



# Cognitive Complexity Classification of the 2012-13 Statewide Assessment Test Items

The Florida Comprehensive Assessment Test® 2.0 (FCAT 2.0) and Florida End-of-Course (EOC) Assessments measure student achievement of the Next Generation Sunshine State Standards (NGSSS) in selected grades and courses in reading, writing, mathematics, science, and social studies. The NGSSS are the core content of the curricula taught in Florida, and the NGSSS benchmarks identify the knowledge and skills students are expected to acquire at each grade or course level. Although not all benchmarks lend themselves to large-scale testing, successful schools recognize the need for students to master all of Florida’s standards. The increased rigor exemplified in the NGSSS will enhance student achievement in a rapidly advancing, global environment.

The degree of challenge of FCAT 2.0 and EOC assessment questions, which are referred to as test items, is currently categorized in two ways: **item difficulty** and **cognitive complexity**. Item difficulty refers to the percentage of students who chose the correct answer. Generally, item difficulties are classified in three ways: (1) items for which the correct answer is chosen by more than 70 percent of the students are considered easy, (2) items for which the correct answer is chosen by 40–70 percent of the students are considered average, and (3) items for which the correct answer is chosen by less than 40 percent of the students are considered challenging.

Cognitive complexity refers to the cognitive demand associated with an item. In the early years of the FCAT program, the Department used Bloom’s Taxonomy<sup>1</sup> to classify test items; 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 item. Beginning in 2004, the Department implemented a new cognitive classification system based on Dr. Norman L. Webb’s Depth of Knowledge (DOK) levels.<sup>2</sup> The rationale for classifying items by their level of complexity is to focus on the expectations of the item, not the ability of the student. The item’s demands—what the item requires the student to recall, understand, analyze, and do—are made with the assumption that the student is familiar with the basic concepts of the task. Items are chosen for the FCAT 2.0 and EOC assessments based on the NGSSS and their grade-level appropriateness, but the complexity of the items remains independent of the particular curriculum a student has experienced. On any given assessment, the cognitive complexity of a multiple-choice item may be affected by the distractors (incorrect answer choices). In addition, the cognitive complexity of an item depends on the grade level of the assessment; an item that has a high level of cognitive complexity at one grade may not be as complex at a higher grade.

The categories of cognitive complexity—low complexity, moderate complexity, and high complexity—form an ordered description of the demands an item may make on a student. For example, low-complexity items may require a student to solve a one-step problem. Moderate-complexity items may require multiple steps. High-complexity items may require a student to analyze and synthesize information. The distinctions made in item complexity ensure that items will assess the depth of student knowledge at each benchmark.

The pages that follow illustrate some, but not all, of the varying complexity demands of FCAT 2.0 and EOC assessment items at each level. Note that an item may fit one or more descriptions, but should be classified in the highest level of complexity demanded by the item. The last page of this document breaks down the percentages of points by cognitive complexity level for each content area.

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<sup>1</sup> Bloom, B.S., et al. (1956). *Taxonomy of Educational Objectives, Handbook I: Cognitive Domain*. New York: McKay.

<sup>2</sup> Webb, Norman L., et al. “Webb Alignment Tool.” (2005, July 24). Wisconsin Center of Educational Research, University of Wisconsin-Madison. Retrieved from <http://www.wcer.wisc.edu/WAT/index.aspx>

## FCAT 2.0 Reading (Grades 3-10)

### Low Complexity

Low-complexity items may require students to recall, observe, question, or represent basic facts. For a low-complexity item, the student would be expected to demonstrate simple skills or abilities. A low-complexity item requires only a basic understanding of text—often verbatim recall from text or simple understanding of a single word or phrase. Skills required to respond correctly to low-complexity items include, but are not limited to, the following:

- identifying the correct meanings of grade-appropriate words
- locating details in a text
- locating details on a graph, chart, or diagram
- recognizing the correct order of events in a text
- identifying figurative language in a text

### Moderate Complexity

Moderate-complexity items may require students to perform a two-step process: first, comprehension, and then subsequent processing of text. Students are expected to make simple inferences within the text and may encounter items that include words such as *summarize*, *infer*, *classify*, *gather*, *organize*, *compare*, and *display*. Depending on the objective of a particular moderate-level item, students may also be required to explain, describe, or interpret. Skills required to respond correctly to moderate-complexity items include, but are not limited to, the following:

- using context clues to identify the meanings of unfamiliar words
- determining how details support the main idea
- interpreting the information in graphs, charts, and diagrams
- identifying cause-and-effect relationships
- determining an author's main purpose or point of view
- identifying similarities and differences
- demonstrating an understanding of plot development
- recognizing elements of plot
- recognizing patterns of organization
- summarizing the major points of a text
- comparing word meanings

### High Complexity

High-complexity items make heavy demands on student thinking. Students may be encouraged to explain, generalize, or make multiple connections. High-complexity items require several steps involving abstract reasoning and planning. Students must be able to support their thinking. Items may involve identifying theme and implicit main idea and making complex inferences within or across texts. Students may also be asked to take information from at least one portion of the text and apply this information to a new task. They may be asked to perform complex analyses of the connections among texts. Skills required to respond correctly to high-complexity items include, but are not limited to, the following:

- analyzing the use of figurative language in a text
- showing how graphs, charts, and diagrams contribute to a text
- determining an author's purpose and/or point of view and describing how it affects the text
- evaluating strong versus weak arguments in a text
- analyzing similarities and differences
- describing and analyzing the characteristics of various types of literature
- describing and illustrating how common themes are found across texts
- analyzing cause-and-effect relationships

## FCAT 2.0 Mathematics (Grades 3-8), Algebra 1, and Geometry EOC Assessment

### Low Complexity

Low-complexity items may require students to recall and recognize previously learned concepts and principles. Items typically specify what the student is to do, which is often to carry out a procedure that can be performed mechanically. The student is not required to come up with an original method or solution. Skills required to respond to low-complexity items include, but are not limited to, the following:

- solving a one-step problem
- computing a sum, difference, product, or quotient
- calculating the value of an expression, given specific values for the variables
- recognizing or determining an equivalent representation
- recalling or recognizing a fact, term, or property
- retrieving information from a graph, table, or figure
- identifying appropriate units or tools for common measurements
- performing a single-unit conversion

### Moderate Complexity

Moderate-complexity items involve more flexible thinking than low-complexity items. To arrive at a response requires procedures that go beyond the habitual, are not specified, and ordinarily have more than a single step. The student is expected to decide what to do—using informal methods of reasoning and problem-solving strategies—and to bring together skills and knowledge from various domains. Skills required to respond to moderate-complexity items include, but are not limited to, the following:

- solving a problem requiring multiple operations
- solving a problem involving multiple transformations of a figure or spatial visualization and/or reasoning
- retrieving information from a graph, table, or figure and using it to solve a problem
- determining a reasonable estimate
- extending an algebraic or geometric pattern
- explaining steps of a solution process
- comparing figures or statements
- representing a situation mathematically in more than one way
- translating and solving a routine problem, given data and conditions

### High Complexity

High-complexity items make heavy demands on student thinking. Students must engage in more abstract reasoning, planning, analysis, judgment, and creative thought. These items require the student to think in an abstract, sophisticated way. Skills required to respond correctly to high complexity items include, but are not limited to, the following:

- solving real-world problems requiring multiple steps and multiple decision points
- solving a non-routine problem (as determined by grade-level appropriateness)
- solving a problem in more than one way
- describing how different representations can be used for different purposes
- generalizing an algebraic or geometric pattern
- describing, comparing, and contrasting solution methods
- providing a mathematical explanation to a problem and/or a justification for a solution
- analyzing similarities and differences between procedures and concepts
- formulating an original problem, given a situation
- formulating a mathematical model for a complex situation
- analyzing or producing a deductive argument

## FCAT 2.0 Science (Grades 5 and 8) and Biology 1 EOC Assessment

### Low Complexity

Low-complexity items may require students to recall and recognize previously learned concepts and principles. Items typically specify what the student is to do, which is often to carry out a procedure that can be performed mechanically. The student is not required to come up with an original method or solution. Skills required to respond to low-complexity items may include, but are not limited to, the following:

- identifying a common example or recognizing a concept
- retrieving information from a chart, table, diagram, or graph
- recognizing a standard scientific representation of a simple phenomenon
- calculating or completing a familiar single-step procedure or solving a problem using a known formula

### Moderate Complexity

Moderate-complexity items involve more flexible thinking than low-complexity items. Items require procedures that go beyond the habitual, are not specified, and ordinarily have more than a single step or thought process. The student is expected to decide what to do—using informal methods of reasoning and problem-solving strategies—and to bring together skills and knowledge from various domains. Skills required to respond to moderate-complexity items may include, but are not limited to, the following:

- interpreting data from a chart, table, or simple graph
- determining the best way to organize or present data from observations, investigations, or experiments
- specifying or inferring relationships among different groups, facts, properties, or variables
- describing or explaining examples and non-examples of scientific processes or concepts
- predicting or determining the logical next step or outcome
- differentiating structures and functions of different organisms or systems
- applying and using concepts from a standard scientific model or theory

### High Complexity

High-complexity items make heavy demands on student thinking. Students must engage in abstract reasoning, planning, analysis, judgment, and creative thought. The items often involve multiple steps and require the student to think in an abstract, sophisticated way. Skills required to respond to high-complexity items may include, but are not limited to, the following:

- developing a generalization from multiple data sources
- analyzing data from an investigation or experiment and formulating a conclusion
- analyzing and evaluating an experiment with multiple variables
- analyzing an investigation or experiment to identify a flaw and proposing a method for correcting it
- interpreting, explaining, or solving a problem involving complex spatial relationships
- analyzing a problem, situation, or system and making long-term predictions

## FCAT 2.0 Writing (Grades 4, 8, and 10)

### High Complexity

For FCAT 2.0 Writing, instead of multiple-choice items, students are asked to produce an extended, written response to an assigned topic (prompt) for a designated purpose – narrative or expository for grade 4; persuasive or expository for grades 8 and 10. The intent of this performance task is that students will consider, examine, and/or analyze the writing prompt as they plan, draft, revise, and edit their work. Student responses should integrate the writing elements of focus, organization, support, and conventions. Inherent in such an item is the expectation that students respond in a way that indicates insight and involvement with the topic and purpose. This item type requires students to support their thinking as they develop a written composition, which calls for a mature command of language and complex sentence structures, showing synthesis and analysis of compositional elements. Beginning with the 2013 administration, students will have a time period of 60 minutes to work on a response to this type of item.

Skills required for such a high-complexity item include, but are not limited to, the following:

- establishing a relationship between a written response and the intended audience and purpose
- using the prewriting, drafting, revising/editing processes
- applying conventions for spelling, usage, capitalization, punctuation, and sentence structure

Beginning in 2011-12, scoring decisions for the statewide writing assessment included increased expectations regarding the following:

- increased attention to the correct use of standard English conventions
- increased attention to the quality of details, requiring use of relevant, logical, and plausible support, rather than contrived statistical claims or unsubstantiated generalities

## U.S. History EOC Assessment

### Low Complexity

Low-complexity items may require students to recall and recognize previously learned concepts, facts, and principles. Items typically require a single step or simple demonstration of social studies skills and abilities. Items in this category do not necessarily require the student to apply previously learned information in a new scenario or context. Skills required to respond to low-complexity items may include, but are not limited to, the following:

- defining the correct meanings of social-studies-related words, concepts, and terminology
- identifying or recalling common contemporary or historical events, actions, personalities, or concepts
- utilizing a chart, table diagram, graph, or image to recall or recognize information
- identifying characteristics of a group, place, or event

### Moderate Complexity

Moderate-complexity items involve greater flexibility of thought and choice among alternatives than low-complexity items. Items require a response that goes beyond the habitual, is not specified, and ordinarily has more than a single step or thought process. The student is expected to apply previously learned material in new ways—using informal methods of reasoning and problem-solving strategies—and to bring together skills and knowledge from various domains. Skills required to respond to moderate-complexity items may include, but are not limited to, the following:

- applying or inferring cause-and-effect relationships
- identifying outcomes of particular cause-and-effect relationships
- identifying the significance of historical or contemporary events, actions, personalities, or concepts
- categorizing historical or contemporary people, places, events, or concepts
- determining the relationship between historical or contemporary events, actions, personalities, or concepts
- explaining historical or contemporary problems, patterns, or issues

### High Complexity

High-complexity items make heavy demands on student thinking. Students must engage in more abstract reasoning, planning, analysis, judgment, and creative thought. The items often involve multiple steps and require the student to think in an abstract, sophisticated way. Skills required to respond to high-complexity items may include, but are not limited to, the following:

- solving or predicting the outcome of a problem
- generalizing or drawing conclusions when presented with historical or contemporary information
- providing justification for events, actions, or issues in the past or current timeframe
- predicting a long-term result, outcome, or change within society
- analyzing how changes have influenced people or social institutions
- recognizing and explaining historical or contemporary misconceptions
- analyzing similarities and differences between historical or contemporary events

## Percentage of Points by Cognitive Complexity Level

The tables below show the target range for the percentage of points by cognitive complexity level for each FCAT 2.0 and EOC assessment.

### FCAT 2.0 Reading

Grade	Low Level	Moderate Level	High Level
3	25–35	50–70	5–15
4	20–30	50–70	10–20
5–7	15–25	50–70	15–25
8	10–20	50–70	20–30
9	10–20	50–70	20–30
10	10–20	45–65	25–35

### FCAT 2.0 Mathematics, Algebra 1, and Geometry EOC Assessments

Grade/Course	Low Level	Moderate Level	High Level
3–4	25–35	50–70	5–15
5–8	10–20	60–80	10–20
Algebra 1	10–20	60–80	10–20
Geometry	10–20	60–80	10–20

### FCAT 2.0 Science and Biology 1 EOC Assessment

Grade/Course	Low Level	Moderate Level	High Level
5	10–20	60–80	10–20
8	10–20	60–80	10–20
Biology 1	10–20	60–80	10–20

### FCAT 2.0 Writing

The FCAT 2.0 Writing prompt is a high-complexity performance task administered at grades 4, 8, and 10.

### U.S. History EOC Assessment

Course	Low Level	Moderate Level	High Level
U.S. History	20–30	45–65	15–25