. Percentages may not total 100 due to rounding. For the purpose of computing school, district, and state results, students who were absent with or without a medically documented excuse from any subject area MCAS test were not included in performance results but were counted as non-participants for that subject area.

**Table 5.2.1.1.6: Statewide MCAS Results, Grade 8;
English Language Arts 2006, Mathematics 1998–2006,
and Science and Technology/Engineering 2003–2006;
Percentage of Students at Each Performance Level¹**

Content Area and Year	Performance Level			
	<i>Advanced</i>	<i>Proficient</i>	<i>Needs Improvement</i>	<i>Warning</i>
ENGLISH LANGUAGE ARTS				
2006	12	62	19	7
MATHEMATICS				
2006	12	28	31	29
2005	13	26	30	31
2004	13	26	32	29
2003	12	25	30	33
2002	11	23	33	33
2001	11	23	34	31
2000	10	24	27	39
1999	6	22	31	40
1998	8	23	26	42
SCIENCE AND TECHNOLOGY/ENGINEERING				
2006	4	28	43	25
2005	4	29	41	26
2004	5	28	35	31
2003	4	28	37	30

1. Percentages may not total 100 due to rounding. For the purpose of computing school, district, and state results, students who were absent with or without a medically documented excuse from any subject area MCAS test were not included in performance results but were counted as non-participants for that subject area.

**Table 5.2.1.1.7: Statewide MCAS Results, Grade 10;
English Language Arts 1998–2006 and Mathematics 1998–2006;
Percentage of Students at Each Performance Level¹**

Content Area and Year	Performance Level			
	<i>Advanced</i>	<i>Proficient</i>	<i>Needs Improvement</i>	<i>Failing</i>
ENGLISH LANGUAGE ARTS				
2006	16	54	24	7
2005	22	42	25	11
2004	19	43	27	11
2003	20	41	28	11
2002	19	40	27	14
2001	15	36	31	18
2000	7	29	30	34
1999	4	30	34	32
1998	5	33	34	28
MATHEMATICS				
2006	40	27	21	12
2005	34	27	24	15
2004	29	28	28	15
2003	24	27	29	20
2002	20	24	31	25
2001	18	27	30	25
2000	15	18	22	45
1999	9	15	23	53
1998	7	17	24	52

1. Percentages may not total 100 due to rounding. For the purpose of computing school, district, and state results, students who were absent with or without a medically documented excuse from any subject area MCAS test were not included in performance results but were counted as non-participants for that subject area.

5.2.1.2 Percentages by Student Status

In tables 5.2.1.2.1 through 5.2.1.2.16, the category of “Students with Disabilities” include all of the following:

- students with disabilities who took the standard MCAS test *with* accommodations
- students with disabilities who took the standard MCAS test *without* accommodations
- students with disabilities who participated in MCAS through the MCAS-Alt

**Table 5.2.1.2.1:
Statewide MCAS Performance Level Results by Student Status
2003–2006 Grade 3 Reading
Percentage of Students at Each Performance Level¹**

Student Status Category	Year	Performance Level			
		<i>Above Proficient</i> ²	<i>Proficient</i>	<i>Needs Improvement</i>	<i>Warning</i>
GRADE 3 READING					
Non-Disabled Students					
	2006	21	44	31	5
	2005	--	71	26	3
	2004	--	72	25	3
	2003	--	71	26	3
Students with Disabilities					
	2006	5	23	47	25
	2005	--	34	45	21
	2004	--	35	45	21
	2003	--	34	48	18
Limited English Proficient (LEP)					
	2006	3	17	51	29
	2005	--	26	51	23
	2004	--	28	51	21
	2003	--	23	48	30
Formerly LEP					
	2006	12	35	43	10
	2005	--	39	48	13
	2004	--	43	45	12
	2003	--	41	48	12
LEP and Formerly LEP					
	2006	5	22	49	24
	2005	--	28	49	23
	2004	--	32	48	20
	2003	--	28	46	26
Low Income					
	2006	6	28	48	17
	2005	--	38	47	15
	2004	--	40	46	14
	2003	--	39	46	15
<p>1. Percentages may not total 100 due to rounding. For the purpose of computing school, district, and state results, students who were absent with or without a medically documented excuse from any subject area MCAS test were not included in performance results but were counted as non-participants for that subject area.</p> <p>2. To comply with NCLB, Massachusetts added the “<i>Above Proficient</i>” performance level for Grade 3 Reading in 2006. To compare 2006 student performance in Grade 3 Reading to prior years, the percent of students scoring <i>Above Proficient</i> and <i>Proficient</i> in 2006 can be compared to the percent scoring <i>Proficient</i> in 2001–2005.</p>					

**Table 5.2.1.2.2:
Statewide MCAS Performance Level Results by Student Status
2006 Grade 3 Mathematics
Percentage of Students at Each Performance Level¹**

Student Status Category	Year	Performance Level			
		<i>Above Proficient</i> ²	<i>Proficient</i>	<i>Needs Improvement</i>	<i>Warning</i>
GRADE 3 MATHEMATICS					
Non-Disabled Students					
	2006	5	53	31	11
Students with Disabilities					
	2006	1	22	36	41
Limited English Proficient (LEP)					
	2006	1	23	35	42
Formerly LEP					
	2006	4	42	32	22
LEP and Formerly LEP					
	2006	2	28	34	36
Low Income					
	2006	1	30	38	31
<p>1. Percentages may not total 100 due to rounding. For the purpose of computing school, district, and state results, students who were absent with or without a medically documented excuse from any subject area MCAS test were not included in performance results but were counted as non-participants for that subject area.</p> <p>2. To comply with NCLB, Massachusetts added the "<i>Above Proficient</i>" performance level for Grade 3 Reading in 2006. To compare 2006 student performance in Grade 3 Reading to prior years, the percent of students scoring <i>Above Proficient</i> and <i>Proficient</i> in 2006 can be compared to the percent scoring <i>Proficient</i> in 2001–2005.</p>					

**Table 5.2.1.2.3:
Statewide MCAS 2003–2006 Performance Level Results by Student Status
Grade 4 English Language Arts
Percentage of Students at Each Performance Level¹**

Student Status Category	Year	Performance Level			
		<i>Advanced</i>	<i>Proficient</i>	<i>Needs Improvement</i>	<i>Warning</i>
GRADE 4 ENGLISH LANGUAGE ARTS					
Non-Disabled Students					
	2006	9	48	37	6
	2005	12	45	38	6
	2004	13	49	32	5
	2003	12	50	32	6
Students with Disabilities					
	2006	1	15	48	36
	2005	1	16	51	32
	2004	1	20	49	30
	2003	1	21	47	31
Limited English Proficient (LEP)					
	2006	1	13	46	40
	2005	1	11	47	41
	2004	1	16	46	36
	2003	1	15	40	45
Formerly LEP					
	2006	5	34	46	14
	2005	4	28	50	17
	2004	5	30	45	19
	2003	3	25	49	23
LEP and Formerly LEP					
	2006	2	20	46	31
	2005	3	20	49	29
	2004	3	22	46	29
	2003	2	18	43	38
Low Income					
	2006	2	25	49	23
	2005	2	24	53	21
	2004	3	28	49	20
	2003	2	28	47	22
1. Percentages may not total 100 due to rounding. For the purpose of computing school, district, and state results, students who were absent with or without a medically documented excuse from any subject area MCAS test were not included in performance results but were counted as non-participants for that subject area.					

**Table 5.2.1.2.4:
Statewide MCAS 2003–2006 Performance Level Results by Student Status
Grade 4 Mathematics
Percentage of Students at Each Performance Level¹**

Student Status Category	Year	Performance Level			
		<i>Advanced</i>	<i>Proficient</i>	<i>Needs Improvement</i>	<i>Warning</i>
GRADE 4 MATHEMATICS					
Non-Disabled Students					
	2006	17	28	45	9
	2005	16	30	44	10
	2004	16	32	43	9
	2003	14	31	43	12
Students with Disabilities					
	2006	3	12	46	39
	2005	3	11	46	41
	2004	3	12	47	38
	2003	2	13	44	40
Limited English Proficient (LEP)					
	2006	4	11	45	39
	2005	2	9	44	45
	2004	3	12	45	39
	2003	3	10	41	46
Formerly LEP					
	2006	13	22	47	19
	2005	8	18	50	23
	2004	9	19	47	26
	2003	5	17	46	32
LEP and Formerly LEP					
	2006	7	15	46	32
	2005	5	14	47	34
	2004	6	15	46	33
	2003	3	12	42	42
Low Income					
	2006	6	15	51	28
	2005	4	15	51	29
	2004	4	17	51	28
	2003	11	16	49	31
<p>1. Percentages may not total 100 due to rounding. For the purpose of computing school, district, and state results, students who were absent with or without a medically documented excuse from any subject area MCAS test were not included in performance results but were counted as non-participants for that subject area.</p>					

**Table 5.2.1.2.5:
Statewide MCAS Performance Level Results by Student Status
2006 Grade 5 English Language Arts
Percentage of Students at Each Performance Level¹**

Student Status Category	Year	Performance Level			
		<i>Advanced</i>	<i>Proficient</i>	<i>Needs Improvement</i>	<i>Warning</i>
GRADE 5 ENGLISH LANGUAGE ARTS					
Non-Disabled Students					
	2006	19	50	28	4
Students with Disabilities					
	2006	2	22	47	28
Limited English Proficient (LEP)					
	2006	1	12	44	43
Formerly LEP					
	2006	3	22	46	29
LEP and Formerly LEP					
	2006	6	33	47	14
Low Income					
	2006	4	30	47	18
1. Percentages may not total 100 due to rounding. For the purpose of computing school, district, and state results, students who were absent with or without a medically documented excuse from any subject area MCAS test were not included in performance results but were counted as non-participants for that subject area.					

**Table 5.2.1.2.6:
Statewide MCAS Performance Level Results by Student Status
2006 Grade 5 Mathematics
Percentage of Students at Each Performance Level¹**

Student Status Category	Year	Performance Level			
		<i>Advanced</i>	<i>Proficient</i>	<i>Needs Improvement</i>	<i>Warning</i>
GRADE 5 MATHEMATICS					
Non-Disabled Students					
	2006	20	30	35	16
Students with Disabilities					
	2006	3	11	31	55
Limited English Proficient (LEP)					
	2006	3	10	28	59
Formerly LEP					
	2006	7	15	32	46
LEP and Formerly LEP					
	2006	10	21	36	32
Low Income					
	2006	6	16	37	42
1. Percentages may not total 100 due to rounding. For the purpose of computing school, district, and state results, students who were absent with or without a medically documented excuse from any subject area MCAS test were not included in performance results but were counted as non-participants for that subject area.					

**Table 5.2.1.2.7:
Statewide MCAS 2003–2006 Performance Level Results by Student Status
Grade 5 Science and Technology/Engineering
Percentage of Students at Each Performance Level¹**

Student Status Category	Year	Performance Level			
		<i>Advanced</i>	<i>Proficient</i>	<i>Needs Improvement</i>	<i>Warning</i>
GRADE 5 SCIENCE AND TECHNOLOGY/ENGINEERING					
Non-Disabled Students					
	2006	19	36	37	7
	2005	18	38	36	8
	2004	22	37	31	9
	2003	21	36	32	11
Students with Disabilities					
	2006	5	18	48	30
	2005	4	18	46	33
	2004	6	20	42	32
	2003	5	18	41	36
Limited English Proficient (LEP)					
	2006	1	9	43	47
	2005	1	8	38	52
	2004	2	13	36	49
	2003	0	3	17	79
Formerly LEP					
	2006	5	21	51	23
	2005	5	19	50	26
	2004	4	18	43	34
	2003	4	15	43	38
LEP and Formerly LEP					
	2006	3	15	46	36
	2005	3	14	44	39
	2004	3	15	39	43
	2003	3	11	37	49
Low Income					
	2006	5	20	51	24
	2005	4	20	49	26
	2004	6	21	45	28
	2003	5	19	43	33
1. Percentages may not total 100 due to rounding. For the purpose of computing school, district, and state results, students who were absent with or without a medically documented excuse from any subject area MCAS test were not included in performance results but were counted as non-participants for that subject area.					

**Table 5.2.1.2.8:
Statewide MCAS Performance Level Results by Student Status
2006 Grade 6 English Language Arts
Percentage of Students at Each Performance Level¹**

Student Status Category	Year	Performance Level			
		<i>Advanced</i>	<i>Proficient</i>	<i>Needs Improvement</i>	<i>Warning</i>
GRADE 6 ENGLISH LANGUAGE ARTS					
Non-Disabled Students					
	2006	12	60	24	4
Students with Disabilities					
	2006	1	25	46	28
Limited English Proficient (LEP)					
	2006	1	13	43	43
Formerly LEP					
	2006	3	38	45	14
LEP and Formerly LEP					
	2006	1	23	44	31
Low Income					
	2006	2	36	45	17
<p>1. Percentages may not total 100 due to rounding. For the purpose of computing school, district, and state results, students who were absent with or without a medically documented excuse from any subject area MCAS test were not included in performance results but were counted as non-participants for that subject area.</p>					

**Table 5.2.1.2.9:
Statewide MCAS 2003–2006 Performance Level Results by Student Status
Grade 6 Mathematics
Percentage of Students at Each Performance Level¹**

Student Status Category	Year	Performance Level			
		<i>Advanced</i>	<i>Proficient</i>	<i>Needs Improvement</i>	<i>Warning</i>
ENGLISH LANGUAGE ARTS					
Non-Disabled Students					
	2006	20	33	30	17
	2005	21	33	31	16
	2004	20	29	33	18
	2003	19	30	33	19
Students with Disabilities					
	2006	2	11	27	61
	2005	2	11	29	58
	2004	2	8	27	63
	2003	2	8	26	64
Limited English Proficient (LEP)					
	2006	3	8	23	67
	2005	3	9	24	65
	2004	3	9	24	64
	2003	3	7	22	68
Formerly LEP					
	2006	9	20	32	39
	2005	7	19	33	41
	2004	6	13	31	50
	2003	8	16	31	45
LEP and Formerly LEP					
	2006	5	12	27	56
	2005	5	13	28	54
	2004	4	11	28	57
	2003	5	11	26	58
Low Income					
	2006	5	17	32	46
	2005	5	18	34	43
	2004	5	15	34	47
	2003	5	14	33	48
1. Percentages may not total 100 due to rounding. For the purpose of computing school, district, and state results, students who were absent with or without a medically documented excuse from any subject area MCAS test were not included in performance results but were counted as non-participants for that subject area.					

**Table 5.2.1.2.10:
Statewide MCAS 2003–2006 Performance Level Results by Student Status
Grade 7 English Language Arts
Percentage of Students at Each Performance Level¹**

Student Status Category	Year	Performance Level			
		<i>Advanced</i>	<i>Proficient</i>	<i>Needs Improvement</i>	<i>Warning</i>
GRADE 7 ENGLISH LANGUAGE ARTS					
Non-Disabled Students					
	2006	12	61	22	4
	2005	12	63	22	3
	2004	10	66	21	3
	2003	9	64	23	4
Students with Disabilities					
	2006	1	24	43	32
	2005	1	25	48	26
	2004	1	26	46	27
	2003	0	24	49	26
Limited English Proficient (LEP)					
	2006	0	15	36	48
	2005	1	15	44	40
	2004	1	18	44	38
	2003	1	18	40	40
Formerly LEP					
	2006	3	38	42	17
	2005	3	36	48	13
	2004	2	37	43	18
	2003	4	21	44	31
LEP and Formerly LEP					
	2006	2	24	39	36
	2005	2	25	46	27
	2004	1	27	43	29
	2003	1	22	44	32
Low Income					
	2006	2	39	39	19
	2005	2	39	44	15
	2004	2	41	41	16
	2003	1	37	45	17
1. Percentages may not total 100 due to rounding. For the purpose of computing school, district, and state results, students who were absent with or without a medically documented excuse from any subject area MCAS test were not included in performance results but were counted as non-participants for that subject area.					

Table 5.2.1.2.11:
Statewide MCAS Performance Level Results by Student Status
2006 Grade 7 Mathematics
Percentage of Students at Each Performance Level¹

Student Status Category	Year	Performance Level			
		<i>Advanced</i>	<i>Proficient</i>	<i>Needs Improvement</i>	<i>Warning</i>
GRADE 7 MATHEMATICS					
Non-Disabled Students					
	2006	15	32	34	19
Students with Disabilities					
	2006	1	8	26	65
Limited English Proficient (LEP)					
	2006	2	7	22	69
Formerly LEP					
	2006	6	15	32	46
LEP and Formerly LEP					
	2006	4	10	26	60
Low Income					
	2006	3	14	33	49
1. Percentages may not total 100 due to rounding. For the purpose of computing school, district, and state results, students who were absent with or without a medically documented excuse from any subject area MCAS test were not included in performance results but were counted as non-participants for that subject area.					

Table 5.2.1.2.12:
Statewide MCAS Performance Level Results by Student Status
2006 Grade 8 English Language Arts
Percentage of Students at Each Performance Level¹

Student Status Category	Year	Performance Level			
		<i>Advanced</i>	<i>Proficient</i>	<i>Needs Improvement</i>	<i>Warning</i>
GRADE 8 ENGLISH LANGUAGE ARTS					
Non-Disabled Students					
	2006	14	68	14	3
Students with Disabilities					
	2006	1	34	39	27
Limited English Proficient (LEP)					
	2006	0	17	37	45
Formerly LEP					
	2006	2	47	36	15
LEP and Formerly LEP					
	2006	1	28	37	35
Low Income					
	2006	3	49	33	16
1. Percentages may not total 100 due to rounding. For the purpose of computing school, district, and state results, students who were absent with or without a medically documented excuse from any subject area MCAS test were not included in performance results but were counted as non-participants for that subject area.					

**Table 5.2.1.2.13:
Statewide MCAS 2003–2006 Performance Level Results by Student Status
Grade 8 Mathematics
Percentage of Students at Each Performance Level¹**

Student Status Category	Year	Performance Level			
		<i>Advanced</i>	<i>Proficient</i>	<i>Needs Improvement</i>	<i>Warning</i>
GRADE 8 MATHEMATICS					
Non-Disabled Students					
	2006	15	32	33	21
	2005	16	30	32	23
	2004	15	30	34	21
	2003	14	29	31	25
Students with Disabilities					
	2006	1	7	24	68
	2005	1	6	22	70
	2004	1	6	25	67
	2003	1	6	21	72
Limited English Proficient (LEP)					
	2006	1	8	18	73
	2005	2	7	16	75
	2004	3	7	22	68
	2003	2	7	18	73
Formerly LEP					
	2006	5	15	30	50
	2005	5	13	27	55
	2004	8	14	26	52
	2003	5	10	23	62
LEP and Formerly LEP					
	2006	3	10	23	65
	2005	3	9	21	66
	2004	5	10	24	61
	2003	3	8	20	68
Low Income					
	2006	3	14	31	52
	2005	3	14	29	54
	2004	3	13	32	52
	2003	3	11	26	60
<p>1. Percentages may not total 100 due to rounding. For the purpose of computing school, district, and state results, students who were absent with or without a medically documented excuse from any subject area MCAS test were not included in performance results but were counted as non-participants for that subject area.</p>					

**Table 5.2.1.2.14:
Statewide MCAS 2003–2006 Performance Level Results by Student Status
Grade 8 Science and Technology/Engineering
Percentage of Students at Each Performance Level¹**

Student Status Category	Year	Performance Level			
		<i>Advanced</i>	<i>Proficient</i>	<i>Needs Improvement</i>	<i>Warning</i>
GRADE 8 SCIENCE AND TECHNOLOGY/ENGINEERING					
Non-Disabled Students					
	2006	5	32	45	18
	2005	4	34	43	19
	2004	6	32	37	24
	2003	5	32	39	23
Students with Disabilities					
	2006	0	7	33	59
	2005	0	7	32	61
	2004	1	7	26	66
	2003	1	7	29	63
Limited English Proficient (LEP)					
	2006	0	3	20	78
	2005	0	3	20	77
	2004	0	5	18	76
	2003	1	7	29	63
Formerly LEP					
	2006	0	8	37	54
	2005	1	8	32	59
	2004	1	9	23	66
	2003	1	6	24	69
LEP and Formerly LEP					
	2006	0	4	26	70
	2005	1	5	25	69
	2004	1	7	21	71
	2003	0	5	20	75
Low Income					
	2006	0	9	40	50
	2005	0	10	39	51
	2004	1	10	30	59
	2003	1	9	33	58
1. Percentages may not total 100 due to rounding. For the purpose of computing school, district, and state results, students who were absent with or without a medically documented excuse from any subject area MCAS test were not included in performance results but were counted as non-participants for that subject area.					

**Table 5.2.1.2.15:
Statewide MCAS 2003–2006 Performance Level Results by Student Status
Grade 10 English Language Arts
Percentage of Students at Each Performance Level¹**

Student Status Category	Year	Performance Level			
		<i>Advanced</i>	<i>Proficient</i>	<i>Needs Improvement</i>	<i>Warning</i>
GRADE 10 ENGLISH LANGUAGE ARTS					
Non-Disabled Students					
	2006	18	58	20	3
	2005	26	46	22	5
	2004	22	48	24	6
	2003	23	44	26	7
Students with Disabilities					
	2006	1	28	45	25
	2005	2	21	42	34
	2004	2	20	43	36
	2003	2	20	41	37
Limited English Proficient (LEP)					
	2006	1	13	42	45
	2005	1	8	32	59
	2004	1	11	36	52
	2003	3	13	31	53
Formerly LEP					
	2006	4	39	42	15
	2005	4	25	45	26
	2004	7	25	40	28
	2003	4	21	44	31
LEP and Formerly LEP					
	2006	2	23	42	33
	2005	2	15	37	46
	2004	4	17	38	42
	2003	3	15	34	47
Low Income					
	2006	5	41	39	15
	2005	7	30	39	24
	2004	5	29	41	25
	2003	5	26	39	29
1. Percentages may not total 100 due to rounding. For the purpose of computing school, district, and state results, students who were absent with or without a medically documented excuse from any subject area MCAS test were not included in performance results but were counted as non-participants for that subject area.					

In table 5.2.1.2.16, the category of “Limited English Proficient (LEP)” includes students who took the Spanish/English version of the grade 10 Mathematics test (this was the only test for which a Spanish/English version was available in 2006).

**Table 5.2.1.2.16:
Statewide MCAS 2003–2006 Performance Level Results by Student Status
Grade 10 Mathematics
Percentage of Students at Each Performance Level¹**

Student Status Category	Year	Performance Level			
		<i>Advanced</i>	<i>Proficient</i>	<i>Needs Improvement</i>	<i>Warning</i>
GRADE 10 MATHEMATICS					
Non-Disabled Students					
	2006	46	28	19	8
	2005	40	28	22	10
	2004	34	30	27	10
	2003	27	29	28	15
Students with Disabilities					
	2006	9	21	32	38
	2005	6	19	33	41
	2004	4	17	36	43
	2003	4	14	28	54
Limited English Proficient (LEP)					
	2006	12	14	27	46
	2005	9	13	29	49
	2004	9	17	33	41
	2003	14	15	28	43
Formerly LEP					
	2006	23	23	30	24
	2005	18	21	33	28
	2004	23	17	29	32
	2003	12	18	29	41
LEP and Formerly LEP					
	2006	17	18	28	37
	2005	13	16	30	41
	2004	15	17	31	37
	2003	13	16	28	42
Low Income					
	2006	19	25	31	26
	2005	14	21	33	31
	2004	11	21	36	31
	2003	9	18	32	41
1. Percentages may not total 100 due to rounding. For the purpose of computing school, district, and state results, students who were absent with or without a medically documented excuse from any subject area MCAS test were not included in performance results but were counted as non-participants for that subject area.					

5.2.1.3 Percentages by Race/Ethnicity

**Table 5.2.1.3.1:
2001–2006 Statewide MCAS Test Results
By Race/Ethnicity**

**African American / Black
Percentage of Students at Each Performance Level¹**

Grade Level and Content Area	Year	Performance Level				Total Students Included
		Advanced/ Above Proficient ²	Proficient	Needs Improvement	Warning/ Failing	
GRADE 3						
READING	2006	7	29	49	16	5,914
	2005	-	38	47	15	6,114
	2004	-	41	46	14	6,586
	2003	-	39	47	14	6,752
	2002	-	40	47	13	6,843
	2001	-	36	49	15	6,804
MATHEMATICS	2006	1	28	39	32	5,931
GRADE 4						
ENGLISH LANGUAGE ARTS	2006	2	25	49	23	6,061
	2005	3	24	51	22	6,584
	2004	3	29	49	19	6,431
	2003	2	27	49	21	6,825
	2002	1	25	52	23	6,663
	2001	1	23	52	24	6,555
MATHEMATICS	2006	4	14	52	30	6,129
	2005	3	13	50	33	6,602
	2004	3	15	52	30	6,524
	2003	2	12	49	37	6,872
	2002	2	11	43	43	6,732
	2001	2	10	49	40	6,591
GRADE 5						
ENGLISH LANGUAGE ARTS	2006	5	30	47	18	6,588
MATHEMATICS	2006	4	14	37	44	6,619
SCIENCE AND TECHNOLOGY/ENGINEERING	2006	4	18	52	27	6,616
	2005	4	18	50	28	6,386
	2004	4	18	47	32	6,784
	2003	4	16	43	37	6,949
GRADE 6						
ENGLISH LANGUAGE ARTS	2006	3	37	44	16	6,578
MATHEMATICS	2006	5	15	32	48	6,612
	2005	4	17	33	46	6,931
	2004	4	12	34	50	6,988
	2003	4	13	33	50	7,091
	2002	2	13	27	59	6,835
	2001	2	9	26	64	6,471
GRADE 7						
ENGLISH LANGUAGE ARTS	2006	3	40	39	18	6,810
	2005	2	39	44	14	7,123
	2004	2	43	41	15	7,011
	2003	1	37	48	14	7,000
	2002	2	35	45	18	6,525
	2001	1	28	44	27	5,826
MATHEMATICS	2006	2	12	35	51	6,879

(Table 5.2.1.3.1 continued on next page)

**Table 5.2.1.3.1 (cont.):
2001–2006 Statewide MCAS Test Results
By Race/Ethnicity**

**African American / Black (cont.)
Percentage of Students at Each Performance Level¹**

Grade Level and Content Area	Year	Performance Level				Total Students Included
		<i>Advanced/ Above Proficient</i> ²	<i>Proficient</i>	<i>Needs Improvement</i>	<i>Warning/ Failing</i>	
GRADE 8						
ENGLISH LANGUAGE ARTS	2006	3	50	33	14	6,920
MATHEMATICS	2006	3	14	30	54	6,952
	2005	2	12	29	56	6,964
	2004	2	12	31	55	6,929
	2003	2	10	26	62	6,762
	2002	2	9	30	60	6,252
	2001	2	9	29	60	5,650
SCIENCE AND TECHNOLOGY/ENGINEERING	2006	0	8	37	55	6,947
	2005	0	8	38	55	6,958
	2004	1	8	29	63	6,929
	2003	0	7	32	61	6,765
GRADE 10						
ENGLISH LANGUAGE ARTS	2006	5	42	39	13	6,331
	2005	7	30	39	24	6,235
	2004	5	32	41	23	5,834
	2003	6	28	39	28	5,943
	2002	5	27	35	32	5,334
	2001	4	21	37	39	4,783
MATHEMATICS	2006	16	24	33	26	6,352
	2005	10	19	35	36	6,257
	2004	9	22	37	31	5,945
	2003	7	16	34	43	6,083
	2002	4	12	30	54	5,553
	2001	3	13	32	51	4,890

1. Percentages may not total 100 due to rounding. For the purpose of computing school, district, and state results, students who were absent with or without a medically documented excuse from any subject area MCAS test were not included in performance results but were counted as non-participants for that subject area.

2. To comply with NCLB, Massachusetts added the "Above Proficient" performance level for Grade 3 Reading in 2006. To compare 2006 student performance in Grade 3 Reading to prior years, the percent of students scoring *Above Proficient* and *Proficient* in 2006 can be compared to the percent scoring *Proficient* in 2001–2005.

**Table 5.2.1.3.2:
2001–2006 Statewide MCAS Test Results
By Race/Ethnicity**

**Asian or Pacific Islander
Percentage of Students at Each Performance Level¹**

Grade Level and Content Area	Year	Performance Level				Total Students Included
		<i>Advanced/ Above Proficient²</i>	<i>Proficient</i>	<i>Needs Improvement</i>	<i>Warning/ Failing</i>	
GRADE 3						
READING	2006	22	40	32	7	3,604
	2005	-	62	30	7	3,643
	2004	-	64	30	6	3,531
	2003	-	63	30	7	3,490
	2002	-	64	29	7	3,213
	2001	-	57	36	8	3,246
MATHEMATICS	2006	8	55	26	11	3,623
GRADE 4						
ENGLISH LANGUAGE ARTS	2006	14	43	33	9	3,668
	2005	17	40	34	10	3,596
	2004	16	42	33	10	3,391
	2003	14	43	33	11	3,315
	2002	9	45	35	10	3,255
	2001	10	43	34	14	3,238
MATHEMATICS	2006	28	29	34	9	3,685
	2005	24	29	37	10	3,601
	2004	23	31	37	10	3,406
	2003	22	31	36	12	3,328
	2002	20	28	37	16	3,268
	2001	17	27	41	16	3,247
GRADE 5						
ENGLISH LANGUAGE ARTS	2006	22	43	27	8	3,603
MATHEMATICS	2006	32	28	27	13	3,609
SCIENCE AND TECHNOLOGY/ENGINEERING	2006	23	33	36	9	3,608
	2005	21	33	33	12	3,467
	2004	21	32	34	14	3,298
	2003	20	30	34	16	3,414
GRADE 6						
ENGLISH LANGUAGE ARTS	2006	18	52	24	6	3,460
MATHEMATICS	2006	32	30	22	15	3,471
	2005	34	29	23	15	3,312
	2004	32	26	26	16	3,346
	2003	31	26	26	18	3,398
	2002	27	28	22	23	3,222
	2001	24	24	26	26	3,196
GRADE 7						
ENGLISH LANGUAGE ARTS	2006	17	53	22	8	3,356
	2005	17	53	23	6	3,383
	2004	16	56	22	7	3,390
	2003	14	55	24	7	3,347
	2002	15	52	26	7	3,240
	2001	10	47	31	12	2,965
MATHEMATICS	2006	28	30	26	16	3,386

(Table 5.2.1.3.2 continued on next page)

**Table 5.2.1.3.2 (cont.):
2001–2006 Statewide MCAS Test Results
By Race/Ethnicity**

**Asian or Pacific Islander (cont.)
Percentage of Students at Each Performance Level¹**

Grade Level and Content Area	Year	Performance Level				Total Students Included
		<i>Advanced/ Above Proficient</i> ²	<i>Proficient</i>	<i>Needs Improvement</i>	<i>Warning/ Failing</i>	
GRADE 8						
ENGLISH LANGUAGE ARTS	2006	20	56	18	7	3,422
MATHEMATICS	2006	27	32	24	18	3,435
	2005	28	29	23	20	3,437
	2004	29	28	25	18	3,277
	2003	26	27	24	24	3,445
	2002	21	26	27	26	3,157
	2001	22	26	28	25	2,964
SCIENCE AND TECHNOLOGY/ENGINEERING	2006	8	31	39	23	3,436
	2005	8	36	36	21	3,434
	2004	10	32	31	27	3,277
	2003	9	29	34	28	3,445
GRADE 10						
ENGLISH LANGUAGE ARTS	2006	24	49	21	6	3,315
	2005	28	36	25	11	3,325
	2004	24	38	28	11	3,176
	2003	23	34	28	15	3,157
	2002	23	38	25	14	2,913
	2001	21	30	30	20	2,712
MATHEMATICS	2006	63	17	14	7	3,331
	2005	53	21	17	10	3,323
	2004	49	24	18	10	3,194
	2003	42	24	20	15	3,186
	2002	35	24	23	18	2,970
	2001	34	26	25	16	2,742

1. Percentages may not total 100 due to rounding. For the purpose of computing school, district, and state results, students who were absent with or without a medically documented excuse from any subject area MCAS test were not included in performance results but were counted as non-participants for that subject area.

2. To comply with NCLB, Massachusetts added the "Above Proficient" performance level for Grade 3 Reading in 2006. To compare 2006 student performance in Grade 3 Reading to prior years, the percent of students scoring *Above Proficient* and *Proficient* in 2006 can be compared to the percent scoring *Proficient* in 2001–2005.

**Table 5.2.1.3.3:
2001–2006 Statewide MCAS Test Results
By Race/Ethnicity**

**Hispanic
Percentage of Students at Each Performance Level¹**

Grade Level and Content Area	Year	Performance Level				Total Students Included
		<i>Advanced/ Above Proficient²</i>	<i>Proficient</i>	<i>Needs Improvement</i>	<i>Warning/ Failing</i>	
GRADE 3						
READING	2006	5	23	50	22	8,671
	2005	-	31	49	20	8,607
	2004	-	33	49	18	8,717
	2003	-	32	48	21	8,667
	2002	-	35	48	17	8,119
	2001	-	29	51	20	8,202
MATHEMATICS	2006	1	25	37	37	8,699
GRADE 4						
ENGLISH LANGUAGE ARTS	2006	2	22	48	29	8,546
	2005	2	20	51	27	8,632
	2004	3	24	48	25	8,281
	2003	2	23	47	28	8,676
	2002	1	22	50	27	8,156
	2001	1	19	49	31	7,679
MATHEMATICS	2006	5	13	49	33	8,644
	2005	3	13	49	35	8,651
	2004	4	14	49	34	8,438
	2003	2	13	48	37	8,827
	2002	2	11	44	43	8,600
	2001	2	9	45	44	8,071
GRADE 5						
ENGLISH LANGUAGE ARTS	2006	3	25	48	24	8,650
MATHEMATICS	2006	4	14	34	48	8,674
SCIENCE AND TECHNOLOGY/ENGINEERING	2006	3	16	50	31	8,670
	2005	3	16	47	33	8,574
	2004	4	17	43	37	8,688
	2003	3	14	41	41	9,175
GRADE 6						
ENGLISH LANGUAGE ARTS	2006	2	31	45	23	8,775
MATHEMATICS	2006	4	14	30	53	8,823
	2005	4	15	32	50	9,000
	2004	4	12	30	54	9,088
	2003	3	12	29	56	8,896
	2002	3	11	25	62	8,550
	2001	2	8	22	69	8,103
GRADE 7						
ENGLISH LANGUAGE ARTS	2006	2	33	40	25	8,954
	2005	2	33	45	20	9,389
	2004	1	35	43	21	8,839
	2003	1	31	46	22	8,896
	2002	1	28	44	27	7,806
	2001	1	22	43	34	6,722
MATHEMATICS	2006	2	11	30	57	9,110

(Table 5.2.1.3.3 continued on next page)

**Table 5.2.1.3.3 (cont.):
2001–2006 Statewide MCAS Test Results
By Race/Ethnicity**

**Hispanic (cont.)
Percentage of Students at Each Performance Level¹**

Grade Level and Content Area	Year	Performance Level				Total Students Included
		<i>Advanced/ Above Proficient</i> ²	<i>Proficient</i>	<i>Needs Improvement</i>	<i>Warning/ Failing</i>	
GRADE 8						
ENGLISH LANGUAGE ARTS	2006	2	42	35	21	9,274
MATHEMATICS	2006	3	12	29	57	9,331
	2005	2	11	26	60	8,802
	2004	2	10	28	60	8,789
	2003	2	9	23	67	8,609
	2002	1	7	26	66	7,525
	2001	2	7	26	65	6,913
SCIENCE AND TECHNOLOGY/ENGINEERING	2006	0	7	35	58	9,319
	2005	0	7	32	60	8,795
	2004	1	7	25	68	8,791
	2003	0	6	25	69	8,605
GRADE 10						
ENGLISH LANGUAGE ARTS	2006	3	36	41	20	7,476
	2005	5	25	39	31	7,202
	2004	4	25	40	31	6,381
	2003	4	23	39	34	6,382
	2002	4	21	36	39	5,427
	2001	3	15	34	48	4,568
MATHEMATICS	2006	14	22	32	32	7,438
	2005	10	19	32	39	7,221
	2004	8	18	37	37	6,489
	2003	6	15	32	48	6,526
	2002	4	10	29	58	5,863
	2001	3	11	29	58	4,999

1. Percentages may not total 100 due to rounding. For the purpose of computing school, district, and state results, students who were absent with or without a medically documented excuse from any subject area MCAS test were not included in performance results but were counted as non-participants for that subject area.

2. To comply with NCLB, Massachusetts added the "Above Proficient" performance level for Grade 3 Reading in 2006. To compare 2006 student performance in Grade 3 Reading to prior years, the percent of students scoring *Above Proficient* and *Proficient* in 2006 can be compared to the percent scoring *Proficient* in 2001–2005.

**Table 5.2.1.3.4:
2001–2006 Statewide MCAS Test Results
By Race/Ethnicity**

**Native American
Percentage of Students at Each Performance Level¹**

Grade Level and Content Area	Year	Performance Level				Total Students Included
		<i>Advanced/ Above Proficient²</i>	<i>Proficient</i>	<i>Needs Improvement</i>	<i>Warning/ Failing</i>	
GRADE 3						
READING	2006	11	38	38	13	283
	2005	-	54	39	7	221
	2004	-	55	40	5	241
	2003	-	51	42	7	213
	2002	-	58	35	7	246
	2001	-	54	38	8	248
MATHEMATICS	2006	2	42	37	18	283
GRADE 4						
ENGLISH LANGUAGE ARTS	2006	4	33	47	16	225
	2005	6	30	56	8	248
	2004	5	39	43	13	217
	2003	6	39	45	11	244
	2002	4	38	45	13	236
	2001	3	39	43	16	228
MATHEMATICS	2006	9	22	50	18	226
	2005	10	18	54	18	249
	2004	6	23	54	18	218
	2003	6	27	45	23	245
	2002	5	19	48	28	236
	2001	5	19	54	22	229
GRADE 5						
ENGLISH LANGUAGE ARTS	2006	10	42	40	9	248
MATHEMATICS	2006	9	28	37	27	247
SCIENCE AND TECHNOLOGY/ENGINEERING	2006	9	33	47	11	247
	2005	9	29	42	20	225
	2004	14	30	41	15	235
	2003	12	34	39	15	234
GRADE 6						
ENGLISH LANGUAGE ARTS	2006	5	45	40	9	226
MATHEMATICS	2006	9	21	31	38	232
	2005	10	26	32	32	241
	2004	7	23	40	31	242
	2003	11	23	37	30	233
	2002	7	23	27	43	219
	2001	4	15	35	46	207
GRADE 7						
ENGLISH LANGUAGE ARTS	2006	5	54	30	11	241
	2005	5	54	34	7	248
	2004	6	53	31	10	231
	2003	3	55	29	13	220
	2002	5	44	36	16	220
	2001	2	39	37	22	222
MATHEMATICS	2006	5	23	37	35	240

(Table 5.2.1.3.4 continued on next page)

**Table 5.2.1.3.4 (cont.):
2001–2006 Statewide MCAS Test Results
By Race/Ethnicity**

**Native American (cont.)
Percentage of Students at Each Performance Level¹**

Grade Level and Content Area	Year	Performance Level				Total Students Included
		<i>Advanced/Above Proficient</i> ²	<i>Proficient</i>	<i>Needs Improvement</i>	<i>Warning/Failing</i>	
GRADE 8						
ENGLISH LANGUAGE ARTS	2006	7	60	25	9	245
MATHEMATICS	2006	6	23	34	37	247
	2005	9	24	30	36	247
	2004	7	22	32	40	228
	2003	6	16	29	49	218
	2002	4	15	36	45	220
	2001	9	23	39	30	367
SCIENCE AND TECHNOLOGY/ENGINEERING	2006	2	22	45	32	246
	2005	2	25	43	29	247
	2004	1	24	37	38	228
	2003	1	17	40	41	218
GRADE 10						
ENGLISH LANGUAGE ARTS	2006	8	56	29	7	213
	2005	10	45	31	14	205
	2004	10	42	34	13	198
	2003	10	37	38	15	235
	2002	8	35	38	19	175
	2001	9	34	34	24	204
MATHEMATICS	2006	29	30	30	11	210
	2005	17	30	26	26	205
	2004	21	25	33	21	202
	2003	11	25	32	32	236
	2002	9	18	35	39	179
	2001	9	24	34	33	209

1. Percentages may not total 100 due to rounding. For the purpose of computing school, district, and state results, students who were absent with or without a medically documented excuse from any subject area MCAS test were not included in performance results but were counted as non-participants for that subject area.

2. To comply with NCLB, Massachusetts added the "Above Proficient" performance level for Grade 3 Reading in 2006. To compare 2006 student performance in Grade 3 Reading to prior years, the percent of students scoring *Above Proficient* and *Proficient* in 2006 can be compared to the percent scoring *Proficient* in 2001–2005.

**Table 5.2.1.3.5:
2001–2006 Statewide MCAS Test Results
By Race/Ethnicity**

**White
Percentage of Students at Each Performance Level¹**

Grade Level and Content Area	Year	Performance Level				Total Students Included
		<i>Advanced/ Above Proficient²</i>	<i>Proficient</i>	<i>Needs Improvement</i>	<i>Warning/ Failing</i>	
GRADE 3						
READING	2006	21	44	29	5	52,000
	2005	-	70	26	4	52,778
	2004	-	71	25	4	54,167
	2003	-	70	26	4	54,859
	2002	-	75	22	3	55,824
	2001	-	70	26	4	56,996
MATHEMATICS	2006	5	53	31	11	52,035
GRADE 4						
ENGLISH LANGUAGE ARTS	2006	9	47	37	7	52,379
	2005	11	45	37	7	53,743
	2004	13	50	32	6	54,421
	2003	13	51	30	6	55,858
	2002	9	52	33	6	56,750
	2001	8	50	35	7	57,260
MATHEMATICS	2006	17	28	44	10	52,634
	2005	16	30	43	10	53,768
	2004	16	32	42	10	54,585
	2003	15	32	43	11	55,957
	2002	14	32	41	13	56,881
	2001	12	28	47	13	57,387
GRADE 5						
ENGLISH LANGUAGE ARTS	2006	18	50	27	5	53,449
MATHEMATICS	2006	19	29	34	17	53,551
SCIENCE AND TECHNOLOGY/ENGINEERING	2006	20	38	36	6	53,532
	2005	19	40	35	7	54,070
	2004	24	40	30	7	55,465
	2003	23	38	32	8	57,187
GRADE 6						
ENGLISH LANGUAGE ARTS	2006	12	60	23	5	54,674
MATHEMATICS	2006	19	33	30	18	54,266
	2005	20	33	30	17	55,125
	2004	20	29	33	18	56,782
	2003	18	30	32	19	58,239
	2002	15	33	30	22	59,876
	2001	15	27	32	25	58,788
GRADE 7						
ENGLISH LANGUAGE ARTS	2006	12	60	22	6	54,674
	2005	11	62	22	5	56,486
	2004	10	65	20	4	57,749
	2003	9	64	23	4	59,745
	2002	10	61	24	5	59,122
	2001	7	55	30	8	56,290
MATHEMATICS	2006	14	32	33	20	54,948

(Table 5.2.1.3.5 continued on next page)

**Table 5.2.1.3.5 (cont.):
2001–2006 Statewide MCAS Test Results
By Race/Ethnicity**

**White (cont.)
Percentage of Students at Each Performance Level¹**

Grade Level and Content Area	Year	Performance Level				Total Students Included
		<i>Advanced/Above Proficient</i> ²	<i>Proficient</i>	<i>Needs Improvement</i>	<i>Warning/Failing</i>	
GRADE 8						
ENGLISH LANGUAGE ARTS	2006	14	67	14	4	56,110
MATHEMATICS	2006	14	32	32	22	56,225
	2005	15	30	31	24	57,367
	2004	15	30	34	22	59,330
	2003	14	29	31	26	59,370
	2002	12	27	35	26	57,977
SCIENCE AND TECHNOLOGY/ENGINEERING	2001	13	27	36	24	55,478
	2006	5	34	45	17	56,213
	2005	4	35	43	18	57,250
	2004	6	33	38	22	59,326
	2003	5	34	40	21	59,349
GRADE 10						
ENGLISH LANGUAGE ARTS	2006	18	58	20	4	55,397
	2005	26	46	22	7	55,465
	2004	22	47	24	7	53,928
	2003	23	45	25	7	53,696
	2002	22	44	25	9	52,235
	2001	18	39	30	13	50,409
MATHEMATICS	2006	45	28	19	8	55,387
	2005	39	29	22	10	55,534
	2004	33	30	27	11	54,193
	2003	27	30	28	15	54,014
	2002	23	27	32	19	52,608
	2001	21	30	31	19	50,652

1. Percentages may not total 100 due to rounding. For the purpose of computing school, district, and state results, students who were absent with or without a medically documented excuse from any subject area MCAS test were not included in performance results but were counted as non-participants for that subject area.

2. To comply with NCLB, Massachusetts added the "Above Proficient" performance level for Grade 3 Reading in 2006. To compare 2006 student performance in Grade 3 Reading to prior years, the percent of students scoring *Above Proficient* and *Proficient* in 2006 can be compared to the percent scoring *Proficient* in 2001–2005.

5.2.1.4 Percentages by Gender

**Table 5.2.1.4.1:
2001-2006 Statewide MCAS Test Results
By Gender**

**Female
Percentage of Students at Each Performance Level¹**

Grade Level and Content Area	Year	Performance Level				Total Students Included
		Advanced/ Above Proficient ²	Proficient	Needs Improvement	Warning/ Failing	
GRADE 3						
READING	2006	21	41	32	7	34,262
	2005	-	65	29	6	34,503
	2004	-	66	28	5	35,445
	2003	-	65	30	6	35,599
	2002	-	70	26	5	35,794
	2001	-	64	31	5	36,387
MATHEMATICS	2006	4	47	32	16	34,298
GRADE 4						
ENGLISH LANGUAGE ARTS	2006	11	46	35	9	34,409
	2005	13	42	36	8	35,061
	2004	15	47	31	7	35,171
	2003	14	47	31	8	35,901
	2002	11	49	33	8	36,429
	2001	9	47	35	8	35,978
MATHEMATICS	2006	15	25	45	15	34,587
	2005	14	26	45	15	35,064
	2004	15	28	43	14	35,369
	2003	11	28	45	16	36,114
	2002	12	28	42	19	36,801
	2001	11	24	47	18	36,250
GRADE 5						
ENGLISH LANGUAGE ARTS	2006	20	45	28	7	35,183
MATHEMATICS	2006	16	26	35	23	35,269
SCIENCE AND TECHNOLOGY/ENGINEERING	2006	16	32	41	11	35,254
	2005	15	34	39	12	35,066
	2004	18	35	35	13	35,981
	2003	17	32	36	15	37,050
GRADE 6						
ENGLISH LANGUAGE ARTS	2006	13	55	25	6	35,338
MATHEMATICS	2006	16	29	30	25	35,427
	2005	17	29	31	22	35,899
	2004	16	26	34	24	37,026
	2003	16	27	33	25	37,266
	2002	13	28	29	29	37,944
	2001	12	23	32	33	37,193
GRADE 7						
ENGLISH LANGUAGE ARTS	2006	14	57	22	7	35,740
	2005	14	59	22	5	36,868
	2004	12	61	22	5	37,234
	2003	11	61	24	5	37,991
	2002	12	58	24	6	37,115
	2001	9	53	29	9	35,559
MATHEMATICS	2006	12	28	34	27	35,948

(Table 5.2.1.4.1 continued on next page)

**Table 5.2.1.4.1 (cont.):
2001–2006 Statewide MCAS Test Results
By Gender**

**Female (cont.)
Percentage of Students at Each Performance Level¹**

Grade Level and Content Area	Year	Performance Level				Total Students Included
		<i>Advanced/Above Proficient</i> ²	<i>Proficient</i>	<i>Needs Improvement</i>	<i>Warning/Failing</i>	
GRADE 8						
ENGLISH LANGUAGE ARTS	2006	17	62	16	5	36,844
MATHEMATICS	2006	13	28	32	27	36,925
	2005	13	27	31	29	37,092
	2004	12	26	33	29	38,051
	2003	12	25	31	32	37,758
	2002	10	23	34	33	36,679
	2001	11	23	35	31	34,792
SCIENCE AND TECHNOLOGY/ENGINEERING	2006	4	27	44	25	36,910
	2005	3	27	42	28	37,028
	2004	4	26	37	34	38,046
	2003	4	26	38	33	37,761
GRADE 10						
ENGLISH LANGUAGE ARTS	2006	20	54	20	5	35,948
	2005	28	42	22	8	35,008
	2004	23	44	25	9	34,617
	2003	25	42	25	9	33,848
	2002	23	41	24	11	32,487
	2001	20	38	29	14	31,144
MATHEMATICS	2006	39	27	22	11	35,901
	2005	35	27	25	14	35,048
	2004	29	28	29	14	34,834
	2003	23	28	30	19	34,236
	2002	18	25	32	25	32,997
	2001	18	28	32	22	31,528

1. Percentages may not total 100 due to rounding. For the purpose of computing school, district, and state results, students who were absent with or without a medically documented excuse from any subject area MCAS test were not included in performance results but were counted as non-participants for that subject area.

2. To comply with NCLB, Massachusetts added the "Above Proficient" performance level for Grade 3 Reading in 2006. To compare 2006 student performance in Grade 3 Reading to prior years, the percent of students scoring *Above Proficient* and *Proficient* in 2006 can be compared to the percent scoring *Proficient* in 2001–2005.

**Table 5.2.1.4.2:
2001–2006 Statewide MCAS Test Results
By Gender**

**Male
Percentage of Students at Each Performance Level¹**

Grade Level and Content Area	Year	Performance Level				Total Students Included
		<i>Advanced/ Above Proficient²</i>	<i>Proficient</i>	<i>Needs Improvement</i>	<i>Warning/ Failing</i>	
GRADE 3						
READING	2006	16	40	35	9	36,262
	2005	-	60	32	8	36,749
	2004	-	60	32	8	37,837
	2003	-	61	32	7	37,812
	2002	-	64	29	7	38,400
	2001	-	61	33	7	38,469
MATHEMATICS	2006	4	48	31	16	36,329
GRADE 4						
ENGLISH LANGUAGE ARTS	2006	5	38	43	14	36,509
	2005	6	37	44	13	37,415
	2004	7	42	39	12	37,600
	2003	7	44	37	11	38,136
	2002	5	43	40	12	38,477
	2001	4	41	42	13	38,089
MATHEMATICS	2006	15	25	45	15	36,771
	2005	14	27	44	16	37,439
	2004	13	29	44	14	37,837
	2003	13	29	43	15	38,436
	2002	12	27	41	19	38,856
	2001	11	25	47	18	38,382
GRADE 5						
ENGLISH LANGUAGE ARTS	2006	11	44	34	10	37,398
MATHEMATICS	2006	17	26	33	23	37,478
SCIENCE AND TECHNOLOGY/ENGINEERING	2006	17	33	38	11	37,466
	2005	16	35	37	12	37,631
	2004	21	35	32	13	38,548
	2003	20	34	33	13	39,218
GRADE 6						
ENGLISH LANGUAGE ARTS	2006	7	53	30	10	37,884
MATHEMATICS	2006	17	29	29	25	38,021
	2005	18	28	30	24	38,697
	2004	18	25	31	26	39,524
	2003	16	26	31	27	39,934
	2002	14	28	28	30	40,638
	2001	14	24	30	32	39,730
GRADE 7						
ENGLISH LANGUAGE ARTS	2006	7	53	29	12	38,326
	2005	6	54	31	9	39,414
	2004	6	57	28	9	40,055
	2003	5	55	32	8	40,510
	2002	6	52	31	11	39,573
	2001	4	46	35	16	37,142
MATHEMATICS	2006	13	27	32	28	38,649

(Table 5.2.1.4.2 continued on next page)

**Table 5.2.1.4.2 (cont.):
2001–2006 Statewide MCAS Test Results
By Gender**

**Male (cont.)
Percentage of Students at Each Performance Level¹**

Grade Level and Content Area	Year	Performance Level				Total Students Included
		<i>Advanced/Above Proficient</i> ²	<i>Proficient</i>	<i>Needs Improvement</i>	<i>Warning/Failing</i>	
GRADE 8						
ENGLISH LANGUAGE ARTS	2006	8	62	21	9	39,161
MATHEMATICS	2006	12	27	30	30	39,303
	2005	13	25	30	32	39,706
	2004	13	26	32	29	40,603
	2003	12	25	29	34	40,111
	2002	11	23	33	34	38,499
SCIENCE AND TECHNOLOGY/ENGINEERING	2006	4	29	42	26	39,288
	2005	4	31	40	25	39,637
	2004	7	30	34	29	40,605
	2003	5	30	37	28	40,112
GRADE 10						
ENGLISH LANGUAGE ARTS	2006	11	53	28	8	36,812
	2005	18	42	28	12	35,616
	2004	15	43	30	12	34,987
	2003	16	40	31	13	34,628
	2002	15	39	29	16	33,361
	2001	11	34	33	21	31,501
MATHEMATICS	2006	40	26	20	13	36,846
	2005	36	27	22	15	35,671
	2004	29	27	28	16	35,297
	2003	25	27	27	21	35,090
	2002	21	23	29	26	33,964
	2001	19	26	29	25	31,926

1. Percentages may not total 100 due to rounding. For the purpose of computing school, district, and state results, students who were absent with or without a medically documented excuse from any subject area MCAS test were not included in performance results but were counted as non-participants for that subject area.

2. To comply with NCLB, Massachusetts added the "Above Proficient" performance level for Grade 3 Reading in 2006. To compare 2006 student performance in Grade 3 Reading to prior years, the percent of students scoring *Above Proficient* and *Proficient* in 2006 can be compared to the percent scoring *Proficient* in 2001–2005.

5.2.2 MCAS-Alt Performance Level Results

Tables 5.2.2.1 through 5.2.2.8 show MCAS-Alt performance level results for the year 2006 for each grade.

**Table 5.2.2.1: 2006 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	96	10.08	71	7.51
Awareness	18	1.89	15	1.59
Emerging	44	4.62	60	6.34
Progressing	794	83.40	798	84.36
Needs Improvement	0	0.00	2	0.21
Proficient	0	0.00	0	0.00
Advanced	0	0.00	0	0.00
Total	952		946	

*Percentages may not total 100 due to rounding.

**Table 5.2.2.2: 2006 MCAS-Alt
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	108	9.96	105	9.39
Awareness	9	0.83	16	1.43
Emerging	99	9.13	63	5.64
Progressing	867	79.98	934	83.54
Needs Improvement	1	0.09	0	0.00
Proficient	0	0.00	0	0.00
Advanced	0	0.00	0	0.00
Total	1084		1118	

*Percentages may not total 100 due to rounding.

**Table 5.2.2.3: 2006 MCAS-Alt
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	122	11.96	130	12.36	38	3.84
Awareness	16	1.57	15	1.43	37	3.74
Emerging	42	4.12	46	4.37	110	11.12
Progressing	840	82.35	859	81.65	804	81.29
Needs Improvement	0	0.00	2	0.19	0	0.00
Proficient	0	0.00	0	0.00	0	0.00
Advanced	0	0.00	0	0.00	0	0.00
Total	1020		1052		989	

*Percentages may not total 100 due to rounding.

**Table 5.2.2.4: 2006 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	98	10.55	103	10.46
Awareness	22	2.37	19	1.93
Emerging	49	5.27	53	5.38
Progressing	759	81.70	805	81.73
Needs Improvement	1	0.11	5	0.51
Proficient	0	0.00	0	0.00
Advanced	0	0.00	0	0.00
Total	929		985	

*Percentages may not total 100 due to rounding.

**Table 5.2.2.5: 2006 MCAS-AIT
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	87	9.14	95	9.63
Awareness	7	0.74	15	1.52
Emerging	78	8.19	44	4.46
Progressing	777	81.62	828	83.89
Needs Improvement	3	0.32	5	0.51
Proficient	0	0.00	0	0.00
Advanced	0	0.00	0	0.00
Total	952		987	

*Percentages may not total 100 due to rounding.

**Table 5.2.2.6: 2006 MCAS-AIT
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	95	10.59	100	10.25	56	6.18
Awareness	15	1.67	18	1.84	36	3.97
Emerging	39	4.35	44	4.51	119	13.13
Progressing	746	83.17	808	82.79	693	76.49
Needs Improvement	2	0.22	6	0.61	2	0.22
Proficient	0	0.00	0	0.00	0	0.00
Advanced	0	0.00	0	0.00	0	0.00
Total	897		976		906	

*Percentages may not total 100 due to rounding.

**Table 5.2.2.7: 2006 MCAS-AIT
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	96	13.31	97	13.31
Awareness	10	1.39	13	1.78
Emerging	85	11.79	90	12.35
Progressing	528	73.23	528	72.43
Needs Improvement	2	0.28	1	0.14
Proficient	0	0.00	0	0.00
Advanced	0	0.00	0	0.00
Total	721		729	

*Percentages may not total 100 due to rounding.

**Table 5.2.2.8: 2006 MCAS-AIT
Performance Level Results
Grades 11-12 Optional Participation
English Language Arts and Mathematics**

Performance Level Results				
Performance Level	Content Area			
	English Language Arts		Mathematics	
	Number	Percent*	Number	Percent*
Incomplete	4	8.51	3	5.66
Awareness	1	2.13	0	0.00
Emerging	0	0.00	6	11.32
Progressing	39	82.98	33	62.26
Needs Improvement	1	2.13	10	18.87
Proficient	2	4.26	1	1.89
Advanced	0	0.00	0	0.00
Total	47		53	

*Percentages may not total 100 due to rounding.

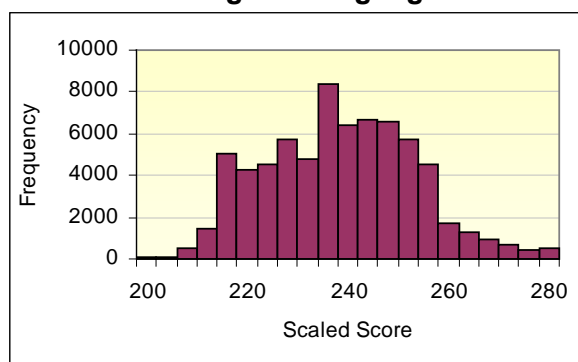
5.3 Scaled-Score Distributions for the Standard MCAS Tests

Tables 5.3.1 through 5.3.14 and figures 5.3.A through 5.3.BB show the scaled-score distributions for each grade and content area combination. No scaled scores were calculated for grade 3 test results or for test results of first-year LEP students in any grade.

**Table 5.3.1:
2006 MCAS
Scaled-Score Distribution
Grade 4 English Language Arts**

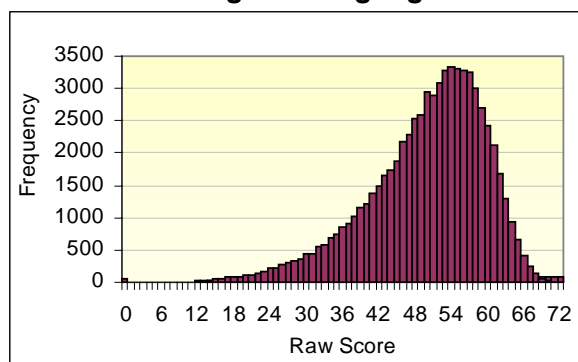
Score	Number	Percentage	Cumulative Percentage
200	56	0.08	0.08
202	4	0.01	0.09
204	14	0.02	0.11
206	76	0.11	0.21
208	229	0.33	0.54
210	299	0.43	0.97
212	440	0.63	1.59
214	1015	1.45	3.04
216	1606	2.29	5.32
218	3417	4.87	10.19
220	3078	4.38	14.57
222	1211	1.72	16.30
224	2855	4.07	20.36
226	1650	2.35	22.71
228	1730	2.46	25.18
230	4025	5.73	30.91
232	2280	3.25	34.16
234	2529	3.60	37.76
236	5519	7.86	45.62
238	2898	4.13	49.74
240	3088	4.40	54.14
242	3283	4.68	58.82
244	3331	4.74	63.56
246	3300	4.70	68.26
248	3288	4.68	72.94
250	3259	4.64	77.58
252	2994	4.26	81.85
254	2714	3.86	85.71
256	2430	3.46	89.17
258	2111	3.01	92.18
262	1692	2.41	94.59
264	1298	1.85	96.44
268	934	1.33	97.77
272	662	0.94	98.71
276	421	0.60	99.31
280	486	0.69	100.00

**Figure 5.3.A:
2006 MCAS
Scaled Score Distribution
Grade 4 English Language Arts**



N	70222
Mean	239.30
Std. Deviation	14.73
Skewness	0.16
Kurtosis	-0.43

**Figure 5.3.B:
2006 MCAS
Raw Score Distribution
Grade 4 English Language Arts**

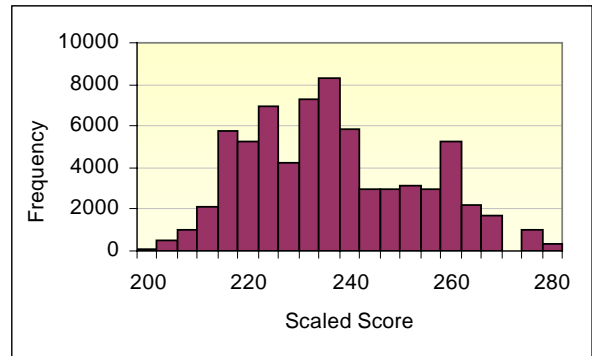


N	70222
Mean	49.83
Std. Deviation	9.81
Skewness	-0.94
Kurtosis	1.10

**Table 5.3.2:
2006 MCAS
Scaled-Score Distribution
Grade 4 Mathematics**

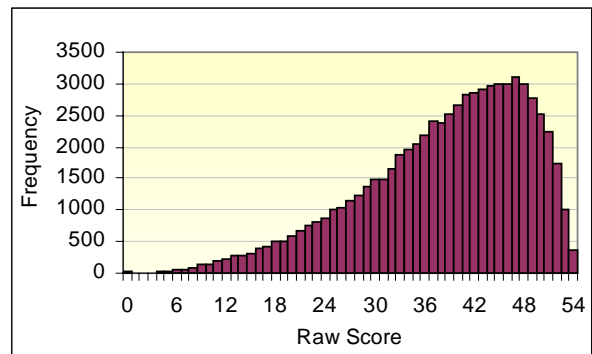
Score	Number	Percentage	Cumulative Percentage
200	36	0.05	0.05
202	26	0.04	0.09
204	137	0.20	0.28
206	381	0.54	0.83
208	421	0.60	1.43
210	558	0.80	2.22
212	695	0.99	3.21
214	1415	2.02	5.23
216	2846	4.06	9.29
218	2913	4.15	13.45
220	3760	5.36	18.81
222	1486	2.12	20.93
224	3137	4.47	25.40
226	3832	5.47	30.87
228	2042	2.91	33.78
230	2172	3.10	36.88
232	4795	6.84	43.72
234	2514	3.59	47.30
236	5467	7.80	55.10
238	2852	4.07	59.17
240	2920	4.16	63.33
242	2959	4.22	67.55
246	2991	4.27	71.82
248	3004	4.28	76.10
252	3102	4.42	80.53
256	2997	4.27	84.80
260	2783	3.97	88.77
262	2513	3.58	92.36
266	2228	3.18	95.53
270	1732	2.47	98.00
278	1021	1.46	99.46
280	378	0.54	100.00

**Figure 5.3.C:
2006 MCAS
Scaled-Score Distribution
Grade 4 Mathematics**



N	70113
Mean	237.66
Std. Deviation	16.62
Skewness	0.42
Kurtosis	-0.54

**Figure 5.3.D:
2006 MCAS
Raw-Score Distribution
Grade 4 Mathematics**

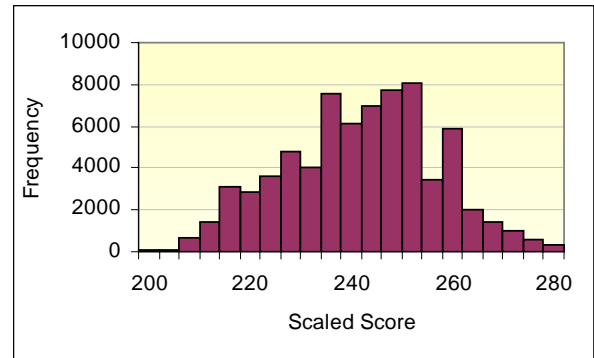


N	70113
Mean	38.40
Std. Deviation	9.94
Skewness	-0.77
Kurtosis	0.11

**Table 5.3.3:
2006 MCAS
Scaled-Score Distribution
Grade 5 English Language Arts**

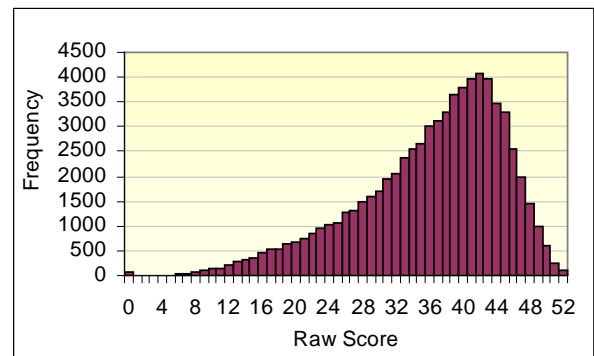
Score	Number	Percentage	Cumulative Percentage
200	70	0.10	0.10
202	6	0.01	0.11
204	13	0.02	0.12
206	59	0.08	0.21
208	305	0.42	0.63
210	375	0.52	1.15
212	271	0.38	1.53
214	1135	1.58	3.11
216	1062	1.48	4.59
218	2052	2.86	7.45
220	1796	2.50	9.95
222	1029	1.43	11.39
224	2328	3.24	14.63
226	1308	1.82	16.45
228	1479	2.06	18.51
230	3304	4.60	23.12
232	1943	2.71	25.83
234	2065	2.88	28.70
236	4914	6.85	35.55
238	2675	3.73	39.28
240	2999	4.18	43.46
242	3111	4.33	47.79
244	3304	4.60	52.39
246	3634	5.06	57.46
248	3790	5.28	62.74
250	3970	5.53	68.27
252	4084	5.69	73.96
254	3959	5.52	79.48
256	3487	4.86	84.34
260	3283	4.57	88.91
262	2558	3.56	92.47
266	1993	2.78	95.25
270	1441	2.01	97.26
274	993	1.38	98.64
278	603	0.84	99.48
280	371	0.52	100.00

**Figure 5.3.E:
2006 MCAS
Scaled-Score Distribution
Grade 5 English Language Arts**



N	71769
Mean	242.95
Std. Deviation	15.14
Skewness	-0.07
Kurtosis	-0.43

**Figure 5.3.F:
2006 MCAS
Raw-Score Distribution
Grade 5 English Language Arts**

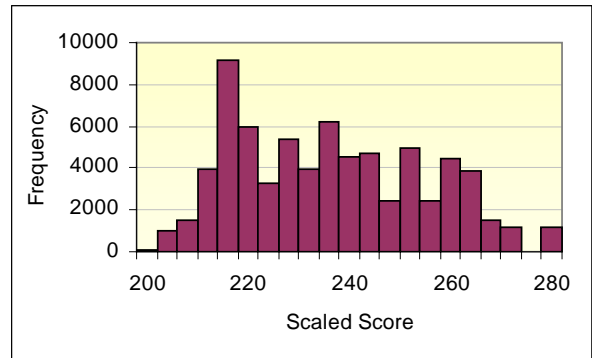


N	71769
Mean	36.19
Std. Deviation	8.70
Skewness	-0.86
Kurtosis	0.40

**Table 5.3.4:
2006 MCAS
Scaled-Score Distribution
Grade 5 Mathematics**

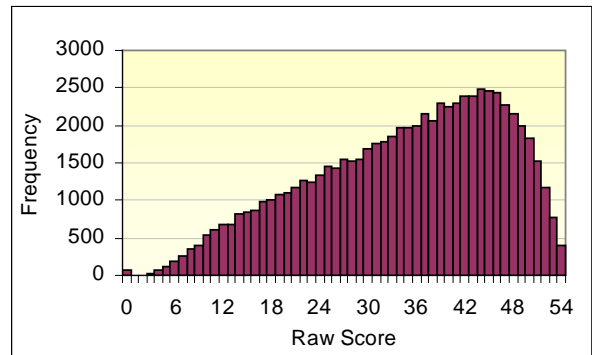
Score	Number	Percentage	Cumulative Percentage
200	71	0.10	0.10
202	36	0.05	0.15
204	374	0.52	0.67
206	621	0.87	1.54
208	406	0.57	2.11
210	1145	1.60	3.71
212	1375	1.92	5.63
214	2543	3.55	9.18
216	4159	5.81	14.99
218	5010	7.00	21.99
220	4413	6.17	28.16
222	1524	2.13	30.29
224	1558	2.18	32.46
226	1694	2.37	34.83
228	3525	4.93	39.76
230	1842	2.57	42.33
232	1976	2.76	45.09
234	1977	2.76	47.85
236	4137	5.78	53.63
238	2071	2.89	56.53
240	2289	3.20	59.73
242	2241	3.13	62.86
244	2292	3.20	66.06
246	2384	3.33	69.39
248	2399	3.35	72.74
252	2493	3.48	76.23
254	2455	3.43	79.66
256	2431	3.40	83.05
260	2283	3.19	86.24
262	2164	3.02	89.27
264	1999	2.79	92.06
266	1827	2.55	94.61
268	1518	2.12	96.73
272	1165	1.63	98.36
280	1174	1.64	100.00

**Figure 5.3.G:
2006 MCAS
Scaled-Score Distribution
Grade 5 Mathematics**



N	71571
Mean	237.09
Std. Deviation	18.36
Skewness	0.32
Kurtosis	-0.91

**Figure 5.3.H:
2006 MCAS
Raw-Score Distribution
Grade 5 Mathematics**

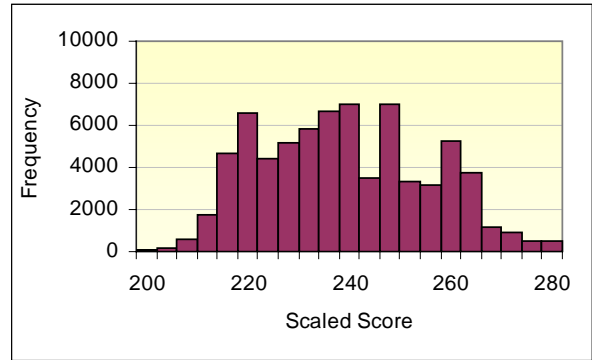


N	71571
Mean	34.49
Std. Deviation	11.77
Skewness	-0.47
Kurtosis	-0.66

**Table 5.3.5:
2006 MCAS
Scaled-Score Distribution
Grade 5 Science and
Technology/Engineering**

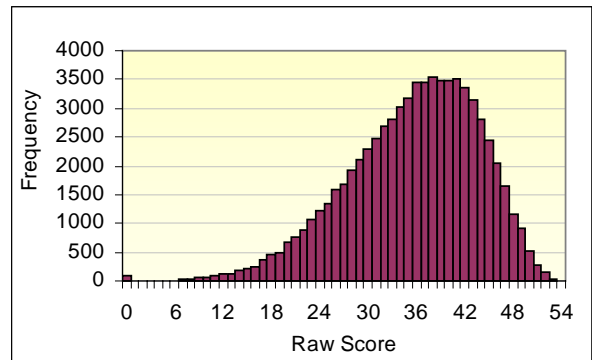
Score	Number	Percentage	Cumulative Percentage
200	103	0.14	0.14
202	5	0.01	0.15
204	25	0.03	0.18
206	107	0.15	0.33
208	152	0.21	0.55
210	434	0.60	1.15
212	471	0.66	1.80
214	1316	1.83	3.63
216	1461	2.03	5.67
218	3191	4.44	10.10
220	4616	6.42	16.52
222	1933	2.69	19.21
224	2114	2.94	22.15
226	2275	3.16	25.32
228	2482	3.45	28.77
230	2685	3.73	32.50
232	2822	3.93	36.43
234	3037	4.22	40.65
236	3181	4.42	45.08
238	3452	4.80	49.88
240	3450	4.80	54.68
242	3540	4.92	59.60
246	3471	4.83	64.43
248	3496	4.86	69.29
250	3512	4.88	74.18
254	3359	4.67	78.85
258	3154	4.39	83.23
260	2819	3.92	87.16
262	2454	3.41	90.57
264	2059	2.86	93.43
266	1654	2.30	95.73
270	1172	1.63	97.36
272	912	1.27	98.63
276	517	0.72	99.35
280	467	0.65	100.00

**Figure 5.3.I:
2006 MCAS
Scaled-Score Distribution
Grade 5 Science and
Technology/Engineering**



N	71898
Mean	240.14
Std. Deviation	16.42
Skewness	0.18
Kurtosis	-0.84

**Figure 5.3.J:
2006 MCAS
Raw-Score Distribution
Grade 5 Science and
Technology/Engineering**

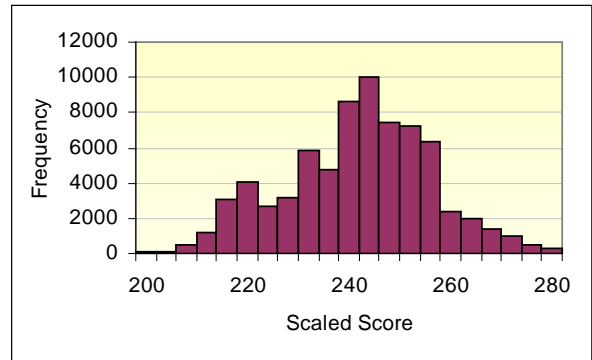


N	71898
Mean	35.58
Std. Deviation	8.14
Skewness	-0.61
Kurtosis	0.32

**Table 5.3.6:
2006 MCAS
Scaled-Score Distribution
Grade 6 English Language Arts**

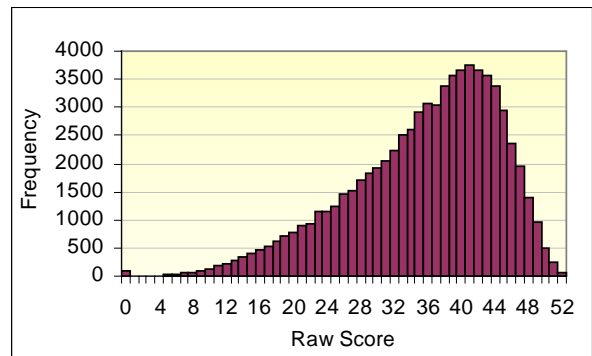
Score	Number	Percentage	Cumulative Percentage
200	86	0.12	0.12
202	6	0.01	0.13
204	33	0.05	0.17
206	74	0.10	0.27
208	293	0.40	0.68
210	185	0.26	0.93
212	491	0.68	1.61
214	724	1.00	2.61
216	979	1.35	3.96
218	2103	2.90	6.86
220	1807	2.49	9.35
222	2288	3.15	12.50
224	1226	1.69	14.19
226	1446	1.99	16.19
228	1506	2.08	18.26
230	1706	2.35	20.62
232	3780	5.21	25.83
234	2056	2.83	28.66
236	2218	3.06	31.72
238	2507	3.46	35.18
240	5539	7.64	42.81
242	3065	4.23	47.04
244	6435	8.87	55.91
246	3557	4.90	60.82
248	3665	5.05	65.87
250	3741	5.16	71.03
252	3667	5.06	76.08
254	3558	4.91	80.99
256	3382	4.66	85.65
258	2943	4.06	89.71
260	2370	3.27	92.98
264	1949	2.69	95.66
268	1388	1.91	97.58
272	946	1.30	98.88
276	490	0.68	99.56
280	321	0.44	100.00

**Figure 5.3.K:
2006 MCAS
Scaled-Score Distribution
Grade 6 English Language Arts**



N	72530
Mean	242.50
Std. Deviation	14.25
Skewness	-0.17
Kurtosis	-0.28

**Figure 5.3.L:
2006 MCAS
Raw-Score Distribution
Grade 6 English Language Arts**

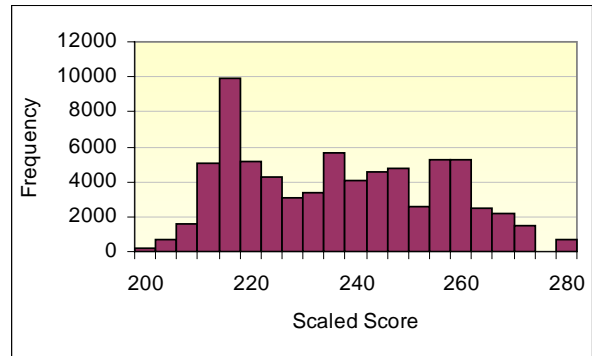


N	72530
Mean	35.59
Std. Deviation	8.80
Skewness	-0.76
Kurtosis	0.22

**Table 5.3.7:
2006 MCAS
Scaled-Score Distribution
Grade 6 Mathematics**

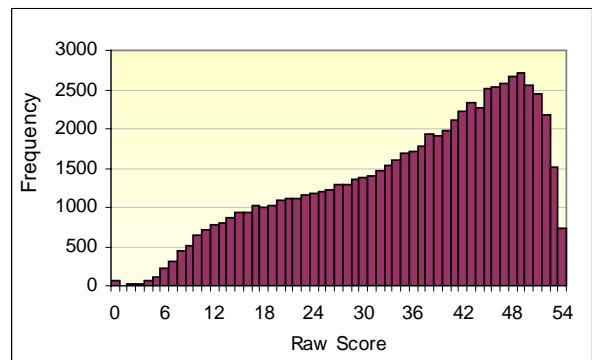
Score	Number	Percentage	Cumulative Percentage
200	63	0.09	0.09
202	105	0.15	0.23
204	349	0.48	0.72
206	314	0.43	1.15
208	452	0.63	1.78
210	1154	1.60	3.37
212	1490	2.06	5.43
214	3534	4.89	10.32
216	4137	5.72	16.05
218	5779	8.00	24.05
220	3794	5.25	29.30
222	1355	1.88	31.17
224	1381	1.91	33.08
226	2880	3.99	37.07
228	1531	2.12	39.19
230	1591	2.20	41.39
232	1684	2.33	43.72
234	1704	2.36	46.08
236	1783	2.47	48.54
238	3832	5.30	53.85
240	1968	2.72	56.57
242	2107	2.92	59.49
244	2214	3.06	62.55
246	2340	3.24	65.79
248	2269	3.14	68.93
250	2506	3.47	72.39
252	2537	3.51	75.91
256	2587	3.58	79.49
258	2661	3.68	83.17
260	2713	3.75	86.92
262	2566	3.55	90.47
264	2451	3.39	93.86
268	2173	3.01	96.87
274	1521	2.10	98.98
280	740	1.02	100.00

**Figure 5.3.M:
2006 MCAS
Scaled-Score Distribution
Grade 6 Mathematics**



N	72265
Mean	237.61
Std. Deviation	18.66
Skewness	0.21
Kurtosis	-1.08

**Figure 5.3.N:
2006 MCAS
Raw-Score Distribution
Grade 6 Mathematics**

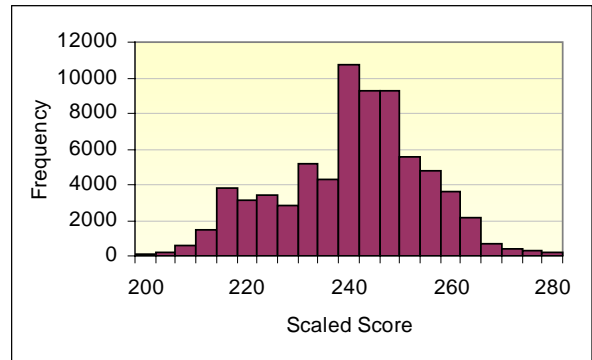


N	72265
Mean	35.52
Std. Deviation	12.64
Skewness	-0.53
Kurtosis	-0.77

**Table 5.3.8:
2006 MCAS
Scaled-Score Distribution
Grade 7 English Language Arts**

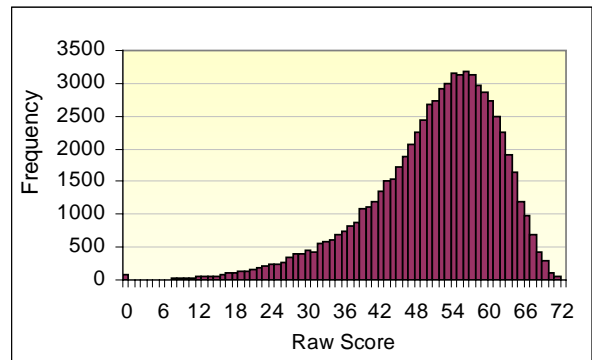
Score	Number	Percentage	Cumulative Percentage
200	82	0.11	0.11
202	14	0.02	0.13
204	54	0.08	0.21
206	98	0.14	0.35
208	237	0.33	0.68
210	314	0.44	1.11
212	676	0.94	2.06
214	745	1.04	3.09
216	1581	2.20	5.30
218	2176	3.03	8.33
220	2254	3.14	11.47
222	876	1.22	12.69
224	1085	1.51	14.20
226	2310	3.22	17.42
228	1346	1.88	19.29
230	1500	2.09	21.38
232	3264	4.55	25.93
234	1894	2.64	28.57
236	2059	2.87	31.44
238	2250	3.13	34.57
240	5120	7.13	41.71
242	5627	7.84	49.55
244	3007	4.19	53.74
246	6279	8.75	62.49
248	3170	4.42	66.90
250	6105	8.51	75.41
252	2855	3.98	79.39
254	2718	3.79	83.17
256	2480	3.46	86.63
258	2266	3.16	89.79
260	1919	2.67	92.46
262	1656	2.31	94.77
264	1203	1.68	96.44
266	976	1.36	97.80
270	682	0.95	98.75
274	434	0.60	99.36
278	280	0.39	99.75
280	180	0.25	100.00

**Figure 5.3.O:
2006 MCAS
Scaled-Score Distribution
Grade 7 English Language Arts**



N	71772
Mean	241.95
Std. Deviation	14.12
Skewness	-0.26
Kurtosis	-0.25

**Figure 5.3.P:
2006 MCAS
Raw-Score Distribution
Grade 7 English Language Arts**

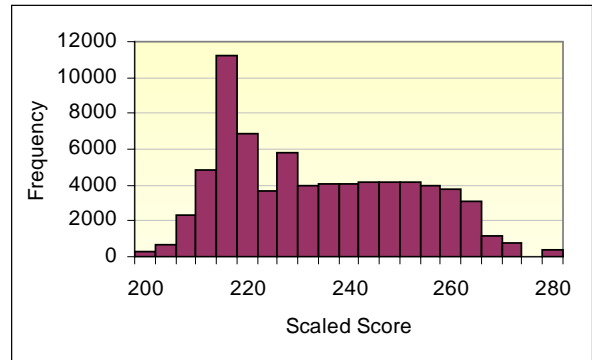


N	71772
Mean	50.75
Std. Deviation	10.63
Skewness	-0.99
Kurtosis	1.25

**Table 5.3.9:
2006 MCAS
Scaled-Score Distribution
Grade 7 Mathematics**

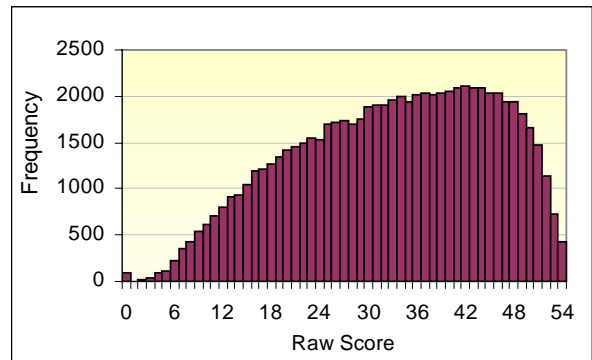
Score	Number	Percentage	Cumulative Percentage
200	103	0.14	0.14
202	145	0.20	0.34
204	339	0.46	0.80
206	361	0.49	1.29
208	968	1.32	2.61
210	1330	1.81	4.43
212	1719	2.35	6.77
214	3166	4.32	11.09
216	5239	7.15	18.24
218	6034	8.23	26.47
220	5137	7.01	33.48
222	1702	2.32	35.81
224	1763	2.41	38.21
226	1876	2.56	40.77
228	3801	5.19	45.96
230	1965	2.68	48.64
232	1992	2.72	51.36
234	1938	2.64	54.00
236	2007	2.74	56.74
238	2028	2.77	59.51
240	2020	2.76	62.26
242	2042	2.79	65.05
244	2055	2.80	67.85
246	2093	2.86	70.71
248	2111	2.88	73.59
250	2093	2.86	76.44
252	2090	2.85	79.29
254	2025	2.76	82.06
256	2031	2.77	84.83
258	1945	2.65	87.48
260	1936	2.64	90.12
262	1807	2.47	92.59
264	1653	2.26	94.84
266	1481	2.02	96.86
268	1141	1.56	98.42
274	734	1.00	99.42
280	423	0.58	100.00

**Figure 5.3.Q:
2006 MCAS
Scaled-Score Distribution
Grade 7 Mathematics**



N	73293
Mean	234.92
Std. Deviation	17.98
Skewness	0.36
Kurtosis	-1.01

**Figure 5.3.R:
2006 MCAS
Raw-Score Distribution
Grade 7 Mathematics**

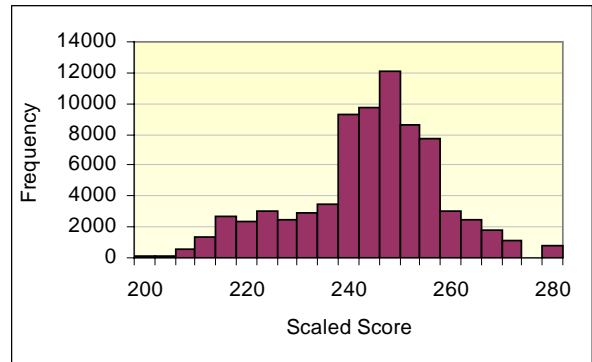


N	73293
Mean	32.98
Std. Deviation	12.06
Skewness	-0.29
Kurtosis	-0.84

**Table 5.3.10:
2006 MCAS
Scaled-Score Distribution
Grade 8 English Language Arts**

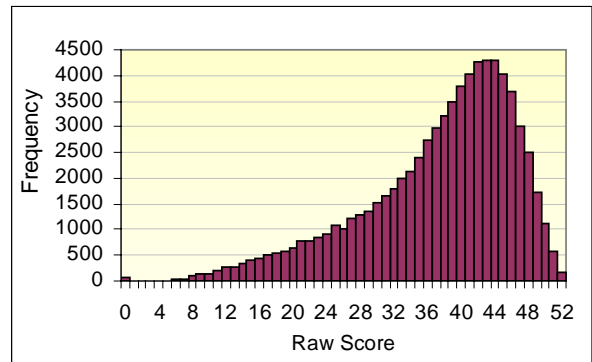
Score	Number	Percentage	Cumulative Percentage
200	67	0.09	0.09
202	6	0.01	0.10
204	21	0.03	0.12
206	59	0.08	0.20
208	204	0.27	0.47
210	338	0.45	0.92
212	529	0.70	1.62
214	760	1.01	2.63
216	955	1.27	3.90
218	1786	2.37	6.27
220	1531	2.03	8.30
222	859	1.14	9.44
224	902	1.20	10.63
226	2087	2.77	13.40
228	1221	1.62	15.02
230	1293	1.71	16.73
232	1359	1.80	18.54
234	1531	2.03	20.57
236	1667	2.21	22.78
238	1796	2.38	25.16
240	4127	5.47	30.63
242	5141	6.82	37.45
244	2985	3.96	41.41
246	6715	8.91	50.32
248	3782	5.02	55.33
250	8290	10.99	66.33
252	4293	5.69	72.02
254	4284	5.68	77.70
256	4018	5.33	83.03
258	3695	4.90	87.93
262	2995	3.97	91.90
264	2487	3.30	95.20
268	1742	2.31	97.51
272	1130	1.50	99.01
280	745	0.99	100.00

**Figure 5.3.S:
2006 MCAS
Scaled-Score Distribution
Grade 8 English Language Arts**



N	75400
Mean	245.19
Std. Deviation	13.97
Skewness	-0.46
Kurtosis	0.11

**Figure 5.3.T:
2006 MCAS
Raw-Score Distribution
Grade 8 English Language Arts**

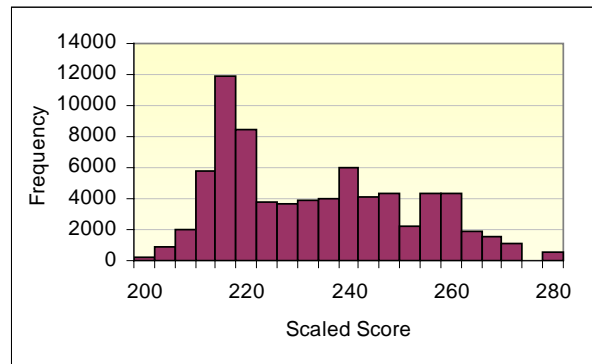


N	75400
Mean	37.32
Std. Deviation	9.00
Skewness	-0.97
Kurtosis	0.55

**Table 5.3.11:
2006 MCAS
Scaled-Score Distribution
Grade 8 Mathematics**

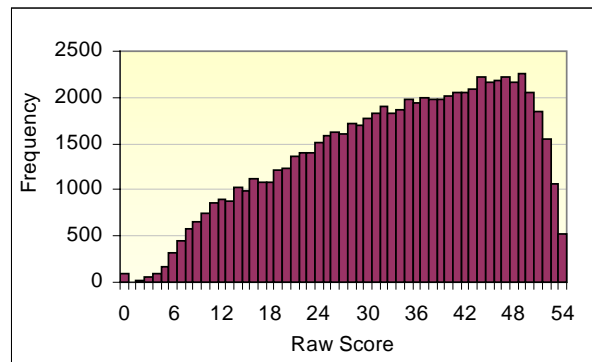
Score	Number	Percentage	Cumulative Percentage
200	106	0.14	0.14
202	160	0.21	0.35
204	481	0.64	1.00
206	455	0.61	1.60
208	572	0.76	2.36
210	1406	1.87	4.24
212	2643	3.52	7.76
214	3128	4.17	11.93
216	4617	6.15	18.09
218	7261	9.68	27.76
220	6645	8.86	36.62
222	1780	2.37	38.99
224	1832	2.44	41.44
226	1897	2.53	43.97
228	1834	2.44	46.41
230	1858	2.48	48.89
232	1980	2.64	51.53
234	1944	2.59	54.12
236	1997	2.66	56.78
238	1976	2.63	59.41
240	3991	5.32	64.73
242	2053	2.74	67.47
244	2048	2.73	70.20
246	2096	2.79	72.99
248	2219	2.96	75.95
250	2166	2.89	78.84
252	2175	2.90	81.74
256	2212	2.95	84.69
258	2171	2.89	87.58
260	2258	3.01	90.59
262	2059	2.74	93.33
264	1855	2.47	95.81
268	1555	2.07	97.88
274	1064	1.42	99.30
280	527	0.70	100.00

**Figure 5.3.U:
2006 MCAS
Scaled-Score Distribution
Grade 8 Mathematics**



N	75021
Mean	234.27
Std. Deviation	18.03
Skewness	0.43
Kurtosis	-0.90

**Figure 5.3.V:
2006 MCAS
Raw-Score Distribution
Grade 8 Mathematics**

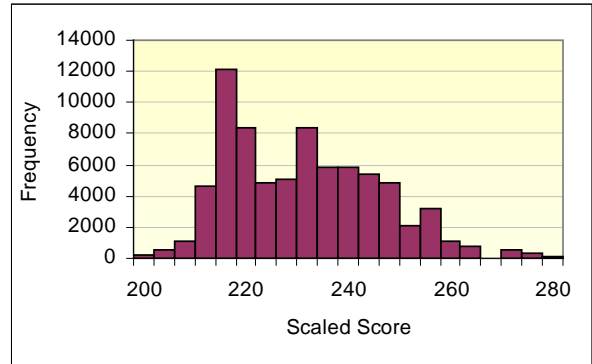


N	75021
Mean	33.56
Std. Deviation	12.54
Skewness	-0.36
Kurtosis	-0.85

**Table 5.3.12:
2006 MCAS
Scaled-Score Distribution
Grade 8 Science and
Technology/Engineering**

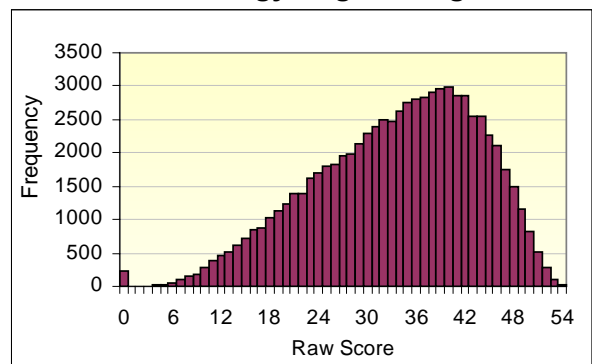
Score	Number	Percentage	Cumulative Percentage
200	222	0.29	0.29
202	26	0.03	0.33
204	195	0.26	0.59
206	348	0.46	1.05
208	279	0.37	1.42
210	830	1.10	2.52
212	1861	2.47	4.98
214	2743	3.63	8.62
216	5137	6.81	15.42
218	6953	9.21	24.64
220	6081	8.06	32.69
222	2281	3.02	35.72
224	2393	3.17	38.89
226	2509	3.32	42.21
228	2458	3.26	45.47
230	2635	3.49	48.96
232	5556	7.36	56.32
234	2832	3.75	60.07
236	2905	3.85	63.92
238	2951	3.91	67.83
240	2987	3.96	71.79
242	2866	3.80	75.59
244	2844	3.77	79.35
246	2536	3.36	82.71
248	2535	3.36	86.07
250	2270	3.01	89.08
252	2112	2.80	91.88
256	1756	2.33	94.20
258	1482	1.96	96.17
262	1148	1.52	97.69
266	811	1.07	98.76
272	510	0.68	99.44
278	287	0.38	99.82
280	136	0.18	100.00

**Figure 5.3.W:
2006 MCAS
Scaled-Score Distribution
Grade 8 Science and
Technology/Engineering**



N	75475
Mean	232.07
Std. Deviation	14.74
Skewness	0.52
Kurtosis	-0.29

**Figure 5.3.X:
2006 MCAS
Raw-Score Distribution
Grade 8 Science and
Technology/Engineering**

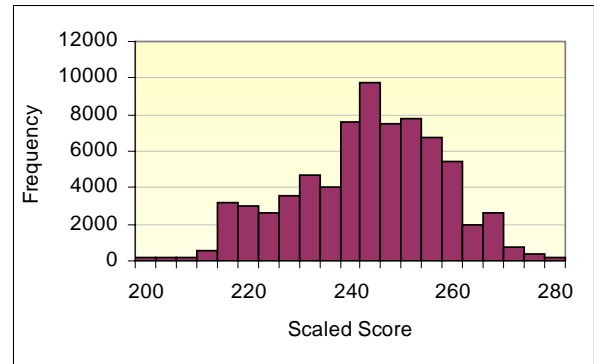


N	75475
Mean	33.56
Std. Deviation	10.01
Skewness	-0.47
Kurtosis	-0.32

**Table 5.3.13:
2006 MCAS
Scaled-Score Distribution
Grade 10 English Language Arts**

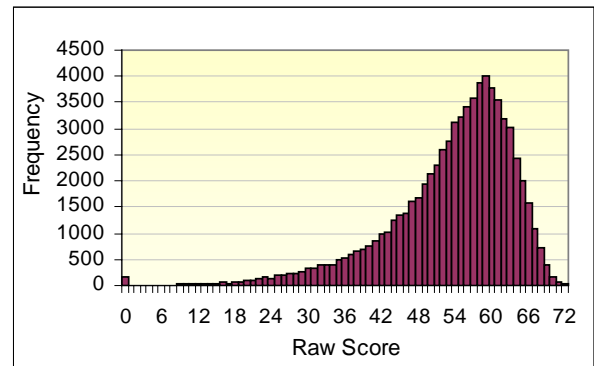
Score	Number	Percentage	Cumulative Percentage
200	181	0.25	0.25
202	17	0.02	0.27
204	61	0.08	0.35
206	120	0.16	0.52
208	77	0.11	0.62
210	108	0.15	0.77
212	141	0.19	0.96
214	451	0.62	1.58
216	1010	1.38	2.96
218	2136	2.92	5.89
220	2276	3.11	9.00
222	698	0.96	9.96
224	1625	2.22	12.18
226	1000	1.37	13.55
228	2267	3.10	16.65
230	1337	1.83	18.48
232	1367	1.87	20.35
234	3274	4.48	24.83
236	1947	2.66	27.50
238	2124	2.91	30.41
240	4886	6.69	37.09
242	2751	3.76	40.86
244	6331	8.66	49.52
246	3407	4.66	54.18
248	3587	4.91	59.09
250	3880	5.31	64.40
252	4023	5.51	69.91
254	3793	5.19	75.10
256	3539	4.84	79.94
258	3200	4.38	84.32
260	3035	4.15	88.48
262	2430	3.33	91.80
264	1995	2.73	94.53
268	1579	2.16	96.69
270	1073	1.47	98.16
272	718	0.98	99.14
276	399	0.55	99.69
280	227	0.31	100.00

**Figure 5.3.Y:
2006 MCAS
Scaled-Score Distribution
Grade 10 English Language Arts**



N	73070
Mean	244.53
Std. Deviation	14.41
Skewness	-0.32
Kurtosis	-0.31

**Figure 5.3.Z:
2006 MCAS
Raw-Score Distribution
Grade 10 English Language Arts**

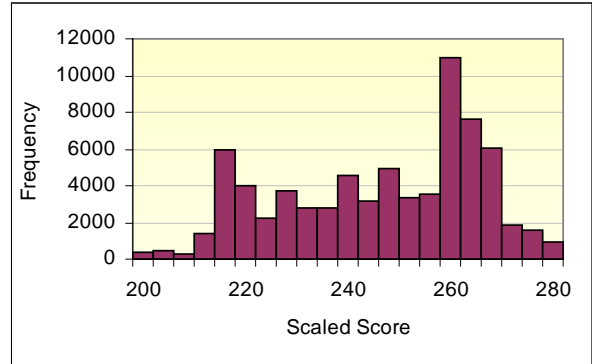


N	73070
Mean	53.32
Std. Deviation	10.33
Skewness	-1.39
Kurtosis	2.84

**Table 5.3.14:
2006 MCAS
Scaled-Score Distribution
Grade 10 Mathematics**

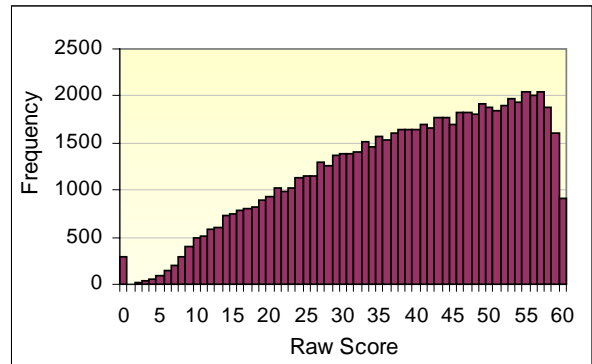
Score	Number	Percentage	Cumulative Percentage
200	299	0.41	0.41
202	45	0.06	0.47
204	144	0.20	0.67
206	344	0.47	1.15
208	284	0.39	1.54
212	395	0.54	2.08
214	995	1.37	3.45
216	1905	2.62	6.08
218	4068	5.61	11.68
220	2938	4.05	15.73
222	1031	1.42	17.15
224	1128	1.55	18.71
226	1143	1.57	20.28
228	1142	1.57	21.85
230	2558	3.52	25.38
232	1365	1.88	27.26
234	1389	1.91	29.17
236	1393	1.92	31.09
238	1414	1.95	33.04
240	1513	2.08	35.13
242	3026	4.17	39.29
244	1529	2.11	41.40
246	1604	2.21	43.61
248	1634	2.25	45.86
250	3299	4.55	50.41
252	1697	2.34	52.75
254	1669	2.30	55.05
256	1773	2.44	57.49
258	1779	2.45	59.94
260	5345	7.36	67.31
262	5594	7.71	75.01
264	3730	5.14	80.15
266	3899	5.37	85.52
268	4052	5.58	91.11
270	2040	2.81	93.92
272	1887	2.60	96.52
276	1607	2.21	98.73
280	920	1.27	100.00

**Figure 5.3.AA:
2006 MCAS
Scaled-Score Distribution
Grade 10 Mathematics**



N	72577
Mean	247.34
Std. Deviation	19.08
Skewness	-0.41
Kurtosis	-1.02

**Figure 5.3.BB:
2006 MCAS
Raw-Score Distribution
Grade 10 Mathematics**



N	72577
Mean	38.60
Std. Deviation	14.04
Skewness	-0.43
Kurtosis	-0.73

5.4 MCAS-Alt Scoring Dimension Results

Tables 5.4.1.1.1 through 5.4.5.11 include 2006 results for the MCAS-Alt in each of the following scoring dimensions:

- Level of Complexity (section 5.4.1)
- Demonstration of Skills and Concepts (section 5.4.2)
- Independence (section 5.4.3)
- Self-Evaluation (section 5.4.4)
- Generalized Performance (section 5.4.5)

For information on the determination of score in each dimension, see section 4.2.

5.4.1 Level of Complexity

In 2006, 94.04 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 (2.4 percent) accessed the learning standards through “access skills” and received a score of 2. A total of 3.51 percent of students received a score of 4 or 5, signifying that the student was addressing learning standards at or above grade-level expectations.

The tables in section 5.4.1 show the distribution of Level of Complexity scores on the 2006 MCAS-Alt for all strands and content areas, by grade (English Language Arts/Reading = 5.4.1.1; Mathematics = 5.4.1.2; Science and Technology/Engineering = 5.4.1.3).

Table 5.4.1.4 shows scores at each score point for all grades and content areas combined. Table 5.4.1.5 shows the 2006 statewide MCAS-Alt Composite Level of Complexity score distributions for English Language Arts and Mathematics.

5.4.1.1 English Language Arts/Reading

**Table 5.4.1.1.1: 2006 MCAS-Alt Statewide Score Distribution
for Level of Complexity by Strand:
English Language Arts/Reading (for all tested grades)**

Score Point	English Language Arts (ELA)/Reading Strands			Totals for ELA/Reading	
	Language	Reading (Literature)	Composition (Writing)	Number	Percent
1	1	4	0	5	0.03
2	155	164	58	377	2.40
3	6110	6187	2570	14867	94.63
4	175	155	93	423	2.69
5	16	14	9	39	0.25

**Table 5.4.1.1.2: 2006 MCAS-Alt Statewide Score Distribution
for Level of Complexity by Strand and Grade: Grade 3 Reading**

Score Point	Reading Strands		Totals for Reading	
	Language	Reading (Literature)	Number	Percent
1	0	0	0	0.00
2	34	32	66	3.52
3	876	888	1764	93.98
4	24	22	46	2.45
5	1	0	1	0.05

**Table 5.4.1.1.3: 2006 MCAS-Alt Statewide Score Distribution
for Level of Complexity by Strand and Grade: English Language Arts, Grade 4**

Score Point	English Language Arts (ELA) Strands			Totals for ELA	
	Language	Reading (Literature)	Composition (Writing)	Number	Percent
1	0	1	0	1	0.03
2	31	39	29	99	3.13
3	977	992	996	2965	93.59
4	39	29	32	100	3.16
5	1	1	1	3	0.09

**Table 5.4.1.1.4: 2006 MCAS-Alt Statewide Score Distribution
for Level of Complexity by Strand and Grade: English Language Arts, Grade 5**

Score Point	English Language Arts (ELA) Strands		Totals for ELA	
	Language	Reading (Literature)	Number	Percent
1	0	0	0	0.00
2	20	22	42	2.10
3	951	978	1929	96.35
4	17	14	31	1.55
5	0	0	0	0.00

**Table 5.4.1.1.5: 2006 MCAS-Alt Statewide Score Distribution
for Level of Complexity by Strand and Grade: English Language Arts, Grade 6**

Score Point	English Language Arts (ELA) Strands		Totals for ELA	
	Language	Reading (Literature)	Number	Percent
1	0	1	1	0.05
2	29	34	63	3.44
3	854	868	1722	93.94
4	24	17	41	2.24
5	3	3	6	0.33

**Table 5.4.1.1.6: 2006 MCAS-Alt Statewide Score Distribution
for Level of Complexity by Strand and Grade: English Language Arts, Grade 7**

Score Point	English Language Arts (ELA) Strands			Totals for ELA	
	Language	Reading (Literature)	Composition (Writing)	Number	Percent
1	0	0	0	0	0.00
2	10	8	16	34	1.22
3	902	907	877	2686	96.07
4	24	21	22	67	2.40
5	3	3	3	9	0.32

**Table 5.4.1.1.7: 2006 MCAS-Alt Statewide Score Distribution
for Level of Complexity by Strand and Grade: English Language Arts, Grade 8**

Score Point	English Language Arts (ELA) Strands		Totals for ELA	
	Language	Reading (Literature)	Number	Percent
1	1	1	2	0.11
2	16	17	33	1.85
3	862	856	1718	96.46
4	10	14	24	1.35
5	2	2	4	0.22

**Table 5.4.1.1.8: 2006 MCAS-Alt Statewide Score Distribution
for Level of Complexity by Strand and Grade: English Language Arts, Grade 10**

Score Point	English Language Arts (ELA) Strands			Totals for ELA	
	Language	Reading (Literature)	Composition (Writing)	Number	Percent
1	0	1	0	1	0.05
2	15	12	13	40	1.89
3	664	673	671	2008	94.90
4	19	21	21	61	2.88
5	2	2	2	6	0.28

**Table 5.4.1.1.9: 2006 MCAS-Alt Statewide Score Distribution
for Level of Complexity by Strand and Grade: English Language Arts, Grade 11**

Score Point	English Language Arts (ELA) Strands			Totals for ELA	
	Language	Reading (Literature)	Composition (Writing)	Number	Percent
1	0	0	0	0	0.00
2	0	0	0	0	0.00
3	17	17	18	52	69.33
4	8	7	8	23	30.67
5	0	0	0	0	0.00

**Table 5.4.1.1.10: 2006 MCAS-Alt Statewide Score Distribution
for Level of Complexity by Strand and Grade: English Language Arts, Grade 12**

Score Point	English Language Arts (ELA) Strands			Totals for ELA	
	Language	Reading (Literature)	Composition (Writing)	Number	Percent
1	0	0	0	0	0.00
2	0	0	0	0	0.00
3	5	6	6	17	29.82
4	10	10	10	30	52.63
5	4	3	3	10	17.54

**Table 5.4.1.1.11: 2006 MCAS-Alt Statewide Score Distribution
for Level of Complexity by Strand and Grade: English Language Arts, Grade 12+**

Score Point	English Language Arts (ELA) Strands			Totals for ELA	
	Language	Reading (Literature)	Composition (Writing)	Number	Percent
1	0	0	0	0	0.00
2	0	0	0	0	0.00
3	2	2	2	6	100.00
4	0	0	0	0	0.00
5	0	0	0	0	0.00

5.4.1.2 *Mathematics*

**Table 5.4.1.2.1: 2006 MCAS-Alt Statewide Score Distribution
for Level of Complexity by Strand:
Mathematics (for all tested grades)**

Score Point	Mathematics Strands					Totals for Mathematics	
	Number Sense and Operations	Patterns, Relations, and Functions	Geometry	Measurement	Data Analysis, Statistics, and Probability	Number	Percent
1	3	1	0	1	3	8	0.06
2	174	76	28	30	53	361	2.51
3	6301	2213	1247	1371	2259	13391	93.01
4	175	75	82	65	99	496	3.44
5	52	19	23	18	30	142	0.99

**Table 5.4.1.2.2: 2006 MCAS-Alt Statewide Score Distribution
for Level of Complexity by Strand and Grade: Mathematics, Grade 3**

Score Point	Mathematics Strands		Totals for Mathematics	
	Number Sense and Operations	Patterns, Relations, and Functions	Number	Percent
1	0	0	0	0.00
2	32	27	59	3.15
3	897	885	1782	95.04
4	14	16	30	1.60
5	2	2	4	0.21

**Table 5.4.1.2.3: 2006 MCAS-Alt Statewide Score Distribution
for Level of Complexity by Strand and Grade: Mathematics, Grade 4**

Score Point	Mathematics Strands		Totals for Mathematics	
	Number Sense and Operations	Data Analysis, Statistics, and Probability	Number	Percent
1	2	2	4	0.18
2	34	31	65	2.95
3	1039	1009	2048	92.92
4	40	46	86	3.90
5	1	0	1	0.05

**Table 5.4.1.2.4: 2006 MCAS-Alt Statewide Score Distribution
for Level of Complexity by Strand and Grade: Mathematics, Grade 5**

Score Point	Mathematics Strands		Totals for Mathematics	
	Number Sense and Operations	Measurement	Number	Percent
1	0	1	1	0.05
2	25	23	48	2.31
3	1009	980	1989	95.67
4	15	22	37	1.78
5	2	2	4	0.19

**Table 5.4.1.2.5: 2006 MCAS-Alt Statewide Score Distribution
for Level of Complexity by Strand and Grade: Mathematics, Grade 6**

Score Point	Mathematics Strands		Totals for Mathematics	
	Number Sense and Operations	Patterns, Relations, and Functions	Number	Percent
1	0	0	0	0.00
2	39	33	72	3.70
3	912	900	1812	93.16
4	27	23	50	2.57
5	6	5	11	0.57

**Table 5.4.1.2.6: 2006 MCAS-Alt Statewide Score Distribution
for Level of Complexity by Strand and Grade: Mathematics, Grade 7**

Score Point	Mathematics Strands		Totals for Mathematics	
	Number Sense and Operations	Data Analysis, Statistics, and Probability	Number	Percent
1	0	0	0	0.00
2	14	16	30	1.54
3	939	923	1862	95.54
4	23	22	45	2.31
5	6	6	12	0.62

**Table 5.4.1.2.7: 2006 MCAS-Alt Statewide Score Distribution
for Level of Complexity by Strand and Grade: Mathematics, Grade 8**

Score Point	Mathematics Strands		Totals for Mathematics	
	Number Sense and Operations	Geometry	Number	Percent
1	0	0	0	0.00
2	17	16	33	1.70
3	914	909	1823	94.02
4	34	35	69	3.56
5	8	6	14	0.72

**Table 5.4.1.2.8: 2006 MCAS-Alt Statewide Score Distribution
for Level of Complexity by Strand and Grade: Mathematics, Grade 10**

Score Point	Mathematics Strands					Totals for Mathematics	
	Number Sense and Operations	Patterns, Relations, and Functions	Geometry	Measurement	Data Analysis, Statistics, and Probability	Number	Percent
1	1	1	0	0	1	3	0.14
2	13	16	12	7	6	54	2.46
3	572	410	322	383	323	2010	91.57
4	14	20	27	27	18	106	4.83
5	8	1	5	2	6	22	1.00

**Table 5.4.1.2.9: 2006 MCAS-Alt Statewide Score Distribution
for Level of Complexity by Strand and Grade: Mathematics, Grade 11**

Score Point	Mathematics Strands					Totals for Mathematics	
	Number Sense and Operations	Patterns, Relations, and Functions	Geometry	Measurement	Data Analysis, Statistics, and Probability	Number	Percent
1	0	0	0	0	0	0	0.00
2	0	0	0	0	0	0	0.00
3	14	16	11	5	4	50	40.98
4	4	10	15	11	9	49	40.16
5	8	2	2	4	7	23	18.85

**Table 5.4.1.2.10: 2006 MCAS-Alt Statewide Score Distribution
for Level of Complexity by Strand and Grade: Mathematics, Grade 12**

Score Point	Mathematics Strands					Totals for Mathematics	
	Number Sense and Operations	Patterns, Relations, and Functions	Geometry	Measurement	Data Analysis, Statistics, and Probability	Number	Percent
1	0	0	0	0	0	0	0.00
2	0	0	0	0	0	0	0.00
3	3	1	0	2	0	6	7.89
4	4	6	4	5	4	23	30.26
5	10	8	10	9	10	47	61.84

**Table 5.4.1.2.11: 2006 MCAS-Alt Statewide Score Distribution
for Level of Complexity by Strand and Grade: Mathematics, Grade 12+**

Score Point	Mathematics Strands					Totals for Mathematics	
	Number Sense and Operations	Patterns, Relations, and Functions	Geometry	Measurement	Data Analysis, Statistics, and Probability	Number	Percent
1	0	0	0	0	0	0	0.00
2	0	0	0	0	0	0	0.00
3	2	1	2	1	0	6	54.55
4	0	0	0	0	0	0	0.00
5	1	1	1	1	1	5	45.45

5.4.1.3 *Science and Technology/Engineering*

**Table 5.4.1.3.1: 2006 MCAS-Alt Statewide Score Distribution
for Level of Complexity by Strand:
Science and Technology/Engineering (for all tested grades)**

Score Point	Science and Technology/Engineering Strands				Totals for Science and Technology/Engineering	
	Earth Science	Life Science	Physical Sciences	Technology/Engineering	Number	Percent
1	1	0	0	1	2	0.04
2	30	37	28	20	115	2.06
3	1637	1678	1271	712	5298	95.10
4	43	48	37	20	148	2.66
5	2	2	3	1	8	0.14

**Table 5.4.1.3.2: 2006 MCAS-Alt Statewide Score Distribution
for Level of Complexity by Strand and Grade:
Science and Technology/Engineering, Grade 5**

Score Point	Science and Technology/Engineering Strands				Totals for Science and Technology/Engineering	
	Earth Science	Life Science	Physical Sciences	Technology/Engineering	Number	Percent
1	1	0	0	1	2	0.07
2	17	24	16	12	69	2.36
3	879	889	725	300	2793	95.59
4	17	18	10	13	58	1.98
5	0	0	0	0	0	0.00

**Table 5.4.1.3.3: 2006 MCAS-Alt Statewide Score Distribution
for Level of Complexity by Strand and Grade:
Science and Technology/Engineering, Grade 8**

Score Point	Science and Technology/Engineering Strands				Totals for Science and Technology/Engineering	
	Earth Science	Life Science	Physical Sciences	Technology/Engineering	Number	Percent
1	0	0	0	0	0	0.00
2	13	13	12	8	46	1.74
3	758	789	546	412	2505	94.56
4	26	30	27	7	90	3.40
5	2	2	3	1	8	0.30

5.4.1.4 All Content Areas Combined

**Table 5.4.1.4: 2006 MCAS-Alt
Statewide Score Distribution
for Level of Complexity by Strand:
All Content Areas Combined
(for all tested grades)**

Score Point	Totals for All Content Areas	
	Number	Percent
1	15	0.04
2	853	2.39
3	33556	94.05
4	1067	2.99
5	189	0.53

5.4.1.5 Composite Level of Complexity

**Table 5.4.1.5: 2006 MCAS-Alt Statewide Score Distribution
for Composite Level of Complexity:
English Language Arts/Reading and Mathematics**

ALT = portfolios for students with significant cognitive disabilities

GL = portfolios measured against grade-level learning standards

MIS = not determined due to missing data

MOD = portfolios measured against modified learning standards

Score Point	Content Area	
	English Language Arts/Reading	Mathematics
ALT	6114	6394
GL	133	171
MIS	685	354
MOD	74	87

5.4.2 Demonstration of Skills and Concepts

The tables in section 5.4.2 show the 2006 statewide distribution of all MCAS-Alt scores for Demonstration of Skills and Concepts in all portfolio strands (English Language Arts/Reading = 5.4.2.1; Mathematics = 5.4.2.2; Science and Technology/Engineering = 5.4.2.3).

5.4.2.1 English Language Arts/Reading

Table 5.4.2.1.1: 2006 MCAS-Alt Statewide Score Distribution for Demonstration of Skills and Concepts by Strand: English Language Arts/Reading (for all tested grades)

Score Point	Strand		
	<i>Language</i>	<i>Literature (Reading)</i>	<i>Composition (Writing)</i>
M	382	401	5
1	6	6	25
2	56	49	173
3	398	450	2328
4	5615	5618	199

Table 5.4.2.1.2: 2006 MCAS-Alt Statewide Score Distribution for Demonstration of Skills and Concepts by Strand and Grade: Grade 3 Reading

Score Point	Strand	
	<i>Language</i>	<i>Literature (Reading)</i>
M	56	41
1	0	2
2	5	7
3	67	61
4	807	831

Table 5.4.2.1.3: 2006 MCAS-Alt Statewide Score Distribution for Demonstration of Skills and Concepts by Strand and Grade: English Language Arts, Grade 4

Score Point	Strand		
	<i>Language</i>	<i>Literature (Reading)</i>	<i>Composition (Writing)</i>
M	57	53	58
1	0	1	1
2	11	7	13
3	49	66	54
4	931	935	932

**Table 5.4.2.1.4: 2006 MCAS-Alt Statewide Score Distribution
for Demonstration of Skills and Concepts
by Strand and Grade: English Language Arts, Grade 5**

Score Point	Strand	
	<i>Language</i>	<i>Literature (Reading)</i>
M	61	58
1	2	2
2	8	9
3	59	75
4	858	870

**Table 5.4.2.1.5: 2006 MCAS-Alt Statewide Score Distribution
for Demonstration of Skills and Concepts
by Strand and Grade: English Language Arts, Grade 6**

Score Point	Strand	
	<i>Language</i>	<i>Literature (Reading)</i>
M	44	59
1	1	0
2	9	6
3	52	65
4	804	793

**Table 5.4.2.1.6: 2006 MCAS-Alt Statewide Score Distribution
for Demonstration of Skills and Concepts
by Strand and Grade: English Language Arts, Grade 7**

Score Point	Strand		
	<i>Language</i>	<i>Literature (Reading)</i>	<i>Composition (Writing)</i>
M	44	51	51
1	0	0	1
2	9	5	6
3	53	58	52
4	833	825	808

**Table 5.4.2.1.7: 2006 MCAS-Alt Statewide Score Distribution
for Demonstration of Skills and Concepts
by Strand and Grade: English Language Arts, Grade 8**

Score Point	Strand	
	<i>Language</i>	<i>Literature (Reading)</i>
M	54	62
1	0	0
2	7	6
3	56	54
4	774	768

**Table 5.4.2.1.8: 2006 MCAS-Alt Statewide Score Distribution
for Demonstration of Skills and Concepts
by Strand and Grade: English Language Arts, Grade 10**

Score Point	Strand		
	<i>Language</i>	<i>Literature (Reading)</i>	<i>Composition (Writing)</i>
M	64	75	88
1	2	0	2
2	7	9	6
3	62	71	64
4	565	554	547

**Table 5.4.2.1.9: 2006 MCAS-Alt Statewide Score Distribution
for Demonstration of Skills and Concepts
by Strand and Grade: English Language Arts, Grade 11**

Score Point	Strand		
	<i>Language</i>	<i>Literature (Reading)</i>	<i>Composition (Writing)</i>
M	1	1	1
1	1	1	1
2	0	0	0
3	0	0	2
4	23	22	22

**Table 5.4.2.1.10: 2006 MCAS-Alt Statewide Score Distribution
for Demonstration of Skills and Concepts
by Strand and Grade: English Language Arts, Grade 12**

Score Point	Strand		
	<i>Language</i>	<i>Literature (Reading)</i>	<i>Composition (Writing)</i>
M	1	1	1
1	0	0	0
2	0	0	0
3	0	0	1
4	18	18	17

**Table 5.4.2.1.11: 2006 MCAS-Alt Statewide Score Distribution
for Demonstration of Skills and Concepts
by Strand and Grade: English Language Arts, Grade 12+**

Score Point	Strand		
	<i>Language</i>	<i>Literature (Reading)</i>	<i>Composition (Writing)</i>
M	0	0	0
1	0	0	0
2	0	0	0
3	0	0	0
4	2	2	2

5.4.2.2 Mathematics

Table 5.4.2.2.1: 2006 MCAS-Alt Statewide Score Distribution for Demonstration of Skills and Concepts by Strand: Mathematics (for all tested grades)

Score Point	Strand				
	<i>Number Sense and Operations</i>	<i>Patterns, Relations, and Functions</i>	<i>Geometry</i>	<i>Measurement</i>	<i>Data Analysis, Statistics, and Probability</i>
M	371	157	115	136	137
1	12	4	3	2	0
2	52	26	8	11	19
3	417	167	117	99	126
4	5853	2030	1137	1237	2162

Table 5.4.2.2.2: 2006 MCAS-Alt Statewide Score Distribution for Demonstration of Skills and Concepts by Strand and Grade: Mathematics, Grade 3

Score Point	Strand	
	<i>Number Sense and Operations</i>	<i>Patterns, Relations, and Functions</i>
M	32	39
1	1	2
2	10	7
3	55	58
4	847	824

Table 5.4.2.2.3: 2006 MCAS-Alt Statewide Score Distribution for Demonstration of Skills and Concepts by Strand and Grade: Mathematics, Grade 4

Score Point	Strand	
	<i>Number Sense and Operations</i>	<i>Data Analysis, Statistics, and Probability</i>
M	44	53
1	2	0
2	4	5
3	70	54
4	996	976

Table 5.4.2.2.4: 2006 MCAS-Alt Statewide Score Distribution for Demonstration of Skills and Concepts by Strand and Grade: Mathematics, Grade 5

Score Point	Strand	
	<i>Number Sense and Operations</i>	<i>Measurement</i>
M	64	79
1	0	1
2	7	6
3	69	59
4	911	883

Table 5.4.2.2.5: 2006 MCAS-Alt Statewide Score Distribution for Demonstration of Skills and Concepts by Strand and Grade: Mathematics, Grade 6

Score Point	Strand	
	<i>Number Sense and Operations</i>	<i>Patterns, Relations, and Functions</i>
M	47	56
1	1	1
2	6	12
3	64	61
4	866	831

Table 5.4.2.2.6: 2006 MCAS-Alt Statewide Score Distribution for Demonstration of Skills and Concepts by Strand and Grade: Mathematics, Grade 7

Score Point	Strand	
	<i>Number Sense and Operations</i>	<i>Data Analysis, Statistics, and Probability</i>
M	47	46
1	3	0
2	9	7
3	59	46
4	864	868

Table 5.4.2.2.7: 2006 MCAS-Alt Statewide Score Distribution for Demonstration of Skills and Concepts by Strand and Grade: Mathematics, Grade 8

Score Point	Strand	
	<i>Number Sense and Operations</i>	<i>Geometry</i>
M	56	70
1	3	0
2	11	7
3	53	73
4	850	816

Table 5.4.2.2.8: 2006 MCAS-Alt Statewide Score Distribution for Demonstration of Skills and Concepts by Strand and Grade: Mathematics, Grade 10

Score Point	Strand				
	<i>Number Sense and Operations</i>	<i>Patterns, Relations, and Functions</i>	<i>Geometry</i>	<i>Measurement</i>	<i>Data Analysis, Statistics, and Probability</i>
M	79	59	43	55	37
1	2	1	3	0	0
2	4	7	1	5	6
3	45	44	44	39	26
4	478	337	275	320	285

**Table 5.4.2.2.9: 2006 MCAS-Alt Statewide Score Distribution
for Demonstration of Skills and Concepts
by Strand and Grade: Mathematics, Grade 11**

Score Point	Strand				
	<i>Number Sense and Operations</i>	<i>Patterns, Relations, and Functions</i>	<i>Geometry</i>	<i>Measurement</i>	<i>Data Analysis, Statistics, and Probability</i>
M	1	3	1	2	1
1	0	0	0	1	0
2	1	0	0	0	1
3	2	4	0	0	0
4	22	21	27	17	18

**Table 5.4.2.2.10: 2006 MCAS-Alt Statewide Score Distribution
for Demonstration of Skills and Concepts
by Strand and Grade: Mathematics, Grade 12**

Score Point	Strand				
	<i>Number Sense and Operations</i>	<i>Patterns, Relations, and Functions</i>	<i>Geometry</i>	<i>Measurement</i>	<i>Data Analysis, Statistics, and Probability</i>
M	0	0	1	0	0
1	0	0	0	0	0
2	0	0	0	0	0
3	0	0	0	0	0
4	17	15	16	16	14

**Table 5.4.2.2.11: 2006 MCAS-Alt Statewide Score Distribution
for Demonstration of Skills and Concepts
by Strand and Grade: Mathematics, Grade 12+**

Score Point	Strand				
	<i>Number Sense and Operations</i>	<i>Patterns, Relations, and Functions</i>	<i>Geometry</i>	<i>Measurement</i>	<i>Data Analysis, Statistics, and Probability</i>
M	1	0	0	0	0
1	0	0	0	0	0
2	0	0	0	0	0
3	0	0	0	1	0
4	2	2	3	1	1

5.4.2.3 *Science and Technology/Engineering*

**Table 5.4.2.3.1: 2006 MCAS-Alt Statewide Score Distribution
for Demonstration of Skills and Concepts by Strand:
Science and Technology/Engineering (for all tested grades)**

Score Point	Strand			
	<i>Earth and Space Science</i>	<i>Life Science</i>	<i>Physical Sciences</i>	<i>Technology/Engineering</i>
M	120	140	89	54
1	0	1	1	3
2	11	7	11	9
3	98	107	75	50
4	1484	1510	1163	638

**Table 5.4.2.3.2: 2006 MCAS-Alt Statewide Score Distribution
for Demonstration of Skills and Concepts
by Strand and Grade: Science and Technology/Engineering, Grade 5**

Score Point	Strand			
	<i>Earth and Space Science</i>	<i>Life Science</i>	<i>Physical Sciences</i>	<i>Technology/Engineering</i>
M	59	66	53	21
1	0	1	0	1
2	6	2	9	3
3	52	57	45	22
4	797	805	644	279

**Table 5.4.2.3.3: 2006 MCAS-Alt Statewide Score Distribution
for Demonstration of Skills and Concepts
by Strand and Grade: Science and Technology/Engineering, Grade 8**

Score Point	Strand			
	<i>Earth and Space Science</i>	<i>Life Science</i>	<i>Physical Sciences</i>	<i>Technology/Engineering</i>
M	61	74	36	33
1	0	0	1	2
2	5	5	2	6
3	46	50	30	28
4	687	705	519	359

5.4.3 Independence

The tables in section 5.4.3 show the 2006 statewide distribution of MCAS-Alt scores for Independence in all strands and grades.

**Table 5.4.3.1: 2006 MCAS-Alt
Statewide Score Distribution for Independence by Strand for All Grades**

Score Point	Content Area											
	English Language Arts/ Reading Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			Mathematics NmbSn = Number Sense and Operations Pattns = 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	Pattns	Geom	Meas	Data	Earth	Life	Phys	Tch/E
M	383	402	199	370	157	115	136	137	120	140	89	54
1	64	72	29	92	24	19	13	29	24	17	13	4
2	152	157	70	162	63	30	40	74	38	41	25	14
3	595	651	314	617	209	132	157	245	156	150	122	56
4	5263	5242	2118	5464	1931	1084	1139	1959	1375	1417	1090	626

**Table 5.4.3.2: 2006 MCAS-Alt
Statewide Score Distribution for Independence by Strand, Grade 3**

Score Point	Content Area											
	Reading Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			Mathematics NmbSn = Number Sense and Operations Pattns = 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	Pattns	Geom	Meas	Data	Earth	Life	Phys	Tch/E
M	56	41		32	39							
1	6	10		17	6							
2	15	17		21	20							
3	92	84		82	78							
4	766	790		793	787							

**Table 5.4.3.3: 2006 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 Pattns = 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	Pattns	Geom	Meas	Data	Earth	Life	Phys	Tch/E
M	57	53	58	44				53				
1	6	9	8	13				13				
2	21	28	25	22				31				
3	112	108	110	114				99				
4	852	864	857	923				892				

**Table 5.4.3.4: 2006 MCAS-Alt
Statewide Score Distribution for Independence by Strand, Grade 5**

Score Point	Content Area											
	<i>English Language Arts</i> Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			<i>Mathematics</i> NmbSn = Number Sense and Operations Pattrns = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability					<i>Science and Technology/Engineering</i> 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	61	58		64			79		59	66	53	21
1	14	11		12			11		11	6	4	0
2	21	18		23			20		19	22	11	7
3	79	77		73			98		78	69	67	17
4	813	850		879			820		747	768	616	281

**Table 5.4.3.5: 2006 MCAS-Alt
Statewide Score Distribution for Independence by Strand, Grade 6**

Score Point	Content Area											
	<i>English Language Arts</i> Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			<i>Mathematics</i> NmbSn = Number Sense and Operations Pattrns = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability					<i>Science and Technology/Engineering</i> 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	44	60		47	56							
1	10	12		13	9							
2	28	24		26	28							
3	67	84		109	80							
4	761	743		789	788							

**Table 5.4.3.6: 2006 MCAS-Alt
Statewide Score Distribution for Independence by Strand, Grade 7**

Score Point	Content Area											
	<i>English Language Arts</i> Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			<i>Mathematics</i> NmbSn = Number Sense and Operations Pattrns = Patterns, Relations, and Algebra Geom = Geometry Meas = Measurement Data = Data Analysis, Statistics, and Probability					<i>Science and Technology/Engineering</i> 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	44	51	51	47				46				
1	5	7	11	10				7				
2	25	27	21	24				27				
3	85	101	97	87				99				
4	780	753	738	814				788				

**Table 5.4.3.7: 2006 MCAS-Alt
Statewide Score Distribution for Independence by Strand, Grade 8**

Score Point	Content Area											
	English Language Arts Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			Mathematics NmbSn = Number Sense and Operations Pattns = 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	Pattns	Geom	Meas	Data	Earth	Life	Phys	Tch/E
M	54	62		56		70			61	74	36	33
1	10	14		13		11			13	11	9	4
2	23	18		29		18			19	19	14	7
3	83	98		83		79			78	81	55	39
4	721	698		792		788			628	649	474	345

**Table 5.4.3.8: 2006 MCAS-Alt
Statewide Score Distribution for Independence by Strand, Grade 10**

Score Point	Content Area											
	English Language Arts Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			Mathematics NmbSn = Number Sense and Operations Pattns = 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	Pattns	Geom	Meas	Data	Earth	Life	Phys	Tch/E
M	65	75	88	78	59	43	55	37				
1	13	9	10	14	9	8	2	8				
2	19	25	23	17	14	12	20	16				
3	73	96	104	66	50	50	56	45				
4	530	504	482	433	316	253	286	248				

**Table 5.4.3.9: 2006 MCAS-Alt
Statewide Score Distribution for Independence by Strand, Grade 11**

Score Point	Content Area											
	English Language Arts Lang = Language Read = Literature (Reading) Comp = Composition (Writing)			Mathematics NmbSn = Number Sense and Operations Pattns = 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	Pattns	Geom	Meas	Data	Earth	Life	Phys	Tch/E
M	1	1	1	1	3	1	2	1				
1	0	0	0	0	0	0	0	1				
2	0	0	1	0	1	0	0	0				
3	3	3	3	3	1	2	2	1				
4	21	20	21	22	23	25	16	17				

**Table 5.4.3.10: 2006 MCAS-Alt
Statewide Score Distribution for Independence by Strand, Grade 12**

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	1	1	1	0	0	1	0	1				
1	0	0	0	0	0	0	0	0				
2	0	0	0	0	0	0	0	0				
3	0	0	0	0	0	1	1	1				
4	18	18	18	17	15	15	15	13				

**Table 5.4.3.11: 2006 MCAS-Alt
Statewide Score Distribution for Independence by Strand, Grade 12+**

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	0	0	0	1	0	0	0	0				
1	0	0	0	0	0	0	0	0				
2	0	0	0	0	0	0	0	0				
3	1	0	0	0	0	0	0	0				
4	1	2	2	2	2	3	2	1				

5.4.4 Self-Evaluation

The tables in section 5.4.4 show the 2006 statewide MCAS-Alt score distribution for Self-Evaluation in each content area and grade tested.

**Table 5.4.1.1: 2006 MCAS-Alt
Statewide Score Distribution for Self-Evaluation
by Content Area for All Tested Grades**

Score Point	Content Area		
	English Language Arts/ Reading	Mathematics	Science and Technology/ Engineering
M	376	386	107
1	260	276	58
2	291	193	101
3	324	281	147
4	5351	5710	1482

**Table 5.4.1.2: 2006 MCAS-Alt
Statewide Score Distribution for Self-Evaluation by Content Area,
Grade 3**

Score Point	Content Area	
	Reading	Mathematics
M	42	39
1	47	32
2	22	22
3	35	31
4	806	822

**Table 5.4.1.3: 2006 MCAS-Alt
Statewide Score Distribution for Self-Evaluation by Content Area,
Grade 4**

Score Point	Content Area	
	English Language Arts	Mathematics
M	47	46
1	22	46
2	70	27
3	79	45
4	866	954

**Table 5.4.1.4: 2006 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	53	50	53
1	66	60	30
2	34	37	49
3	43	43	88
4	824	862	769

**Table 5.4.1.5: 2006 MCAS-Alt
Statewide Score Distribution for Self-Evaluation by Content Area,
Grade 6**

Score Point	Content Area	
	English Language Arts	Mathematics
M	65	72
1	53	53
2	30	25
3	32	33
4	749	802

**Table 5.4.1.6: 2006 MCAS-Alt
Statewide Score Distribution for Self-Evaluation by Content Area,
Grade 7**

Score Point	Content Area	
	English Language Arts	Mathematics
M	47	54
1	20	43
2	64	31
3	59	30
4	762	829

**Table 5.4.1.7: 2006 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	54	58	54
1	31	25	28
2	22	21	52
3	26	33	59
4	764	839	713

**Table 5.4.1.8: 2006 MCAS-Alt
Statewide Score Distribution for Self-Evaluation by Content Area,
Grade 10**

Score Point	Content Area	
	English Language Arts	Mathematics
M	66	63
1	20	17
2	48	30
3	49	66
4	538	553

**Table 5.4.1.9: 2006 MCAS-Alt
Statewide Score Distribution for Self-Evaluation by Content Area,
Grade 11**

Score Point	Content Area	
	English Language Arts	Mathematics
M	1	3
1	1	0
2	1	0
3	0	0
4	23	30

**Table 5.4.1.10: 2006 MCAS-Alt
Statewide Score Distribution for Self-Evaluation by Content Area,
Grade 12**

Score Point	Content Area	
	English Language Arts	Mathematics
M	1	1
1	0	0
2	0	0
3	1	0
4	17	16

**Table 5.4.1.11: 2006 MCAS-Alt
Statewide Score Distribution for Self-Evaluation by Content Area,
Grade 12+**

Score Point	Content Area	
	English Language Arts	Mathematics
M	0	0
1	0	0
2	0	0
3	0	0
4	2	3

5.4.5 Generalized Performance

The tables in section 5.4.5 show the 2006 statewide MCAS-Alt score distributions for Generalized Performance, disaggregated by content area.

**Table 5.4.5.1: 2006 MCAS-Alt Statewide Score Distribution
for Generalized Performance by Content Area for All Tested Grades**

Score Point	Content Area					
	<i>English Language Arts/ Reading</i>		<i>Mathematics</i>		<i>Science and Technology/Engineering</i>	
	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>
1	484	7.33	460	6.72	63	3.32
2	1339	20.28	1044	15.25	309	16.31
3	1952	29.57	2004	29.27	462	24.38
4	2827	42.82	3338	48.76	1061	55.99

**Table 5.4.5.2: 2006 MCAS-Alt Statewide Score Distribution
for Generalized Performance by Content Area, Grade 3**

Score Point	Content Area			
	<i>Reading</i>		<i>Mathematics</i>	
	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>
1	64	6.72	57	6.03
2	151	15.86	123	13.00
3	272	28.57	292	30.87
4	465	48.84	474	50.11

Table 5.4.5.3: 2006 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>	
	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>
1	68	6.27	62	5.55
2	263	24.26	160	14.31
3	298	27.49	298	26.65
4	455	41.97	598	53.49

Table 5.4.5.4: 2006 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>	
	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>
1	90	8.82	74	7.03	34	3.44
2	157	15.39	155	14.73	169	17.09
3	307	30.10	323	30.70	251	25.38
4	466	45.69	500	47.53	535	54.10

Table 5.4.5.5: 2006 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>	
	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>
1	87	9.36	87	8.83
2	143	15.39	137	13.91
3	285	30.68	296	30.05
4	414	44.56	465	47.21

Table 5.4.5.6: 2006 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>	
	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>
1	47	4.94	52	5.27
2	223	23.42	146	14.79
3	277	29.10	270	27.36
4	405	42.54	519	52.58

Table 5.4.5.7: 2006 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>	
	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>
1	54	6.02	54	5.53	29	3.20
2	166	18.51	125	12.81	140	15.45
3	263	29.32	248	25.41	211	23.29
4	414	46.15	549	56.25	526	58.06

Table 5.4.5.8: 2006 MCAS-Alt Statewide Score Distribution for Generalized Performance by Content Area, Grade 10

Score Point	Content Area			
	<i>English Language Arts</i>		<i>Mathematics</i>	
	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>
1	70	9.71	69	9.47
2	230	31.90	189	25.93
3	243	33.70	266	36.49
4	178	24.69	205	28.12

Table 5.4.5.9: 2006 MCAS-Alt Statewide Score Distribution for Generalized Performance by Content Area, Grade 11

Score Point	Content Area			
	<i>English Language Arts</i>		<i>Mathematics</i>	
	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>
1	4	15.38	4	12.12
2	4	15.38	7	21.21
3	5	19.23	9	27.27
4	13	50.00	13	39.39

Table 5.4.5.10: 2006 MCAS-Alt Statewide Score Distribution for Generalized Performance by Content Area, Grade 12

Score Point	Content Area			
	<i>English Language Arts</i>		<i>Mathematics</i>	
	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>
1	0	0.00	1	5.88
2	1	5.26	1	5.88
3	2	10.53	1	5.88
4	16	84.21	14	82.35

Table 5.4.5.11: 2006 MCAS-Alt Statewide Score Distribution for Generalized Performance by Content Area, Grade 12+

Score Point	Content Area			
	<i>English Language Arts</i>		<i>Mathematics</i>	
	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>
1	0	0.00	0	0.00
2	1	50.00	1	33.33
3	0	0.00	1	33.33
4	1	50.00	1	33.33

5.5 Participation Results for the MCAS-Alt

MCAS-Alt student portfolios were measured against either *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; also see section 4.2.1.2.A)

Tables 5.5.1 through 5.5.7 show statewide participation data for the 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 5.5.1: 2006 MCAS-Alt Participation Results
Grade 3 English Language Arts and Mathematics**

2006 MCAS-Alt Participation				
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	69795	98.65	69792	98.66
MCAS-Alt, measured on grade-level achievement standards	19	0.03	10	0.01
MCAS-Alt, measured on modified achievement standards	10	0.01	10	0.01
MCAS-Alt, measured on alternate achievement standards	896	1.27	900	1.27
MCAS-Alt, achievement standards level not determined	27	0.04	26	0.04
Total	70747		70738	

*Percentages may not total 100 due to rounding.

**Table 5.5.2: 2006 MCAS-Alt Participation Results
Grade 4 English Language Arts and Mathematics**

2006 MCAS-Alt Participation				
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	70193	98.48	70300	98.43
MCAS-Alt, measured on Grade-level achievement standards	21	0.03	32	0.04
MCAS-Alt, measured on Modified achievement standards	27	0.04	22	0.03
MCAS-Alt, measured on Alternate achievement standards	964	1.35	1031	1.44
MCAS-Alt, achievement standards level not determined	72	0.10	33	0.05
Total	71277		71418	

*Percentages may not total 100 due to rounding.

**Table 5.5.3: 2006 MCAS-Alt Participation Results
Grade 5 English Language Arts, Mathematics, and
Science and Technology/Engineering**

2006 MCAS-Alt Participation						
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	71690	98.60	71744	98.55	71779	98.64
MCAS-Alt, measured on Grade-level achievement standards	12	0.02	12	0.02	11	0.02
MCAS-Alt, measured on Modified achievement standards	10	0.01	14	0.02	18	0.02
MCAS-Alt, measured on alternate achievement standards	960	1.32	999	1.37	920	1.26
MCAS-Alt, achievement standards level not determined	37	0.05	27	0.04	40	0.05
Total	72709		72796		72768	

*Percentages may not total 100 due to rounding.

**Table 5.5.4: 2006 MCAS-Alt Participation Results
Grade 6 English Language Arts and Mathematics**

2006 MCAS-Alt Participation				
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	72452	98.73	72484	98.66
MCAS-Alt, measured on grade-level achievement standards	18	0.02	22	0.03
MCAS-Alt, measured on modified achievement standards	7	0.01	7	0.01
MCAS-Alt, measured on alternate achievement standards	877	1.20	925	1.26
MCAS-Alt, achievement standards level not determined	27	0.04	31	0.04
Total	73381		73469	

*Percentages may not total 100 due to rounding.

**Table 5.5.5: 2006 MCAS-Alt Participation Results
Grade 7 English Language Arts and Mathematics**

2006 MCAS-Alt Participation				
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	73556	98.72	73659	98.68
MCAS-Alt, measured on grade-level achievement standards	19	0.03	20	0.03
MCAS-Alt, measured on modified achievement standards	7	0.01	6	0.01
MCAS-Alt, measured on alternate achievement standards	868	1.16	932	1.25
MCAS-Alt, achievement standards level not determined	58	0.08	29	0.04
Total	74508		74646	

*Percentages may not total 100 due to rounding.

**Table 5.5.6: 2006 MCAS-Alt Participation Results
Grade 8 English Language Arts, Mathematics, and
Science and Technology/Engineering**

2006 MCAS-Alt Participation						
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	75346	98.82	75300	98.72	75328	98.81
MCAS-Alt, measured on grade-level achievement standards	9	0.01	32	0.04	22	0.03
MCAS-Alt, measured on modified achievement standards	6	0.01	10	0.01	16	0.02
MCAS-Alt, measured on alternate achievement standards	867	1.14	915	1.20	809	1.06
MCAS-Alt, achievement standards level not determined	15	0.02	19	0.02	59	0.08
Total	76243		76276		76234	

*Percentages may not total 100 due to rounding.

**Table 5.5.7: 2006 MCAS-Alt Participation Results
Grade 10 English Language Arts and Mathematics**

2006 MCAS-Alt Participation				
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	72634	99.02	72011	99.00
MCAS-Alt, measured on grade-level achievement standards	18	0.02	24	0.03
MCAS-Alt, measured on modified achievement standards	5	0.01	16	0.02
MCAS-Alt, measured on alternate achievement standards	659	0.90	671	0.92
MCAS-Alt, achievement standards level not determined	39	0.05	18	0.02
Total	73355		72740	

*Percentages may not total 100 due to rounding.

5.6 MCAS Spring 2006 Reports of Test Results

The following reports provided spring 2006 MCAS test results:

- Parent/Guardian Report. This report provided results for each individual student. Two printed reports for each student were sent to the student's school, one for the student's school record and one to be distributed to the student's parent or guardian, along with a label for the student's file. An interpretive guide for the report (*Guide to the 2006 MCAS for Parents/Guardians*) was also provided for each student. The Parent/Guardian Report was translated into 9 different languages (Cape Verdean, Simplified Chinese, Traditional Chinese, Haitian Creole, Khmer, Portuguese, Russian, Spanish, and Vietnamese), based on the state's demographics. A sample report in English is provided in Appendix J.
- School Report. Each School Report provided results for one tested grade and content area for the school receiving the report, for the school district, and for the state. This report was provided to schools online via a secure website. Schools that tested more than one content area and/or grade received a separate report for each grade and content area tested. An interpretive guide for the report (*Guide to Interpreting the Spring 2006 MCAS Reports for Schools and Districts*) was available to schools on the Department's website (www.doe.mass.edu/mcas). For a sample report, see Appendix K.
- District Report. Each District Report provided combined results for one tested grade and content area for all schools in the district as well as for all schools statewide. This report was provided online via a secure password-protected website. Districts received a separate report for each grade and content area tested in the district. An interpretive guide for the report (*Guide to Interpreting the Spring 2006 MCAS Reports for Schools and Districts*) was available to districts on the Department's website (www.doe.mass.edu/mcas). A sample District Report is provided in Appendix K.
- Test Item Analysis Reports. Samples of both reports described below are provided in Appendix L.
 - School Test Item Analysis Roster. This report provided results for each student in a school in one grade and content area test, showing points scored for each constructed-response item, as well as the student's correct or incorrect choice for each multiple-choice item.
 - District Test Item Analysis Report Summary. This report provided combined results for all students in one grade across the school district for each item of a content area test. Each report showed average scores across the district and percentages for each correct/incorrect multiple-choice answer and for each score point on constructed-response items on the test.
- Statewide Report. This report was made available to the public and reported via the Department's website at www.doe.mass.edu/mcas/results.html.

6. STATISTICAL AND PSYCHOMETRIC SUMMARIES

6.1 Item Analyses

As noted in Brown (1983), “A test is only as good as the items it contains.” A complete evaluation of a test’s quality must include an evaluation of each question. Both the *Standards for Educational and Psychological Testing* and the *Code of Fair Testing Practices in Education* include standards for identifying quality questions. Questions should assess only knowledge or skills that are identified as part of the domain being measured and should avoid assessing irrelevant factors. They should also be unambiguous and free of grammatical errors, potentially insensitive content or language, and other confounding characteristics. Further, questions must not unfairly disadvantage test takers from particular racial, ethnic, or gender groups.

Both qualitative and quantitative analyses are conducted to ensure that MCAS questions meet these standards. Previous sections in this report have outlined the qualitative checks on question quality.

Three categories of statistical evaluations are performed to ensure that MCAS questions meet these standards:

- difficulty indices
- item-test correlation
- subgroup differences in item performance (differential item functioning)

The results of these evaluations for the 2006 MCAS administration are presented below.

6.1.1 Difficulty Indices

All items were evaluated in terms of difficulty and relationship to overall score, according to standard classical test theory practice. Difficulty was measured by averaging the proportion of points received across all students who received the item.

Multiple-choice and short-answer items were scored dichotomously (correct vs. incorrect), so for these items the difficulty index was simply the proportion of students who correctly answered the item. Most open-response items were scored 0 to 4. Writing prompts were scored by two separate scorers, who assigned two scores each, from 1–4 for Standard English Conventions, and from 1–6 for Topic Development; the total final score for writing prompts therefore was between 4 and 20.

By computing the difficulty index as the average proportion of points received, the indices for multiple-choice, short-answer, and open-response items are placed on a similar scale; the index ranges from 0 to 1 regardless of the item type. Although this index is traditionally described as a measure of difficulty (as it is described here), it is properly interpreted as an easiness index because larger values indicate easier items. An index of 0 indicates that no student received credit for the item, and an index of 1 indicates that every student received full credit for the item.

Items that are answered correctly by almost all students provide little information about differences in student ability, but they do indicate knowledge or skills that have been mastered by most students. Similarly, items that are correctly answered by very few students may indicate knowledge or skills that have not yet been mastered by most students, but such items provide little information about differences in student ability.

In general, to provide best measurement, difficulty indices should range from near-chance performance (0.25 for four-option, multiple-choice items; or essentially 0.0 for open-response items) to 0.90. Indices outside this range indicate items that were either too difficult or too easy for the target population. However, on a standards-referenced assessment such as MCAS, it may be appropriate to include some items with very low or very high item difficulty values to ensure sufficient content coverage.

6.1.2 Item-Test Correlation

Within classical test theory, item-test correlation is referred to as the *item's discrimination* because it indicates the extent to which successful performance on an item discriminates between high and low scores on the test. For open-response items, the item discrimination index used was the Pearson product-moment correlation; for dichotomous items, the corresponding statistic is commonly called a *point-biserial correlation*. The theoretical range of these statistics is -1 to $+1$, with a typical range from 0.2 to 0.6.

Discrimination indices can be interpreted as a measure of construct consistency; that is, they measure how closely an item assesses the same knowledge and skills assessed by other items contributing to the criterion total score. For the 2006 MCAS administration, the criterion score for each item is the total score for all items.

6.1.3 Summary of Item Analysis Results

Summary statistics of the difficulty and discrimination indices for each item are provided in tables 6.1.3.1 through 6.1.3.5. In general, the 2006 MCAS item difficulty and discrimination indices are within acceptable and expected ranges.

A comparison of indices across grade levels is complicated because these indices are population-dependent. Direct comparisons would require that either the items or students were common across groups. As that is not the case for MCAS administrations, it cannot be determined whether differences in performance across grade levels are due to differences in student ability or differences in item difficulty or both. However, difficulty indices tended to decrease as grade level increased, i.e., average item scores were lower at higher grades.

Comparing the difficulty indices of multiple-choice to constructed-response items (short-answer items, open-response items, and ELA Compositions, in the case of the MCAS administration) is inappropriate because multiple-choice items can be answered correctly by guessing. Difficulty indices for multiple-choice items are higher (indicating that students performed better on these items) than difficulty indices for short-answer items, open-response items, or ELA Composition writing prompts. Similarly, the range of allowable scores for ELA Compositions, short-answer items, and open-response items is advantageous in the computation of item-test correlation, so

the discrimination indices for these items tend to be larger than the discrimination indices of other item types. In tables 6.1.3.1 through 6.1.3.5, the numbers in “()” denote standard deviation values.

**Table 6.1.3.1: MCAS 2006
Average Difficulty and Discrimination of Different Item Types
Grade 3 Reading**

Grade Level	Statistics	Item Type		
		All	Multiple-Choice	Open-Response
3	Difficulty	0.78 (0.11)	0.8 (0.09)	0.6 (0.13)
	Discrimination	0.45 (0.08)	0.44 (0.07)	0.55 (0.07)
	Number of Items	78	72	6

**Table 6.1.3.2: MCAS 2006
Average Difficulty and Discrimination of Different Item Types
Grades 4 through 10 English Language Arts**

Grade Level	Statistics	Item Type		
		All	Multiple-Choice	Open-Response and Writing Prompt
4	Difficulty	0.72 (0.15)	0.75 (0.14)	0.5 (0.06)
	Discrimination	0.4 (0.09)	0.38 (0.08)	0.53 (0.06)
	Number of Items	82	72	10
5	Difficulty	0.73 (0.12)	0.76 (0.1)	0.54 (0.04)
	Discrimination	0.42 (0.07)	0.4 (0.06)	0.54 (0.05)
	Number of Items	82	72	10
6	Difficulty	0.71 (0.13)	0.73 (0.11)	0.53 (0.05)
	Discrimination	0.42 (0.09)	0.4 (0.07)	0.59 (0.05)
	Number of Items	82	72	10
7	Difficulty	0.74 (0.13)	0.77 (0.11)	0.52 (0.04)
	Discrimination	0.42 (0.1)	0.4 (0.07)	0.6 (0.02)
	Number of Items	82	72	10
8	Difficulty	0.74 (0.1)	0.77 (0.08)	0.57 (0.05)
	Discrimination	0.45 (0.08)	0.43 (0.06)	0.62 (0.04)
	Number of Items	82	72	10
10	Difficulty	0.73 (0.12)	0.75 (0.11)	0.58 (0.05)
	Discrimination	0.38 (0.11)	0.35 (0.08)	0.58 (0.05)
	Number of Items	150	130	20

**Table 6.1.3.3: MCAS 2006
Average Difficulty and Discrimination of Different Item Types
Grade 3 Mathematics**

Grade Level	Statistics	Item Type		
		All	Multiple-Choice	Open-Response
3	Difficulty	0.77 (0.11)	0.79 (0.11)	0.72 (0.1)
	Discrimination	0.42 (0.07)	0.41 (0.07)	0.45 (0.08)
	Number of Items	70	50	20

**Table 6.1.3.4: MCAS 2006
Average Difficulty and Discrimination of Different Item Types
Grades 4 through 10 Mathematics**

Grade Level	Statistics	Item Type		
		<i>All</i>	<i>Multiple-Choice</i>	<i>Short-Answer and Open-Response</i>
4	Difficulty	0.7 (0.15)	0.72 (0.14)	0.62 (0.14)
	Discrimination	0.41 (0.11)	0.38 (0.09)	0.49 (0.11)
	Number of Items	78	58	20
5	Difficulty	0.67 (0.12)	0.7 (0.11)	0.58 (0.13)
	Discrimination	0.44 (0.1)	0.41 (0.08)	0.52 (0.13)
	Number of Items	78	58	20
6	Difficulty	0.7 (0.12)	0.73 (0.08)	0.61 (0.15)
	Discrimination	0.49 (0.11)	0.47 (0.07)	0.57 (0.15)
	Number of Items	78	58	20
7	Difficulty	0.62 (0.13)	0.63 (0.14)	0.6 (0.11)
	Discrimination	0.49 (0.1)	0.45 (0.07)	0.59 (0.11)
	Number of Items	78	58	20
8	Difficulty	0.6 (0.15)	0.62 (0.14)	0.55 (0.14)
	Discrimination	0.48 (0.11)	0.43 (0.08)	0.6 (0.1)
	Number of Items	78	58	20
10	Difficulty	0.54 (0.16)	0.56 (0.16)	0.48 (0.14)
	Discrimination	0.42 (0.14)	0.37 (0.1)	0.59 (0.14)
	Number of Items	126	96	30

**Table 6.1.3.5: MCAS 2006
Average Difficulty and Discrimination of Different Item Types
Grades 5 and 8 Science and Technology/Engineering**

Grade Level	Statistics	Item Type		
		<i>All</i>	<i>Multiple-Choice</i>	<i>Open-Response</i>
5	Difficulty	0.7 (0.15)	0.73 (0.13)	0.52 (0.09)
	Discrimination	0.34 (0.09)	0.31 (0.07)	0.48 (0.07)
	Number of Items	78	68	10
8	Difficulty	0.67 (0.14)	0.7 (0.12)	0.5 (0.15)
	Discrimination	0.41 (0.1)	0.38 (0.07)	0.6 (0.08)
	Number of Items	78	68	10

6.1.4 Differential Item Functioning (DIF)

The *Code of Fair Testing Practices in Education* explicitly states that subgroup differences in performance should be examined when sample sizes permit, and actions should be taken to make certain that differences in performance are due to construct-relevant, rather than irrelevant, factors. The *Standards for Educational and Psychological Testing* includes similar guidelines.

The standardization differential item functioning (DIF) procedure (Dorans and Kulick, 1986) is designed to identify items for which subgroups of interest perform differently, beyond the impact of differences in overall achievement. The DIF procedure 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

A differential performance between two groups on a DIF index may or may not be indicative of bias in the test. Course-taking patterns; group differences in interests; and differences in opportunity to learn, such as a difference in school curricula, can lead to a differential performance between subgroups. If subgroup differences in performance are related to construct-relevant factors, the items should be considered for inclusion on a test.

Similarly, items with DIF indices in the “low” or “high” categories may or may not be biased. Both the *Code of Fair Testing Practices in Education* and the *Standards for Educational and Psychological Testing* assert that test items must be free from construct-irrelevant sources of differential difficulty; if the cause of this differential performance between subgroups is construct-relevant, the item may be included on a test.

For the 2006 MCAS tests, three subgroups were evaluated for DIF:

- male/female
- white/African American
- white/Hispanic

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

The index ranged from -1 to 1 for multiple-choice items and was adjusted to the same scale for short-answer items, open-response items, and writing prompts. A negative number indicated that an item was more difficult for female or non-white students. Dorans and Holland (1993) suggest that index values between -0.05 and 0.05 should be considered negligible. Most MCAS items fall within this range. Dorans and Holland further state that items with values between -0.10 and -0.05 and between 0.05 and 0.10 (i.e., “low” DIF) should be inspected to ensure that no possible effect is overlooked, and that items with values outside the $(-0.10, 0.10)$ range (i.e., “high” DIF) are also unusual and should be carefully examined.

Each 2006 MCAS test item was categorized according to the guidelines adapted from Dorans and Holland (1993).

- **Tables 6.1.4.1.1 to 6.1.4.1.11** show the number of items classified into each DIF category by item type (multiple-choice or open-response; in English Language Arts, open-response includes writing prompts at grades 4, 7, and 10; in Mathematics, open-response includes short-answer items at all grades) and test form. The results show that, for male/female subgroups, no more than two items per form (e.g., grade 10 ELA, form 6) were categorized as having high DIF (category C); for white/African American subgroups, no more than one item per form (e.g., grade 10 Mathematics, form 2) had high DIF; and for white/Hispanic subgroups, no more than three items per form (e.g., grade 4 ELA, form 1) had high DIF. Generally, this evaluation suggests that few items exhibited category C DIF for all subgroups of interest (male/female, white/African American, white/Hispanic) across all grades/content areas of MCAS.
- **Tables 6.1.4.2.1 through 6.1.4.2.5** show the number of items, by item type, in each of the three DIF categories that favor males or females. No more than one common item was categorized as having high DIF (category C) for any test.

6.1.4.1 DIF Analysis by Test Form

**Table 6.1.4.1.1: MCAS 2006
DIF Analysis by Form
Grade 3 Reading**

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

Grade Level	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
3	Common	42	0	0	40	0	0	2	0	0	40	2	0	38	2	0	2	0	0	40	2	0	38	2	0	2	0	0
	1	9	0	0	8	0	0	1	0	0	9	0	0	8	0	0	1	0	0	8	0	1	7	0	1	1	1	0
	2	9	0	0	8	0	0	1	0	0	9	0	0	8	0	0	1	0	0	8	1	0	7	1	0	1	1	0
	3	9	0	0	8	0	0	1	0	0	7	2	0	6	2	0	1	0	0	6	1	2	5	1	2	1	1	0
	4	9	0	0	8	0	0	1	0	0	9	0	0	8	0	0	1	0	0	8	1	0	7	1	0	1	1	0

**Table 6.1.4.1.2: MCAS 2006
DIF Analysis by Form
English Language Arts
Grades 4–8 and 10**

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

Grade Level	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			
4	Common	37	3	0	33	3	0	4	0	0	33	7	0	29	7	0	4	0	0	32	7	1	28	7	1	4	0	0	0	0	0
	1	8	1	0	7	1	0	1	0	0	8	0	1	7	0	1	1	0	0	3	3	3	2	3	3	1	0	0	0	0	0
	2	4	1	0	3	1	0	1	0	0	5	0	0	4	0	0	1	0	0	4	1	0	3	1	0	1	0	0	0	0	0
	3	9	0	0	8	0	0	1	0	0	5	4	0	4	4	0	1	0	0	4	4	1	3	4	1	1	0	0	0	0	0
	4	3	2	0	2	2	0	1	0	0	3	1	1	2	1	1	1	0	0	4	1	0	3	1	0	1	0	0	0	0	0
	5	9	0	0	8	0	0	1	0	0	9	0	0	8	0	0	1	0	0	7	2	0	6	2	0	1	0	0	0	0	0
	6	1	3	1	0	3	1	1	0	0	5	0	0	4	0	0	1	0	0	3	2	0	2	2	0	1	0	0	0	0	0
5	Common	39	1	0	35	1	0	4	0	0	34	6	0	30	6	0	4	0	0	34	5	1	30	5	1	4	0	0	0	0	0
	1	9	0	0	8	0	0	1	0	0	7	1	1	6	1	1	1	0	0	8	1	0	7	1	0	1	0	0	0	0	0
	2	3	2	0	3	1	0	0	1	0	4	1	0	3	1	0	1	0	0	3	1	1	2	1	1	1	0	0	0	0	0
	3	9	0	0	8	0	0	1	0	0	9	0	0	8	0	0	1	0	0	6	3	0	5	3	0	1	0	0	0	0	0
	4	5	0	0	4	0	0	1	0	0	5	0	0	4	0	0	1	0	0	5	0	0	4	0	0	1	0	0	0	0	0
	5	9	0	0	8	0	0	1	0	0	5	4	0	4	4	0	1	0	0	6	2	1	5	2	1	1	0	0	0	0	0
	6	5	0	0	4	0	0	1	0	0	5	0	0	4	0	0	1	0	0	5	0	0	4	0	0	1	0	0	0	0	0
6	Common	34	6	0	31	5	0	3	1	0	36	4	0	32	4	0	4	0	0	36	4	0	32	4	0	4	0	0	0	0	0
	1	8	1	0	8	0	0	0	1	0	9	0	0	8	0	0	1	0	0	7	2	0	6	2	0	1	0	0	0	0	0
	2	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	0	0	0
	3	8	1	0	8	0	0	0	1	0	8	1	0	7	1	0	1	0	0	8	1	0	7	1	0	1	0	0	0	0	0
	4	3	2	0	3	1	0	0	1	0	5	0	0	4	0	0	1	0	0	4	1	0	3	1	0	1	0	0	0	0	0
	5	7	2	0	6	2	0	1	0	0	4	4	1	3	4	1	1	0	0	6	2	1	5	2	1	1	0	0	0	0	0
	6	5	0	0	4	0	0	1	0	0	3	2	0	2	2	0	1	0	0	4	1	0	3	1	0	1	0	0	0	0	0
7	Common	34	5	1	31	4	1	3	1	0	37	3	0	33	3	0	4	0	0	34	5	1	30	5	1	4	0	0	0	0	0
	1	8	1	0	8	0	0	0	1	0	8	1	0	7	1	0	1	0	0	8	1	0	7	1	0	1	0	0	0	0	0
	2	5	0	0	4	0	0	1	0	0	3	2	0	2	2	0	1	0	0	3	2	0	2	2	0	1	0	0	0	0	0
	3	8	0	1	7	0	1	1	0	0	7	2	0	6	2	0	1	0	0	8	1	0	7	1	0	1	0	0	0	0	0
	4	5	0	0	4	0	0	1	0	0	2	2	1	1	2	1	1	0	0	1	4	0	0	4	0	1	0	0	0	0	0
	5	8	1	0	7	1	0	1	0	0	5	3	1	4	3	1	1	0	0	5	3	1	4	3	1	1	0	0	0	0	0
	6	4	1	0	4	0	0	0	1	0	4	1	0	3	1	0	1	0	0	5	0	0	4	0	0	1	0	0	0	0	0
8	Common	36	3	1	34	1	1	2	2	0	37	2	1	33	2	1	4	0	0	34	5	1	30	5	1	4	0	0	0	0	0
	1	7	2	0	6	2	0	1	0	0	5	4	0	4	4	0	1	0	0	8	1	0	7	1	0	1	0	0	0	0	0
	2	4	1	0	4	0	0	0	1	0	3	2	0	2	2	0	1	0	0	3	1	1	2	1	1	1	0	0	0	0	0
	3	7	1	1	6	1	1	1	0	0	9	0	0	8	0	0	1	0	0	7	1	1	6	1	1	1	0	0	0	0	0
	4	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	0	0	0
	5	8	1	0	8	0	0	0	1	0	8	1	0	7	1	0	1	0	0	6	2	1	5	2	1	1	0	0	0	0	0
	6	4	1	0	4	0	0	0	1	0	5	0	0	4	0	0	1	0	0	4	1	0	3	1	0	1	0	0	0	0	0
10	Common	37	3	0	34	2	0	3	1	0	34	6	0	30	6	0	4	0	0	35	5	0	31	5	0	4	0	0	0	0	0
	1	12	2	0	11	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2	8	6	0	7	5	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3	10	3	0	9	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	4	8	5	1	7	4	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	5	12	2	0	12	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	6	8	4	2	8	2	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	7	7	6	0	7	4	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	8	7	6	1	6	5	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

**Table 6.1.4.1.3: MCAS 2006
DIF Analysis by Form
Grade 3 Mathematics**

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	32	2	1	23	1	1	9	1	0	30	4	1	21	3	1	9	1	0	30	5	0	21	4	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	0	1	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1
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	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	2	0	1	2	0	0	0	0	1	2	0	1	2	0	0	0	0	1
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	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	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	1	2	0	0	2	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	1	2	0	1	1	0	0	1	0	2	1	0	2	0	0	0	1	0
12	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
13	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
14	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
15	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

**Table 6.1.4.1.4: MCAS 2006
DIF Analysis by Form
Grade 4 Mathematics**

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	36	3	0	27	2	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	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
4	3	1	0	2	1	0	1	0	0	3	0	1	3	0	0	0	0	1	3	1	0	3	0	0	0	1	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	2	2	0	1	2	0	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	2	2	0	1	2	0	1	0	0	4	0	0	3	0	0	1	0	0	2	2	0	1	2	0	1	0	0
9	2	0	0	1	0	0	1	0	0	1	1	0	1	0	0	0	1	0	2	0	0	1	0	0	1	0	0
10	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
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	2	1	0	2	1	0	0	0	0	3	0	0	3	0	0	0	0	0
13	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
14	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
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 6.1.4.1.5: MCAS 2006
DIF Analysis by Form
Grade 5 Mathematics**

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	5	0	25	4	0	9	1	0	33	5	1	27	2	0	6	3	1	34	4	1	26	3	0	8	1	1
1	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
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	4	0	0	3	0	0	1	0	0	3	1	0	3	0	0	0	1	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	3	1	0	2	1	0	1	0	0	4	0	0	3	0	0	1	0	0
7	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
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	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
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	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 6.1.4.1.6: MCAS 2006
DIF Analysis by Form
Grade 6 Mathematics**

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	22	7	0	9	1	0	37	2	0	28	1	0	9	1	0	39	0	0	29	0	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	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	0	1	1	0	0	0	0	1	1	1	0	1	0	0	0	1	0
4	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
5	2	0	0	1	0	0	1	0	0	1	1	0	1	0	0	0	1	0	2	0	0	1	0	0	1	0	0
6	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
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	4	0	0	3	0	0	1	0	0	3	1	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	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	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	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
13	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
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 6.1.4.1.7: MCAS 2006
DIF Analysis by Form
Grade 7 Mathematics**

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	4	0	25	4	0	10	0	0	37	2	0	28	1	0	9	1	0	38	1	0	28	1	0	10	0	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	0	1	0	1	0	0	2	0	0	1	0	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	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
7	2	2	0	1	2	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	3	1	0	2	1	0	1	0	0	3	1	0	2	1	0	1	0	0
9	5	0	0	4	0	0	1	0	0	4	1	0	4	0	0	0	1	0	3	2	0	2	2	0	1	0	0
10	4	1	0	3	1	0	1	0	0	3	2	0	2	2	0	1	0	0	5	0	0	4	0	0	1	0	0
11	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
12	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

**Table 6.1.4.1.8: MCAS 2006
DIF Analysis by Form
Grade 8 Mathematics**

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	1	1	27	1	1	10	0	0	35	4	0	26	3	0	9	1	0	37	2	0	27	2	0	10	0	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	1	0	1	0	0	1	1	0	0	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0
3	0	2	0	0	1	0	0	1	0	1	1	0	1	0	0	0	1	0	1	1	0	0	1	0	1	0	0
4	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
5	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
6	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
7	4	0	0	3	0	0	1	0	0	3	0	1	2	0	1	1	0	0	4	0	0	3	0	0	1	0	0
8	3	1	0	2	1	0	1	0	0	2	2	0	2	1	0	0	1	0	3	1	0	2	1	0	1	0	0
9	3	2	0	2	2	0	1	0	0	5	0	0	4	0	0	1	0	0	4	1	0	3	1	0	1	0	0
10	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
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	3	1	0	3	1	0	0	0	0	4	0	0	4	0	0	0	0	0

**Table 6.1.4.1.9: MCAS 2006
DIF Analysis by Form
Grade 10 Mathematics**

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	39	3	0	29	3	0	10	0	0	39	3	0	29	3	0	10	0	0	41	1	0	31	1	0	10	0	0
1	3	1	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	2	1	1	0	0	0
2	2	1	0	2	0	0	0	1	0	2	0	1	1	0	1	1	0	0	2	1	0	1	1	0	1	0	0
3	3	1	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0
4	3	0	0	1	0	0	2	0	0	1	0	0	0	0	0	1	0	0	1	1	1	0	0	1	1	1	1
5	3	1	0	2	1	0	1	0	0	0	0	0	0	0	0	0	0	0	2	0	2	2	0	1	0	0	1
6	2	1	0	1	1	0	1	0	0	2	1	0	2	0	0	0	1	0	1	1	1	1	1	0	0	0	1
7	4	0	0	3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3	1	0	2	1	0	1	0	0
8	3	0	0	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	4	0	0	3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3	1	0	2	1	0	1	0	0
10	2	1	0	1	1	0	1	0	0	2	0	0	1	0	0	1	0	0	2	0	1	1	0	1	1	0	0
11	4	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	1	0	0	0
12	2	1	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	1	0	0
13	3	1	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0
14	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0
15	2	2	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	3	1	0	0	0	0
16	2	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1
17	3	1	0	2	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	2	1	1	1	1	0	1	0
18	2	1	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0
19	4	0	0	3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2	2	0	2	1	0	0	1	0
20	3	0	0	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2	1	0	1	1	0	1	0	0
21	4	0	0	3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	2	1	1	1	0	0	1
22	2	1	0	1	1	0	1	0	0	1	0	0	1	0	0	0	0	0	3	0	0	2	0	0	1	0	0
23	3	1	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	3	1	0	0	0	0
24	2	1	0	1	1	0	1	0	0	0	0	1	0	0	1	0	0	0	0	0	2	0	0	1	0	0	1
25	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0

**Table 6.1.4.1.10: MCAS 2006
DIF Analysis by Form
Grade 5 Science and Technology/Engineering**
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	38	0	1	33	0	1	5	0	0	35	4	0	30	4	0	5	0	0	32	6	1	27	6	1	5	0	0
1	3	0	0	3	0	0	0	0	0	1	2	0	1	2	0	0	0	0	0	1	1	1	1	1	0	0	0
2	4	0	0	4	0	0	0	0	0	3	1	0	3	1	0	0	0	0	3	0	1	3	0	1	0	0	0
3	2	1	0	2	0	0	0	1	0	2	1	0	1	1	0	1	0	0	1	2	0	0	2	0	1	0	0
4	3	0	0	3	0	0	0	0	0	1	2	0	1	2	0	0	0	0	0	2	1	0	2	1	0	0	0
5	3	0	0	3	0	0	0	0	0	2	1	0	2	1	0	0	0	0	0	3	0	0	3	0	0	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	3	0	0	2	0	0	1	0	0	2	1	0	1	1	0	1	0	0	2	1	0	1	1	0	1	0	0
8	3	0	0	2	0	0	1	0	0	2	1	0	1	1	0	1	0	0	2	1	0	1	1	0	1	0	0
9	2	1	0	2	1	0	0	0	0	1	2	0	1	2	0	0	0	0	0	2	1	0	2	1	0	0	0
10	3	0	0	3	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0	2	1	0	2	1	0	0	0
11	2	1	0	2	1	0	0	0	0	3	0	0	3	0	0	0	0	0	0	2	1	0	2	1	0	0	0
12	3	1	0	2	1	0	1	0	0	4	0	0	3	0	0	1	0	0	0	3	1	0	3	0	0	0	1

**Table 6.1.4.1.11: MCAS 2006
DIF Analysis by Form
Grade 8 Science and Technology/Engineering**
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	5	0	29	5	0	5	0	0	33	6	0	29	5	0	4	1	0	35	4	0	31	3	0	4	1	0
1	3	0	0	3	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0	3	0	0	3	0	0	0	0
2	4	0	0	4	0	0	0	0	0	3	1	0	3	1	0	0	0	0	0	3	1	0	3	1	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	2	1	0	2	1	0	0	0	0	2	1	0	2	1	0	0	0	0	0	3	0	0	3	0	0	0	0
5	3	0	0	3	0	0	0	0	0	2	1	0	2	1	0	0	0	0	0	3	0	0	3	0	0	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	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	3	0	0	2	0	0	1	0	0	1	1	1	0	1	1	1	0	0	3	0	0	2	0	0	1	0	0
9	3	0	0	3	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0	2	1	0	2	1	0	0	0
10	2	1	0	2	1	0	0	0	0	2	1	0	2	1	0	0	0	0	0	1	2	0	1	2	0	0	0
11	3	0	0	3	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	1	2	0	1	2	0	0	0
12	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

6.1.4.2 DIF Categorization by Gender and Item Type

**Table 6.1.4.2.1: MCAS 2006
DIF Categorization by Gender and Item Type
Grade 3 Reading**

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	%
3	MC	38	34	72	100%	0	0	0	0	0	0	0	0
	OR	3	3	6	100%	0	0	0	0	0	0	0	0

**Table 6.1.4.2.2: MCAS 2006
DIF Categorization by Gender and Item Type
English Language Arts
Grades 4–8 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	%
4	MC	35	26	61	85%	1	9	10	14%	0	1	1	1%
	OR	9	1	10	100%	0	0	0	0%	0	0	0	0
5	MC	33	37	70	97%	0	2	2	3%	0	0	0	0
	OR	9	0	9	90%	1	0	1	10%	0	0	0	0
6	MC	29	34	63	88%	0	9	9	13%	0	0	0	0
	OR	6	0	6	60%	4	0	4	4%	0	0	0	0
7	MC	28	37	65	90%	0	5	5	7%	0	2	2	3%
	OR	7	0	7	70%	3	0	3	30%	0	0	0	0
8	MC	28	38	66	92%	0	4	4	6%	0	2	2	3%
	OR	5	0	5	50%	5	0	5	50%	0	0	0	0
10	MC	60	41	101	78%	9	16	25	19%	1	3	4	3%
	OR	8	0	8	40%	12	0	12	60%	0	0	0	0

**Table 6.1.4.2.3: MCAS 2006
DIF Categorization by Gender and Item Type
Mathematics
Grade 3**

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	25	23	48	96%	0	1	1	2%	0	1	1	2%
	OR	9	8	17	85%	1	2	3	15%	0	0	0	0

**Table 6.1.4.2.4: MCAS 2006
DIF Categorization by Gender and Item Type
Mathematics
Grades 4–8 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	%
4	MC	35	16	51	88%	0	7	7	12%	0	0	0	0
	OR	11	8	19	95%	0	1	1	5%	0	0	0	0
5	MC	31	22	53	91%	1	4	5	9%	0	0	0	0
	OR	14	5	19	95%	1	0	1	5%	0	0	0	0
6	MC	32	15	47	81%	2	9	11	19%	0	0	0	0
	OR	13	5	18	90%	1	1	2	10%	0	0	0	0
7	MC	33	18	51	88%	2	5	7	12%	0	0	0	0
	OR	13	6	19	95%	0	1	1	5%	0	0	0	0
8	MC	31	19	50	86%	1	5	6	10%	0	2	2	3%
	OR	11	7	18	90%	0	2	2	10%	0	0	0	0
10	MC	30	50	80	83%	0	16	16	17%	0	0	0	0
	OR	15	13	28	93%	2	0	2	7%	0	0	0	0

**Table 6.1.4.2.5: MCAS 2006
DIF Categorization 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	33	31	64	94%	1	2	3	4%	0	1	1	1%
	OR	7	2	9	90%	1	0	1	10%	0	0	0	0
8	MC	19	41	60	88%	0	8	8	12%	0	0	0	0
	OR	10	0	10	100%	0	0	0	0	0	0	0	0

6.1.5 Item Response Theory (IRT) Analyses

IRT uses mathematical models to define the relationship between an unobserved measure of student ability, usually termed as *theta* (θ), and the probability (*p*) of the student getting a dichotomous item correct or of getting a particular score on a polytomous item. In IRT, it is assumed that all items are independent measures of the same construct (i.e., the same θ).

The process of determining the specific mathematical relationship between θ and *p* is called *item calibration*. After items are calibrated, they are defined by a set of parameters that specify a nonlinear, monotonically increasing relationship between θ and *p*. Once the item parameters are known, the $\hat{\theta}$ for each student can be calculated.

All MCAS items were calibrated using IRT. In IRT, $\hat{\theta}$ is considered to be an estimate of a student's true score, or a general representation of student performance, and has some

characteristics that may make its use preferable to the use of raw scores in rank-ordering students in terms of ability.

Several common IRT models are used to specify the relationship between θ and p (Hambleton and van der Linden, 1997; Hambleton and Swaminathan, 1985). For MCAS 2006, the 3PL model was used for dichotomous items. The 3PL model can be defined as:

$$P_i(1|\theta_j) = c_i + (1 - c_i) \frac{\exp Da_i(\theta_j - b_i)}{1 + \exp Da_i(\theta_j - b_i)}$$

where i indexes the items,
 j indexes students,
 a represents item discrimination,
 b represents item difficulty,
 c is the pseudo-guessing parameter, and
 D is a normalizing constant equal to approximately 1.701.

The graded-response model (GRM) was used for polytomous MCAS 2006 items. In the GRM, an item is scored in $m + 1$ graded categories that can be viewed as a set of m dichotomies. At each point of dichotomization (i.e., at each threshold), a two-parameter model can be used. This implies that a polytomous item with $m + 1$ categories can be characterized by m item category threshold curves (ICTC) of the two-parameter logistic form:

$$P_{ik}^*(1|\theta_j) = \frac{\exp Da_i(\theta_j - b_i + d_{ik})}{1 + \exp Da_i(\theta_j - b_i + d_{ik})}$$

where i indexes the items,
 j indexes students,
 k indexes threshold,
 a represents item discrimination,
 b represents item difficulty,
 d represents threshold, and
 D is a normalizing constant equal to 1.701.

After computing m ICTCs in the GRM, $m + 1$ item category characteristic curves (ICCC) are derived by subtracting adjacent ICTC curves:

$$P_{ik}(1|\theta_j) = P_{i(k-1)}^*(1|\theta_j) - P_{ik}^*(1|\theta_j)$$

where
 P_{ik} represents the probability that the score on item i falls in category k
 P_{ik}^* represents the probability that the score on item i falls above the threshold k ($P_{i0}^* = 1$
and $P_{i(m+1)}^* = 0$)

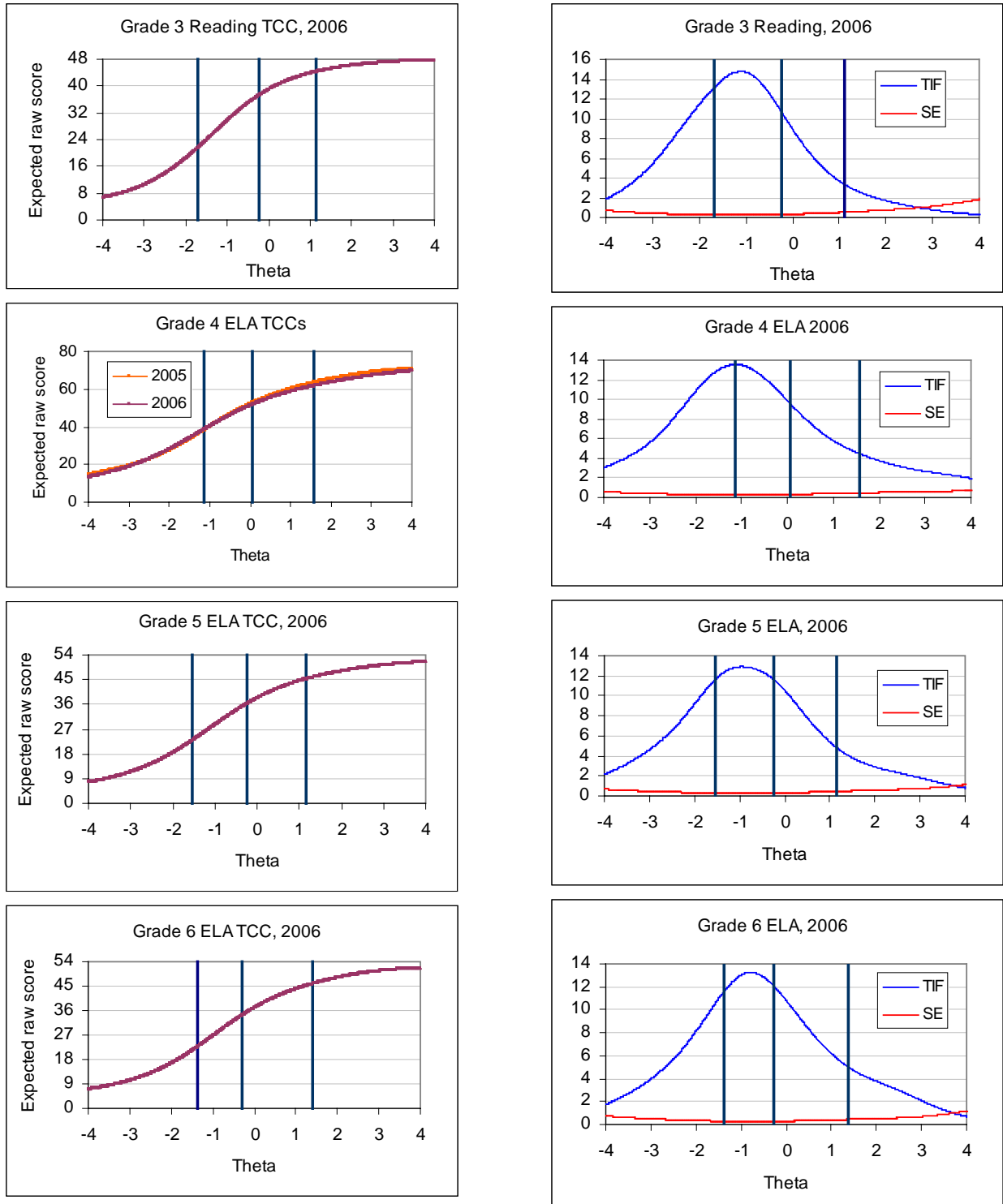
Finally, the item characteristic curve (ICC) for polytomous items is computed as a weighted sum of ICCs, where each ICC is weighted by a score assigned to a corresponding category:

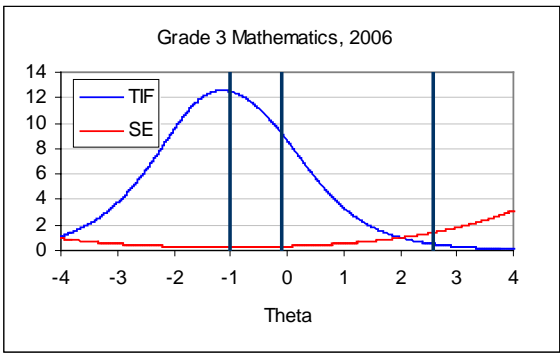
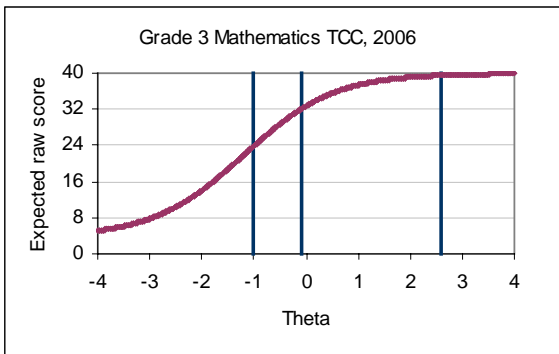
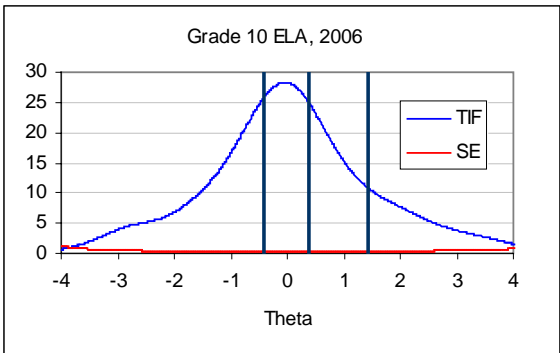
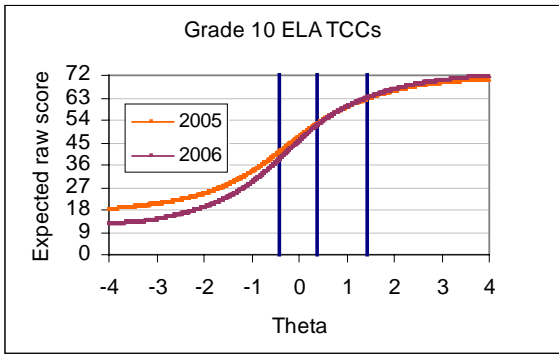
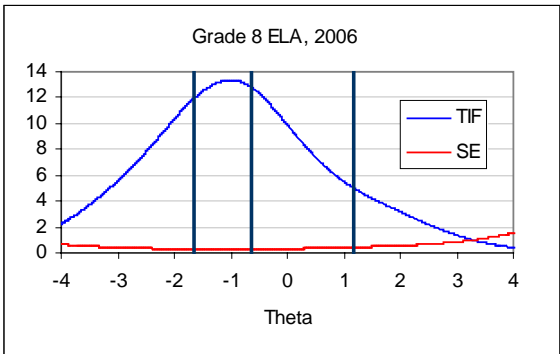
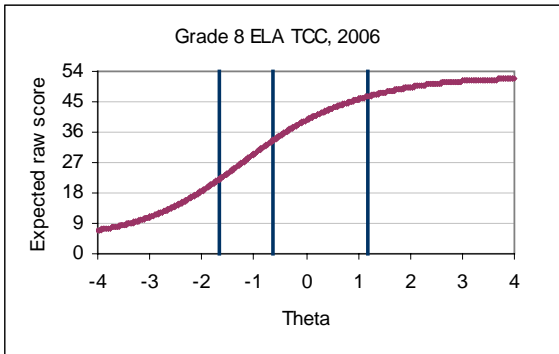
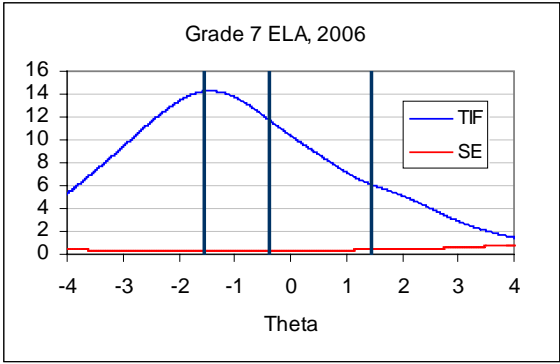
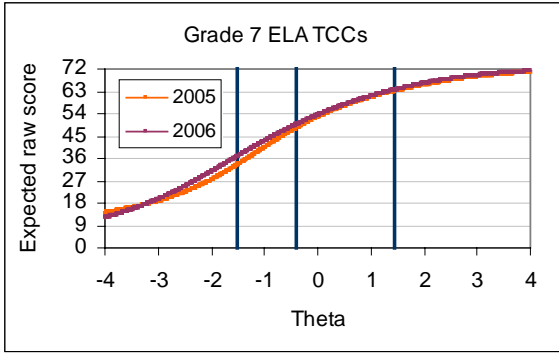
$$P_i(1 | \theta_j) = \sum_k^{m+1} w_{ik} P_{ik}(1 | \theta_j)$$

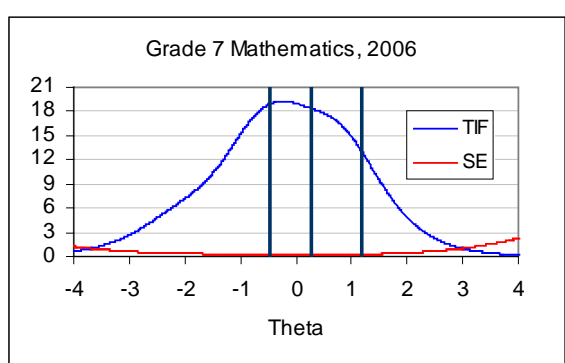
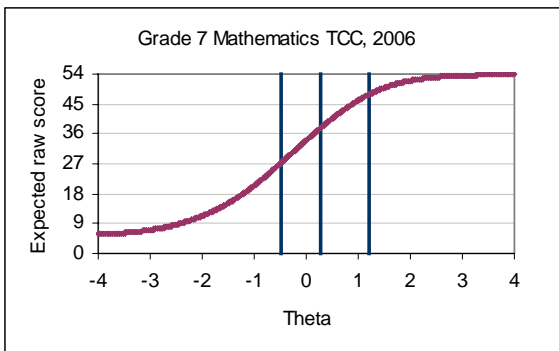
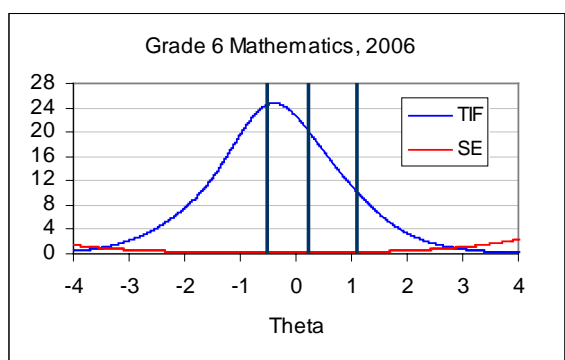
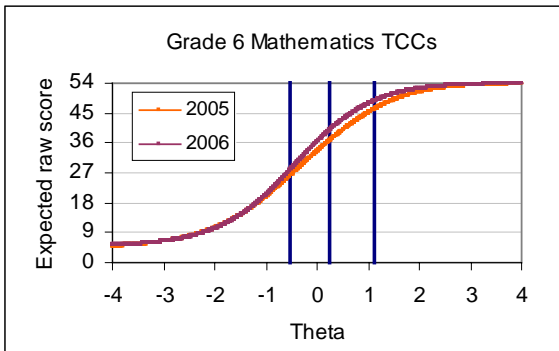
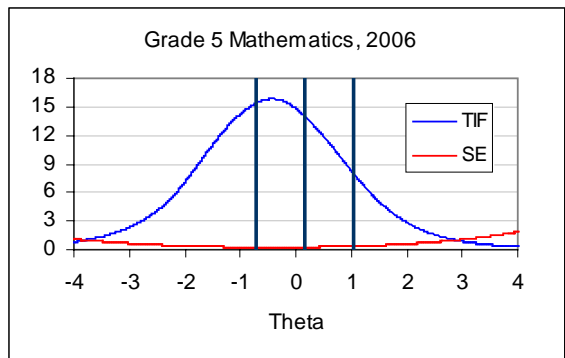
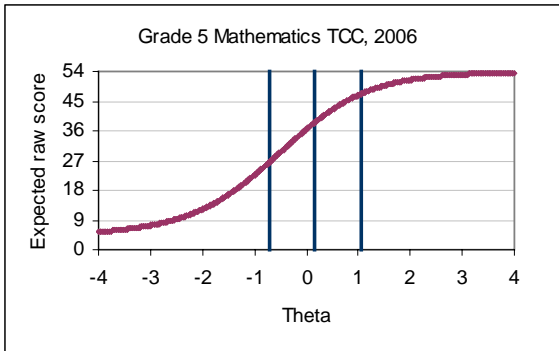
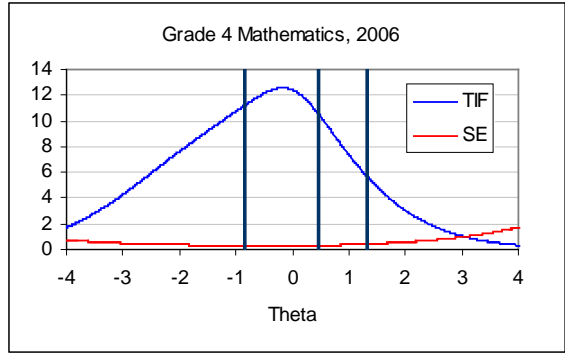
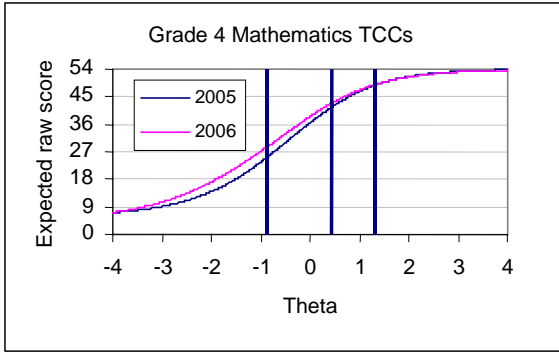
For more information about item calibration and determination, the reader is referred to Lord and Novick (1968) or Hambleton and Swaminathan (1985). For information about the GRM, see Ostini and Nering (2006).

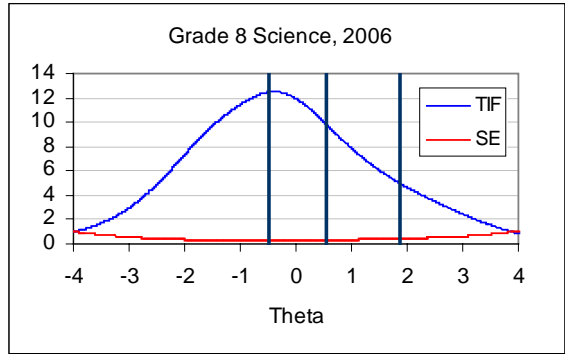
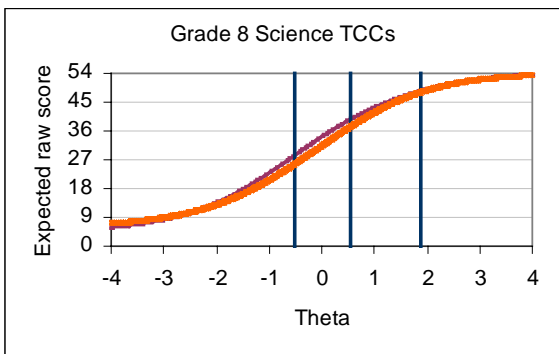
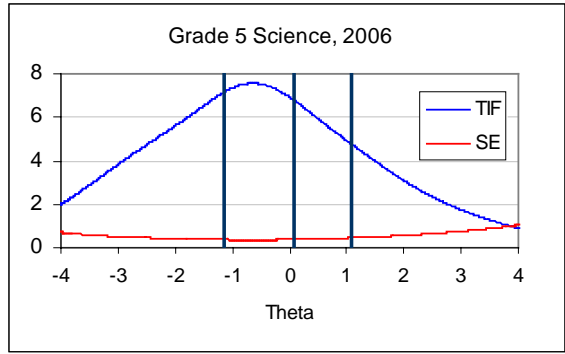
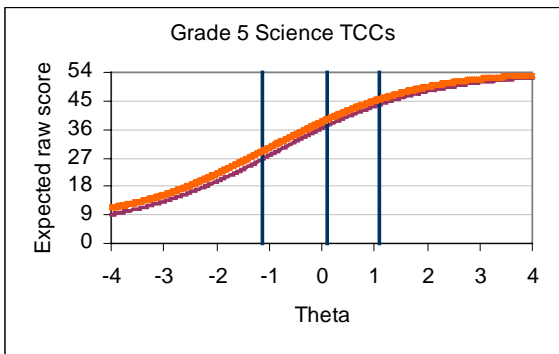
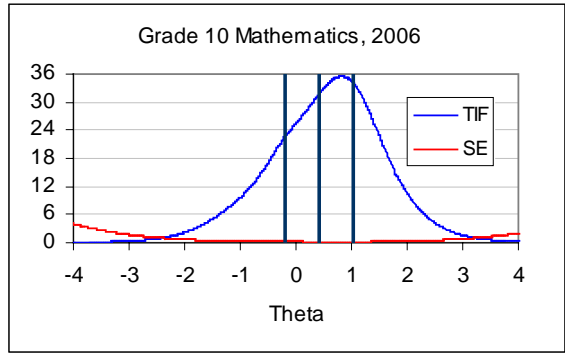
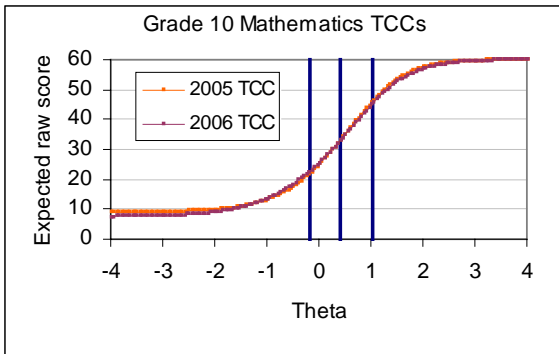
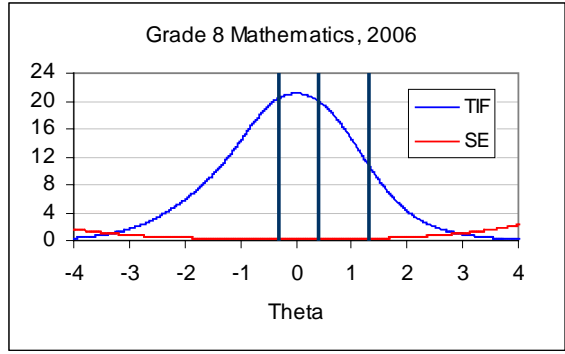
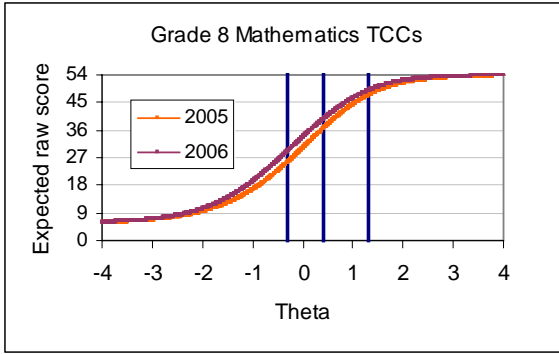
MCAS 2006 test characteristic, test information, and standard error curves for grades 3 through 8 and 10 English Language Arts/Reading and Mathematics are presented in Figure 6.1.5.A (pages 168 through 171). The figure also shows test characteristic curves for MCAS 2005 English Language Arts (grades 4, 7, and 10), Mathematics (grades 4, 6, 8, and 10), and Science and Technology/Engineering (grades 5 and 8).

Figure 6.1.5.A: MCAS 2006 Test Characteristic, Test Information, and Standard Error of Measurement Curves (Grade 3 Reading; grades 4–8 and 10 English Language Arts; grades 3–8 and 10 Mathematics), and MCAS 2005 Test Characteristic Curves (grades 4, 7, 10 English Language Arts; grades 4, 6, 8, 10 Mathematics)









6.2 Assessment Reliability

Items that function well together will produce an assessment that has a low amount of error, and which is therefore described as reliable.

There are a number of ways to estimate an assessment's reliability. One approach is to split all test items into two groups and then correlate students' scores on the two half-tests. This procedure is known as a *split-half estimate of reliability*. If the two half-test scores correlate highly, items on the two half-tests are likely to be measuring very similar knowledge or skills. This is evidence that the items complement one another and function well as a group. This also suggests that measurement error will be minimal.

The split-half method requires psychometricians to select items that contribute to each half-test score. This decision may have an impact on the resulting correlation. Cronbach (1951) provided a statistic that avoids this concern about the split-half method. Cronbach's α coefficient is an estimate of the average of all possible split-half reliability coefficients. Cronbach's α 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

σ_x^2 represents the total test variance.

6.2.1 Reliability and Standard Errors of Measurement

Table 6.2.1 presents descriptive statistics, Cronbach's α coefficient, and raw score standard errors of measurement for each 2006 MCAS test administration and grade level.

**Table 6.2.1: MCAS 2006
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	Minimum Score	Maximum Score	Mean Score	SD	Rel	SEM
Reading	3	69,795	48	0	48	36.07	8.55	0.90	2.64
English Language Arts (Composition not included)	4	70,193	52	0	52	35.53	7.86	0.88	2.78
	5	71,690	52	0	52	36.23	8.64	0.90	2.77
	6	72,452	52	0	52	35.62	8.75	0.89	2.88
	7	73,556	52	0	52	37.00	8.55	0.90	2.76
	8	75,346	52	0	52	37.34	8.97	0.90	2.82
Mathematics	10	70,070	52	0	52	38.61	8.13	0.90	2.58
	3	69,792	40	0	40	31.07	7.22	0.88	2.51
	4	70,300	54	0	54	38.40	9.93	0.88	3.39
	5	71,744	54	0	54	34.51	11.73	0.90	3.78
	6	72,484	54	0	54	35.52	12.62	0.93	3.43
	7	73,659	54	0	54	32.97	12.05	0.92	3.43
Science and Technology/Engineering	8	75,300	54	0	54	33.55	12.52	0.92	3.56
	10	72,316	60	0	60	38.71	13.93	0.93	3.82
	5	71,779	54	0	54	35.62	8.07	0.83	3.32
	8	75,328	54	0	54	33.60	9.96	0.89	3.36

6.2.2 Stratified Coefficient Alpha (α)

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 coefficient α is built on the assumption that there are no such local or clustered dependencies. A stratified version of coefficient α corrects for this problem:

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

where

j indexes the subtests or categories,

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

α is the unstratified Cronbach's α coefficient, and

σ_x^2 represents the total test variance.

Stratified coefficient α was calculated separately for each grade/content combination. The stratification was based on item types (multiple-choice v. open-response). These 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 2006 Test Coefficients
Cronbach's α and Stratified α**

Content Area	Grade Level	Cronbach's α	Cronbach's α_{mc}	N_{mc}	Cronbach's α_{or}	N_{or}	Stratified α
Reading	3	0.90	0.90	40	0.56	2 (8)	0.91
English Language Arts	4	0.88	0.86	36	0.72	4 (16)	0.89
	5	0.90	0.89	36	0.77	4 (16)	0.91
	6	0.89	0.88	36	0.77	4 (16)	0.91
	7	0.90	0.88	36	0.83	4 (16)	0.91
	8	0.90	0.89	36	0.79	4 (16)	0.92
	10	0.90	0.88	36	0.84	4 (16)	0.92
Mathematics	3	0.88	0.85	25	0.70	10 (15)	0.88
	4	0.88	0.84	29	0.78	10 (25)	0.89
	5	0.90	0.87	29	0.78	10 (25)	0.90
	6	0.93	0.90	29	0.85	10 (25)	0.93
	7	0.92	0.88	29	0.84	10 (25)	0.93
	8	0.92	0.89	29	0.84	10 (25)	0.93
	10	0.92	0.88	32	0.88	10 (28)	0.94
Science and Technology/Engineering	5	0.83	0.80	34	0.67	5 (20)	0.85
	8	0.89	0.87	34	0.77	5 (20)	0.90

6.2.3 Reliability of Performance Level Categorization

All test scores contain measurement error; thus, classifications based on test scores are also subject to measurement error. For the 2006 MCAS administration, after students were classified into performance levels, empirical analyses were conducted to determine the statistical accuracy and consistency of those classifications.

6.2.3.1 Accuracy

Accuracy refers to the extent to which decisions based on test scores match decisions that would have been made if the scores did not contain any measurement error. Accuracy must be estimated because errorless test scores do not exist.

6.2.3.2 Consistency

Consistency measures the extent to which classification decisions based on test scores match the decisions based on scores from a second, parallel form of the same test. Consistency can be evaluated directly from actual responses to test items if two complete, parallel forms of the test are administered to the same group of students. This is usually impractical, especially on lengthy tests, such as the MCAS administration. To overcome this issue, techniques have been developed to estimate both accuracy and consistency of classification decisions on the basis of a single administration of a test. The technique developed by Livingston and Lewis (1995) was used for MCAS because their technique can be used with both open-response and multiple-choice items.

6.2.3.3 Calculating Accuracy and Consistency

All of the accuracy and consistency estimation techniques described herein make use of the concept of “true scores” in the sense of classical test theory. A true score is the score that would be obtained on a test that had no measurement error. It is a theoretical concept that cannot be observed, although it can be estimated. Following Livingston and Lewis (1995), the true-score distribution for the MCAS tests was estimated using a four-parameter beta distribution, which is a flexible model that allows for extreme degrees of skewness in test scores.

In the Livingston and Lewis method, the estimated true scores are used to classify students into their “true” performance categories, labeled “true status.” After various technical adjustments (described in Livingston and Lewis, 1995), to calculate accuracy, a 4×4 contingency table was created for each content area test and grade level. The cells in the table show the proportions of students who were classified into each performance category by their actual (or observed) scores on the MCAS test and by their true scores (i.e., true status).

To estimate consistency, the true scores are used to estimate the distribution of classifications on an independent, parallel test form. After statistical adjustments (see Livingston and Lewis, 1995), a new 4×4 contingency table was created for each MCAS test and grade level that showed the proportions of students who were classified into each performance category by the actual test and who would be classified into each performance category by another (hypothetical) parallel test form. Consistency, which is the proportion of students classified into exactly the same categories by both forms of the test, is the sum of the diagonal for the new contingency table.

6.2.3.4 Kappa (κ)

Another way to measure consistency is to use Cohen’s (1960) coefficient κ (kappa), which assesses the proportion of consistent classifications after removing the proportion of consistent classification that would be expected by chance. Cohen’s κ can be used to estimate the classification consistency of a test from two parallel forms of the test. The second form in this case was the one estimated using the Livingston and Lewis (1995) method. Because Cohen’s κ is corrected for chance, the values of κ are lower than other consistency estimates.

6.2.3.5 Results of Accuracy, Consistency, and Kappa Analyses

Summaries of the accuracy and consistency analyses are provided in tables 6.2.3.5.1 through 6.2.3.5.16.

The first section of each table shows the overall accuracy and consistency indices, as well as κ . The overall index is, as described, 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 0.8147 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, 81.47 percent would be expected to be in the *Needs Improvement* category if categorized according to their actual scores. The corresponding consistency value of 0.7574 indicates that 75.74 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 used.

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 6.2.3.5.1: 2006 MCAS
Accuracy and Consistency
Grade 3 Reading**

Overall Indices	Accuracy	Consistency		Kappa (κ)	
	0.803	0.7253		0.5985	
Indices Conditional on Level	Performance Level	Accuracy		Consistency	
	<i>Warning/Failing</i>	0.823		0.6945	
	<i>Needs Improvement</i>	0.8413		0.788	
	<i>Proficient</i>	0.7331		0.6495	
	<i>Above Proficient</i>	0.8437		0.7348	
Indices at Cut Points	Accuracy			Consistency	
	Accuracy	False Positives	False Negatives		
	<i>W: NI</i>	0.9715	0.0104	0.0181	0.9594
	<i>NI :P</i>	0.9074	0.0472	0.0453	0.87
	<i>P:AP</i>	0.9240	0.0477	0.0283	0.8938

**Table 6.2.3.5.2: 2006 MCAS
Accuracy and Consistency
Grade 4 English Language Arts**

Overall Indices	Accuracy		Consistency		Kappa (κ)
		0.7965		0.7145	
Indices Conditional on Level	Accuracy		Consistency		
	<i>Warning/Failing</i>		0.8169		0.691
	<i>Needs Improvement</i>		0.8147		0.7574
	<i>Proficient</i>		0.7664		0.6871
	<i>Advanced</i>		0.8024		0.6457
Indices at Cut Points	Accuracy			Consistency	
	Accuracy	False Positives	False Negatives		
	<i>W:NI</i>	0.9526	0.0177	0.0297	0.9329
	<i>NI:P</i>	0.894	0.0556	0.0504	0.8519
	<i>P:A</i>	0.9498	0.0336	0.0165	0.9286

**Table 6.2.3.5.3: 2006 MCAS
Accuracy and Consistency
Grade 5 English Language Arts**

Overall Indices	Accuracy		Consistency		Kappa (κ)
		0.8108		0.7346	
Indices Conditional on Level	Accuracy		Consistency		
	<i>Warning/Failing</i>		0.8200		0.6886
	<i>Needs Improvement</i>		0.8298		0.7705
	<i>Proficient</i>		0.7817		0.7123
	<i>Advanced</i>		0.8356		0.7235
Indices at Cut Points	Accuracy			Consistency	
	Accuracy	False Positives	False Negatives		
	<i>W: NI</i>	0.9694	0.0110	0.0195	0.9565
	<i>NI:P</i>	0.9069	0.0464	0.0468	0.8695
	<i>P:A</i>	0.9344	0.0409	0.0247	0.9079

**Table 6.2.3.5.4: 2006 MCAS
Accuracy and Consistency
Grade 6 English Language Arts**

Overall Indices	Accuracy		Consistency		Kappa (κ)
		0.8293		0.7598	
Indices Conditional on Level	Accuracy		Consistency		
	<i>Warning/Failing</i>		0.8176		0.6829
	<i>Needs Improvement</i>		0.8143		0.7464
	<i>Proficient</i>		0.8424		0.7972
	<i>Advanced</i>		0.8196		0.6841
Indices at Cut Points	Accuracy			Consistency	
	Accuracy	False Positives	False Negatives		
	<i>W:NI</i>	0.9705	0.0105	0.019	0.958
	<i>NI:P</i>	0.9102	0.0434	0.0463	0.8743
	<i>P:A</i>	0.9485	0.0336	0.0179	0.9274

**Table 6.2.3.5.5: 2006 MCAS
Accuracy and Consistency
Grade 7 English Language Arts**

Overall Indices	Accuracy		Consistency		Kappa (κ)
		0.8202		0.7469	
Indices Conditional on Level	Accuracy		Consistency		
	<i>Warning/Failing</i>		0.8262		0.7053
	<i>Needs Improvement</i>		0.7938		0.7182
	<i>Proficient</i>		0.8362		0.7878
	<i>Advanced</i>		0.8209		0.6908
Indices at Cut Points	Accuracy			Consistency	
		Accuracy	False Positives		False Negatives
	<i>W:NI</i>	0.9642	0.0134	0.0224	0.9492
	<i>NI:P</i>	0.9093	0.044	0.0467	0.8725
<i>P:A</i>	0.9467	0.0343	0.019	0.925	

**Table 6.2.3.5.6: 2006 MCAS
Accuracy and Consistency
Grade 8 English Language Arts**

Overall Indices	Accuracy		Consistency		Kappa (κ)
		0.8435		0.7799	
Indices Conditional on Level	Accuracy		Consistency		
	<i>Warning/Failing</i>		0.8234		0.6928
	<i>Needs Improvement</i>		0.7949		0.7132
	<i>Proficient</i>		0.8676		0.8341
	<i>Advanced</i>		0.8321		0.7125
Indices at Cut Points	Accuracy			Consistency	
		Accuracy	False Positives		False Negatives
	<i>W:NI</i>	0.9764	0.0085	0.0151	0.9664
	<i>NI:P</i>	0.9259	0.0342	0.0399	0.8959
<i>P:A</i>	0.9412	0.0374	0.0214	0.9175	

**Table 6.2.3.5.7: 2006 MCAS
Accuracy and Consistency
Grade 10 English Language Arts**

Overall Indices	Accuracy		Consistency		Kappa (κ)
		0.826		0.7558	
Indices Conditional on Level	Accuracy		Consistency		
	<i>Warning/Failing</i>		0.8239		0.6965
	<i>Needs Improvement</i>		0.8264		0.7605
	<i>Proficient</i>		0.8174		0.7618
	<i>Advanced</i>		0.8487		0.7515
Indices at Cut Points	Accuracy			Consistency	
		Accuracy	False Positives		False Negatives
	<i>W:NI</i>	0.9758	0.0088	0.0153	0.9656
	<i>NI:P</i>	0.9169	0.0400	0.0431	0.8833
<i>P:A</i>	0.9333	0.0404	0.0262	0.9067	

**Table 6.2.3.5.8: 2006 MCAS
Accuracy and Consistency
Grade 3 Mathematics**

Overall Indices	Accuracy		Consistency		Kappa (κ)
		0.7738		0.6862	
Indices Conditional on Level	Accuracy		Consistency		
	<i>Warning/Failing</i>		0.8296		0.7243
	<i>Needs Improvement</i>		0.7293		0.6428
	<i>Proficient</i>		0.7917		0.7406
	<i>Above Proficient</i>		0.7425		0.4559
Indices at Cut Points	Accuracy			Consistency	
	Accuracy	<i>False Positives</i>	<i>False Negatives</i>		
	<i>W:NI</i>	0.9379	0.0251	0.037	0.9123
	<i>NI:P</i>	0.8883	0.0584	0.0533	0.844
	<i>P:AP</i>	0.9475	0.0448	0.0076	0.9272

**Table 6.2.3.5.9: 2006 MCAS
Accuracy and Consistency
Grade 4 Mathematics**

Overall Indices	Accuracy		Consistency		Kappa (κ)
		0.7735		0.6893	
Indices Conditional on Level	Accuracy		Consistency		
	<i>Warning/Failing</i>		0.8325		0.7239
	<i>Needs Improvement</i>		0.8181		0.7663
	<i>Proficient</i>		0.6314		0.5244
	<i>Advanced</i>		0.8123		0.6684
Indices at Cut Points	Accuracy			Consistency	
	Accuracy	<i>False Positives</i>	<i>False Negatives</i>		
	<i>W:NI</i>	0.944	0.0221	0.0339	0.9207
	<i>NI:P</i>	0.8976	0.0567	0.0457	0.8569
	<i>P:A</i>	0.9304	0.0462	0.0234	0.9021

**Table 6.2.3.5.10: 2006 MCAS
Accuracy and Consistency
Grade 5 Mathematics**

Overall Indices	Accuracy		Consistency		Kappa (κ)
		0.7594		0.6688	
Indices Conditional on Level	Accuracy		Consistency		
	<i>Warning/Failing</i>		0.8639		0.7888
	<i>Needs Improvement</i>		0.7604		0.6798
	<i>Proficient</i>		0.6554		0.5505
	<i>Advanced</i>		0.789		0.6607
Indices at Cut Points	Accuracy			Consistency	
	Accuracy	<i>False Positives</i>	<i>False Negatives</i>		
	<i>W:NI</i>	0.9313	0.03	0.0387	0.9033
	<i>NI:P</i>	0.9054	0.0497	0.0449	0.8672
	<i>P:A</i>	0.9218	0.0477	0.0305	0.8903

**Table 6.2.3.5.11: 2006 MCAS
Accuracy and Consistency
Grade 6 Mathematics**

Overall Indices	Accuracy	Consistency			Kappa (κ)
		0.7851	0.701		
Indices Conditional on Level	Accuracy			Consistency	
	<i>Warning/Failing</i>	0.8902			0.8349
	<i>Needs Improvement</i>	0.775			0.6926
	<i>Proficient</i>	0.7243			0.6295
	<i>Advanced</i>	0.7579			0.6403
Indices at Cut Points	Accuracy				Consistency
		Accuracy	False Positives	False Negatives	
	<i>W:NI</i>	0.9423	0.0265	0.0311	0.9187
	<i>NI:P</i>	0.9243	0.0389	0.0368	0.8932
	<i>P:A</i>	0.9184	0.046	0.0356	0.8867

**Table 6.2.3.5.12: 2006 MCAS
Accuracy and Consistency
Grade 7 Mathematics**

Overall Indices	Accuracy	Consistency			Kappa (κ)
		0.8096	0.7332		
Indices Conditional on Level	Accuracy			Consistency	
	<i>Warning/Failing</i>	0.8921			0.8383
	<i>Needs Improvement</i>	0.7801			0.7027
	<i>Proficient</i>	0.7669			0.6852
	<i>Advanced</i>	0.8085			0.6856
Indices at Cut Points	Accuracy				Consistency
		Accuracy	False Positives	False Negatives	
	<i>W:NI</i>	0.9366	0.0293	0.0341	0.9107
	<i>NI:P</i>	0.9254	0.0393	0.0353	0.8952
	<i>P:A</i>	0.9476	0.0323	0.0202	0.9262

**Table 6.2.3.5.13: 2006 MCAS
Accuracy and Consistency
Grade 8 Mathematics**

Overall Indices	Accuracy		Consistency		Kappa (κ)
		0.8044		0.7263	
Indices Conditional on Level	Accuracy		Consistency		
	<i>Warning/Failing</i>		0.8929		0.8397
	<i>Needs Improvement</i>		0.7685		0.6873
	<i>Proficient</i>		0.7640		0.6831
	<i>Advanced</i>		0.7900		0.6529
Indices at Cut Points	Accuracy			Consistency	
	Accuracy	False Positives	False Negatives		
	<i>W:NI</i>	0.9344	0.0304	0.0353	0.9076
	<i>NI:P</i>	0.9233	0.0406	0.0361	0.8921
	<i>P:A</i>	0.9467	0.0336	0.0197	0.9253

**Table 6.2.3.5.14: 2006 MCAS
Accuracy and Consistency
Grade 10 Mathematics**

Overall Indices	Accuracy		Consistency		Kappa (κ)
		0.823		0.7523	
Indices Conditional on Level	Accuracy		Consistency		
	<i>Warning/Failing</i>		0.8591		0.7715
	<i>Needs Improvement</i>		0.7498		0.657
	<i>Proficient</i>		0.7417		0.6506
	<i>Advanced</i>		0.9134		0.8703
Indices at Cut Points	Accuracy			Consistency	
	Accuracy	False Positives	False Negatives		
	<i>W:NI</i>	0.9604	0.0162	0.0234	0.9441
	<i>NI:P</i>	0.9341	0.0313	0.0345	0.9071
	<i>P:A</i>	0.9284	0.0383	0.0333	0.899

**Table 6.2.3.5.15: 2006 MCAS
Accuracy and Consistency
Grade 5 Science and Technology/Engineering**

Overall Indices	Accuracy		Consistency		Kappa (κ)
		0.7405		0.644	
Indices Conditional on Level	Accuracy		Consistency		
	<i>Warning/Failing</i>		0.7908		0.6373
	<i>Needs Improvement</i>		0.7732		0.7048
	<i>Proficient</i>		0.6571		0.5582
	<i>Advanced</i>		0.7968		0.6486
Indices at Cut Points	Accuracy			Consistency	
	Accuracy	False Positives	False Negatives		
	<i>W:NI</i>	0.9437	0.0194	0.0368	0.9200
	<i>NI:P</i>	0.8749	0.0654	0.0597	0.8258
	<i>P:A</i>	0.9209	0.0519	0.0272	0.8886

**Table 6.2.3.5.16: 2006 MCAS
Accuracy and Consistency
Grade 8 Science and Technology/Engineering**

Overall Indices	Accuracy	Consistency		Kappa (κ)	
	0.8047	0.7254		0.5901	
Indices Conditional on Level		Accuracy		Consistency	
	<i>Warning/Failing</i>	0.8618		0.7859	
	<i>Needs Improvement</i>	0.7964		0.7354	
	<i>Proficient</i>	0.7665		0.6731	
	<i>Advanced</i>	0.7749		0.5659	
Indices at Cut Points		Accuracy			Consistency
		Accuracy	False Positives	False Negatives	
	W:NI	0.9206	0.0347	0.0447	0.8882
	NI :P	0.9114	0.0505	0.0381	0.8755
	P:A	0.9726	0.0201	0.0073	0.9607

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* (1985, 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 2006 MCAS operational administration, the *Guide to Interpreting the Spring 2006 MCAS Reports for Schools and Districts* 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 2006 MCAS for Parents/Guardians* 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 2006 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 include the following:

- After the MCAS program was first introduced, the Department commissioned two separate studies (Gong, 1999; Thacker & Hoffman, 1999) to examine the relationship between performance on the MCAS tests of students in two large urban districts in Massachusetts and performance of the same sample of students on a locally administered, national standardized achievement test. Gong (1999) examined the relationship between MCAS scores and performance on the Metropolitan Achievement Test (MAT-7) at grade 10 and the relationship between MCAS scores and the Stanford Achievement Test (SAT-9) scores at grade 4. Thacker and Hoffman (1999) examined the relationship between MCAS scores and performance on the Stanford 9 at grades 4, 8, and 10. The two studies also examined the relationship between MCAS performance and students’ enrollment in specific courses.

These studies found that students in each of the four MCAS performance levels (*Warning/Failing*, *Needs Improvement*, *Proficient*, and *Advanced*) generally performed similarly on a commercially available, standardized instrument. That is, students at higher performance levels on MCAS also tended to perform at higher performance levels on the commercial tests. It was also found that students who scored *Proficient* or *Advanced* on MCAS tended to score above the 75th percentile on the Stanford 9 tests. Students who scored at the *Needs Improvement* level on MCAS scored around the 50th percentile, and students whose MCAS performance was at the *Warning/Failing* level consistently averaged below the 25th percentile on the Stanford-9.

- The two studies mentioned above were based on the results of individual school districts, since the commercially available tests (MAT-7 and Stanford) were administered by the districts rather than by the Commonwealth. One commercially available standardized test, however, has been administered to students statewide. From 1996–1998, third-grade students were administered the Iowa Test of Basic Skills (ITBS) in reading. Fourth-grade students who completed the 1998 MCAS tests had also taken the ITBS reading tests as third-graders in 1997. Although the MCAS and ITBS tests were administered approximately one year apart and differed slightly in what was assessed—reading only on ITBS and reading and writing on grade 4 MCAS—the results from these

two tests provide an opportunity to examine the relationship between performance on MCAS and performance on an external measure. A comparison of the performance of approximately 55,000 students who were assessed statewide revealed a strong relationship—a positive correlation of approximately 0.75—between the performances on the MCAS and ITBS tests. Students who performed at higher levels on the MCAS test tended to score at the higher percentile ranks on the ITBS test.

- In 2005–2006, Massachusetts has looked to other large-scale assessments in which its students have participated to further demonstrate the strength of the state’s MCAS tests. Two in particular, the NAEP and the SAT I tests, have demonstrated results that in most instances parallel trends seen on MCAS over recent years. Additionally, an examination of MCAS and NAEP revealed that there is a strong correlation between performances on the two instruments in both reading and mathematics. This correlation provides evidence that MCAS and NAEP content and performance standards are closely related.

In addition to the above, the *Standards for Educational and Psychological Testing* advocates 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 detail in section 2 of this document, “MCAS 2006 Test Development and Design.” Test curriculum alignment was also studied by Hambleton, R., Smith, Z., and Zhao, Y. (2006) to provide further evidence of alignment. According to their studies, MCAS tests that are built each year (1) are consistent or in alignment with the test content specifications; (2) over regular intervals of time, assess all of the learning standards in each curriculum that are intended to be included in the tests; and (3) use test items that are valid indicators of the learning standards to which they are matched. The studies are presented as Appendix M of this document.

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 reading 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 Education (DOE) for review 10 days prior to ADC meeting.
- Item is reviewed by DOE 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 DOE developers.
- Item is presented to Bias Committee for review.
- Item and comments from Bias Committee are reviewed by DOE; 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 DOE.
- Item is reviewed by ADC panelists for statistics (performance), alignment, content, and expert review comments. Panelists make recommendations.
- DOE 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*.

Bias Committee

Four two- to three-day Bias 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 Committee consists of classroom teachers, school administrators, and other educators from the community.

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*. Committee members decide whether to recommend that materials be kept as is, edited, or deleted. The decisions of the Bias Committee are reviewed by the DOE 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, section 6.1.1; item-test correlation, section 6.1.2)
- differential item functioning analyses (section 6.1.4)
- a variety of reliability coefficients (section 6.2)
- standard errors of measurement (section 6.2.1)
- item response theory parameters and procedures (section 6.1.5)

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 (Appendix D) also supports data structure found through Item Response Theory 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 *Consequences of Testing*

Reporting information is provided in section 5 of this document, “Reporting of MCAS 2006 Results.” The state 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 *Framework* on which the test is 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 state 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 as follows:

- to evaluate the performance of students, schools, districts, and the state based upon the *Massachusetts Curriculum Framework* content standards and the MCAS performance standards
- to improve classroom instruction and student academic achievement by providing data that assist local educators in improving curriculum design and instruction

- to relate MCAS test scores to AYP requirements, in concert with other evidence, to determine NCLB federal funding
- to 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 class of 2010 will also be required to earn a Competency Determination in Science in order to be eligible for a Massachusetts high school diploma

6.3.2 Validity Evidence for the MCAS-Alt

According to the *2006 Educator’s Manual for MCAS-Alt*, the purposes of the MCAS-Alt are as follows:

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

To demonstrate validity for the MCAS-Alt, two types of validity are discussed below:

- content validity
- procedural validity

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 PreK through grade 12.

The *Resource Guide to the Massachusetts Curriculum Frameworks for Students with Significant 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 DOE 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 DOE 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 policy makers, 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, DOE 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 test.
- 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 2006 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

- thirty-five DOE-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 *2006 Educators Manual*, disseminated in the fall of 2005, and the *2006 Guidelines for Scoring Student Portfolios* (Appendix E). Scores were analyzed using the 2006 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 DOE. 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 DOE, along with all research reports and other documentation. Additional documentation can be found on the DOE MCAS-Alt web page, including the following:

- definition and purpose of the assessment
- definition of assessment standards
- description of the assessment method and rationale for its choice
- selection and training of scorers
- description of scoring procedures and rubrics used
- feedback from scorers, including their level of satisfaction with the training and scoring processes
- description of procedures used to determine student-level results, as well as aggregated results
- description of procedures used to set performance levels
- monthly reports from the testing contractor provided to the DOE
- state performance and participation results from 2001-2005
- MCAS and MCAS-Alt Technical Reports

6.3.3 MCAS 2006 Standard Test Curriculum Alignment Studies

The DOE commissioned two curriculum-test alignment studies to investigate the coherence between intended and actual curriculum coverage within all operational MCAS assessments. The studies evaluated whether the MCAS tests met the following requirements:

- (1) The test was consistent or in alignment with test content specifications.
- (2) The test, over regular intervals of time, assessed all of the learning standards in the curriculum that were intended to be included in the test.
- (3) The test used test items that were valid indicators of the learning standards to which they were matched.

One study investigated curriculum-test alignment for tests that were operational for the first time in 2006 (Grade 3 Reading; grades 5, 6, and 8 English Language Arts; and grades 3, 5, and 7 Mathematics). The second study reviewed curriculum-test alignment for ongoing operational assessments (grades 4, 7, and 10 English Language Arts; and grades 4, 6, 8, and 10 Mathematics).

The overall research findings determined that the actual distribution of test content was nearly perfectly consistent or in alignment with test content specifications. The studies are provided in Appendix M.

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