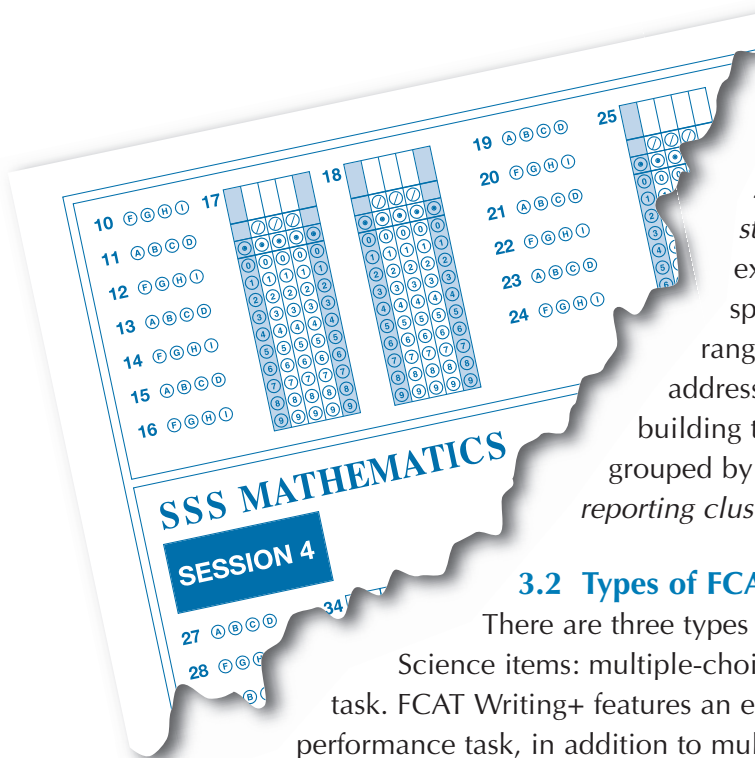


3.0 TEST CONTENT AND FORMAT

The FCAT is administered to students on regular school days under the supervision of each school's staff. FCAT Reading, FCAT Mathematics, and FCAT Science are given on specific days within a two-week period in the spring. The FCAT NRT is also administered during the same time frame. FCAT Writing+ is administered to students in Grade 4 over a two-day period and to Grades 8 and 10 in a single day in February. All test forms are printed in English only.

3.1 Test Format

FCAT items² are based directly on individual benchmarks found in the *Sunshine State Standards*. Within each subject, items are developed to represent the complete range of content associated with the benchmarks. A few benchmarks are not easily assessed within the time limitations or through the format of FCAT items and, therefore, are not assessed on the test. Because of the FCAT's direct link to the *Standards*, students who have mastered the *Standards* and have practiced with FCAT item formats should perform well on the FCAT.



Within subjects and established grade ranges (i.e., PreK–2, 3–5, 6–8, 9–12), there are three categories for *Sunshine State Standards* expectations: *strand* (broad category of knowledge), *standard* (general statement of expectation), and *benchmark* (more specific level of expectation for each grade range). All FCAT items are designed to address specific benchmarks. For the purpose of building the test, scoring, and reporting, items are grouped by *content clusters* (sometimes called *reporting clusters* or *strands*).

3.2 Types of FCAT Items

There are three types of FCAT Reading, Mathematics, and Science items: multiple-choice, gridded-response, and performance task. FCAT Writing+ features an essay component, which is considered a performance task, in addition to multiple-choice items. These item types

² In assessment terminology, an *item* is any question, essay prompt, or other task to which a student is expected to respond. Not all items are presented as questions, so the term *item* is used.

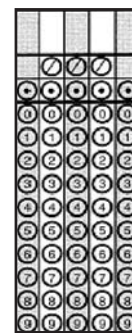
differ not only in format, but in the amount of time students should need to respond to them and in the number of points a correct response to each item is worth.³ The time estimates for item types are used to establish the test administration schedule and to ensure that students have ample time to complete the test. Although the FCAT is a timed test, the time allotted is intended to be sufficient for almost all students. In students' test booklets, special icons are used to identify gridded-response items, short-response performance tasks, and extended-response performance tasks.

Multiple-choice items (FCAT Reading, Reading Retakes, Mathematics, Mathematics Retakes, Science, Writing+)—Students choose the correct answer from three or four possible choices and mark the choice by filling in a bubble in the test booklet or answer document. Three-option multiple-choice items are found only in FCAT Writing+. (See Section 3.8 for more information about FCAT Writing+ multiple-choice items.) Multiple-choice items require approximately one minute to answer and are each worth one raw score point.



Mathematics and science gridded-response icon

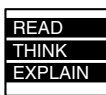
Gridded-response items (FCAT Mathematics, Mathematics Retake, Science)—Students solve problems or answer questions requiring a numerical response and bubble or mark their numerical answers in response grids. Answers may be gridded using several correct formats. Students must accurately fill in the bubbles below the grids to receive credit for their answers. Students are provided with detailed instructions for filling in the bubbles in the *FCAT Sample Test Materials*. Additional instructions are also included in the front of the test book. Gridded-response items require approximately one and a half minutes to answer and are each worth one raw score point.



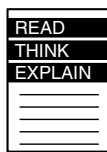
Sample answer grid for Grades 6–10 mathematics and science

Performance Tasks

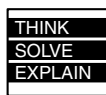
Short- and extended-response items (FCAT Mathematics, Reading, Science)—Students respond to items in their own words or show their solutions to problems. Short-response tasks require approximately five minutes to complete, and students may receive a raw score of 0, 1, or 2 points. Extended-response tasks require approximately 15 minutes to complete, and students may receive a raw score of 0, 1, 2, 3, or 4 points.



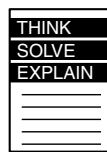
Reading short-response icon



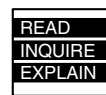
Reading extended-response icon



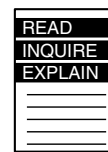
Mathematics short-response icon



Mathematics extended-response icon



Science short-response icon



Science extended-response icon

³ Multiple-choice and gridded-response items are worth one point each; short-response performance tasks are worth two points each; extended-response performance tasks are worth four points each; and essay responses are worth six points each.

Prompted essay (FCAT Writing+)—Each FCAT Writing+ prompt has two parts: the *writing situation* and the *directions for writing*. The *writing situation* orients the students to the subject about which they are to write. The *directions for writing* guide the students to think about the topic before they begin to write. Essays are scored on a scale ranging from 0 points (unscorable) to 6 points. Students are given 45 minutes to complete their writing.

Calculators are provided to students in Grades 7 and higher on the mathematics and science portions of the FCAT. (See pages 28 and 34.) Dictionaries⁴ and other reference materials are **not** allowed on any test at any grade level.

3.3 Cognitive Complexity

The benchmarks in the *Sunshine State Standards* identify knowledge and skills that students are expected to acquire, with the underlying expectation that students also demonstrate critical thinking. Goal 3, Standard 4 of Florida's *System of School Improvement and Accountability* makes this expectation clear:

“Florida students use creative thinking skills to generate new ideas, make the best decisions, recognize and solve problems through reasoning, interpret symbolic data, and develop efficient techniques for lifelong learning.”

The degree of challenge of FCAT items is currently categorized in two ways: cognitive complexity and item difficulty. Cognitive complexity refers to the cognitive level associated with the item. Since the inception of the FCAT, Bloom's Taxonomy⁵ has been used for this purpose; however, Bloom's Taxonomy is difficult to use because it requires an inference about the skill, knowledge, and background of the students responding to the



⁴ Limited English proficient (LEP) students may use an English-to-heritage-language dictionary, but not an English language dictionary. For more information on LEP accommodations: http://www.firn.edu/doe/omsle/pdf/lep_factsheet.pdf

⁵ Bloom, B.S., et al. *Taxonomy of Educational Objectives, Handbook I: Cognitive Domain*. New York: McKay, 1956.

item. Beginning in 2004, a new cognitive classification system is being used that is based, in part, on Dr. Norman L. Webb’s work with “Depth of Knowledge” levels.⁶ This change in classification systems has not changed the difficulty of the FCAT.

The transition to a new cognitive classification system was made to focus on the expectations of the item, not the ability of the student. The demands on thinking that an item makes—that is, what it asks the student to recall, understand, reason about, and do—are determined with the assumption that the student is familiar with the knowledge and skills the item assesses.

The categories—low complexity, moderate complexity, and high complexity—form an ordered description of the cognitive demands an item makes on a student. Items at the low level of complexity require a simple skill, such as locating details in a text or solving a one-step problem. At the moderate level, an item can ask the student to summarize a passage or retrieve information from a graph and use it to solve a problem. At the high level, an item may require a student to analyze cause-and-effect relationships or justify a solution to a problem. The distinctions made in item complexity are intended to provide a balance across the tasks administered at each grade level.

Item difficulty has two meanings, depending on the stage of item development. At the item review stage (before use on the test), item difficulty is based on professional judgment about how hard an item is for students working at grade level. At this point, items are classified as easy, medium, or hard. After field testing, item difficulty refers to the percentage of students who actually chose the correct answer. At this stage, item difficulty is referred to as the p -value. (See Chapter 4.0 or Appendix A for more information about p -values.)

While an item can be classified as having a low level of challenge, in terms of cognitive complexity, it can still be difficult in terms of p -value. In general, if 70 percent or more of the students answered the item correctly, it is considered easy. If 40–69 percent of the students answered the item correctly, it is considered average. If less than 40 percent of the students answered the item correctly, it is considered challenging.

⁶ Webb, N.L., (1999). *Alignment Between Standards and Assessment*, University of Wisconsin Center for Educational Research.

3.4 Test Forms, Operational Items, Field-Test Items, and Anchor Items

When taking the FCAT, all students of the same grade level respond to a common set of items on each test. These common items are called *operational items* and count toward students' scores. Either *field-test items* or *anchor items* are also found on all students' tests, but do not count toward students' scores. Field-test items are administered to students only to gather data on the items. Items found to be acceptable may be considered for future use on the FCAT operational test. Anchor items are those which have appeared on the FCAT in previous years and are used to ensure that the scores on the test can be equated or made comparable from year to year.⁷

Grade	Reading	Writing+*	Mathematics	Science
3	MC		MC	
4	MC, SR, ER	WP, MC	MC	
5	MC		MC, GR, SR, ER	MC, SR, ER
6	MC		MC, GR	
7	MC		MC, GR	
8	MC, SR, ER	WP, MC	MC, GR, SR, ER	MC, GR, SR, ER
9	MC		MC, GR	
10	MC, SR, ER	WP, MC	MC, GR, SR, ER	
11				MC, GR, SR, ER
Retake	MC		MC, GR	

Key

MC multiple-choice
GR gridded-response
SR short-response
 performance task
ER extended-response
 performance task
WP writing prompt or
 prompted essay

* Beginning with the field test in 2005, FCAT Writing+ includes multiple-choice items at the same grade levels, in addition to the prompted essay.

Table 3, above, lists the types of items used in each content area, by grade. The next four sections of the *Handbook* provide additional information about the different content areas and detail the knowledge and skills assessed in each area. Examples of sample test items are included. In addition, certain content-specific features of the FCAT are examined, such as calculator use at given grade levels, and the types of reading passages that are used on the test.

⁷ Prior to 2004, anchor items counted toward students' scores.

3.5 Reading Content

FCAT Reading employs a wide variety of written material to assess students' reading comprehension as defined in the *Sunshine State Standards*. FCAT Reading is composed of about 6–8 reading passages with sets of 6–11 items based on each passage. There are two types of reading passages: informational and literary.

Informational passages provide readers with facts about a particular subject and may include magazine and newspaper articles, editorials, and biographies. Literary passages are written primarily for readers' enjoyment and may include short stories, poems, folk tales, and selections from novels. Table 4, on the next page, shows the different types of passages students may encounter on the test. Most passages are selected from published sources, although some may be written expressly for the FCAT.



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“FCAT has made alignment of the curriculum and training to the *Sunshine State Standards* a must for all districts. Being involved with FCAT at the district level has made me realize the importance of raising expectations for all students and the importance of providing meaningful instruction to help them meet these high expectations. Serving on FCAT committees over the years has helped me to know the importance of all educators working together, both at the state and district levels, to ensure the success of all Florida students.”

The Orlando Sentinel—Florida

February 11, 2003, FINAL

Study Praises FCAT as Indicator of Learning

For the complete text of this article, see Appendix C.

TABLE 4: TYPES OF READING PASSAGES

Types of Informational Texts	Types of Literary Texts
Subject-area text (e.g., science, history)	Short stories
Magazine and newspaper articles	Literary essays (e.g., critiques, personal narratives)
Diaries	Excerpts from novels
Editorials	Poems
Informational essays	Historical fiction
Biographies and autobiographies	Fables and folktales
Primary sources (e.g., Bill of Rights)	Plays
Consumer materials	
How-to articles	
Advertisements	
Tables and graphic presentations of text (e.g., illustrations, photographs, and captions)	

Table 5 below shows the percentage of FCAT Reading items on a test for literary and informational text, as well as the passage length for each grade level. As students progress beyond the early grades, they will read informational text with increasing frequency in and out of school. The percentage of informational text students will encounter on the FCAT also increases as they progress through the grades. Likewise, the range of words per passage increases across the grade levels.

TABLE 5: DISTRIBUTION OF FCAT READING TEST ITEMS BY PASSAGE TYPE AND LENGTH

Grade	Percentage Distribution of Reading Test Items by Passage Type		Number of Words per Passage	
	Informational	Literary	Average	Range
3	40%	60%	350	100–700
4	50%	50%	400	100–900
5	50%	50%	450	200–900
6	50%	50%	500	200–1000
7	60%	40%	600	300–1100
8	60%	40%	700	300–1100
9	70%	30%	800	300–1400
10	70%	30%	900	300–1700

Knowledge and Skills Tested

FCAT Reading is based on the benchmarks found in the Reading and Literature strands of the Language Arts *Sunshine State Standards*. The four reading content clusters used for the FCAT are: (1) Words and Phrases in Context; (2) Main Idea, Plot, and Purpose; (3) Comparison and Cause/Effect; and (4) Reference and Research.

Table 6 indicates the relative emphasis on each cluster by providing the percentage of raw score points available in each cluster assessed on the FCAT at the different grade levels. As students progress through the grades, more emphasis is placed on higher level thinking skills, which predominate in the Reference and Research cluster. Some of the benchmark skills addressed at each grade level are shown on these pages. For more detailed information, refer to the *FCAT Reading Test Item Specifications*, available at <http://www.firn.edu/doe/sas/fcat/fcatis01.htm>.

Table 6 also indicates a range of percentages for score points in each cluster by grade. This range is necessary because each passage identified for use on FCAT Reading is unique and has varied potential for assessing benchmarks and for the number and type of possible items. Since each year’s test has a different selection of passages, the variance in this potential creates shifts in the percentage of score points in a cluster.

TABLE 6: APPROXIMATE PERCENTAGE DISTRIBUTION OF RAW SCORE POINTS ACROSS FCAT READING CONTENT CLUSTERS BY GRADE LEVEL

Grade	Words and Phrases In Context	Main Idea, Plot, and Purpose	Comparison and Cause/Effect	Reference and Research
3–5	15–20%	30–55%	20–45%	5–15%
6–8	15–20%	30–55%	15–25%	10–30%
9–10	15–20%	20–50%	10–25%	20–40%

FCAT Reading includes multiple-choice items at all grades. At Grades 4, 8, and 10, it also includes short- and extended-response performance tasks, scored using two- or four-point rubrics. Rubrics are the scoring guidelines or criteria used to evaluate all of the FCAT performance tasks and essays. The rubric describes what is required for each possible score point. For example, a short-response task may require the student to describe how a character in a story changes or shows growth. An extended-response task requires a longer and more detailed response, such as a comparison of traits or actions of two different characters. Students are provided eight lines on which to write their answers for short-response items and 14 lines for extended-response items. Table 7, on the next page, presents the number of items per type at each grade level, as well as the total time needed to take a test at each grade level. Sample items are also presented to illustrate each item type. Additional sample items are included in the *FCAT Sample Test Materials* posted on the DOE web site (www.firn.edu/doe/sas/fcat/fcatsmpl.htm).

Grade	Multiple-Choice	Performance Tasks	Total Minutes per Test
3	50–55	0	120
4	45–50	5–7	160
5	50–55	0	120
6	50–55	0	120
7	50–55	0	120
8	45–50	5–7	160
9	50–55	0	120
10	45–50	5–7	160
Retake	55–60	0	160


Note: Total testing time is divided into two testing sessions, except for the retake test, which only has one session. Students taking the retake test may receive additional time to complete the test. The data in this table give ranges for the approximate number of items by item type. These ranges include both operational and field-test or anchor items.

Figure 3: Example of a Grade 8 FCAT Reading Multiple-Choice Item

According to the story, why do the inhabitants of Earth and Kaan say that this has been the “very best Zoo”?


- A. Both groups felt safe because of the protective bars.
- B. Both groups felt the zoo was worth the money spent.
- C. Both groups considered each other frightening creatures behind bars.
- D. Both groups considered each other the strangest creatures they had ever seen.

Figure 4: Example of a Grade 10 FCAT Reading Short-Response Performance Task



How did William Fee contribute to the cotton industry and everyday life? Support your answer with details and information from the article.

Figure 5: Example of a Grade 8 FCAT Reading Extended-Response Performance Task



How have sea gulls contributed to or affected the development of Salt Lake City? Use details and information from the article to support your answer.

At Grades 3, 4, and 5, FCAT Reading assesses the following skills:

Words and Phrases in Context

- uses strategies to increase vocabulary through word structure clues (prefixes, suffixes, roots), word relationships (antonyms, synonyms), and words with multiple meanings
- uses context clues to determine word meanings

Main Idea, Plot, and Purpose

- determines main idea or essential message in a text
- identifies relevant details and facts
- recognizes and arranges events in chronological order
- identifies author's purpose in a text
- understands plot development and conflict resolution in a story

Comparisons and Cause/Effect

- recognizes the use of comparison and contrast
- recognizes cause-and-effect relationships
- identifies similarities and differences among characters, settings, and events in various texts

Reference and Research

- uses maps, charts, photos, or other multiple representations of information
- reads, organizes, and interprets written information for various purposes, such as making a report, conducting an interview, taking a test, or performing a task



At Grades 6, 7, and 8, FCAT Reading assesses the following skills:

Words and Phrases in Context

- uses various strategies, including contextual and word structure clues, to analyze words and text
- draws conclusions from a reading text

Main Idea, Plot, and Purpose

- determines the stated or implied main idea or essential message in a text
- identifies relevant details and facts
- recognizes organizational patterns
- identifies and uses the author's purpose and point of view to construct meaning from text
- recognizes persuasive text
- recognizes and understands how literary elements support text (e.g., character and plot development, point of view, tone, setting, and conflicts and resolutions)

Comparisons and Cause/Effect

- recognizes comparison and contrast
- recognizes cause-and-effect relationships

Reference and Research

- locates, organizes, and interprets written information for a variety of purposes
- synthesizes information within or across texts
- checks validity and accuracy of research information
- synthesizes strong versus weak arguments

At Grades 9 and 10, FCAT Reading assesses the following skills:

Words and Phrases in Context

- selects and uses strategies to understand words and text
- makes and confirms inferences from a reading text
- interprets data presentations (e.g., maps, diagrams, graphs, and statistical illustrations)

Main Idea, Plot, and Purpose

- determines stated or implied main idea
- identifies relevant details
- identifies methods of development
- determines author's purpose and point of view
- identifies devices of persuasion and methods of appeal
- identifies and analyzes complex elements of plot (e.g., setting, tone, major events, and conflicts and resolutions)

Comparisons and Cause/Effect

- recognizes the use of comparison and contrast
- recognizes cause-and-effect relationships

Reference and Research

- locates, gathers, analyzes, and evaluates information for a variety of purposes
- selects and uses appropriate study and research skills and tools according to the type of information being gathered or organized
- analyzes the validity and reliability of primary source information and uses the information appropriately
- synthesizes information from multiple sources to draw conclusions

3.6 Mathematics Content Knowledge and Skills Tested

FCAT Mathematics addresses almost all of the *Sunshine State Standards* benchmarks at the associated grade levels. Most items address a single benchmark, but some items, especially extended-response performance tasks, can address more than one related benchmark. The five mathematics content strands used for FCAT design, scoring, and reporting are the same as the five strands under which the benchmarks are grouped in the *Standards*. The five strands are: (1) Number Sense, Concepts, and Operations; (2) Measurement; (3) Geometry and Spatial Sense; (4) Algebraic Thinking; and (5) Data Analysis and Probability. Table 8, below, shows the relative emphasis on each strand by providing the percentage of raw score points available in each at the different grade levels. At Grades 9 and 10, the Geometry and Spatial Sense strand and the Algebraic Thinking strand have slightly more items than the other three strands. A summary of the content assessed at each grade level is provided on the next few pages. For more detailed information, refer to the *FCAT Mathematics Test Item Specifications* available at <http://www.firn.edu/doe/sas/fcat/fcatis01.htm>.



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Related Experience: Mathematics Region II Leadership Team; Florida Association of Mathematics Supervisors (FAMS), Secretary

“Serving on a variety of FCAT committees has provided me with many insights into the FCAT processes. The opportunity to share these experiences with others has greatly influenced both staff development and curriculum alignment projects within our district. Rangefinding committees were most valuable to me as I learned how to design rubrics to objectively assess performance task responses.”

TABLE 8: APPROXIMATE PERCENTAGE DISTRIBUTION OF RAW SCORE POINTS ACROSS FCAT MATHEMATICS CONTENT STRANDS BY GRADE LEVEL

Grade	Number Sense, Concepts, and Operations	Measurement	Geometry and Spatial Sense	Algebraic Thinking	Data Analysis and Probability
3	30%	20%	17%	15%	18%
4	28%	20%	17%	17%	18%
5–8	20%	20%	20%	20%	20%
9–10	17%	17%	25%	25%	16%

Mathematics Content Tested

FCAT Mathematics assesses the following skills at Grades 3–10:

Number Sense, Concepts, and Operations

- identifies operations (+, −, ×, ÷) and the effects of operations
- determines estimates
- knows how numbers are represented and used

Measurement

- recognizes measurements and units of measurement
- compares, contrasts, and converts measurements

Geometry and Spatial Sense

- describes, draws, identifies, and analyzes two- and three-dimensional shapes
- visualizes and illustrates changes in shapes
- uses coordinate geometry

Algebraic Thinking

- describes, analyzes, and generalizes patterns, relations, and functions
- writes and uses expressions, equations, inequalities, graphs, and formulas

Data Analysis and Probability

- analyzes, organizes, and interprets data
- identifies patterns and makes predictions, inferences, and valid conclusions
- uses probability and statistics

Figure 6: Example of a Grade 10 FCAT Mathematics Multiple-Choice Item

The rectangle below is divided into 12 congruent squares. The shaded region covers $9\frac{1}{2}$ squares.

If the area of the shaded region is 342 square inches, what is the length of \overline{AB} ?

A. $16\frac{1}{2}$ inches
 B. 24 inches
 C. $28\frac{1}{2}$ inches
 D. 36 inches

FCAT Mathematics includes multiple-choice items in Grades 3–10, gridded-response items in Grades 5–10, and short- and extended-response performance tasks in Grades 5, 8, and 10. Performance tasks, scored on two- or four-point rubrics, require students to read all parts of the question carefully, think about and analyze the problem, determine a way to solve it, and write a detailed solution or describe an answer to the problem in their own words. A short-response performance task may ask for an equation that represents a problem

situation. An extended-response item requires a longer, more detailed response, such as constructing a graph. Answer spaces may include blank work space, charts or graphs, or lined answer space. Table 9, below, displays the number of items per item type and total test time for each grade. Examples of mathematics items are shown on the next few pages. Additional sample items are included in the *FCAT Sample Test Materials* on the DOE web site (www.firn.edu/doe/sas/fcat/fcatsmpl.htm).

Figure 7: Example of a Grade 10 FCAT Mathematics Gridded-Response Item

A forester wanted to compare the growth of trees in a tree farm with the growth of trees in a forest. This stem-and-leaf plot lists the yearly growth, in centimeters, of a selection of trees in both the tree farm and the forest.

YEARLY TREE GROWTH (in centimeters)		
Tree Farm		Forest
1	1	0 1 3
3 3	2	1 5 7
7 2 1	3	0 0 1 3 8 9 9 9 9
9 8 0	4	2 3 4 4 8
1 0	5	0 1 3 7

What is the difference between the median growth in centimeters of the selected trees in the tree farm and in the forest?

Key	
2 5 =	25 centimeters
5 2 =	25 centimeters

TABLE 9: NUMBER OF MATHEMATICS ITEMS PER ITEM TYPE AND TOTAL TEST TIME BY GRADE

Grade	Multiple-Choice	Gridded-Response	Performance Tasks	Total Minutes per Test
3	45–50	0	0	120
4	45–50	0	0	120
5	35–40	10–15	5–8	160
6	35–40	10–15	0	120
7	35–40	10–15	0	120
8	30–35	10–15	5–8	160
9	30–35	15–20	0	120
10	30–35	15–20	5–8	160
Retake	25–30	25–30	0	160

Note: Total testing time is divided into two testing sessions, except for the retake test, which only has one session. Students taking the retake test may receive additional time to complete the test. The data in this table give ranges for the approximate number of items by item type. These ranges include both operational and field-test or anchor items.

Figure 8: Example of a Grade 10 FCAT Mathematics Short-Response Performance Task with Two Parts

THINK
SOLVE
EXPLAIN

The course of the monorail at an amusement park must be changed to make room for a new parking lot. Engineers have decided that only the main supporting column located at point C on the grid below should be relocated. They have also decided that the rebuilt course should be in the shape of a parallelogram.

Part A Plot the new location of the supporting column and write its coordinates. Label the new location C' .

MONORAIL COURSE

Part B Use the definition or properties of a parallelogram to verify that the new monorail course is a parallelogram. You must use the slopes of the sides, the lengths of the sides, or both, to help verify your answer.

Calculators, Reference Sheets, and Rulers

Items for Grades 3–6 are designed to not require calculators, and students in those grades may not use them. In Grades 7–10, four-function calculators are provided to all students for use on all items in all testing sessions. Visually impaired students in these grades are provided with “talking calculators.” A reference sheet of appropriate formulas and conversions is provided to students in Grades 6–10 for use during testing. If any formula is needed in Grades 3–5, the appropriate formula is included with the test item. Although rulers may be used on the NRT portion of the FCAT, they are not required and may not be used during FCAT Mathematics.



3.7 Science Content

Knowledge and Skills Tested

FCAT Science measures student achievement of the science benchmarks contained in the *Sunshine State Standards* at Grades 5, 8, and 11. The eight science strands found in the *Standards* are grouped into four reporting clusters: (1) Physical and Chemical Sciences; (2) Earth and Space Sciences; (3) Life and Environmental Sciences; and (4) Scientific Thinking. Items in all clusters may require scientific thinking, although success on the first three clusters depends primarily upon content knowledge. Items classified as Scientific Thinking may be presented in the context of another cluster, but success on these items depends primarily on scientific thinking skills rather than content knowledge. At all three grade levels tested, score points are distributed approximately evenly across the four clusters.

Because of the large number of *Sunshine State Standards* science benchmarks assessed by the FCAT (58 at Grade 5, 70 at Grade 8, and 74 at Grade 11), some benchmarks are assessed annually while the content of others is sampled (assessed) only periodically.

Some of the benchmarks addressed annually in each science cluster for Grades 5, 8, and 11 are described on the next few pages. For more detailed information, refer to the *FCAT Science Test Item Specifications* available at <http://www.firn.edu/doe/sas/fcat/fcatis01.htm>.



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Miami, Florida

FCAT Committee Experience: Science Content Advisory; Science Item Review; Science Performance Review

Related Experience: Florida Association of Science Teachers (FAST), past President; curriculum writer with NOAA, NASA, and the University of Miami

“From the very beginning of the FCAT Science test development, I have been impressed by the ability and diligence of the people involved. Every effort is being made to construct an accurate test of a student’s scientific literacy, not recall of isolated facts and terms.”

Science Content Tested

At Grade 5, FCAT Science annually assesses the following skills:

Physical and Chemical Sciences

- understands that matter can be described, classified, and compared
- traces the flow of energy in a system
- identifies the differences between renewable and non-renewable energy sources
- describes, predicts, and measures the types of motion and effects of forces
- identifies the types of force that act upon an object

Earth and Space Sciences

- understands that changes in climate, geological activity, and life forms can be traced and compared
- recognizes that Earth's systems change over time
- identifies the cause of the phases of the Moon and seasons
- recognizes the role of Earth in the vast universe

Life and Environmental Sciences

- understands that living things are different but share similar structures
- recognizes that many characteristics of an organism are inherited
- explains the relationship and interconnectedness of all living things to their environments
- understands that plants use carbon dioxide, minerals, and sunlight to produce food (photosynthesis)

Scientific Thinking

- uses scientific methods and processes to solve problems
- recognizes that most natural events occur in consistent patterns
- understands the interdependence of science, technology, and society



At Grade 8, FCAT Science annually assesses the following skills:

Physical and Chemical Sciences

- recognizes the differences between solids, liquids, and gases
- contrasts physical and chemical changes
- identifies atomic structures
- recognizes properties of waves
- describes how energy flows through a system
- describes, measures, and predicts the types of motion and effects of force

Earth and Space Sciences

- recognizes that forces within and on Earth result in geologic structures, weather, erosion, and ocean currents
- explains the relationship between the Sun, Moon, and Earth
- understands that activities of humans affect ecosystems
- compares and contrasts characteristics of planets, stars, and satellites

Life and Environmental Sciences

- identifies the structure and function of cells
- compares and contrasts structures and functions of living things
- understands the importance of genetic diversity
- recognizes how living things interact with their environments

Scientific Thinking

- uses scientific methods and processes to solve problems
- recognizes that most natural events occur in consistent patterns
- understands the interdependence of science, technology, and society



At Grade 11, FCAT Science annually assesses the following skills:

Physical and Chemical Sciences

- describes and explains the structure of an atom and its interactions with other atoms
- recognizes and explains chemical reactions
- describes how energy flows through a system
- describes, measures, and predicts the types of motion and effects of force

Earth and Space Sciences

- recognizes that forces within and on Earth result in geologic structures, weather, erosion, and ocean currents
- identifies and explains the interconnectedness of Earth's systems
- understands that human activities affect ecosystems
- compares and contrasts characteristics of planets, stars, and satellites

Life and Environmental Sciences

- compares and contrasts the structure and function of major body systems
- recognizes that structures, physiology, and behaviors of living things are adapted to their environments
- identifies and explains the role of DNA
- explains the relationship and interdependence of all living things and their environments

Scientific Thinking

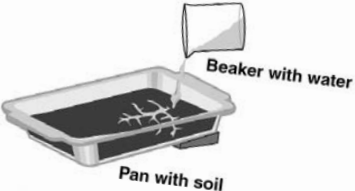
- uses scientific methods and processes to solve problems
- recognizes that most natural events occur in consistent patterns
- understands the interdependence of science, technology, and society

FCAT Science includes multiple-choice and short- and extended-response performance tasks at all three grade levels. Gridded-response items are also included at Grades 8 and 11. Performance tasks, scored with two- or four-point rubrics, require students to explain the scientific concept or process used to determine the answer and to provide the answer in their own words. A short-response item may ask the student to explain a scientific concept. An extended-response item (shown at right) requires a longer, more detailed response, such as describing the steps to use in an experiment. Performance task answer spaces may include blank work space, charts, drawings, or lined answer space, based on what is required to answer the item. Table 10, on the next page, illustrates the range of items per item type as well as test time by grade. One sample multiple-choice item is presented on the next page, and additional sample items are included on the DOE web site (www.firn.edu/doe/sas/fcat/fcatsmpl.htm).

Figure 9: Example of a Grade 5 FCAT Science Extended-Response Performance Task with Two Parts

READ
 INQUIRE
 EXPLAIN

After a visit to the Grand Canyon in Arizona, Jamie wondered how a river could carve such a deep canyon. Her grandfather created a model to show the formation of the Grand Canyon. He took a glass pan and filled it with tightly packed soil. He raised the pan slightly at one end. Then he took a beaker filled with water and slowly began to pour it on the raised end of the pan. He filled the beaker with water several times and repeated the process. Every time he poured more water onto the soil, the water flow would form deeper gaps along its path in the soil.



Part A Describe the similarities between the formation of the Grand Canyon and Jamie's grandfather's model.

Part B The Grand Canyon was shaped by other factors not demonstrated in the model. Identify and describe two of these factors.

TABLE 10: NUMBER OF SCIENCE ITEMS PER ITEM TYPE AND TOTAL TEST TIME BY GRADE

Grade	Multiple-Choice	Gridded-Response	Performance Tasks	Total Minutes per Test
5	45–55	0	5–7	120
8	40–45	3–6	5–7	120
11	40–45	3–6	5–7	150

Note: Total testing time is divided into two testing sessions. The data in this table give ranges for the approximate number of items by item type. These ranges include both operational and field-test or anchor items.

Figure 10: Example of a Grade 5 FCAT Science Multiple-Choice Item

Tanisha built the circuit in the picture below using a battery, insulated copper wire, and an iron nail. The iron nail has become magnetized by the battery and is attracting a metal paper clip.

Tanisha's Circuit

Which form of energy caused this nail to become magnetized?

- Ⓐ electrical
- Ⓑ heat
- Ⓒ light
- Ⓓ mechanical

Calculators and Reference Sheets

Students in Grades 8 and 11 are provided with reference sheets that include important formulas and conversions and a periodic table of the elements. If any formula is needed in Grade 5, the appropriate formula is included with the test item. Although four-function calculators are provided to students in Grades 8 and 11, use of calculators is not essential because of item design.

3.8 Writing Content Knowledge and Skills Tested

On FCAT Writing+, students are asked to write an essay within a 45-minute testing session on a single assigned topic. The test is based on the benchmarks describing the writing process in the writing strand of the Language Arts *Sunshine State Standards*. For the purpose of scoring and describing the quality of student essays, four elements of writing inherent in the writing process and benchmarks are considered. These are: (1) focus; (2) organization; (3) support; and (4) conventions.

FCAT Writing+ prompts require students to respond with a narrative, expository, or persuasive essay. At Grade 4, prompts are written to elicit either a narrative or an expository response, and at Grades 8 and 10, the prompts are written to elicit either an expository or a persuasive response. A narrative response tells a story, an expository response explains an idea, and a persuasive response attempts to convince an audience to agree with a given position (see Figure 11 below).

More information on FCAT Writing+, including sample prompts and scored responses, may be found in *Florida Writes! Report on the FCAT Writing+ Assessment*, published by the DOE each year for Grades 4, 8, and 10. Additional information about FCAT Writing+ may be found in the *FCAT Sample Test Materials* and the *Keys to FCAT*, available on the DOE web site in PDF format.

The new section of the test includes multiple-choice items with three- and four-answer options. The test includes the following sample types on which items are based: writing samples that model student draft writing (see Figure 12, page 37); stand-alone samples that provide a succinct context for measuring knowledge of conventions (see Figure 13, page 37); cloze samples that contain high-interest material and numbered blanks (see Figure 14, page 38); and writing plans that provide a prewriting structure (see Figure 15, page 38).



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FCAT Committee Experience: Writing Content Advisory; Prompt Writing; *Lessons Learned* Committee

Related Experience: Florida Council of Language Arts Supervisors, President; FDOE Middle Grades Reform Task Force

*“FCAT tests what we **should** be teaching: students **should** be able to read and understand and then explain their thinking in a reasonable format. My involvement in FCAT processes has given me a clear way to distinguish what’s essential from what’s ‘nice to know.’”*

Figure 11: Example of a Grade 4 FCAT Writing+ Expository Writing Prompt

Most students like to do something to help the teacher at school.

Think about what you like to do to help the teacher.

Now write to explain what you like to do to help the teacher.

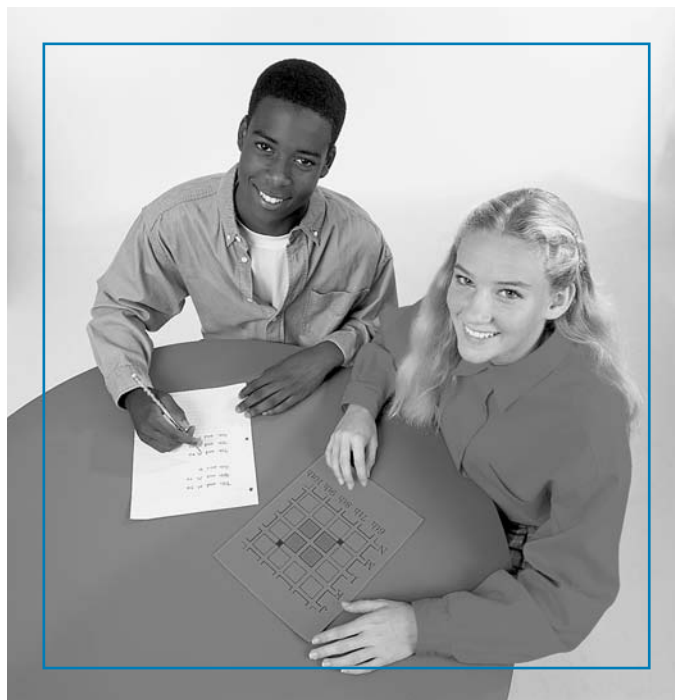
At Grade 4, FCAT Writing+ assesses the following skills:

Writing Process

The student drafts and revises writing (in cursive*) that

- focuses on the topic;
- provides a logical organizational pattern, including a beginning, middle, conclusion, and transitional devices;
- includes ample development of supporting ideas;
- demonstrates a sense of completeness or wholeness;
- demonstrates a command of language, including precision in word choice;
- indicates a general knowledge of the correct use of subject/verb agreement and verb and noun forms;
- includes, with few exceptions, sentences that are complete, excluding purposefully used fragments; and
- uses a variety of sentence structures and demonstrates a knowledge of the basic conventions of punctuation, capitalization, and spelling.

* Note: One Language Arts writing benchmark for Grade 4 states that students should write in cursive. For FCAT Writing+, students may print or write in cursive.



At Grade 10, FCAT Writing+ assesses the following skills:

Writing Process

The student drafts and revises writing that

- focuses on the topic, is purposeful, and reflects insight into the writing situation;
- provides an organizational pattern with a logical progression of ideas;
- includes effective use of transitional devices that contribute to a sense of completeness;
- includes support that is substantial, specific, relevant, and concrete;
- demonstrates a commitment to and an involvement with the subject;
- employs creative writing strategies appropriate to the purpose of the paper;
- demonstrates a mature command of language with freshness of expression;
- uses a variety of sentence structures; and
- contains few, if any, convention errors in mechanics, usage, punctuation, and spelling.

Figure 14: Example of a Grade 10 FCAT Writing+ Cloze-Based Multiple-Choice Item with Excerpted Cloze Sample

Read the article "A Popular Dance." Choose the word or words that correctly complete questions 16–18.

A Popular Dance

In the early part of the (16) century, a popular dance called *Jarabe Tapatio* developed in Mexico. The dance tells a story of romance

Which answer should go in blank (16)?

F. twentieth
G. twentieth
H. twentyeth

Figure 15: Example of a Grade 10 FCAT Writing+ Plan-Based Multiple-Choice Item

Reggie created the writing plan below to organize ideas for an essay. Read his writing plan to answer questions 1–3.

Reggie's Writing Plan

```

graph TD
    Topic([Topic: National Parks]) --> Geo[Geographic Features]
    Topic --> Emp[Park Employees]
    Topic --> Rec[Recreational Activities]
    Topic --> Fla[Florida Sites]
    Fla --> Everglades([Everglades National Park])
    Fla --> Canaveral([Canaveral National Seashore])
    Rec --> Swim([Swimming])
    Rec --> Fish([Fishing])
    
```

Under which subtopic should the writer add information about tour guides?

A. Florida Sites
B. Park Employees
C. Geographic Features
D. Recreational Activities