2010

FCAT 2.0

Florida Comprehensive Assessment Test®

FCAT 2.0 MATHEMATICS

Test Item Specifications

Grades 3–5

(Updated January 2012)

FLORIDA DEPARTMENT OF EDUCATION
www.fldoe.org

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Introduction

In recent years, two realities focused attention on the need to reevaluate Florida's Sunshine State Standards. First, in 2005, outside consultants reviewed the 1996 Standards and suggested that the benchmark language offer greater specificity to indicate clearly what teachers should teach and what students should be able to do. Second, federal legislation through the *No Child Left Behind Act of 2001* (NCLB) holds schools and school districts accountable for how well each child is learning, and further emphasizes the need to hone expectations for all students.

In January 2006, the Department of Education (DOE) committed to a six-year cycle of review and revision of the K–12 content standards. The mathematics standards were rewritten, and the Next Generation Sunshine State Standards (NGSSS) for mathematics were adopted by the Florida State Board of Education in September 2007 (available online at: http://www.floridastandards.org/Standards/FLStandardSearch.aspx).

The NGSSS are divided into benchmarks that identify what a student should know and be able to do at each grade level. This document, *FCAT 2.0 Mathematics Test Item Specifications, Grades 3–5* (*Specifications*), provides information about the benchmarks, the stimulus types, and the test items.

The Florida Comprehensive Assessment Test® 2.0 (FCAT 2.0) measures achievement of Florida students in writing, reading, mathematics, and science. End-of-course (EOC) assessments measure achievement of Florida students who have completed coursework in Algebra 1, Biology 1, Geometry, and U.S. History.

Origin and Purpose of the *Specifications*

The Florida Department of Education and committees of experienced Florida educators developed and approved the specifications documents. The *Specifications* is a resource document that defines the content and format of the test and test items for item writers and reviewers. Each *Specifications* document indicates the alignment of items with the NGSSS. It also serves to provide all stakeholders with information about the scope and function of the FCAT 2.0 and end-of-course assessments.

Scope of this Document

The *Specifications* for Grades 3–5 provides general and grade-specific guidelines for the development of all test items used in the FCAT 2.0 Mathematics test for Grades 3–5. Three additional *Specifications* documents provide the same information for the FCAT 2.0 Mathematics Grades 6–8, Algebra 1 EOC Assessment, and Geometry EOC Assessment.

The Overall Considerations section in this Introduction provides an explanation of the mathematics elements assessed by the test. The Criteria for FCAT 2.0 Mathematics Test Items section addresses the quality of the stimuli and test items and selection and development of multiple-choice items. The Item Difficulty and Cognitive Complexity section addresses cognitive complexity levels as well as item difficulty and universal design. The Grade-Level Specifications section contains specific information about each benchmark. This section identifies the manner in which each benchmark is assessed at Grades 3–5, provides content limits and stimulus attributes for each benchmark, and gives specific information about content, item types, and response attributes.

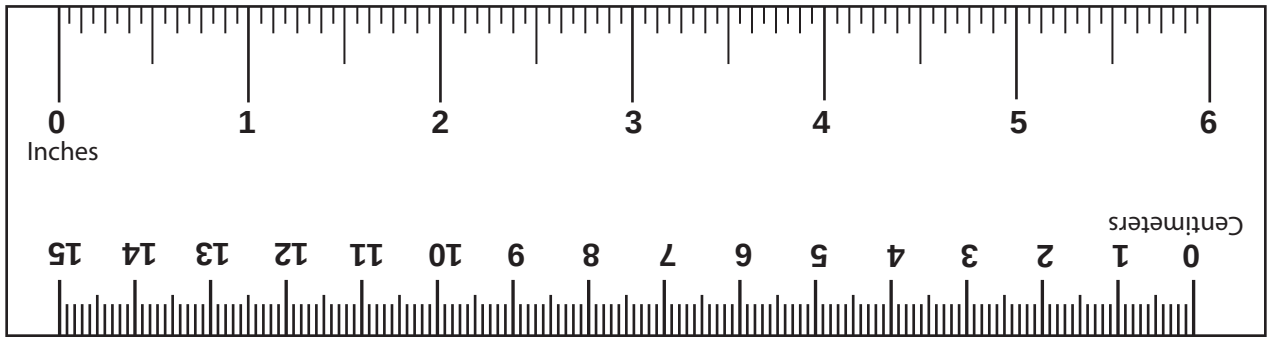
Overall Considerations

This section of the *Specifications* describes the guidelines that apply to all test items developed for the FCAT 2.0 Mathematics Grades 3–5.

Overall considerations are broad item-development issues that should be addressed during the development of test items. Other sections of Criteria for FCAT 2.0 Mathematics Test Items relate more specifically to one aspect of the development (for example, individual item types or content limits).

1. Each item should be written to measure primarily one benchmark; however, other benchmarks may also be reflected in the item content.
2. When benchmarks are combined for assessment, the individual specification indicates which benchmarks are combined.
3. Items should be appropriate for students in terms of grade-level difficulty, cognitive development, and reading level.
4. At a given grade, the test items will exhibit a varied range of difficulty.
5. For mathematics items, the reading level should be approximately one grade level below the grade level of the test, except for specifically assessed mathematical terms or concepts.
6. Items should not disadvantage or exhibit disrespect to anyone in regard to age, gender, race, ethnicity, language, religion, socioeconomic status, disability, or geographic region.
7. At Grades 3–6, all items should be written so they can be answered without using a calculator. At Grades 7 and 8, students are allowed to use a four-function calculator, although items should still be written to be answered without a calculator within the timing guidelines for each item type. For the Algebra 1 EOC Assessment, a four-function calculator will also be allowed. For the Geometry EOC Assessment, a scientific calculator will be used.
8. Items may require the student to apply mathematical knowledge described in NGSSS benchmarks from lower grades; however, the benchmarks from lower grades will not be assessed in isolation.
9. Some items should provide information for students to analyze and use in order to respond to the items.
10. Items should provide clear and complete instructions to students.
11. Each item should be written clearly and unambiguously to elicit the desired response.
12. A reference sheet containing appropriate formulas and conversions is provided to students in Grades 5, 6–8, 10 (1996 Standards), Algebra 1 EOC, and Geometry EOC for use during testing. Copies of the reference sheets are included in Appendix G of this document.

13. Items on the FCAT 2.0 and EOC assessments should be written so that students are expected to select or provide the most accurate answer possible. Students should not round decimal equivalents and/or approximations until the final step of the item or task. Whenever possible, the item stem should specify the decimal place, equivalent fraction, and/or *pi* approximation needed for the answer. In most cases, front-end estimation and truncation are not accurate processes for estimation.
14. The FCAT 2.0 Mathematics Grades 3 and 4 tests will require the use of a six-inch ruler with both metric and standard units. The metric edge will be in millimeter and centimeter increments. The standard edge will be in $\frac{1}{16}$, $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, and one-inch increments.



Criteria for FCAT 2.0 Mathematics Test Items

FCAT 2.0 Mathematics includes two types of test items: multiple-choice items (MC) and gridded-response items (GR). The general specifications on pages 4 through 17 cover the following criteria for the FCAT 2.0:

- Use of Graphics
- Item Style and Format
- Scope of Items
- Guidelines for Item Writers
- Cognitive Complexity of FCAT 2.0 Mathematics Items
- Universal Design

Use of Graphics

Graphics are used extensively in the FCAT 2.0 to provide both necessary and supplemental information; that is, some graphics contain information that is necessary for answering the question, while other graphics illustrate or support the context of the question. The benchmarks assessed by the FCAT 2.0 require different levels of graphics and illustrations. For example, the standards involving geometry depend heavily upon graphics to present geometric concepts and/or properties required for answering a question. In contrast, items or tasks in other benchmarks may contain graphics or pictures that illustrate and enhance interest but are not necessary to answer the question.

All artwork must be high quality; clip art is not acceptable under any conditions.

Most of the individual benchmark specifications in the *Specifications* indicate the extent to which graphics should be used to support test items developed for the benchmark. When no reference is made to the use of graphics, graphics are not required, even though they may be used.

Item Style and Format

This section presents stylistic guidelines and formatting directions that should be followed while developing test items. Guidelines are provided separately for each item type to be developed.

General Guidelines

1. Items should be clear and concise, and they should use vocabulary and sentence structure appropriate for the assessed grade level.
2. The final sentence of any MC or GR item stem must be expressed as a question.
3. If an item or task asks a question involving the word *not*, the word *not* should be emphasized by all uppercase letters (e.g., "Which of the following is NOT an example of . . .").
4. For MC and GR items that refer to an estimate (noun), lowercase letters should be used.
5. As appropriate, boldface type should be used to emphasize key words in GR items (e.g., **least, most, greatest, percent, mode, median, mean, range,** etc.).

6. Masculine pronouns should NOT be used to refer to both sexes. Plural forms should be used whenever possible to avoid gender-specific pronouns (e.g., instead of "The student will make changes so that he . . . ," use "The students will make changes so that they . . .").
7. An equal balance of male and female names should be used, including names representing different ethnic groups appropriate for Florida.
8. For clarity, operation symbols, equality signs, and ordinates should be preceded and followed by one space.
9. Decimal numbers between -1 and 1 (including currency) should have a leading zero.
10. Metric numbers should be expressed in a single unit when possible (e.g., 1.4 kilograms instead of 1 kilogram 400 grams). At Grade 3, there is an exception for MA.3.G.5.1 and MA.3.G.5.2.
11. Decimal notation should be used for numbers with metric units (e.g., 1.2 grams instead of $1\frac{1}{5}$ grams).
12. The comma should be used in a number greater than or equal to 1,000 unless the number indicates a metric unit. Metric numbers with four digits should be presented without a comma or a space (e.g., 9960 meters). For metric numbers with more than four digits, a thin space should be inserted in place of a comma (e.g., 10 123 kilograms). For all grades, dollar amounts of $1,000 or more should include commas.
13. Units of measure should be spelled out, except in graphics, where an abbreviation may be used (e.g., *ft* or *yd*). Abbreviations that also spell a word must be punctuated to avoid confusion. For example, to avoid confusion with the preposition *in*, the abbreviation *in*. should include a period and should be used for the unit of measure *inches*. If an abbreviation is used in a graphic, an explanation of the meaning of the abbreviation should be included in the stem.
14. In titles for tables and charts and in labels for axes, the units of measure should be included, preferably in lowercase and in parentheses, e.g., *height* (*in inches*).
15. Fractions should be typed with a horizontal fraction bar. The numerator and denominator should be centered with respect to each other. The bar should cover all portions (superscripts, parentheses, etc.) of the numerator and denominator. In a mixed number, a half space should appear between the whole number and the fraction. If a variable appears before or after a fraction bar, the variable should be centered with respect to the fraction bar. If a stimulus, stem, or set of responses contains a fraction in fractional notation, that portion of the item should be 1.5-spaced.
16. In general, numbers zero through nine should be presented as words, and numbers 10 and above should be presented as numerals. In the item stem, any numbers needed to compute answers should be presented as numerals.

Multiple-Choice (MC) Items

1. MC items should take an average of one minute per item to solve.
2. MC items are worth one point each.
3. MC items should have four answer choices (A, B, C, D or F, G, H, I for alternating items).
4. During item development and review, the correct response should be indicated with a star next to the answer choice letter.
5. During item development and review, the rationale for options (incorrect answer choices) should be indicated and set off in brackets.
6. In most cases, answer choices should be arranged vertically beneath the item stem.
7. If four graphics are labeled horizontally or vertically and horizontally, the labeling should be as follows:

A. B. C. D.	**or**	A. C. B. D.	
Figure 1 Figure 2 Figure 3 Figure 4	**or**	Figure 1 Figure 2	Figure 3 Figure 4

8. If the answer choices for an item are strictly numerical, they should be arranged in ascending or descending order, with the place values of digits aligned. When the item requires the identification of relative size or magnitude, choices should be arranged as they are presented in the item stem.
9. If the answer choices for an item are neither strictly numerical nor denominate numbers, the choices should be arranged by the logic presented in the question, by alphabetical order, or by length.
10. Distractors should represent computational or procedural errors commonly made by students who have not mastered the assessed concepts. Each distractor should be a believable answer for someone who does not really know the correct answer.
11. Outliers (i.e., answer choices that are longer phrases or sentences than the other choices, or choices with significantly more/fewer digits than the other choices) should NOT be used.
12. Responses such as “None of the Above,” “All of the Above,” and “Not Here” should NOT be used.
13. Responses such as “Not Enough Information” or “Cannot Be Determined” should NOT be used unless they are a part of the benchmark being assessed. They should not be used as distractors for the sake of convenience.
14. If a response is a phrase, the phrase should start with a lowercase letter. No period should be used at the end of a phrase.
15. If a response is a sentence, the sentence should be conventionally capitalized and punctuated.

Gridded-Response (GR) and Fill-In Response (FR) Items

1. Grades 4–8 use GR items, while the Algebra 1 EOC and Geometry EOC use FR items.
2. GR and FR items should take an average of 1.5 minutes per item to complete.
3. GR and FR items are worth one point each.
4. The bubble grids used with GR items contain four, five, six, or seven columns. Columns in which students may bubble a numeral contain the digits 0 through 9 enclosed in bubbles. Appendix H provides examples of the various FCAT 2.0 Mathematics grids.
5. The GR format is designed for items that require a positive numeric solution (whole numbers, decimals, percents, or fractions) at Grades 4–7. GR items in two benchmarks in Grade 7 and all GR items in Grade 8 may require a negative numeric solution. A seventh column is added to these grids to allow for the negative sign. Note: The only benchmarks in Grade 7 that will use negative grids are MA.7.A.3.2 and MA.7.A.3.3.
6. Multiple formats (e.g., equivalent fractions and decimals) are acceptable for items as long as each form of the correct response can be recorded in the grid.
7. Four- or five-column grids are used for Grades 4 and 5 and may be preceded with a dollar sign ($) or followed by a percent sign (%), as appropriate.
8. Special grids are provided at Grades 4 and 5 for gridding decimal numbers. The decimal grid is six columns wide with a fixed decimal point in the third column from the left. That is, there are two columns preceding the column with the decimal and three columns following it.
9. There are two types of currency grids for Grades 4 and 5. One includes a decimal point for dollars and cents, and one does not. Both grids have a dollar sign preceding the grid.
10. Grades 6 and 7 use a six-column grid that includes the digits 0 through 9 plus two symbols: a decimal point (.) and a fraction bar (/) for gridding fractions. The fraction bar cannot be used in the first or the sixth column.
11. Gridded items assessing two Grade 7 benchmarks and all gridded items in Grade 8 use a seven-column grid. The first column of the grid is used for only a negative sign, and the remaining columns include the digits 0 through 9 plus two symbols: the decimal point (.) and the fraction bar (/) for gridding fractions. The fraction bar cannot be used in the second or the seventh column.
12. All grids include light shading in alternate columns. Shading should not interfere with students' ability to read the numbers inside each column.
13. GR/FR items should include instructions that specify the unit in which the answer is to be provided (e.g., inches). If several units of measure are in the item (e.g., in an item involving a conversion), the final unit needed for the answer should be written in boldface.
14. GR/FR items are written with consideration for the number of columns in the grid.
15. The Algebra 1 and Geometry EOC will be computer based and will use a seven-column FR for items not assessed by multiple choice.

Scope of Items

The scope of FCAT 2.0 Mathematics test items for Grades 3–5 is presented in Appendix B, which gives the benchmarks for Grades 3–5. The benchmarks serve as the objectives to which the test items are written. There may be additional specifications or restrictions by grade level; these are given in the General Content Limits by Grade Level section of the *Specifications* for Grades 3–5.

Some of the benchmarks are assessed across Grades 3–8. These benchmarks are introduced at one grade with the understanding that they will be assessed at higher levels of difficulty in each succeeding grade. Florida's NGSSS are available at: http://www.floridastandards.org/Standards/FLStandardSearch.aspx.

Guidelines for Item Writers

FCAT 2.0 Mathematics item writers must have a comprehensive knowledge of the assessed mathematics curriculum and a strong understanding of the cognitive abilities of the students taking the test. Item writers should know and consistently apply the guidelines established in these *Specifications* as well as contribute to the goal of developing test content that allows students to perform at their best. Item writers are also expected to use their best judgment in writing items that measure the mathematics benchmarks of the NGSSS without introducing extraneous elements that reflect bias for or against a group of students.

Item writers for FCAT 2.0 Mathematics must submit items in a particular format and must include the following information about each item. Because items are rated by committees of Florida educators following submission to the DOE, familiarity with the directions for rating items (found in Appendix E) would prove useful to all item writers.

Format

Item writers must submit items in the agreed-upon template. All appropriate sections of the template should be completed before the items are submitted.

Sources

Item writers are expected to provide sources of all verifiable information included in the item. Acceptable sources include up-to-date textbooks, magazines, and journals respected by the mathematics community, and Internet sites maintained by reputable organizations such as universities. It may be necessary to provide sources verifying why a correct answer is correct, as well as why other responses are incorrect.

Correct Response

Item writers must supply the correct response.

- For multiple-choice items, this includes an explanation of why each of the distractors is incorrect.
- For gridded-response items, this includes explanations of why the correct answer is correct and an explanation of additional possible correct answers.
- For fill-in response items, this includes explanations of why the correct answer is correct and an explanation of additional possible correct answers.

Submission of Items

When submitting items, item writers must balance several factors. Item submissions should:

- include items of varying difficulty;
- include items of varying cognitive complexity;
- have an approximate balance, for multiple-choice items, of the correct response among the four answer options;
- have an equal balance of male and female names; and
- include names representing different ethnic groups in Florida.

Item Difficulty and Cognitive Complexity of FCAT 2.0 Mathematics Items

Educational standards and assessments can be aligned based on the category of content covered and also on the complexity of knowledge required. The FCAT 2.0 items, while assessing Florida's NGSSS, must also reflect this goal and standard. It is important to develop items that elicit student responses that demonstrate the complexity of knowledge and skills required to meet these objectives. The degree of challenge of FCAT 2.0 items is currently categorized in two ways: **item difficulty** and **cognitive complexity**.

Item Difficulty

The difficulty of FCAT 2.0 items is initially estimated by committees of educators participating in Item Content Review meetings each year. As each test item is reviewed, committee members make a prediction of difficulty based upon their knowledge of student performance at the given grade level. The classification scheme used for this prediction of item difficulty is based on the following:

Easy	More than 70 percent of the students are likely to respond correctly.
Average	Between 40 percent and 70 percent of the students are likely to respond correctly.
Challenging	Fewer than 40 percent of the students are likely to respond correctly.

After an item appears on a test, item difficulty refers to the actual percentage of students who chose the correct answer.

Cognitive Complexity

Cognitive complexity refers to the cognitive demand associated with an item. In the early years of the FCAT program, the DOE used Bloom's Taxonomy[1] 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 DOE implemented a new cognitive classification system based upon Dr. Norman L. Webb's Depth of Knowledge (DOK) levels.[2] The rationale for classifying an item by its DOK level of complexity focuses on the *expectations made of the item*, not on the *ability of the student*. When classifying an item's demands on thinking (i.e., what the item requires the student to recall, understand, analyze, and do), it is assumed that the student is familiar with the basic concepts of the task. Items are chosen for the FCAT 2.0 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 options). 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—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 intent of the item writer weighs heavily in determining the complexity of an item.

The pages that follow illustrate some of the varying demands that items might make at each complexity level for FCAT 2.0 Mathematics. Note that items may fit one or more descriptions. In most instances, these items are classified at the highest level of complexity demanded by the item. Caution must be used in referring to the chart of descriptors that is provided for each cognitive complexity level. This chart is provided for ease of reference, but the ultimate determination of item complexity should be made considering the overall cognitive demand placed on a student. A table also provides the breakdown of the percentage of points by cognitive complexity level.

Item writers are expected to evaluate their items in terms of cognitive complexity and include this on the item template. Items should be written to the highest level of complexity as appropriate to the assessed benchmark.

[1] Bloom, B.S. et al. *Taxonomy of Educational Objectives, Handbook I: Cognitive Domain.* New York: McKay, 1956.
[2] Webb, Norman L. and others. "Webb Alignment Tool" 24 July 2005. Wisconsin Center of Educational Research. University of Wisconsin-Madison. 2 Feb. 2006. http://www.wcer.wisc.edu/WAT/index.aspx.

Low Complexity

FCAT 2.0 Mathematics low-complexity items rely heavily on the recall and recognition of previously learned concepts and principles. Items typically specify what the student is to do, which often is to carry out some procedure that can be performed mechanically. It is not left to the student to come up with an original method or solution.

Below is an example of a low-complexity item that is based on Benchmark MA.4.A.1.2. For more information about this item, see page 78.

A giant panda eats 83 pounds of bamboo per day. How many pounds of bamboo will a giant panda eat in 7 days?

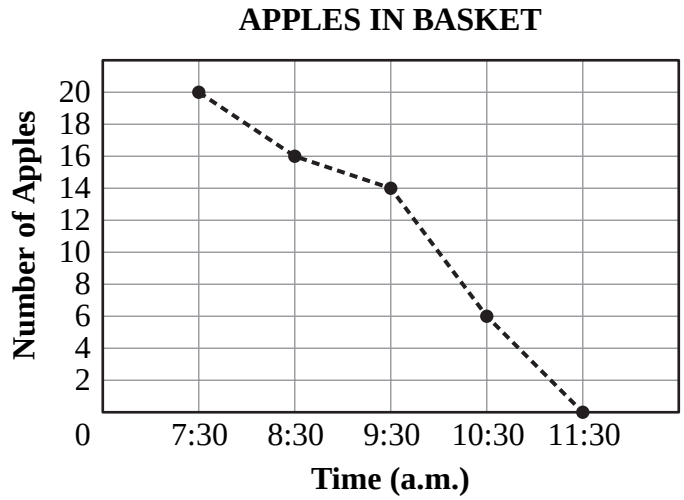
A. 171 pounds
B. 571 pounds
★ **C.** 581 pounds
D. 701 pounds

Moderate Complexity

FCAT 2.0 Mathematics moderate-complexity items involve more flexible thinking than low-complexity items. Items require a response that goes beyond the habitual, is not explicitly specified in the text, and ordinarily has 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 skill and knowledge from various domains.

Below is an example of a moderate-complexity item that is based on Benchmark MA.5.S.7.1. For more information about this item, see page 151.

Mrs. Reich put a basket of 20 apples in the teachers' work room one morning. The line graph below shows the number of apples that were in the basket at several times during that morning.



According to the graph, during which of the following periods of time were the most apples taken from the basket?

A. from 7:30 a.m. to 8:30 a.m.
B. from 8:30 a.m. to 9:30 a.m.
★ **C.** from 9:30 a.m. to 10:30 a.m.
D. from 10:30 a.m. to 11:30 a.m.

High Complexity

FCAT 2.0 Mathematics high-complexity items make heavy demands on student thinking. Students must engage in more abstract reasoning, planning, analysis, judgment, and creative thought. Items require that the student think in an abstract and sophisticated way.

Below is an example of a high-complexity item that is based on Benchmark MA.3.A.6.2. For more information about this item, see page 74.

Mrs. Tellez is buying fish for her fish tank. The price of each fish changes according to the type and size of the fish, as shown in the chart below.

FISH PRICES

Type of Fish	Price Range (including tax)
Angelfish	$0.69 to $0.89
Goldfish	$1.09 to $1.29
Guppies	$0.99 to $1.09
Mollies	$1.79 to $1.99

Mrs. Tellez wants to buy 1 angelfish, 2 goldfish, 2 guppies, and 3 mollies. Which of the following could be the total cost of the 8 fish?

A. $ 8.00
B. $ 9.00
C. $10.00
★ **D.** $11.00

The following chart is provided for ease of reference; however, caution must be used in referring to this chart of descriptors for each cognitive complexity level. The ultimate determination of an item's cognitive complexity should be made considering the intent of the overall cognitive demand placed on a student.

Examples of FCAT 2.0 Mathematics Activities Across Cognitive Complexity Levels		
Low Complexity	**Moderate Complexity**	**High Complexity**
• Recall or recognize a fact, term, or property. • Identify appropriate units or tools for common measurements. • Compute a sum, difference, product, or quotient. • Recognize or determine an equivalent representation. • Calculate the value of an expression, given specific values for the variables. • Solve a one-step problem. • Retrieve information from a graph, table, or figure. • Perform a single-unit conversion (e.g., feet to inches).	• Solve a problem requiring multiple operations. • Solve a problem involving multiple transformations of a figure or spatial visualization or reasoning. • Retrieve information from a graph, table, or figure and use it to solve a problem. • Compare figures or statements. • Determine a reasonable estimate. • Extend an algebraic or geometric pattern. • Explain steps of a solution process. • Translate and solve a routine problem, given data and conditions. • Represent a situation mathematically in more than one way.	• Solve real-world problems using multiple steps and multiple decision points. • Describe how different representations can be used for different purposes. • Solve a nonroutine problem (as determined by grade-level appropriateness). • Analyze similarities and differences between procedures and concepts. • Generalize an algebraic or geometric pattern. • Formulate an original problem, given a situation. • Solve a problem in more than one way. • Provide a mathematical explanation and/or justification to a problem. • Describe, compare, and contrast solution methods. • Formulate a mathematical model for a complex situation. • Analyze or produce a deductive argument.

Items are classified on the cognitive demand inherent in the test item, not on assumptions about the student's approach to the item. Low-complexity items rely heavily on recall and recognition. Moderate-complexity items require more flexible thinking and may require informal reasoning or problem solving. High-complexity items are written to elicit analysis and abstract reasoning. The table below presents the range for the percentage of raw-score points by cognitive complexity level on each FCAT 2.0 Mathematics test.

Percentage of Points by Cognitive Complexity Level for FCAT 2.0 Mathematics

Assessment	Low	Moderate	High
3–4	25–35	50–70	5–15
5	10–20	55–75	10–20
6–8	10–20	60–80	10–20
Algebra 1 EOC	10–20	60–80	10–20
Geometry EOC	10–20	60–80	10–20

Universal Design

The application of universal design principles helps develop assessments that are usable by the greatest number of test takers, including those with disabilities and nonnative speakers of English. To support the goal of providing access to all students, the test maximizes readability, legibility, and compatibility with accommodations, and test development includes a review for potential bias and sensitivity issues.

The DOE trains both internal and external reviewers to revise items, allowing for the widest possible range of student participation. Item writers must attend to the best practices suggested by universal design including, but not limited to,

- reduction of wordiness;
- avoidance of ambiguity;
- selection of reader-friendly construction and terminology; and
- consistently applied concept names and graphic conventions.

Universal design principles also inform decisions about test layout and design including, but not limited to, type size, line length, spacing, and graphics.

Review Procedures for FCAT 2.0 Mathematics

Prior to appearing on any assessment, all mathematics items must pass several levels of review as part of the development process. Florida educators and citizens, in conjunction with the DOE and assessment contractors, scrutinize all material prior to accepting it for placement on the tests.

Review for Potential Bias

Mathematics items are reviewed by groups of Florida educators generally representative of Florida's geographic regions and culturally diverse population. Items are reviewed for the following kinds of bias: gender, racial, ethnic, linguistic, religious, geographic, and socioeconomic. Item reviews also include consideration of issues related to individuals with disabilities.

Review for Community Sensitivity

Florida citizens associated with a variety of organizations and institutions review all items for issues of potential concern to members of the community at large. The purpose of this review is to ensure that the primary purpose of assessing mathematics achievement is not undermined by inadvertently including in the test any materials that parents and other stakeholders may deem inappropriate. Reviewers are asked to consider the variety of cultural, regional, philosophical, political, and religious backgrounds throughout Florida, and then to determine whether the subject matter will be acceptable to Florida students, their parents, and other members of Florida communities. Test items are written to meet FCAT 2.0 criteria.

Review of Test Items

The DOE and the assessment contractors review all test items during the item development process.

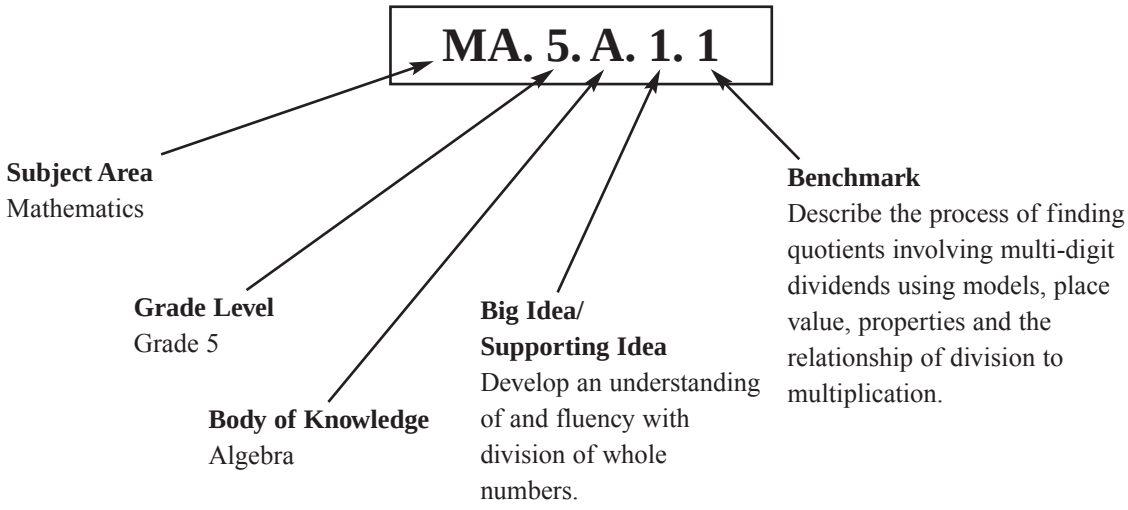
Groups of Florida educators and citizens are subsequently convened to review the items for content characteristics and item specifications. The content review focuses on validity, determining whether each item is a valid measure of the designated NGSSS benchmark, as defined by the grade-level specifications for test items. Separate reviews for bias and sensitivity issues are also conducted as noted above.

FCAT 2.0 items are field tested with a large group of students in Florida to ensure clarity of items before they count toward a student's score. In the event an item does not test well, it is either deleted or revised. Revised items will again require field testing prior to being scored.

Benchmark Classification System

Each benchmark in the NGSSS is labeled with a system of numbers and letters.

- The letters in the *first two positions* of the code identify the **Subject Area** (e.g., MA for mathematics).
- The number in the *third position* represents the **Grade Level** to which the benchmark belongs.
- The letter in the *fourth position* of the code represents the **Body of Knowledge** to which the benchmark belongs.
- The number in the *fifth position* represents the **Big Idea/Supporting Idea** to which the benchmark belongs.
- The number in the *last position* of the code states the specific **Benchmark** under grade-level Big Idea/Supporting Idea.
- Note that, in Grades 3–8, Number and Operations is assessed within the Algebra Body of Knowledge.



Grade 5
Big Idea 1: Develop an understanding of and fluency with division of whole numbers.
MA.5.A.1.1 Describe the process of finding quotients involving multi-digit dividends using models, place value, properties and the relationship of division to multiplication.

Definitions of Benchmark Specifications

The *Specifications* identify how Florida's NGSSS benchmarks are assessed at Grades 3–8, Algebra 1 EOC, and Geometry EOC. For each benchmark assessed in mathematics, the following information is provided in each grade-level *Specifications* section.

Reporting Categories are groupings of related benchmarks from the NGSSS that are used to summarize and report achievement for FCAT 2.0 Mathematics, Algebra 1 EOC, and Geometry EOC.

Standard refers to the standard statement presented in the NGSSS.

Big Idea/ Supporting Idea are general statements of expected student achievement within each reporting category.

Benchmark refers to the benchmark statement presented in the NGSSS. The benchmarks are specific statements of expected student achievement. The benchmarks are different for the different grade levels assessed (as described at the beginning of this section). In some cases, two or more related benchmarks are grouped together because the assessment of one benchmark addresses another benchmark. Such groupings are indicated in the benchmark statement.

Item Types are used to assess the benchmark or group of benchmarks. The types of items used on the FCAT 2.0 are described in the Item Style and Format section of the *Specifications*. In the Sample Items section that follows, the item types are abbreviated as MC for multiple choice and GR for gridded response.

Benchmark Clarifications explain how the achievement of the benchmark will be demonstrated by students for each specific item type. In other words, the clarification statements explain what the student will do when responding to questions of each type.

Content Limits define the range of content knowledge and degree of difficulty that should be assessed in the items for the benchmark.

Benchmark content limits are to be used in conjunction with the General Content Limits identified for each grade level in the *Specifications*. The content limits defined in the Individual Benchmark Specifications section may be an expansion or further restriction of the General Content Limits by Grade Level specified earlier in the *Specifications*.

Stimulus Attributes	define the types of stimulus materials that should be used in the items, including the appropriate use of graphic materials and item context or content.
Response Attributes	define the characteristics of the answers that a student must choose from or provide.
Sample Items	are provided for each type of question assessed. The sample items are presented in a format like that used in the test. The correct answer for each sample item is identified in the following manner: • For MC items, the correct answer is indicated with a five-point star. • For GR items, the acceptable answers are given. • For FR items, the acceptable answers are given.
Item Context	gives a topical frame of reference to real-world applications of the test items.

General Content Limits by Grade Level

Grade 3 General Content Limits

The content limits described below are applicable to all items developed for Grade 3; however, the content limits defined in the individual benchmark specifications can supersede these general content limits.

Whole numbers

- Items should not require the use of more than two operations.
- Place values should range from ones through hundred thousands.

Addition

- Items should not exceed three 5-digit addends or two 6-digit addends.

Subtraction

- Subtrahends cannot exceed 999,999.
- Minuends and differences should not exceed five digits.

Multiplication

- Items may include whole-number multiplication facts from 0×0 through 9×9.
- Multiples of 10 through 100, multiples of 100 through 1,000, and multiples of 50 through 500 may be used.

Division

- Items may include the related division facts for 0×0 through 9×9.

Decimals

- Decimal numbers are limited to amounts of money to the nearest cent.

Addition, Subtraction, Multiplication, and Division

- Not assessed at Grade 3.

Fractions

- Fractions should have denominators of 1–10, 12, or 16.
- Items may include fractions and mixed numbers up to and including the whole number 5.

Addition, Subtraction, Multiplication, and Division

- Not assessed at Grade 3.

Percent

- Not assessed at Grade 3.

Measurement

- Items will not assess weight/mass, capacity, or temperature in isolation.
- Time and linear measurement, including perimeter, will be assessed.
- Items may use customary and/or metric units.

Grade 4 General Content Limits

The content limits described below are applicable to all items developed for Grade 4; however, the content limits defined in the individual benchmark specifications can supersede these general content limits.

Whole numbers

- Items should not require the use of more than two operations.
- Place values should range from ones through hundred millions.

Addition

- Items should not exceed three 7-digit addends or two 8-digit addends.

Subtraction

- Subtrahends, minuends, and differences should not exceed eight digits.

Multiplication

- Factors used may include up to two 3-digit numbers, or, when a four-digit factor is used, the other factor may not exceed two digits.
- Multiplication can be shown by use of parentheses [e.g., 5(4)], a multiplication sign (the dot or $\times$), or as a coefficient and variable (e.g., $4n$).

Division

- Divisors should not exceed one digit, unless it is a related division fact of 0×0 through 12×12.
- Dividends should not exceed three digits.
- Quotients may include remainders expressed only as whole numbers.
- Items will not require the use of long division.

Decimals

- Place values could range from tenths through thousandths with no more than five total digits.

Addition, Subtraction, Multiplication, and Division

- Not assessed at Grade 4.

Fractions

- Items may have denominators of 1–20, 25, 50, 100, or 1,000, or denominators that are derived from multiplication facts through 12×12 may also be used (e.g., 24 has the factors 6 and 4; 72 has the factors 8 and 9).

Addition, Subtraction, Multiplication, and Division

- Not assessed at Grade 4.

Percent

- Percents must be equivalent only to halves, fourths, tenths, or hundredths.
- Items dealing with percents will not involve computation using the percent.

Measurement

- Items will not assess weight/mass, time, temperature, perimeter, and/or capacity in isolation.
- Items may use customary and/or metric units.
- See Geometry and Measurement benchmarks for specifics.

Gridded-Response Items

- Answers may not exceed five digits.
- Answers may not include fractions.
- See grid types for appropriate answer formats. See Appendix H.

Grade 5 General Content Limits

The content limits described below are applicable to all items developed for Grade 5; however, the content limits defined in the individual benchmark specifications can supersede these general content limits.

Whole numbers

- Items should not require the use of more than three operations.
- Integers may range from -500 through 999,999,999.

Addition

- Items should not exceed four addends.
- Items should not exceed four 4-digit addends, three 5-digit addends, or two 6-digit addends.

Subtraction

- Subtrahends, minuends, and differences should not exceed six digits.

Multiplication

- Factors can have up to three digits by three digits or four digits by two digits and could include a 0 in the hundreds, tens, and/or ones places.
- Multiplication can be shown by use of parentheses [e.g., 5(4)], a multiplication sign (the dot or $\times$), or as a coefficient and variable (e.g., $4n$).

Division

- Divisors should not exceed two digits.
- Dividends should not exceed four digits.
- Quotients may be expressed as mixed numbers or include remainders.

Decimals

- Place values could range from tenths through thousandths.

Addition

- Items should not require the use of more than four 4-digit addends or two 5-digit addends.

Subtraction

- Subtrahends, minuends, and differences should not exceed five digits.

Multiplication

- Multiplication is limited to the context of money.
- Factors may have up to a four-digit number multiplied by a two-digit number.

Division

- Division is limited to the context of money.
- Divisors should not exceed two digits and must be whole numbers.
- Dividends should not exceed four digits.
- Quotients should not have remainders.

Fractions

- Fractions should have denominators of 1–20, 25, 50, 75, 100, 1,000, or denominators that are derived from multiplication facts through 12×12 may also be used (e.g., 24 has the factors 6 and 4; 72 has the factors 8 and 9).

Addition

- Items should not require the use of more than three addends.
- Items may require the use of up to two mixed numbers with unlike denominators of 2 through 12 (excluding 11).
- Items should not require the use of more than two unlike denominators.

Subtraction

- Items should not require the use of more than two unlike denominators.
- Subtrahends and minuends may use up to two mixed numbers with unlike denominators of 2 through 12 (excluding 11).

Multiplication

- Not assessed at Grade 5.

Division

- Not assessed at Grade 5.

Percent

- When finding equivalent fractions and decimals, items will be limited to percents equivalent to halves, fourths, tenths, and hundredths.
- Items dealing with percents will not involve computation using the percent.

Measurement

- Items will be limited to assessment of length (to the nearest $\frac{1}{16}$ inch), weight/mass, elapsed time, temperature, perimeter, area, and volume/capacity.

Gridded-Response Items

- Answers may not exceed five digits.
- See grid types for appropriate answer formats. See Appendix H.

Grade 6 General Content Limits

The content limits described below are applicable to all items developed for Grade 6; however, the content limits defined in the individual benchmark specifications can supersede these general content limits.

Whole numbers

- Items should not require the use of more than three operations.
- Place values should range from -500 through 999,999,999.

Addition

- Items should not exceed five addends.
- Addends should not exceed six digits.
- Addends in items with five addends should not exceed four digits.

Subtraction

- Subtrahends, minuends, and differences should not exceed six digits.

Multiplication

- Products should not exceed seven digits.

Division

- Divisors should not exceed two digits.
- Dividends should not exceed four digits, unless a dividend is a multiple of 10 (e.g., 17,240 ÷ 60).
- Quotients should be terminating decimals.

Decimals

- Place values should range from tenths through thousandths.

Addition

- Items should not require the use of more than five addends.
- Addends should not exceed five digits.
- Items with five addends should not use five-digit numbers.

Subtraction

- Subtrahends, minuends, and differences should not exceed five digits.

Multiplication

- Products should not exceed seven digits.

Division

- Divisors should not exceed three digits.
- Dividends should not exceed four digits.
- Quotients should not exceed four digits and must terminate within three decimal places.

Fractions

- Items should use denominators of 1 through 20; any multiple of 2, 3, or 5 through 100; or 1,000; or denominators that are derived from multiplication facts through 12×12.
- Items may include fractions and mixed numbers.

Addition

- Items should not require the use of more than three unlike denominators.

Subtraction

- Items should not require the use of more than three unlike denominators.

Multiplication

- Items may include up to three factors.

Division

- Denominators of fractions must be less than or equal to 12.
- In fractions that must be simplified, the numerator and denominator must have at least one common prime factor of 2, 3, 5, or 7.

Percent

- See benchmark for specific content limits.

Measurement

- Items will not assess conversion of units in isolation.

Grade 7 General Content Limits

The content limits described below are applicable to all items developed for Grade 7; however, the content limits defined in the individual benchmark specifications can supersede these general content limits.

Whole numbers

Addition
- Items should not require the use of more than five addends.
- Addends should not exceed six digits.

Subtraction
- Subtrahends, minuends, and differences should not exceed six digits.

Multiplication
- Products should not exceed eight digits.

Division
- Dividends should not exceed five digits.

Decimals

- Place values should range from tenths through ten-thousandths.

Addition
- Items should not exceed five addends.
- Addends should not exceed six digits.

Subtraction
- Subtrahends, minuends, and differences should not exceed six digits.

Multiplication
- Products should not exceed eight digits.

Division
- Divisors should not exceed three digits.
- Dividends should not exceed five digits.
- Quotients should not exceed seven digits.

Fractions

- Items should use denominators through 1,000.
- Items may include fractions and mixed numbers.

Addition

- Items should not require the use of more than three addends.

Subtraction

- See benchmark for specific content limits.

Multiplication

- See benchmark for specific content limits.

Division

- Divisors cannot be mixed numbers.

Percent

- See benchmark for specific content limits.

Measurement

- See benchmark for specific content limits.

Grade 8 General Content Limits

The content limits described below are applicable to all items developed for Grade 8; however, the content limits defined in the individual benchmark specifications can supersede these general content limits.

Whole numbers

Addition
- Items should not require the use of more than six addends.
- Addends should not exceed six digits.

Subtraction
- Subtrahends, minuends, and differences should not exceed six digits.

Multiplication
- See benchmark for specific content limits.

Division
- See benchmark for specific content limits.

Decimals

Addition
- Items should not require the use of more than six addends.
- Addends should not exceed six digits.

Subtraction
- Subtrahends, minuends, and differences should not exceed six digits.

Multiplication
- See benchmark for specific content limits.

Division
- Quotients should have terminating decimals.

Fractions
- Items should not require the use of more than three addends or factors.

Percent
- See benchmark for specific content limits.

Measurement
- See benchmark for specific content limits.

Algebra 1 and Geometry End-of-Course General Content Limits

The content limits described below are applicable to all items developed for the Algebra 1 and Geometry End-of-Course assessments; however, the content limits defined in the individual benchmark specifications can supersede these general content limits.

Whole numbers

Addition
- Items should not require the use of more than six addends.
- Addends should not exceed six digits.

Subtraction
- Subtrahends, minuends, and differences should not exceed six digits.

Multiplication
- Products should not exceed eight digits.

Division
- Divisors should not exceed three digits.
- Dividends should not exceed five digits.

Decimals

Addition
- Items should not require the use of more than six addends.
- Addends should not exceed six digits.

Subtraction
- Subtrahends, minuends, and differences should not exceed six digits.

Multiplication
- Products should not exceed eight digits.

Division
- Divisors should not exceed three digits, unless dealing with currency.
- Dividends should not exceed five digits, unless dealing with currency.
- Quotients should not exceed seven digits.

Fractions
- Items should not require the use of more than three addends or factors.

Percent
- See benchmark for specific content limits.

Measurement
- See benchmark for specific content limits.

Item Contexts

The situation in which a test question is presented is called the item context. FCAT 2.0 Mathematics questions may be presented in either a real-world or mathematical context; however, other variables must also be considered. Several of these considerations are listed below, and others are described in the Individual Benchmark Specifications. For more information about item contexts, refer to the DOE website at: http://fcat.fldoe.org/fcat2/pdf/MathematicsAppendixA.pdf.

1. The item content should be designed to interest students at the tested levels.
2. The item context should be designed to incorporate subject areas other than mathematics. Specifically, topics from the NGSSS should be used where appropriate. For example, items may require students to work with topics related to The Arts, Language Arts, Social Studies/Consumerism, Science, Foreign Language, or Health/Physical Education.
3. As often as possible, items should be presented in real-world contexts or should be related to real-world situations.
4. Items including specific information or data should be accurate and documented against reliable sources. It may be necessary to obtain copyright permissions.
5. The item content should be timely but not likely to become dated too quickly.
6. Information should be presented through written text and/or through visual material, such as graphs, tables, diagrams, maps, models, and/or other illustrations.
7. All graphs provided to the students should be complete with title, scale, and labeled axes, except when these components are to be completed by the student.
8. All graphics in items should be uncluttered and should clearly depict the necessary information. Graphics should contain relevant details that contribute to the student's understanding of the item or support the context of the item. Graphics should not introduce bias to the item.
9. Extraneous information may be included in items.

Benchmark Comparison for Grades K–2

Kindergarten	Grade 1	Grade 2
Big Idea 1: Represent, compare, and order whole numbers and join and separate sets.	**Big Idea 1:** Develop understandings of addition and subtraction strategies for basic addition facts and related subtraction facts.	**Big Idea 1:** Develop an understanding of base-ten numerations system and place-value concepts.
MA.K.A.1.1 Represent quantities with numbers up to 20, verbally, in writing, and with manipulatives.	**MA.1.A.1.1** Model addition and subtraction situations using the concepts of "part-whole," "adding to," "taking away from," "comparing," and "missing addend."	**MA.2.A.1.1** Identify relationships between the digits and their place values through the thousands, including counting by tens and hundreds.
MA.K.A.1.2 Solve problems including those involving sets by counting, by using cardinal and ordinal numbers, by comparing, by ordering, and by creating sets up to 20.	**MA.1.A.1.2** Identify, describe, and apply addition and subtraction as inverse operations.	**MA.2.A.1.2** Identify and name numbers through thousands in terms of place value, and apply this knowledge to expanded notation.
MA.K.A.1.3 Solve word problems involving simple joining and separating situations.	**MA.1.A.1.3** Create and use increasingly sophisticated strategies, and use properties such as Commutative, Associative and Additive Identity, to add whole numbers.	**MA.2.A.1.3** Compare and order multi-digit numbers through the thousands.
	MA.1.A.1.4 Use counting strategies, number patterns, and models as a means for solving basic addition and subtraction fact problems.	
Big Idea 2: Describe shapes and space.	**Big Idea 2:** Develop an understanding of whole number relationships, including grouping by tens and ones.	**Big Idea 2:** Develop quick recall of addition facts and related subtraction facts and fluency with multi-digit addition and subtraction.
MA.K.G.2.1 Describe, sort and re-sort objects using a variety of attributes such as shape, size, and position.	**MA.1.A.2.1** Compare and order whole numbers at least to 100.	**MA.2.A.2.1** Recall basic addition and related subtraction facts.

Benchmark Comparison for Grades K–2

Kindergarten	Grade 1	Grade 2
MA.K.G.2.2 Identify, name, describe and sort basic two-dimensional shapes such as squares, triangles, circles, rectangles, hexagons, and trapezoids.	**MA.1.A.2.2** Represent two digit numbers in terms of tens and ones.	**MA.2.A.2.2** Add and subtract multi-digit whole numbers through three digits with fluency by using a variety of strategies, including invented and standard algorithms and explanations of those procedures.
MA.K.G.2.3 Identify, name, describe, and sort three-dimensional shapes such as spheres, cubes and cylinders.	**MA.1.A.2.3** Order counting numbers, compare their relative magnitudes, and represent numbers on a number line.	**MA.2.A.2.3** Estimate solutions to multi-digit addition and subtraction problems through three digits.
MA.K.G.2.4 Interpret the physical world with geometric shapes, and describe it with corresponding vocabulary.		**MA.2.A.2.4** Solve addition and subtraction problems that involve measurement and geometry.
MA.K.G.2.5 Use basic shapes, spatial reasoning, and manipulatives to model objects in the environment and to construct more complex shapes.		
Big Idea 3: Order objects by measurable attributes.	**Big Idea 3:** Compose and decompose two-dimensional and three-dimensional geometric shapes.	**Big Idea 3:** Develop an understanding of linear measurement and facility in measuring lengths.
MA.K.G.3.1 Compare and order objects indirectly or directly using measurable attributes such as length, height, and weight.	**MA.1.G.3.1** Use appropriate vocabulary to compare shapes according to attributes and properties such as number and lengths of sides and number of vertices.	**MA.2.G.3.1** Estimate and use standard units, including inches and centimeters, to partition and measure lengths of objects.
	MA.1.G.3.2 Compose and decompose plane and solid figures, including making predictions about them, to build an understanding of part-whole relationships and properties of shapes.	**MA.2.G.3.2** Describe the inverse relationship between the size of a unit and number of units needed to measure a given object.

Benchmark Comparison for Grades K–2

Kindergarten	Grade 1	Grade 2
		MA.2.G.3.3 Apply the Transitive Property when comparing lengths of objects.
		MA.2.G.3.4 Estimate, select an appropriate tool, measure, and/or compute lengths to solve problems.
Supporting Idea: Algebra		
MA.K.A.4.1 Identify and duplicate simple number and non-numeric repeating and growing patterns.	**MA.1.A.4.1** Extend repeating and growing patterns, fill in missing terms, and justify reasoning.	**MA.2.A.4.1** Extend number patterns to build a foundation for understanding multiples and factors–for example, skip counting by 2's, 5's, 10's.
		MA.2.A.4.2 Classify numbers as odd or even and explain why.
		MA.2.A.4.3 Generalize numeric and non-numeric patterns using words and tables.
		MA.2.A.4.4 Describe and apply equality to solve problems, such as in balancing situations.
		MA.2.A.4.5 Recognize and state rules for functions that use addition and subtraction.

Benchmark Comparison for Grades K–2

Kindergarten	Grade 1	Grade 2
Supporting Idea: Geometry and Measurement		
MA.K.G.5.1 Demonstrate an understanding of the concept of time using identifiers such as morning, afternoon, day, week, month, year, before/after, shorter/longer.	**MA.1.G.5.1** Measure by using iterations of a unit, and count the unit measures by grouping units.	**MA.2.G.5.1** Use geometric models to demonstrate the relationships between wholes and their parts as a foundation to fractions.
	MA.1.G.5.2 Compare and order objects according to descriptors of length, weight, and capacity.	**MA.2.G.5.2** Identify time to the nearest hour and half hour.
		MA.2.G.5.3 Identify, combine, and compare values of money in cents up to $1 and in dollars up to $100, working with a single unit of currency.
		MA.2.G.5.4 Measure weight/mass and capacity/volume of objects. Include the use of the appropriate unit of measure and their abbreviations including cups, pints, quarts, gallons, ounces (oz), pounds (lbs), grams (g), kilograms (kg), milliliters (mL) and liters (L).
Supporting Idea: Number and Operations		
	MA.1.A.6.1 Use mathematical reasoning and beginning understanding of tens and ones, including the use of invented strategies, to solve two-digit addition and subtraction problems.	**MA.2.A.6.1** Solve problems that involve repeated addition.
	MA.1.A.6.2 Solve routine and non-routine problems by acting them out, using manipulatives, and drawing diagrams.	

Benchmarks Assessed at Grades 3–5

Grade 3	Grade 4	Grade 5
Big Idea 1: Develop understandings of multiplication and division and strategies for basic multiplication facts and related division facts.	**Big Idea 1:** Develop quick recall of multiplication facts and related division facts and fluency with whole number multiplication.	**Big Idea 1:** Develop an understanding of and fluency with division of whole numbers.
MA.3.A.1.1 Model multiplication and division, including problems presented in context: repeated addition, multiplicative comparison, array, how many combinations, measurement, and partitioning.	**MA.4.A.1.1** Use and describe various models for multiplication in problem-solving situations, and demonstrate recall of basic multiplication and related division facts with ease. (Assessed with MA.4.A.1.2.)	**MA.5.A.1.1** Describe the process of finding quotients involving multi-digit dividends using models, place value, properties, and the relationship of division to multiplication.
MA.3.A.1.2 Solve multiplication and division fact problems by using strategies that result from applying number properties.	**MA.4.A.1.2** Multiply multi-digit whole numbers through four digits fluently, demonstrating understanding of the standard algorithm and checking for reasonableness of results, including solving real-world problems. (Also assesses MA.4.A.1.1.)	**MA.5.A.1.2** Estimate quotients or calculate them mentally depending on the context and numbers involved. (Assessed with MA.5.A.1.4.)
MA.3.A.1.3 Identify, describe, and apply division and multiplication as inverse operations.		**MA.5.A.1.3** Interpret solutions to division situations, including those with remainders, depending on the context of the problem. (Assessed with MA.5.A.1.4.)
		MA.5.A.1.4 Divide multi-digit whole numbers fluently, including solving real-world problems, demonstrating understanding of the standard algorithm, and checking the reasonableness of results. (Also assesses MA.5.A.1.2 and MA.5.A.1.3.)

Prior Knowledge: Items may require the student to apply mathematical knowledge described in NGSSS benchmarks from lower grades; however, the benchmarks from lower grades will not be assessed in isolation.

Benchmarks Assessed at Grades 3–5

Grade 3	Grade 4	Grade 5
Big Idea 2: Develop an understanding of fractions and fraction equivalence.	**Big Idea 2:** Develop an understanding of decimals, including the connection between fractions and decimals.	**Big Idea 2:** Develop an understanding of and fluency with addition and subtraction of fractions and decimals.
MA.3.A.2.1 Represent fractions, including fractions greater than 1, using area, set, and linear models.	**MA.4.A.2.1** Use decimals through the thousandths place to name numbers between whole numbers. (Assessed with MA.4.A.2.3 and MA.4.A.2.4.)	**MA.5.A.2.1** Represent addition and subtraction of decimals and fractions with like and unlike denominators using models, place value, or properties. (Also assesses MA.5.A.6.1.)
MA.3.A.2.2 Describe how the size of the fractional part is related to the number of equal-sized pieces in the whole. (Assessed with MA.3.A.2.3.)	**MA.4.A.2.2** Describe decimals as an extension of the base-ten number system. (Assessed with MA.4.A.2.3 and MA.4.A.2.4.)	**MA.5.A.2.2** Add and subtract fractions and decimals fluently, and verify the reasonableness of results, including in problem situations. (Also assesses MA.5.A.2.3 and MA.5.A.6.1.)
MA.3.A.2.3 Compare and order fractions, including fractions greater than 1, using models and strategies. (Also assesses MA.3.A.2.2.)	**MA.4.A.2.3** Relate equivalent fractions and decimals with and without models, including locations on a number line. (Also assesses MA.4.A.2.1 and MA.4.A.2.2.)	**MA.5.A.2.3** Make reasonable estimates of fraction and decimal sums and differences, and use techniques for rounding. (Assessed with MA.5.A.2.2.)
MA.3.A.2.4 Use models to represent equivalent fractions, including fractions greater than 1, and identify representations of equivalence.	**MA.4.A.2.4** Compare and order decimals, and estimate fraction and decimal amounts in real-world problems. (Also assesses MA.4.A.2.1 and MA.4.A.2.2.)	**MA.5.A.2.4** Determine the prime factorization of numbers. (Also assesses MA.5.A.6.1.)

Prior Knowledge: Items may require the student to apply mathematical knowledge described in NGSSS benchmarks from lower grades; however, the benchmarks from lower grades will not be assessed in isolation.

Benchmarks Assessed at Grades 3–5

Grade 3	Grade 4	Grade 5
Big Idea 3: Describe and analyze properties of two-dimensional shapes.	**Big Idea 3:** Develop an understanding of area and determine the area of two-dimensional shapes.	**Big Idea 3:** Describe three-dimensional shapes and analyze their properties, including volume and surface area.
MA.3.G.3.1 Describe, analyze, compare, and classify two-dimensional shapes using sides and angles–including acute, obtuse, and right angles–and connect these ideas to the definition of shapes.	**MA.4.G.3.1** Describe and determine area as the number of same-sized units that cover a region in the plane, recognizing that a unit square is the standard unit for measuring area.	**MA.5.G.3.1** Analyze and compare the properties of two-dimensional figures and three-dimensional solids (polyhedra), including the number of edges, faces, vertices, and types of faces.
MA.3.G.3.2 Compose, decompose, and transform polygons to make other polygons, including concave and convex polygons with three, four, five, six, eight, or ten sides.	**MA.4.G.3.2** Justify the formula for the area of the rectangle "area = base × height."	**MA.5.G.3.2** Describe, define, and determine surface area and volume of prisms by using appropriate units and selecting strategies and tools.
MA.3.G.3.3 Build, draw, and analyze two-dimensional shapes from several orientations in order to examine and apply congruence and symmetry.	**MA.4.G.3.3** Select and use appropriate units, both customary and metric, strategies, and measuring tools to estimate and solve real-world area problems.	
Supporting Idea: Algebra		
MA.3.A.4.1 Create, analyze, and represent patterns and relationships using words, variables, tables, and graphs.	**MA.4.A.4.1** Generate algebraic rules and use all four operations to describe patterns, including nonnumeric growing or repeating patterns.	**MA.5.A.4.1** Use the properties of equality to solve numerical and real-world situations.
	MA.4.A.4.2 Describe mathematics relationships using expressions, equations, and visual representations.	**MA.5.A.4.2** Construct and describe a graph showing continuous data, such as a graph of a quantity that changes over time. (Assessed with MA.5.S.7.1 and MA.5.S.7.2.)
	MA.4.A.4.3 Recognize and write algebraic expressions for functions with two operations.	

Prior Knowledge: Items may require the student to apply mathematical knowledge described in NGSSS benchmarks from lower grades; however, the benchmarks from lower grades will not be assessed in isolation.

Benchmarks Assessed at Grades 3–5

Grade 3	Grade 4	Grade 5
Supporting Idea: Geometry and Measurement		
MA.3.G.5.1 Select appropriate units, strategies, and tools to solve problems involving perimeter.	**MA.4.G.5.1** Classify angles of two-dimensional shapes using benchmark angles (45˚, 90˚, 180˚, and 360˚).	**MA.5.G.5.1** Identify and plot ordered pairs on the first quadrant of the coordinate plane.
MA.3.G.5.2 Measure objects using fractional parts of linear units such as $\frac{1}{2}$, $\frac{1}{4}$, and $\frac{1}{10}$.	**MA.4.G.5.2** Identify and describe the results of translations, reflections, and rotations of 45, 90, 180, 270, and 360 degrees, including figures with line and rotational symmetry.	**MA.5.G.5.2** Compare, contrast, and convert units of measure within the same dimension (length, mass, or time) to solve problems.
MA.3.G.5.3 Tell time to the nearest minute and to the nearest quarter hour, and determine the amount of time elapsed.	**MA.4.G.5.3** Identify and build a three-dimensional object from a two-dimensional representation of that object and vice versa.	**MA.5.G.5.3** Solve problems requiring attention to approximation, selection of appropriate measuring tools, and precision of measurement.
		MA.5.G.5.4 Derive and apply formulas for areas of parallelograms, triangles, and trapezoids from the area of a rectangle.
Supporting Idea: Number and Operations		
MA.3.A.6.1 Represent, compute, estimate, and solve problems using numbers through hundred thousands.	**MA.4.A.6.1** Use and represent numbers through millions in various contexts, including estimation of relative sizes of amounts or distances.	**MA.5.A.6.1** Identify and relate prime and composite numbers, factors, and multiples within the context of fractions. (Assessed with MA.5.A.2.1, MA.5.A.2.2 and MA.5.A.2.4.)
MA.3.A.6.2 Solve non-routine problems by making a table, chart, or list and searching for patterns.	**MA.4.A.6.2** Use models to represent division as: • the inverse of multiplication • as partitioning • as successive subtraction	**MA.5.A.6.2** Use the order of operations to simplify expressions, which include exponents and parentheses.
	MA.4.A.6.3 Generate equivalent fractions and simplify fractions.	**MA.5.A.6.3** Describe real-world situations using positive and negative numbers.
	MA.4.A.6.4 Determine factors and multiples for specified whole numbers.	**MA.5.A.6.4** Compare, order, and graph integers, including integers shown on a number line.

Prior Knowledge: Items may require the student to apply mathematical knowledge described in NGSSS benchmarks from lower grades; however, the benchmarks from lower grades will not be assessed in isolation.

Benchmarks Assessed at Grades 3–5

Grade 3	Grade 4	Grade 5
Supporting Idea: Number and Operations (Continued)		
	MA.4.A.6.5 Relate halves, fourths, tenths, and hundredths to decimals and percents.	**MA.5.A.6.5** Solve non-routine problems using various strategies including "solving a simpler problem" and "guess, check, and revise."
	MA.4.A.6.6 Estimate and describe reasonableness of estimates; determine the appropriateness of an estimate versus an exact answer.	
Supporting Idea: Data Analysis		
MA.3.S.7.1 Construct and analyze frequency tables, bar graphs, pictographs, and line plots from data, including data collected through observations, surveys, and experiments.		**MA.5.S.7.1** Construct and analyze line graphs and double bar graphs. (Also assesses MA.5.A.4.2.)
		MA.5.S.7.2 Differentiate between continuous and discrete data, and determine ways to represent those using graphs and diagrams. (Also assesses MA.5.A.4.2.)

Prior Knowledge: Items may require the student to apply mathematical knowledge described in NGSSS benchmarks from lower grades; however, the benchmarks from lower grades will not be assessed in isolation.

Benchmarks Assessed at Grades 6–8

Grade 6	Grade 7	Grade 8
Big Idea 1: Develop an understanding of and fluency with multiplication and division of fractions and decimals.	**Big Idea 1:** Develop an understanding of and apply proportionality, including similarity.	**Big Idea 1:** Analyze and represent linear functions, and solve linear equations and systems of linear equations.
MA.6.A.1.1 Explain and justify procedures for multiplying and dividing fractions and decimals.	**MA.7.A.1.1** Distinguish between situations that are proportional or not proportional, and use proportions to solve problems.	**MA.8.A.1.1** Create and interpret tables, graphs, and models to represent, analyze, and solve problems related to linear equations, including analysis of domain, range, and the difference between discrete and continuous data.
MA.6.A.1.2 Multiply and divide fractions and decimals efficiently. (Assessed with MA.6.A.1.3.)	**MA.7.A.1.2** Solve percent problems, including problems involving discounts, simple interest, taxes, tips, and percents of increase or decrease.	**MA.8.A.1.2** Interpret the slope and the x- and y-intercepts when graphing a linear equation for a real-world problem.
MA.6.A.1.3 Solve real-world problems involving multiplication and division of fractions and decimals. (Also assesses MA.6.A.1.2.)	**MA.7.A.1.3** Solve problems involving similar figures.	**MA.8.A.1.3** Use tables, graphs, and models to represent, analyze, and solve real-world problems related to systems of linear equations. (Also assesses MA.8.A.1.4.)
	MA.7.A.1.4 Graph proportional relationships and identify the unit rate as the slope of the related linear function.	**MA.8.A.1.4** Identify the solution to a system of linear equations using graphs. (Assessed with MA.8.A.1.3.)
	MA.7.A.1.5 Distinguish direct variation from other relationships, including inverse variation.	**MA.8.A.1.5** Translate among verbal, tabular, graphical, and algebraic representations of linear functions.
	MA.7.A.1.6 Apply proportionality to measurement in multiple contexts, including scale drawings and constant speed.	**MA.8.A.1.6** Compare the graphs of linear and nonlinear functions for real-world situations.

Prior Knowledge: Items may require the student to apply mathematical knowledge described in NGSSS benchmarks from lower grades; however, the benchmarks from lower grades will not be assessed in isolation.

Benchmarks Assessed at Grades 6–8

Grade 6	Grade 7	Grade 8
Big Idea 2: Connect ratio and rates to multiplication and division.	**Big Idea 2:** Develop an understanding of and use formulas to determine surface areas and volumes of three-dimensional shapes.	**Big Idea 2:** Analyze two- and three-dimensional figures by using distance and angle.
MA.6.A.2.1 Use reasoning about multiplication and division to solve ratio and rate problems.	**MA.7.G.2.1** Justify and apply formulas for surface area and volume of pyramids, prisms, cylinders, and cones.	**MA.8.G.2.1** Use similar triangles to solve problems that include height and distances.
MA.6.A.2.2 Interpret and compare ratios and rates.	**MA.7.G.2.2** Use formulas to find surface areas and volume of three-dimensional composite shapes.	**MA.8.G.2.2** Classify and determine the measure of angles, including angles created when parallel lines are cut by transversals.
		MA.8.G.2.3 Demonstrate that the sum of the angles in a triangle is 180-degrees and apply this fact to find unknown measure of angles and the sum of angles in polygons.
		MA.8.G.2.4 Validate and apply Pythagorean Theorem to find distances in real world situations or between points in the coordinate plane.
Big Idea 3: Write, interpret, and use mathematical expressions and equations.	**Big Idea 3:** Develop an understanding of operations on all rational numbers and solving linear equations.	**Big Idea 3:** Analyze and summarize data sets.
MA.6.A.3.1 Write and evaluate mathematical expressions that correspond to given situations. (Also assesses MA.6.A.3.3.)	**MA.7.A.3.1** Use and justify the rules for adding, subtracting, multiplying, dividing, and finding the absolute value of integers.	**MA.8.S.3.1** Select, organize and construct appropriate data displays, including box-and-whisker-plots, scatter plots, and lines of best fit to convey information and make conjectures about possible relationships.

Prior Knowledge: Items may require the student to apply mathematical knowledge described in NGSSS benchmarks from lower grades; however, the benchmarks from lower grades will not be assessed in isolation.

Benchmarks Assessed at Grades 6–8

Grade 6	Grade 7	Grade 8
MA.6.A.3.2 Write, solve, and graph one- and two- step linear equations and inequalities. (Also assesses MA.6.A.3.4.)	**MA.7.A.3.2** Add, subtract, multiply, and divide integers, fractions, and terminating decimals, and perform exponential operations with rational bases and whole number exponents including solving problems in everyday contexts.	**MA.8.S.3.2** Determine and describe how changes in data values impact measures of central tendency.
MA.6.A.3.3 Work backward with two-step function rules to undo expressions. (Assessed with MA.6.A.3.1.)		
MA.6.A.3.4 Solve problems given a formula. (Assessed with MA.6.A.3.2, MA.6.G.4.1, MA.6.G.4.2, and MA.6.G.4.3.)	**MA.7.A.3.3** Formulate and use different strategies to solve one-step and two-step linear equations, including equations with rational coefficients. (Also assesses MA.7.A.5.2.)	
MA.6.A.3.5 Apply the Commutative, Associative, and Distributive Properties to show that two expressions are equivalent.	**MA.7.A.3.4** Use the properties of equality to represent an equation in a different way and to show that two equations are equivalent in a given context.	
MA.6.A.3.6 Construct and analyze tables, graphs, and equations to describe linear functions and other simple relations using both common language and algebraic notation.		
Supporting Idea: Algebra		
		MA.8.A.4.1 Solve literal equations for a specified variable.
		MA.8.A.4.2 Solve and graph one- and two-step inequalities in one variable.
Supporting Idea: Geometry and Measurement		
MA.6.G.4.1 Understand the concept of Pi, know common estimates of Pi (3.14; $\frac{22}{7}$) and use these values to estimate and calculate the circumference and the area of circles. (Also assesses MA.6.A.3.4.)	**MA.7.G.4.1** Determine how changes in dimensions affect the perimeter, area, and volume of common geometric figures, and apply these relationships to solve problems.	**MA.8.G.5.1** Compare, contrast, and convert units of measure between different measurement systems (US customary or metric (SI)) and dimensions including temperature, area, volume, and derived units to solve problems.

Prior Knowledge: Items may require the student to apply mathematical knowledge described in NGSSS benchmarks from lower grades; however, the benchmarks from lower grades will not be assessed in isolation.

Benchmarks Assessed at Grades 6–8

Grade 6	Grade 7	Grade 8
Supporting Idea: Geometry and Measurement (Continued)		
MA.6.G.4.2 Find the perimeters and areas of composite two-dimensional figures, including non-rectangular figures (such as semicircles) using various strategies. (Also assesses MA.6.A.3.4.)	**MA.7.G.4.2** Predict the results of transformations, and draw transformed figures with and without the coordinate plane.	
MA.6.G.4.3 Determine a missing dimension of a plane figure or prism given its area or volume and some of the dimensions, or determine the area or volume given the dimensions. (Also assesses MA.6.A.3.4.)	**MA.7.G.4.3** Identify and plot ordered pairs in all four quadrants of the coordinate plane.	
	MA.7.G.4.4 Compare, contrast, and convert units of measure between different measurement systems (US customary or metric (SI)), dimensions, and derived units to solve problems.	
Supporting Idea: Number and Operations		
MA.6.A.5.1 Use equivalent forms of fractions, decimals, and percents to solve problems.	**MA.7.A.5.1** Express rational numbers as terminating or repeating decimals.	**MA.8.A.6.1** Use exponents and scientific notation to write large and small numbers and vice versa and to solve problems.
MA.6.A.5.2 Compare and order fractions, decimals, and percents, including finding their approximate location on a number line.	**MA.7.A.5.2** Solve non-routine problems by working backwards. (Assessed with MA.7.A.3.3.)	**MA.8.A.6.2** Make reasonable approximations of square roots and mathematical expressions that include square roots, and use them to estimate solutions to problems and to compare mathematical expressions involving real numbers and radical expressions.
MA.6.A.5.3 Estimate the results of computations with fractions, decimals, and percents, and judge the reasonableness of the results.		
		MA.8.A.6.3 Simplify real number expressions using the laws of exponents. (Assessed with MA.8.A.6.4.)

Prior Knowledge: Items may require the student to apply mathematical knowledge described in NGSSS benchmarks from lower grades; however, the benchmarks from lower grades will not be assessed in isolation.

Benchmarks Assessed at Grades 6–8

Grade 6	Grade 7	Grade 8
Supporting Idea: Number and Operations (Continued)		
		MA.8.A.6.4 Perform operations on real numbers (including integer exponents, radicals, percents, scientific notation, absolute value, rational numbers, and irrational numbers) using multi-step and real world problems. (Also assesses MA.8.A.6.3.)
Supporting Idea: Data Analysis		
MA.6.S.6.1 Determine the measures of central tendency (mean, median, mode) and variability (range) for a given set of data.	**MA.7.S.6.1** Evaluate the reasonableness of a sample to determine the appropriateness of generalizations made about the population.	
MA.6.S.6.2 Select and analyze the measures of central tendency or variability to represent, describe, analyze, and/or summarize a data set for the purpose of answering questions appropriately.	**MA.7.S.6.2** Construct and analyze histograms, stem-and-leaf plots, and circle graphs.	
Supporting Idea: Probability		
	MA.7.P.7.1 Determine the outcome of an experiment and predict which events are likely or unlikely, and if the experiment is fair or unfair.	
	MA.7.P.7.2 Determine, compare, and make predictions based on experimental or theoretical probability of independent or dependent events.	

Prior Knowledge: Items may require the student to apply mathematical knowledge described in NGSSS benchmarks from lower grades; however, the benchmarks from lower grades will not be assessed in isolation.

Benchmark Specifications for Grades 3–5

This section of the *Specifications* describes how Florida's NGSSS benchmarks are assessed. The benchmarks are defined in the NGSSS from Kindergarten through Grade 8 using a Big Idea/Supporting Idea format. High school assessments are constructed using the Bodies of Knowledge (BOK). FCAT 2.0 Mathematics is administered at Grades 3–8. Algebra 1 and Geometry are assessed separately in end-of-course (EOC) formats.

The set of sample items that is included throughout the *Specifications* document represents a wide range of difficulty and cognitive complexity. Although most of the items are of average difficulty and moderate complexity and can be answered correctly by students who reach Achievement Level 3, some of the items presented will be challenging for some students and are specifically included to prompt item writers to submit items that will measure the abilities of students in higher achievement levels. As the assessment is constructed to measure various achievement levels, this document was constructed to help item writers see the range of difficulties and complexities of items that may appear on a test.

Specifications for Grade 3

Benchmark MA.3.A.1.1

Reporting Category Number: Operations, Problems, and Statistics

Standard **Big Idea 1** Develop understandings of multiplication and division and strategies for basic multiplication facts and related division facts.

Benchmark **MA.3.A.1.1 Model multiplication and division, including problems presented in context: repeated addition, multiplicative comparison, array, how many combinations, measurement, and partitioning.**

Item Type At Grade 3, this benchmark will be assessed using MC items.

Benchmark Clarification Students will identify models of and/or solve problems involving multiplication and/or division situations.

Examples of multiplication or division models might include, but are not limited to

- **Repeated addition:** 4 bags of cookies with 8 in each bag. How many cookies are there? ($8 + 8 + 8 + 8 = 32$)
- **Multiplicative comparison (also known as scalar model):** Sam has 8 baseball cards. Elise has 8 times as many. How many does Elise have?
- **Array:** A marching band has 8 rows with 7 students in each row. How many band members are there?
- **Combination:** How many different combinations of one flavor of ice cream and one topping can be made from 4 different flavors and 5 different toppings?
- **Measurement:** If there are 35 bugs all together and Robbie puts 5 bugs in each jar, how many jars does he need to hold all of the bugs?
- **Partitive:** Robbie has 35 bugs and 7 jars. He will put all of the bugs in jars. If he puts the same number of bugs in each jar, how many bugs are in each jar?

Other models might include

- Finding number of squares (**area**) of wrapping paper; using **rate models**, e.g., traveling 6 miles each day for 3 days; **showing how** 4×6 can be represented by $6 + 6 + 6 + 6$ or 6×4 can be represented by $4 + 4 + 4 + 4 + 4 + 4$.

Content Limits	Items may include whole-number multiplication facts from 0×0 through 9×9 and the related division facts. Items may include division problems with remainders expressed only as whole numbers. Items will not require interpretation of the remainder.
Stimulus Attributes	Items may use graphics, symbols, expressions, or equations. Items may be set in a real-world or mathematical context.
Response Attribute	Responses may include expressions, equations, graphic representations, or numerical values.

Sample Item 1 **MC**

Nathan paid \$2 for each of the 3 books he bought at a bookstore. He can use the expression 3×2 to find the total amount he paid for the 3 books. Which of the following is equal to 3×2?

A. $3 + 3 + 3$
★ **B.** $2 + 2 + 2$
C. $3 + 2 + 3$
D. $2 \times 3 + 3$

Item Context Mathematics

Benchmark MA.3.A.1.2

Reporting Category	Number: Operations, Problems, and Statistics
Standard	**Big Idea 1** Develop understandings of multiplication and division and strategies for basic multiplication facts and related division facts.
Benchmark	**MA.3.A.1.2 Solve multiplication and division fact problems by using strategies that result from applying number properties.**
Item Type	At Grade 3, this benchmark will be assessed using MC items.
Benchmark Clarification	Students will recognize equivalent representations of equations or expressions by using number properties, including the commutative, associative, distributive, and identity properties for multiplication and division and the zero property of multiplication.
Content Limits	Items will not include identifying the properties by name. Items will not require the use of more than two properties to convert one expression or equation to its equivalent. Items may include only factors or divisors of 0 through 9.
Stimulus Attribute	Items may be set in either a real-world or mathematical context.

Sample Item 2 **MC**

Isabella cannot remember the product of 9×8. Which of the following is another expression that Isabella could use to find the product of 9×8?

★**A.** $(9 \times 5) + (9 \times 3)$
B. $(9 \times 4) + (9 \times 2)$
C. $(9 \times 1) + (4 \times 2)$
D. $(9 \times 2) + (8 \times 6)$

Item Context Mathematics

Benchmark MA.3.A.1.3

Reporting Category	Number: Operations, Problems, and Statistics
Standard	**Big Idea 1** Develop understandings of multiplication and division and strategies for basic multiplication facts and related division facts.
Benchmark	**MA.3.A.1.3 Identify, describe, and apply division and multiplication as inverse operations.**
Item Type	At Grade 3, this benchmark will be assessed using MC items.
Benchmark Clarifications	Students will identify the inverse of a multiplication or division equation. Students will apply the inverse property to solve real-world problems and to check the solution of a problem involving multiplication or division.
Content Limits	Items may include whole-number multiplication facts from 0×0 through 9×9 and the related division facts. Items will not include identifying the inverse property by name.
Stimulus Attributes	Blank spaces ($4 \times \_ = 36$), geometric shapes (e.g., $\square$, $\triangle$), or letters may be used to represent variables. Items may be set in either a real-world or mathematical context.
Response Attribute	Responses may be multiplication or division expressions or equations.

Sample Item 3 **MC**

A group of 24 people is getting on a roller coaster. Each car of the roller coaster can hold 4 people. Which equation could be used to find the number of roller coaster cars needed to hold all 24 people?

A. $24 + 4 = \square$
B. $24 \times 4 = \square$
C. $\square + 4 = 24$
★ **D.** $\square \times 4 = 24$

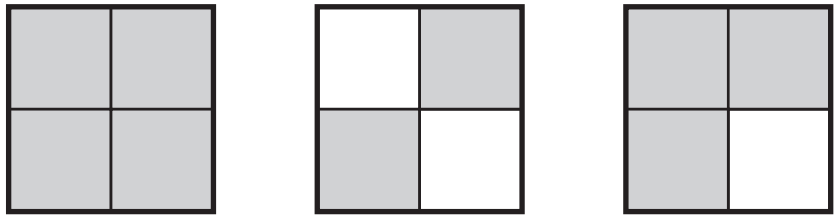
Item Context Mathematics

Benchmark MA.3.A.2.1

Reporting Category	Number: Fractions
Standard	**Big Idea 2** Develop an understanding of fractions and fraction equivalence.
Benchmark	**MA.3.A.2.1 Represent fractions, including fractions greater than 1, using area, set, and linear models.**
Item Type	At Grade 3, this benchmark will be assessed using MC items, with the following distribution: $\frac{1}{3}$ of the items represent fractional parts of an area model, $\frac{1}{3}$ of the items represent fractional parts of a set of objects, and $\frac{1}{3}$ of the items represent fractional parts of a linear model.
Benchmark Clarification	Students will represent a fraction or a mixed number by a graphic representation or identify a fraction or mixed number from its graphic representation.
Content Limits	Area models may include shapes such as circles and rectangles. Set models may include groups of objects such as counters or other objects familiar to Grade 3 students. Linear models may include number lines and fraction strips. Items may include fractions and mixed numbers up to and including the whole number 5. Items may include fractions with denominators from 1 through 10, 12, or 16.
Stimulus Attribute	Graphics must be used in all these items.
Response Attribute	Responses should not be listed in numerical order when this would be a clue to the correct response.

Sample Item 4 **MC**

Rosalyn drew three figures and shaded parts of each figure.



Which mixed number is represented by the shading of the three figures above?

★ **A.** $2\frac{1}{4}$

B. $2\frac{3}{4}$

C. $3\frac{1}{4}$

D. $3\frac{1}{2}$

Item Context Mathematics

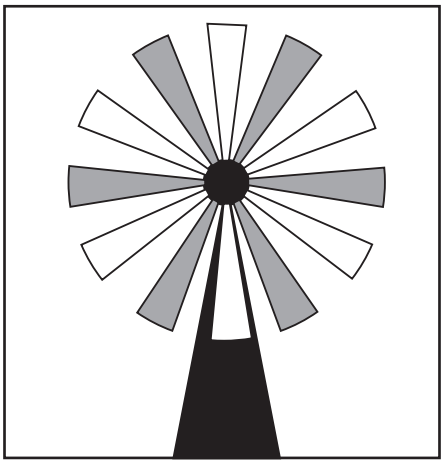
Benchmark MA.3.A.2.3

Reporting Category	Number: Fractions
Standard	**Big Idea 2** Develop an understanding of fractions and fraction equivalence.
Benchmark	**MA.3.A.2.3 Compare and order fractions, including fractions greater than 1, using models and strategies.** Also assesses MA.3.A.2.2 Describe how the size of the fractional part is related to the number of equal-sized pieces in the whole.
Item Type	At Grade 3, this benchmark will be assessed using MC items, with half of the items assessing MA.3.A.2.2 and half assessing MA.3.A.2.3.
Benchmark Clarification	Students will compare or order fractions using graphic representations or other strategies, such as benchmark fractions (0, $\frac{1}{10}$, $\frac{1}{5}$, $\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$, and 1).
Content Limits	Denominators of fractions must be 1 through 10, 12, or 16. Items may include fractions and mixed numbers up to and including the whole number 5. Items may include only the inequality symbols $<$ and $>$.
Stimulus Attributes	Items involving mixed numbers must include graphic representations. Fractions in items must have either the same denominators, the same numerators, graphical representations, or be easily compared to benchmark fractions, such as 0, $\frac{1}{10}$, $\frac{1}{5}$, $\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$, and 1.
Response Attributes	Responses may include fractions, mixed numbers, or graphics. Responses should not be listed in numerical order when this would be a clue to the correct response.

Sample Item 5 **MC**

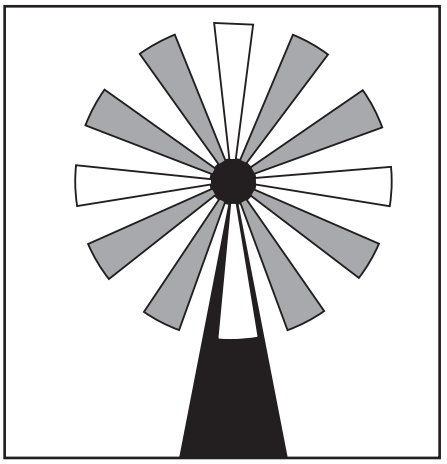
Two windmills are pictured below. On Windmill A, $\frac{1}{2}$ of the blades are shaded gray. On Windmill B, $\frac{2}{3}$ of the blades are shaded gray.

Windmill A



$\frac{1}{2}$

Windmill B



$\frac{2}{3}$

Which inequality below correctly compares the fractions of blades that are shaded gray?

A. $\frac{2}{3} < \frac{1}{2}$

★ **B.** $\frac{2}{3} > \frac{1}{2}$

C. $\frac{3}{2} < \frac{2}{1}$

D. $\frac{3}{2} > \frac{2}{1}$

Item Context Mathematics

Benchmark MA.3.A.2.4

Reporting Category	Number: Fractions
Standard	**Big Idea 2** Develop an understanding of fractions and fraction equivalence.
Benchmark	**MA.3.A.2.4 Use models to represent equivalent fractions, including fractions greater than 1, and identify representations of equivalence.**
Item Type	At Grade 3, this benchmark will be assessed using MC items.
Benchmark Clarification	Students will identify equivalent forms of fractions and mixed numbers.
Content Limits	Denominators of fractions must be 1 through 10, 12, or 16. Items may include fractions and mixed numbers up to and including the whole number 5.
Stimulus Attributes	Graphic representations of fractions may include area models, sets of objects, or linear models. Graphic representations must be used in all of these items.
Response Attribute	Responses should not be listed in numerical order when this would be a clue to the correct response.

Sample Item 6 **MC**

Ramona filled 10 party balloons with air. She noticed that $\frac{4}{10}$ of the balloons were striped, as shown below.

Which fraction is equivalent to $\frac{4}{10}$?

★**A.** $\frac{2}{5}$

B. $\frac{2}{3}$

C. $\frac{2}{4}$

D. $\frac{2}{8}$

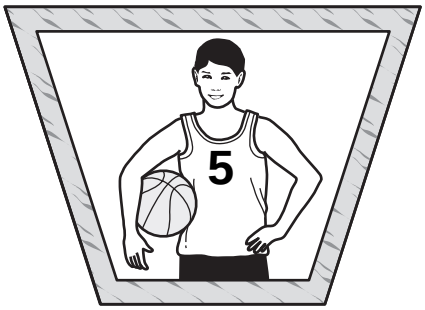
Item Context Mathematics

Benchmark MA.3.G.3.1

Reporting Category	Geometry and Measurement
Standard	**Big Idea 3** Describe and analyze properties of two-dimensional shapes.
Benchmark	**MA.3.G.3.1 Describe, analyze, compare, and classify two-dimensional shapes using sides and angles–including acute, obtuse, and right angles–and connect these ideas to the definition of shapes.**
Item Type	At Grade 3, this benchmark will be assessed using MC items.
Benchmark Clarification	Students will describe, analyze, compare, and classify two-dimensional shapes using sides and angles—including acute, obtuse, and right angles.
Content Limits	Items may include regular and irregular polygons with 3, 4, 5, 6, 8, or 10 sides. Polygons used in items may be concave or convex. Polygons used in items may include types of triangles (right, equilateral, isosceles, and scalene), types of quadrilaterals (parallelogram, trapezoid, rectangle, rhombus, square, and/or kite), pentagons, hexagons, octagons, and decagons. Polygons may be classified by use of parallel or perpendicular sides as well as number of sides and/or types of angles. Items may assess the specific names of polygons with 3, 4, 5, 6, 8, or 10 sides and the following terms: *regular* and *irregular polygons*, *lines* and *line segments* (*parallel* and *perpendicular*), *diagonals*, and *vertices* (vertex). Items will not include defining or identifying the following vocabulary terms: *concave* and *convex*. Types of angles will not be assessed in isolation at this benchmark.
Stimulus Attributes	Items may be set in either a real-world or mathematical context. Graphics should be used in most of these items, as appropriate.

Sample Item 7 **MC**

Andrew bought the frame shown below for his sports picture.



Which best describes the shape of the frame?

A. parallelogram
B. pentagon
C. rhombus
★ **D.** trapezoid

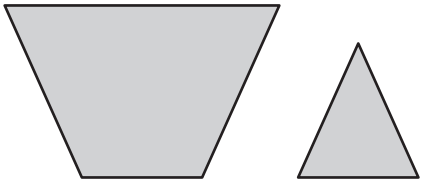
Item Context Health/Physical Education

Benchmark MA.3.G.3.2

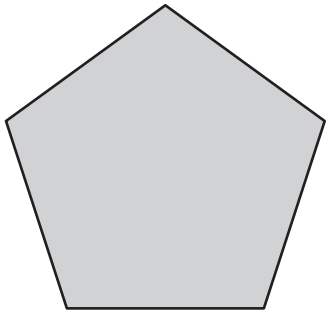
Reporting Category	Geometry and Measurement
Standard	**Big Idea 3** Describe and analyze properties of two-dimensional shapes.
Benchmark	**MA.3.G.3.2 Compose, decompose, and transform polygons to make other polygons, including concave and convex polygons with three, four, five, six, eight, or ten sides.**
Item Type	At Grade 3, this benchmark will be assessed using MC items.
Benchmark Clarifications	Students will identify polygons which have been composed or decomposed from other polygons. Students may use transformations to compose or decompose polygons.
Content Limits	Items may include concave or convex polygons with 3, 4, 5, 6, 8, or 10 sides. Items may include the use of transformations to create new polygons, but the transformation (i.e., rotations, translations, reflections, dilations) will not be assessed. Geometric terms will be used with common terminology set in parentheses, i.e., *reflection* (*flip*). Items may use the following terms: *overlapping*, *combine*, and *polygon*. Items will not assess the following vocabulary terms: *concave*, *convex*, *compose*, or *decompose*.
Stimulus Attribute	Graphics should be used in most of these items, as appropriate.

Sample Item 8 **MC**

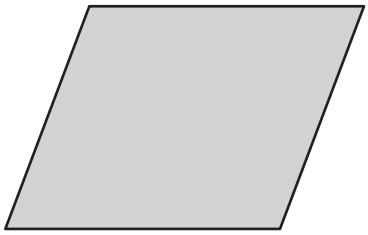
Becky has two shape stickers, as shown below.



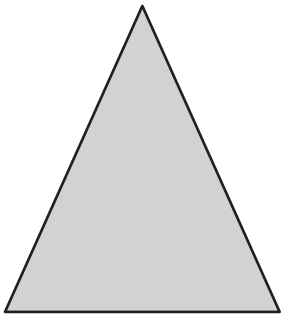
Which of the following figures can Becky make by combining the stickers without overlapping?



A.



C.



★ B.

D.

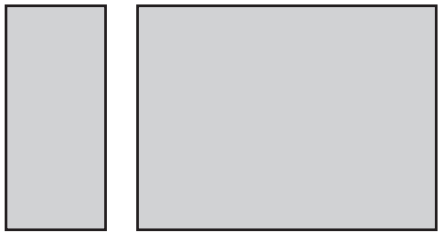
Item Context Mathematics

Benchmark MA.3.G.3.3

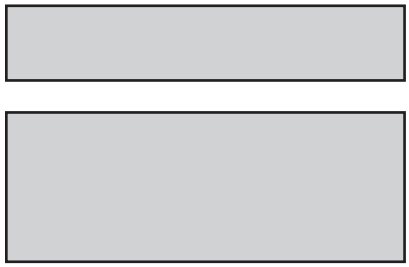
Reporting Category	Geometry and Measurement
Standard	**Big Idea 3** Describe and analyze properties of two-dimensional shapes.
Benchmark	**MA.3.G.3.3 Build, draw, and analyze two-dimensional shapes from several orientations in order to examine and apply congruence and symmetry.**
Item Type	At Grade 3, this benchmark will be assessed using MC items.
Benchmark Clarifications	Students will identify lines of symmetry and/or reflections. Students will identify congruent polygons. Students will identify two-dimensional shapes composed of congruent polygons.
Content Limits	Items may include concave and convex polygons with 3, 4, 5, 6, 8, or 10 sides. Items should use the correct geometric term with common terminology set in parentheses, i.e., *reflection* (*flip*). Items may assess the following terms: *symmetry*, *reflection*, and/or *congruent*. Transformations may be used in graphics; however, the transformations needed to compose or decompose polygons (*rotations*, *translations*, *dilations*) will not be assessed.
Stimulus Attributes	Items may be set in either a real-world or mathematical context. Graphics should be used in all of these items.

Sample Item 9 **MC**

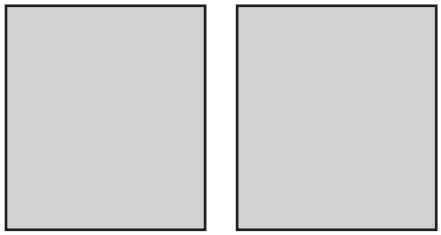
Sam cut a rectangular piece of paper into 2 congruent pieces. Which could be the 2 pieces of paper?



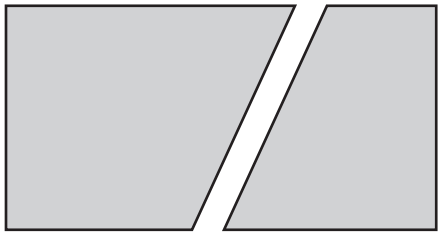
A.



C.



★ **B.**



D.

Item Context Mathematics

Benchmark MA.3.A.4.1

Reporting Category	Number: Operations, Problems, and Statistics
Standard	**Supporting Idea** Algebra
Benchmark	**MA.3.A.4.1 Create, analyze, and represent patterns and relationships using words, variables, tables, and graphs.**
Item Type	At Grade 3, this benchmark will be assessed using MC items.
Benchmark Clarifications	Students may extend numeric or graphic patterns beyond the next step, or find one or more missing elements in a numeric or graphic pattern. Students will identify the rule for a pattern or the relationship between numbers.
Content Limits	Items may use numeric patterns, graphic patterns, function tables, or graphs (bar graphs, pictographs, or line plots only). Numeric patterns should be shown with three or more elements. Graphic patterns should be shown with three or more examples of the pattern repeated. Students should not be asked to extend the pattern more than three steps beyond what is given or to provide more than three missing elements. Items will not include extending the pattern on a bar graph or pictograph. Rules for numeric patterns and relationships shown in function tables must include only one operation limited to addition, subtraction, or multiplication. Patterns or relationships involving multiplication are limited to the multiplication facts of 0×0 through 9×9. Function rules or relationships may be described using words, tables, graphs, or expressions using variables or geometric shapes (e.g., n, $\square$, $\triangle$); however, the intent of the benchmark is not to assess solving equations.

Stimulus Attributes Items may be set in either a real-world or mathematical context.

Graphics may be used in some of these items, as appropriate.

Response Attribute Responses that are function rules may be described using words or mathematical expressions with variables or geometric shapes (e.g., n, $\square$, $\triangle$).

Sample Item 10 **MC**

Allison is making lemonade for a party. The table below shows the number of lemons she will need to make several pitchers of lemonade.

LEMONS NEEDED FOR LEMONADE

Number of Pitchers	Number of Lemons
2	**10**
5	**25**
8	**40**
9	**?**

According to the relationship shown in the table, how many lemons will Allison need to make 9 pitchers of lemonade?

A. 5
B. 15
★ **C.** 45
D. 65

Item Context Mathematics

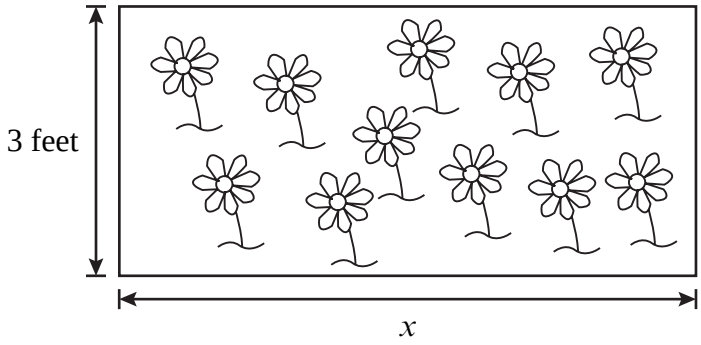
Benchmark MA.3.G.5.1

Reporting Category	Geometry and Measurement
Standard	**Supporting Idea** Geometry and Measurement
Benchmark	**MA.3.G.5.1 Select appropriate units, strategies, and tools to solve problems involving perimeter.**
Item Type	At Grade 3, this benchmark will be assessed using MC items.
Benchmark Clarifications	Students will select appropriate units, strategies, or tools to solve problems involving perimeter. Students will solve real-world problems involving perimeter.
Content Limits	Items may require the student to use properties of polygons to deduce the lengths of a side or sides of a polygon given the perimeter and/or the lengths of the remaining sides of the polygon. Polygons used in items must be convex with 3, 4, 5, 6, 8, or 10 sides or composed of composite rectangles. Items may require students to measure the sides of a polygon using a ruler. The lengths of the sides of polygons must be whole numbers. Items will not include conversions between units of measure.
Stimulus Attributes	Graphics will be used in most of these items. Polygons may be shown on a grid. Items should be in a real-world context.
Response Attributes	Items that include given dimensions of a graphic cannot include an actual measurement as an option. Millimeters (mm) and/or centimeters (cm) must be written using only whole numbers (e.g., 6 centimeters, 3 millimeters).

Sample Item 11 **MC**

The perimeter of a flower garden is 20 feet, as shown below.

FLOWER GARDEN



If the width of the flower garden is 3 feet, what is its length, x?

A. 17 feet
B. 10 feet
★ **C.** 7 feet
D. 6 feet

Item Context Science

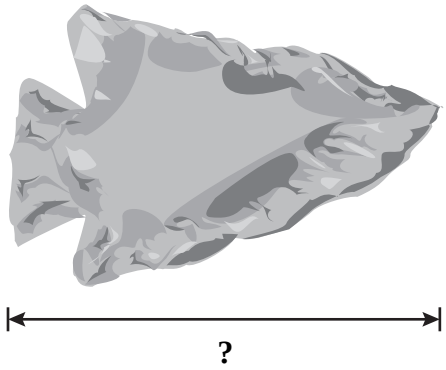
Benchmark MA.3.G.5.2

Reporting Category	Geometry and Measurement
Standard	**Supporting Idea** Geometry and Measurement
Benchmark	**MA.3.G.5.2 Measure objects using fractional parts of linear units such as $\frac{1}{2}$, $\frac{1}{4}$, and $\frac{1}{10}$.**
Item Type	At Grade 3, this benchmark will be assessed using MC items.
Benchmark Clarifications	Students will find the measure of objects to the nearest whole or fractional parts of linear units such as $\frac{1}{4}$, $\frac{1}{2}$, or $\frac{3}{4}$ of an inch. Students will find the measure of objects to the nearest whole millimeter and/or centimeter.
Content Limits	Items that require students to measure objects using the provided ruler will be less than 6 inches or 15 centimeters. If an object is greater than 6 inches or 15 centimeters, then part of the object may be represented pictorially with a partial ruler to be read and interpreted by the student. Items will not include conversions between units.
Stimulus Attribute	Both customary and metric units will not be included in the same item.
Response Attributes	Responses should not be listed in numerical order when this would be a clue to the correct response. Millimeters (mm) and/or centimeters (cm) must be written using only whole numbers (e.g., 6 centimeters, 3 millimeters).

Sample Item 12* **MC**

Terrence found a stone arrowhead like the one shown below.

STONE ARROWHEAD



Using the provided ruler, what is the exact length, in inches, of the stone arrowhead?

A. 2 inches

B. $2\frac{1}{2}$ inches

★ **C.** $2\frac{1}{4}$ inches

D. $2\frac{1}{8}$ inches

Item Context Social Studies/Consumerism

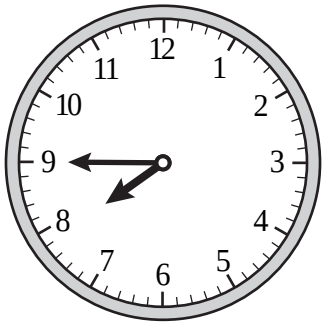
***Note:** The dimensions in this graphic may not be accurate if this Web-based page is printed on a desktop printer because the printer may shrink content to fit the page; however, during the production of test booklets, the Florida Department of Education takes quality assurance steps to ensure the dimensions and scale are accurate in items that require the student to use a ruler to measure.

Benchmark MA.3.G.5.3

Reporting Category	Geometry and Measurement
Standard	**Supporting Idea** Geometry and Measurement
Benchmark	**MA.3.G.5.3 Tell time to the nearest minute and to the nearest quarter hour, and determine the amount of time elapsed.**
Item Type	At Grade 3, this benchmark will be assessed using MC items.
Benchmark Clarifications	Students will identify the time displayed on an analog clock to the nearest minute or quarter hour. Students will determine the amount of time elapsed.
Content Limits	Items may include determining elapsed time of days, weeks, months, or years. For elapsed time greater than 1 hour and less than or equal to 24 hours, only increments of hours and half hours will be assessed. For elapsed time less than 1 hour, only increments of half hours, quarter hours, and 5 minutes will be assessed.
Stimulus Attributes	Graphics will be used in most of these items. Items may use digital or analog clocks. For elapsed time less than one hour, an analog clock must be used. For elapsed time greater than one hour, a digital clock may be used.

Sample Item 13 **MC**

Trina went to see a play. The clock below shows the time that Trina got to the theater.



If the play started at 8:00, how many minutes did Trina wait at the theater before the play started?

A. 45 minutes
B. 30 minutes
★ **C.** 15 minutes
D. 5 minutes

Item Context The Arts

Benchmark MA.3.A.6.1

Reporting Category	Number: Operations, Problems, and Statistics
Standard	**Supporting Idea** Number and Operations
Benchmark	**MA.3.A.6.1 Represent, compute, estimate, and solve problems using numbers through hundred thousands.**
Item Type	At Grade 3, this benchmark will be assessed using MC items.
Benchmark Clarifications	Students will represent, identify, compare, and/or order numbers through the hundred thousands place in real-world contexts. Students will compute sums and differences of numbers through the hundred thousands. Students may use some of the following estimation strategies: chunking, using a reference, unitizing, benchmarks, clustering, reasonableness, compatible numbers, grouping, rounding, etc., when representing and computing numbers through the hundred thousands.
Content Limits	Numbers may be represented flexibly; for example: 947 can be thought of as 9 hundreds, 4 tens, and 7 ones; 94 tens and 7 ones; or 8 hundreds, 14 tens, and 7 ones. Items may include the inequality symbols ($>$, $<$, $=$, $\neq$). Items will not require the estimation strategy to be named. Front-end estimation will not be an acceptable estimation strategy. Decimals may be used in the context of money that estimate to a whole dollar.
Stimulus Attribute	Items should be set in a real-world context.
Response Attribute	Responses may include actual calculations, estimates, or ranges of numbers.

Sample Item 14 **MC**

Ms. Tanaka is ordering calendars for the students at 4 elementary schools. The table below shows the number of students at each of the schools.

STUDENTS IN ELEMENTARY SCHOOLS

Name of School	Number of Students
Greendale	1,789
Jones Park	1,032
Shady River	2,115
Wakefield	1,992

Which is the **best** estimate of the total number of calendars Ms. Tanaka needs to order for all 4 schools?

A. 4,000
B. 5,000
★ **C.** 7,000
D. 8,000

Item Context Social Studies/Consumerism

Benchmark MA.3.A.6.2

Reporting Category	Number: Operations, Problems, and Statistics
Standard	**Supporting Idea** Number and Operations
Benchmark	**MA.3.A.6.2 Solve non-routine problems by making a table, chart, or list and searching for patterns.**
Item Type	At Grade 3, this benchmark will be assessed using MC items.
Benchmark Clarification	Nonroutine problems will be solved in situations where tables, charts, lists, and patterns could be used to find the solution.
Content Limit	Items should require students to solve nonroutine problems and not align with the clarifications of MA.3.A.4.1 (extending a graphic pattern or identifying a simple relationship [rule] for a pattern).
Stimulus Attribute	Items should be set in a real-world context.
Response Attribute	Responses may be solutions or show problem-solving methods used to determine solutions.

Sample Item 15 **MC**

Mr. Jarrell has 4 students in his chess club. He will put them in pairs to play a game of chess. The chart below shows the names of the students in the club.

STUDENTS IN CHESS CLUB

Charles	Erin	Gayle	Paco

What is the total number of different pairs of two students that can be made?

A. 8
★ **B.** 6
C. 4
D. 2

Item Context The Arts

Benchmark MA.3.S.7.1

Reporting Category	Number: Operations, Problems, and Statistics
Standard	**Supporting Idea** Data Analysis
Benchmark	**MA.3.S.7.1 Construct and analyze frequency tables, bar graphs, pictographs, and line plots from data, including data collected through observations, surveys, and experiments.**
Item Type	At Grade 3, this benchmark will be assessed using MC items.
Benchmark Clarifications	Students may identify the correct display of a given set of data. Students will analyze and draw conclusions about data displayed in the form of frequency tables, bar graphs, pictographs, and line plots. Students will analyze data to supply missing data in frequency tables, bar graphs, pictographs, and line plots.
Content Limits	Items may require the student to choose the most appropriate data display given a set of data from observations, surveys, and/or experiments. Items may assess identifying parts of a correct graph and recognizing the appropriate scale. The increments used on the scale are limited to units of 1, 2, 5, 10, 20, 25, 50, or 100. Pictographs can use keys containing a scale of 1, 2, 5, or 10. The data presented in graphs should represent no more than five categories. The total sample size for bar graphs should be no more than 1,000. The total sample size should be no more than 200 for frequency tables, pictographs, and line plots. Addition, subtraction, or multiplication of whole numbers may be used within the item.
Stimulus Attributes	Items may be set in a real-world or mathematical context. Increment grid lines must be shown on graphs. Graphics will be used in all items.

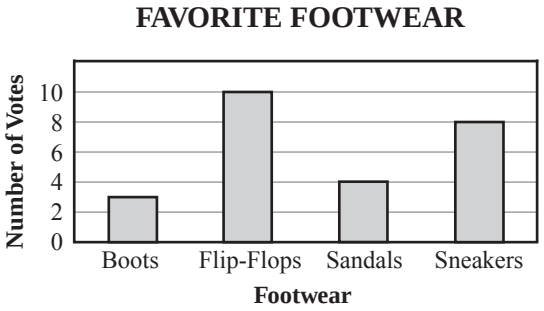
Sample Item 16 **MC**

The students in Mrs. Livingston's class voted for their favorite kind of footwear. The number of votes is shown in the table below.

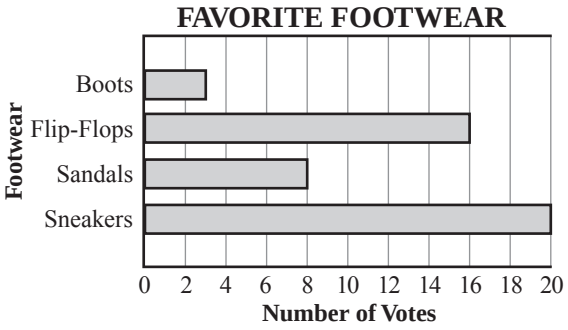
FAVORITE FOOTWEAR

Footwear	Boots	Flip-Flops	Sandals	Sneakers
Number of Votes	3	8	4	10

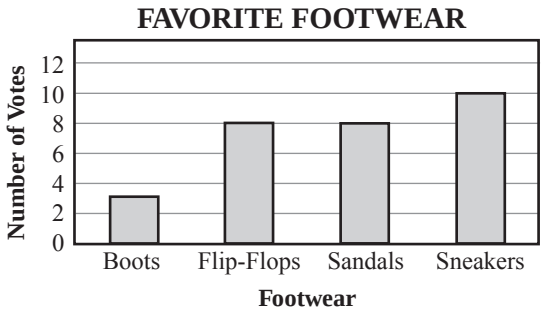
Which bar graph correctly shows the same information as the table?



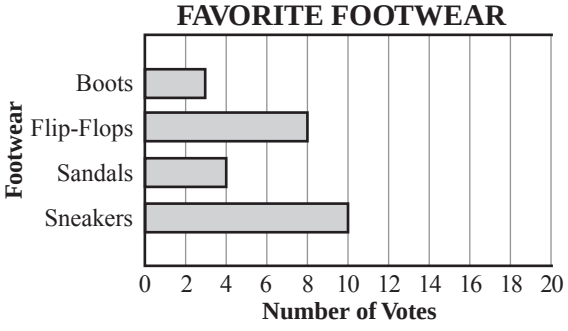
A.



C.



B.



★ D.

Item Context Mathematics

Specifications for Grade 4

Benchmark MA.4.A.1.2

Reporting Category	Number: Operations and Problems
Standard	**Big Idea 1** Develop quick recall of multiplication facts and related division facts and fluency with whole number multiplication.
Benchmark	**MA.4.A.1.2 Multiply multi-digit whole numbers through four digits fluently, demonstrating understanding of the standard algorithm and checking for reasonableness of results, including solving real-world problems.** Also assesses MA.4.A.1.1 Use and describe various models for multiplication in problem-solving situations, and demonstrate recall of basic multiplication and related division facts with ease.
Item Types	At Grade 4, this benchmark will be assessed using MC and GR items.
Benchmark Clarifications	Students will solve real-world problems using basic multiplication and the related division facts. Students will solve multidigit whole-number multiplication problems or supply partial products in real-world multiplication problems.
Content Limits	Items may include whole-number multiplication facts from 0×0 through 12×12 and the related division facts. For items that require solving multidigit multiplication problems, the two factors may not exceed three digits by three digits or four digits by two digits. When both factors have three digits, at least one digit must be a zero. Items may include finding partial products of a multidigit multiplication problem or finding errors in multiplication problems. Items may include checking for reasonableness of products. Items may use properties (e.g., commutative, associative, inverse, identity, distributive, zero) to solve problems but will not include asking students to name the specific properties.
Stimulus Attribute	Items will be set in a real-world or mathematical context.

Sample Item 17 **MC**

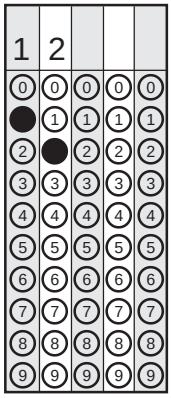
Mr. Desai has 112 art students. He gave each student 150 dried beans to use for a project. What is the total number of dried beans Mr. Desai gave his students?

A. 267
B. 1,680
C. 5,600
★ **D.** 16,800

Item Context The Arts

Sample Item 18 **GR**

Mrs. Pate is displaying science projects on tables in the lunchroom for the science fair. She can display 6 projects on each table. If there are 72 projects to display, what is the total number of tables Mrs. Pate will need?



Sample Response 12

Item Context Science

Benchmark MA.4.A.2.3

Reporting Category	Number: Base Ten and Fractions
Standard	**Big Idea 2** Develop an understanding of decimals, including the connection between fractions and decimals.
Benchmark	**MA.4.A.2.3 Relate equivalent fractions and decimals with and without models, including locations on a number line.** Also assesses MA.4.A.2.1 Use decimals through the thousandths place to name numbers between whole numbers. Also assesses MA.4.A.2.2 Describe decimals as an extension of the base-ten number system.
Item Types	At Grade 4, this benchmark will be assessed using MC and GR items.
Benchmark Clarifications	Students will identify decimals that are equivalent to commonly used fractions or mixed numbers (see content limits on the following page) and vice versa. Students will identify decimals and/or fractions from a graphical representation or a number line. Students will recognize the relationship between the place values (e.g., place values increase by a factor of 10 as they move to the left). Students will identify the place value of a digit to the right of the decimal point. Students will find or identify a decimal, fraction, or mixed number between two numbers.

Content Limits

Items may include mixed numbers and/or fractions.

Items may assess translating the following commonly used fractions or mixed numbers to decimals (or their decimal equivalents): $\frac{1}{10}$, $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, all fifths, tenths, hundredths, and thousandths. For example, 0.2, 0.20, 0.200, and $\frac{2}{10}$ are all equivalent. Also, $0.5 = \frac{1}{2}$, $\frac{3}{5} = 0.6$, $\frac{3}{2} = 1.5$, or $7\frac{1}{2} = 7.5$.

Items will not require the use of division or dividing a denominator into a numerator to translate a fraction to an equivalent decimal.

Items will not assess simplifying fractions, except for converting commonly used fractions or mixed numbers to decimals.

When naming or identifying fractions or decimals between two consecutive whole numbers, the whole numbers may not exceed 99.

Stimulus Attributes

Graphics should be used in some of these items, as appropriate.

Items may include number lines, area models, or other visual representations.

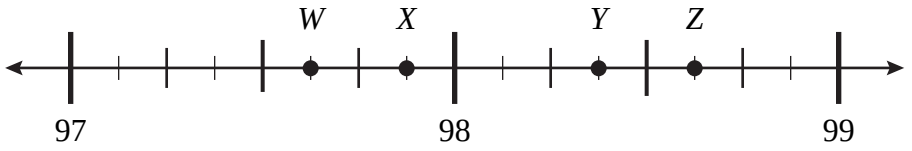
Response Attributes

Gridded responses may not include fractions.

Grids will have five digits, including three decimal places, up through 99.999.

Sample Item 19 **MC**

Naomi plotted four points on the number line below.



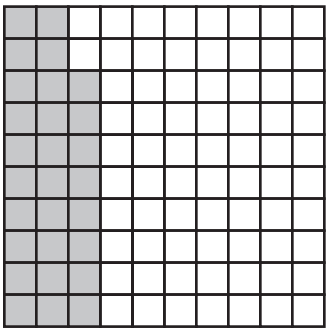
Which letter represents the point plotted at $98\frac{3}{8}$?

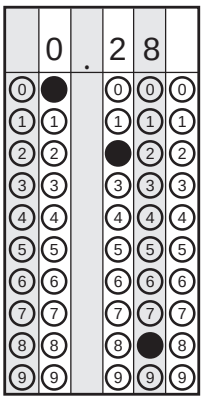
A. *W*
B. *X*
★**C.** *Y*
D. *Z*

Item Context Mathematics

Sample Item 20 **GR**

The figure below represents the number 1. What decimal is represented by the shaded part of the figure?





Sample Response 0.28

Item Context Mathematics

Benchmark MA.4.A.2.4

Reporting Category	Number: Base Ten and Fractions
Standard	**Big Idea 2** Develop an understanding of decimals, including the connection between fractions and decimals.
Benchmark	**MA.4.A.2.4 Compare and order decimals, and estimate fraction and decimal amounts in real-world problems.** Also assesses MA.4.A.2.1 Use decimals through the thousandths place to name numbers between whole numbers. Also assesses MA.4.A.2.2 Describe decimals as an extension of the base-ten number system.
Item Type	At Grade 4, this benchmark will be assessed using MC items.
Benchmark Clarifications	Students will compare and order mixed numbers and decimals through the thousandths place with no more than five digits. Students will compare or order decimals, fractions, and/or mixed numbers between two numbers. Students will estimate fractions and/or decimals in real-world situations. Students will identify a fraction or decimal that is closest to another number or a benchmark fraction, e.g., $\frac{7}{16}$ of a circle is closer to $\frac{1}{2}$ than $\frac{1}{3}$.
Content Limits	Items may include fractions and mixed numbers. Items may include fractions with denominators of 1 through 20, 25, 50, 100, and 1,000. The number of fractions being ordered or compared should not exceed five. The number of decimals being ordered or compared should not exceed six. Numbers being compared may be in the same form or in two different forms. Numbers being compared and ordered in two different forms should not exceed five. Items may include the inequality symbols ($<$, $\leq$, $>$, $\geq$, $=$, or $\neq$).

Stimulus Attribute Graphic representations of fractions or decimals should be used in some items, when appropriate.

Response Attribute Responses should not be listed in numerical order when this would be a clue to the correct response.

Sample Item 21 **MC**

At a county fair, four farmers entered their hogs in a contest. The weight of each hog is shown in the table below.

HOG CONTEST

Farmer	Weight of Hog (in pounds)
Ethan	252.09
Gina	247.99
Miguel	252.8
Rebecca	236.9

According to the table, which farmer's hog weighed the most?

A. Ethan's
B. Gina's
★ **C.** Miguel's
D. Rebecca's

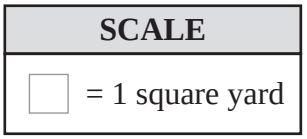
Item Context Science

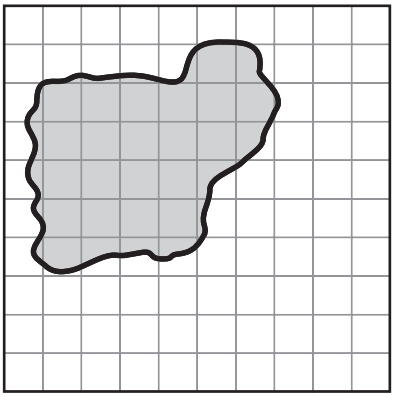
Benchmark MA.4.G.3.1

Reporting Category	Geometry and Measurement
Standard	**Big Idea 3** Develop an understanding of area and determine the area of two-dimensional shapes.
Benchmark	**MA.4.G.3.1 Describe and determine area as the number of same-sized units that cover a region in the plane, recognizing that a unit square is the standard unit for measuring area.**
Item Type	At Grade 4, this benchmark will be assessed using MC items.
Benchmark Clarification	Students will determine the area of a figure or a region on a plane by counting units rather than multiplying dimensions.
Content Limits	Items may include estimating areas of irregular geometric shapes, such as a figure in the shape of a pond, a mitten, a foot, the sole of a shoe, or a solid letter D. Items should include countable units that estimate to a whole unit or half unit. Items may use only a one-to-one scale.
Stimulus Attributes	Shapes must be shown on a grid (or a gridlike graphic, such as geoboards or tiles); however, grid lines need not extend through the shape. Items may be set in either a real-world or mathematical context.

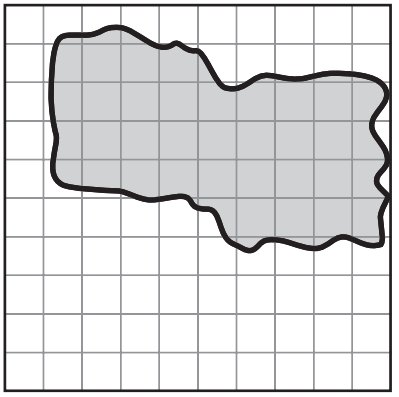
Sample Item 22 **MC**

Carla drew a picture of the shape of a pond at the park. It has an area of about 28 square yards. Which of the following could be Carla's picture of the pond?

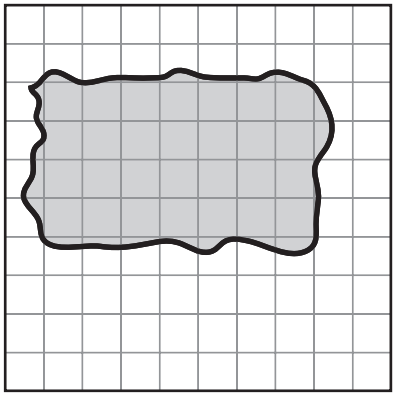




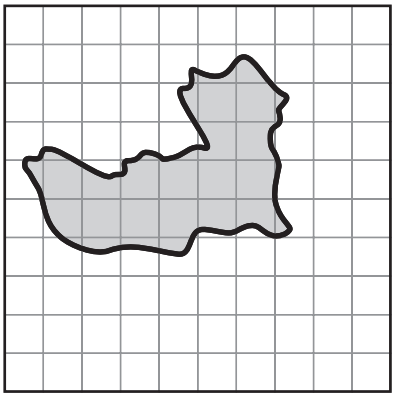
A.



C.



★ B.



D.

Item Context Science

Benchmark MA.4.G.3.2

Reporting Category	Geometry and Measurement
Standard	**Big Idea 3** Develop an understanding of area and determine the area of two-dimensional shapes.
Benchmark	**MA.4.G.3.2 Justify the formula for the area of the rectangle "area = base × height."**
Item Type	At Grade 4, this benchmark will be assessed using MC items.
Benchmark Clarifications	Students will identify situations that require the use of the area formula in real-world contexts. Students will identify the number of square units of a rectangle as the base times the height.
Content Limits	Items may include deriving or explaining the area of a rectangle in order to solve real-world problems. Items will not include the formula for the area of a rectangle.
Stimulus Attributes	Items may be set in either a real-world or a mathematical context. Items may be on a grid, but a grid is not required. Graphics may be used in some items.
Response Attribute	Responses should include units.

Sample Item 23 **MC**

Mr. Clark hired workers to construct an in-ground pool in his backyard. For which of the following situations might the workers have used the area formula when constructing the pool?

A. determining the amount of water needed to fill the pool
B. determining the amount of fencing to put around the pool
★ **C.** determining the amount of ground the bottom of the pool will cover
D. determining the amount of dirt that will need to be dug for the pool

Item Context Social Studies/Consumerism

Benchmark MA.4.G.3.3

Reporting Category	Geometry and Measurement
Standard	**Big Idea 3** Develop an understanding of area and determine the area of two-dimensional shapes.
Benchmark	**MA.4.G.3.3 Select and use appropriate units, both customary and metric, strategies, and measuring tools to estimate and solve real-world area problems.**
Item Types	At Grade 4, this benchmark will be assessed using MC and GR items.
Benchmark Clarifications	Students will find the area of a rectangle by multiplying the base by the height. Students will solve problems involving the area of a rectangle or a composite shape composed of adjacent rectangles, such as L- or E-shaped figures. Students will select appropriate units and/or tools to estimate and/or solve real-world area problems, (e.g., recognize that the area of a room is expressed as square feet, compared to an area of land expressed in square miles or square kilometers).
Content Limits	Items may include figures with whole-number dimensions less than or equal to 100 units. Items will not include the formula for area of a rectangle.
Stimulus Attributes	Items may be on a grid, but this is not required. Graphics may be used in some items. Students may be required to use a ruler to measure the dimensions of a figure to determine its area.
Response Attribute	Responses may include incorrect units of measurement.

Sample Item 24 **MC**

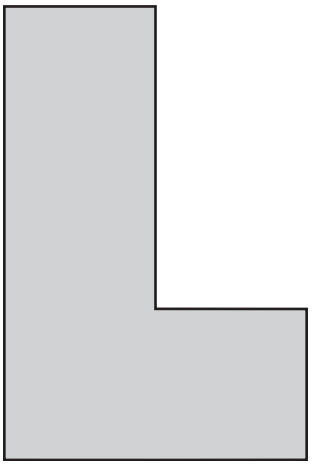
Mr. Hanson is getting new carpet in his classroom. Which is the best estimate of the total amount of carpet needed to cover the entire floor of his classroom?

A. 6 square feet
B. 6 square inches
★ **C.** 600 square feet
D. 600 square inches

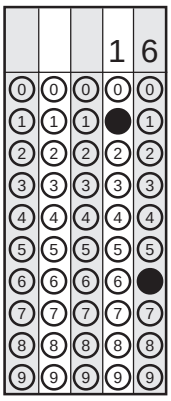
Item Context Mathematics

Sample Item 25* **GR**

Lana bought a patch in the shape of an "L" to sew onto the back of her denim jacket. The size of the patch is shown below.



Using the provided ruler, what is the area, **in square centimeters**, of Lana's patch?



Sample Response 16

Item Context The Arts

***Note:** The dimensions in this graphic may not be accurate if this Web-based page is printed on a desktop printer because the printer may shrink content to fit the page; however, during the production of test booklets, the Florida Department of Education takes quality assurance steps to ensure the dimensions and scale are accurate in items that require the student to use a ruler to measure.

Benchmark MA.4.A.4.1

Reporting Category	Number: Operations and Problems
Standard	**Supporting Idea** Algebra
Benchmark	**MA.4.A.4.1 Generate algebraic rules and use all four operations to describe patterns, including nonnumeric growing or repeating patterns.**
Item Types	At Grade 4, this benchmark will be assessed using MC and GR items.
Benchmark Clarifications	Students will complete a graphic or numeric pattern. Students will describe or generalize the algebraic rule of a pattern. Students may be asked to extend a pattern beyond its next step or find a missing number, graphic, or figure in a pattern.
Content Limits	Items may include any of the four operations but will use only one operation in each numeric pattern. Patterns involving multiplication or division are limited to the multiplication facts of 0×0 through 12×12 and the related division facts. A repeating pattern should be shown with at least three examples of the repeated pattern unless it is clearly explained in the stem of the item.
Stimulus Attributes	Items may use graphics, tables, or lists to describe patterns. Items may be set in either a real-world or mathematical context.
Response Attribute	Responses should not be in the form of expressions or equations.

Sample Item 26 **MC**

A number pattern is shown below.

3, 6, 9, 12, 15, 18 . . .

What algebraic rule can be used to describe the pattern?

A. add 1 to the number before that number
★ **B.** add 3 to the number before that number
C. multiply the number before that number by 3
D. multiply the last 2 numbers

Item Context Mathematics

Sample Item 27 **GR**

Elijah made a pattern using squares for his social studies project on pyramids. The first four figures in the pattern are shown below.

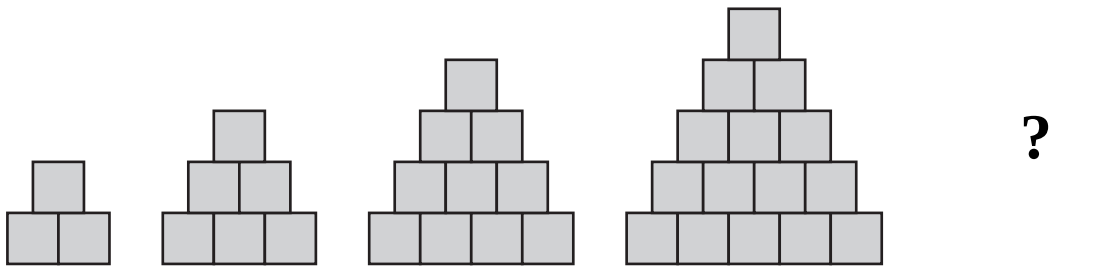
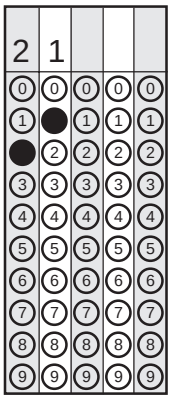


Figure 1 Figure 2 Figure 3 Figure 4 Figure 5

If Elijah continues the pattern, what should be the total number of squares in Figure 5?



Sample Response 21

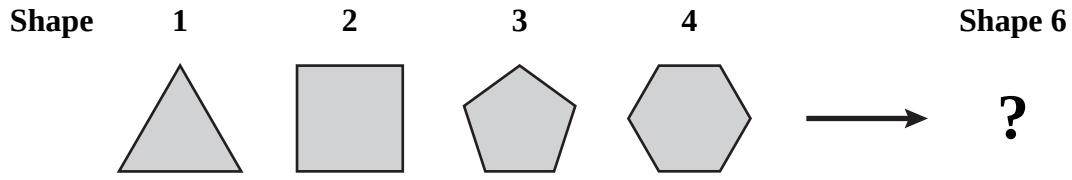
Item Context Social Studies/Consumerism

Benchmark MA.4.A.4.2

Reporting Category	Number: Operations and Problems
Standard	**Supporting Idea** Algebra
Benchmark	**MA.4.A.4.2 Describe mathematics relationships using expressions, equations, and visual representations.**
Item Types	At Grade 4, this benchmark will be assessed using MC and GR items.
Benchmark Clarifications	Students will translate a written description or a graphic to an expression or equation or translate an expression or equation to a written or graphic description to solve a real-world problem. Students will identify a missing number or element in a numeric or graphic relationship. Students will describe or generalize the rule of a visual relationship using an expression, equation, or description of the graphic.
Content Limits	Items must use rules or relationships that involve only one operation or a one-step function. A relationship must be defined in words, or at least three examples of the relationship must be provided. Relationships involving multiplication or division are limited to the multiplication facts of 0×0 through 12×12 and the related division facts. Items may include only one variable.
Stimulus Attributes	Items may be set in a real-world or mathematical context. Relationships may be shown as lists or in function tables.

Sample Item 28 **MC**

Several shapes are shown below.



There is a relationship between the number of the shape and the number of sides that each shape has. If this same pattern continues, which expression below can be used to find the number of sides of Shape 6 ?

A. $6 + 1$
★ **B.** $6 + 2$
C. 6×1
D. 6×2

Item Context Mathematics

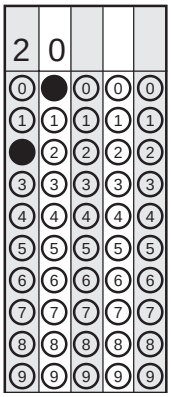
Sample Item 29 **GR**

The table shows the time and the number of light flashes a firefly gives off when the temperature is 82 degrees Fahrenheit (°F).

FIREFLY FLASHES

Seconds	4	8	12		?
Flashes	1	2	3	4	5

How many seconds will it take for the firefly to give off 5 light flashes?



Sample Response 20

Item Context Science

Benchmark MA.4.A.4.3

Reporting Category	Number: Operations and Problems
Standard	**Supporting Idea** Algebra
Benchmark	**MA.4.A.4.3 Recognize and write algebraic expressions for functions with two operations.**
Item Type	At Grade 4, this benchmark will be assessed using MC items.
Benchmark Clarification	Students will identify an expression having two operations or two procedural steps representing a real-world situation or graphic relationship.
Content Limits	Items will use only one variable. A relationship must be defined in words, or at least three examples of the relationship must be provided.
Stimulus Attributes	Items may be set in a real-world or mathematical context. Items will be set in a real-world situation, list, or function table.

Sample Item 30 **MC**

Janelle has saved $15 for a new bike. She will save $10 more each week.

- Let w represent the number of weeks.

Which expression represents the total amount of money Janelle will have saved in w weeks?

A. $w(10 + 15)$
B. $15w + 10$
C. $(w + 15)10$
★ **D.** $15 + 10w$

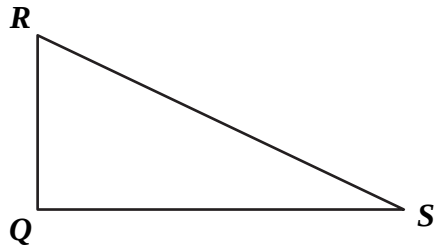
Item Context Social Studies/Consumerism

Benchmark MA.4.G.5.1

Reporting Category	Geometry and Measurement
Standard	**Supporting Idea** Geometry and Measurement
Benchmark	**MA.4.G.5.1 Classify angles of two-dimensional shapes using benchmark angles (45°, 90°, 180°, and 360°).**
Item Type	At Grade 4, this benchmark will be assessed using MC items.
Benchmark Clarifications	Students will classify angles by the following terms: *acute*, *obtuse*, *right*, or *straight*. Students will identify the benchmark angle measurements of 45°, 90°, 180°, and/or 360°.
Content Limits	Items may include the following vocabulary terms: *ray*, *angle (acute*, *obtuse*, *right*, *straight),* and *perpendicular lines*. Items will not include the vocabulary terms: *complementary*, *supplementary*, or *vertical*. Items will not require the use of a protractor or measuring an angle to the nearest degree. Items may include the geometric notation for angle (∠) and degrees (°).
Stimulus Attributes	Items will include only two-dimensional figures. Items may be set in either a real-world or a mathematical context. Graphics should be used in most of these items, as appropriate.

Sample Item 31 **MC**

Lakia drew triangle *QRS*, as shown below.



Which is closest to the measure of $\angle Q$?

A. 45°
★ **B.** 90°
C. 180°
D. 360°

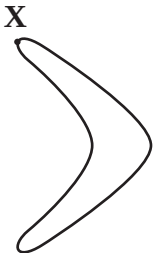
Item Context Mathematics

Benchmark MA.4.G.5.2

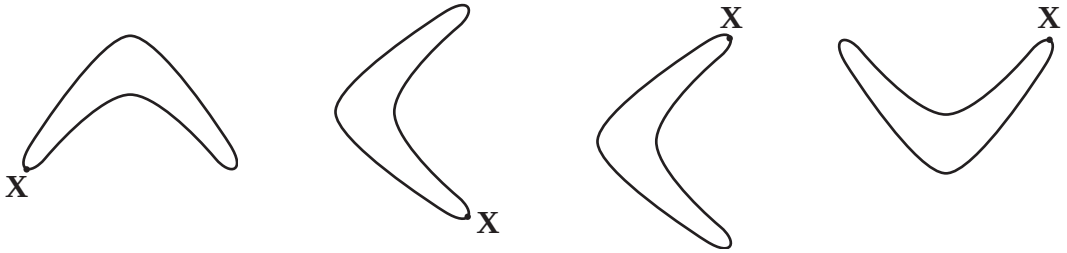
Reporting Category	Geometry and Measurement
Standard	**Supporting Ideas** Geometry and Measurement
Benchmark	**MA.4.G.5.2 Identify and describe the results of translations, reflections, and rotations of 45, 90, 180, 270, and 360 degrees, including figures with line and rotational symmetry.**
Item Type	At Grade 4, this benchmark will be assessed using MC items.
Benchmark Clarification	Students will identify a shape that is the result of a translation, reflection, and/or rotation of 45°, 90°, 180°, 270°, or 360°, including those with line and rotational symmetry.
Content Limits	For rotations, the center of rotation may be shown on the object being rotated. The following vocabulary terms may be used: *transformation*, *translation*, *reflection*, *rotation*, *clockwise*, *counterclockwise*, *line symmetry*, *rotational symmetry*, and *center*. Items should include no more than two transformations.
Stimulus Attributes	Graphics must be used in all these items. Items may be set in either a real-world or a mathematical context.

Sample Item 32 **MC**

Native Australians sometimes used boomerangs. A picture of a boomerang is shown below.



Which of the following pictures shows the boomerang rotated 90° counterclockwise around point **X**?



★ **A.** **B.** **C.** **D.**

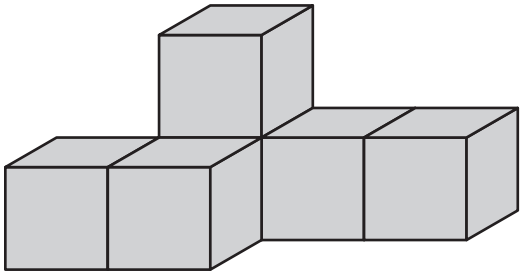
Item Context Social Studies/Consumerism

Benchmark MA.4.G.5.3

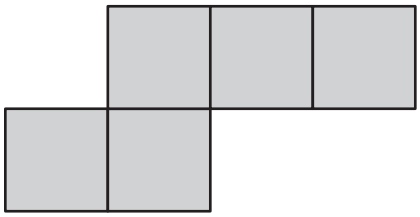
Reporting Category	Geometry and Measurement
Standard	**Supporting Idea** Geometry and Measurement
Benchmark	**MA.4.G.5.3 Identify and build a three-dimensional object from a two-dimensional representation of that object and vice versa.**
Item Type	At Grade 4, this benchmark will be assessed using MC items.
Benchmark Clarifications	Students will identify a three-dimensional object from two-dimensional views of that object. Students will identify one or more of the two-dimensional views of a three-dimensional object.
Content Limits	Items may include drawings of views from the top, sides, front, or base of an object. Three-dimensional objects represented in items must be made from cubes. Items will not include or assess two-dimensional nets of three-dimensional objects.
Stimulus Attributes	Graphics should be used in all these items. Two-dimensional views should show lines indicating square units. Items may be set in either a real-world or mathematical context.

Sample Item 33 **MC**

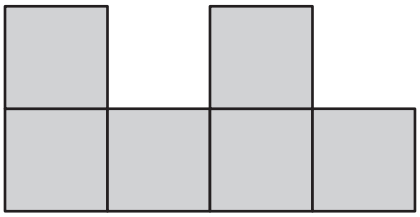
In art class, Duncan used wooden blocks to make the figure shown below.



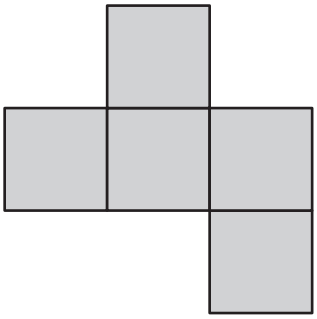
Which shows what Duncan's figure would look like when viewed from the top?



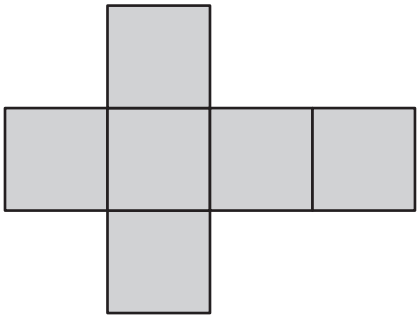
★ A.



C.



B.



D.

Item Context The Arts

Benchmark MA.4.A.6.1

Reporting Category	Number: Operations and Problems
Standard	**Supporting Idea** Number and Operations
Benchmark	**MA.4.A.6.1 Use and represent numbers through millions in various contexts, including estimation of relative sizes of amounts or distances.**
Item Types	At Grade 4, this benchmark will be assessed using MC and GR items.
Benchmark Clarifications	Students will identify, compare and/or order numbers through the millions place in real-world contexts. Students will find the answers to real-world problems that involve adding and subtracting numbers through the millions. Students will make estimations of numbers through the millions in real-world situations.
Content Limits	Items may include the inequality symbols ($>$, $<$, $\leq$, $\geq$, $\neq$). Items will not include decimals or fractions. Items involving units of measure may not involve converting from one unit to another. Front-end estimation will not be an acceptable estimation strategy.
Stimulus Attributes	Numbers used to solve problems may be presented in bar graphs, pictographs, line plots, or tables. Items that present numbers in graphs should not require the student to predict an answer based on interpreting information in the graph.

Sample Item 34 **MC**

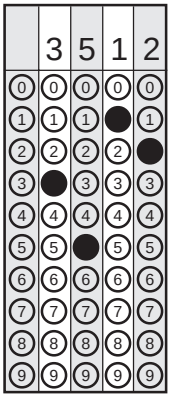
As of 2008, the number of seats at Ben Hill Griffin Stadium in Gainesville, Florida, was 88,548. At a certain event, 9,325 of the seats were empty. Which is the best estimate of the number of seats that were NOT empty at the event?

A. 110,000
B. 100,000
C. 90,000
★ **D.** 80,000

Item Context Health/Physical Education

Sample Item 35 **GR**

Derek reads that the population of his city is 1,575,204. Last year, the population was 1,571,692. By how much did the population in Derek's city increase from last year to this year?



Sample Response 3512

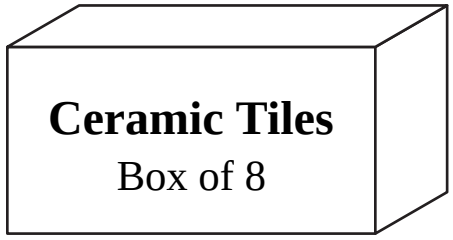
Item Context Social Studies/Consumerism

Benchmark MA.4.A.6.2

Reporting Category	Number: Operations and Problems
Standard	**Supporting Idea** Number and Operations
Benchmark	**MA.4.A.6.2 Use models to represent division as:** **• the inverse of multiplication** **• as partitioning** **• as successive subtraction**
Item Type	At Grade 4, this benchmark will be assessed using MC items.
Benchmark Clarifications	Students will identify inverse equations or expressions for division or multiplication problems. Students will use partitive division to solve a division problem. Students will use successive subtraction to solve a division problem.
Content Limits	Items will include only whole numbers and whole-number remainders. Items will not require students to interpret a remainder. Items may assess how to translate a word problem to a multiplication or division expression or equation. Items will not include computing solutions to long-division problems. Items may be a translation from arrays, equal-sized groups, area, or visual representations.
Stimulus Attribute	Graphics should be used in some of these items, as appropriate.

Sample Item 36 **MC**

Ms. Parker is buying ceramic tiles to put on the floor of her shop. The tiles come 8 to a box.



Ms. Parker needs 176 tiles. Which of the following could be used to find n, the number of boxes of tiles Ms. Parker needs to buy?

A. $176 \times 8 = n$
B. $8 \div 176 = n$
★ **C.** $n \times 8 = 176$
D. $n \div 176 = 8$

Item Context Social Studies/Consumerism

Benchmark MA.4.A.6.3

Reporting Category	Number: Base Ten and Fractions
Standard	**Supporting Idea** Number and Operations
Benchmark	**MA.4.A.6.3 Generate equivalent fractions and simplify fractions.**
Item Type	At Grade 4, this benchmark will be assessed using MC items.
Benchmark Clarifications	Students will find equivalent fractions or simplify fractions to lowest terms. Students will rename fractions as mixed numbers or vice versa.
Content Limits	All common factors of the numerator and denominator must be less than or equal to 10. Items will not include graphical representations of fractions.
Stimulus Attribute	Items may be set in either a real-world or a mathematical context.
Response Attribute	Responses may or may not be in lowest terms.

Sample Item 37 **MC**

On Sally's swim team, $\frac{14}{20}$ of the team members are boys. Which fraction is equivalent to $\frac{14}{20}$?

A. $\frac{3}{4}$

B. $\frac{4}{5}$

★ **C.** $\frac{7}{10}$

D. $\frac{20}{14}$

Item Context Health/Physical Education

Benchmark MA.4.A.6.4

Reporting Category	Number: Operations and Problems
Standard	**Supporting Idea** Number and Operations
Benchmark	**MA.4.A.6.4 Determine factors and multiples for specified whole numbers.**
Item Type	At Grade 4, this benchmark will be assessed using MC items.
Benchmark Clarification	Students will determine factors and/or multiples for whole numbers.
Content Limits	Items may use the vocabulary terms *factors* and *multiples*. The number being factored must be less than or equal to 100. When multiples are assessed, the multiple number must be 1–12, 20, 25, 50, or 100. Items will not include the use of factor trees or prime factorization.
Stimulus Attribute	Items may be set in either a real-world or a mathematical context.

Sample Item 38 **MC**

Megan's father won first place in a bicycle race. The race was divided into equal sections, each measuring exactly 7 miles in length. Which number could be the total number of miles of the race?

A. 17
★ **B.** 28
C. 43
D. 54

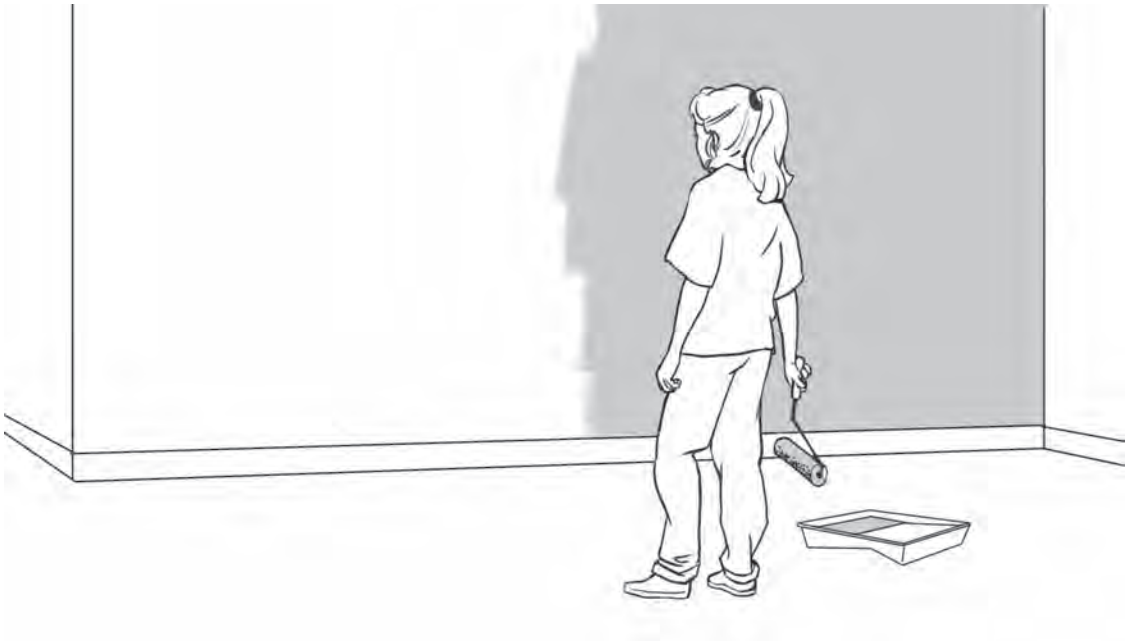
Item Context Health/Physical Education

Benchmark MA.4.A.6.5

Reporting Category	Number: Base Ten and Fractions
Standard	**Supporting Idea** Number and Operations
Benchmark	**MA.4.A.6.5 Relate halves, fourths, tenths, and hundredths to decimals and percents.**
Item Types	At Grade 4, this benchmark will be assessed using MC and GR items.
Benchmark Clarifications	Students will convert a percent to a fraction or a decimal. Students will convert a fraction or a decimal to a percent.
Content Limits	The following fractions: $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, all tenths, and all hundredths may be converted to percents (e.g., $\frac{1}{4} = 25\%$, or $\frac{3}{4} = 75\%$) or vice versa. Items will not assess converting between fractions and decimals. Items will not require a student to solve a problem using decimals, fractions, or percents. Items may include graphic models of fractions, decimals, or percents.
Stimulus Attributes	Items should be set in a real-world context. Graphics should be included in some of the items, as appropriate.
Response Attribute	Gridded responses may not include fractions.

Sample Item 39 **MC**

Alexis is repainting one of the walls in her bedroom. She painted 50% of the wall yesterday.



Which of the following is equivalent to 50%?

★ **A.** $\frac{1}{2}$

B. $\frac{5}{100}$

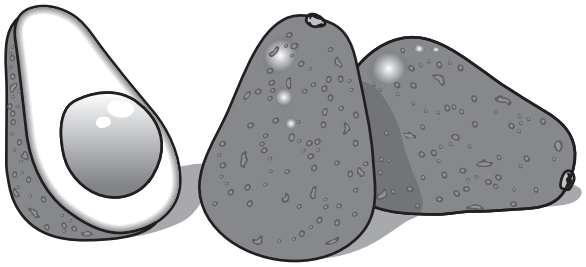
C. 0.10

D. 0.20

Item Context Mathematics

Sample Item 40 **GR**

About $\frac{9}{10}$ of avocados grown in the United States are grown in California.



What **percent** is equivalent to $\frac{9}{10}$?

9	0			%
0	●	0	0	
1	1	1	1	
2	2	2	2	
3	3	3	3	
4	4	4	4	
5	5	5	5	
6	6	6	6	
7	7	7	7	
8	8	8	8	
●	9	9	9	

Sample Response 90

Item Context Social Studies/Consumerism

Benchmark MA.4.A.6.6

Reporting Category	Number: Operations and Problems
Standard	**Supporting Idea** Number and Operations
Benchmark	**MA.4.A.6.6 Estimate and describe reasonableness of estimates; determine the appropriateness of an estimate versus an exact answer.**
Item Type	At Grade 4, this benchmark will be assessed using MC items.
Benchmark Clarifications	Students will use appropriate estimation strategies to determine reasonable estimates. Students will determine whether an exact number or an estimate is more appropriate for a given real-world situation.
Content Limits	Items may include finding numbers or ranges of numbers that are most appropriate or reasonable. Items will not include measurement estimates. Items may include visual estimates. Items may include numbers up to and including the hundred millions place. Items may include fractions or decimals that estimate to a whole number. Items should not require exact calculations. Items will not require the estimation strategy to be named. Front-end estimation will not be an acceptable estimation strategy. Items will not assess rounding of numbers without estimating.
Stimulus Attribute	Items will be set in a real-world context.
Response Attribute	Responses may be exact numbers, ranges of numbers, estimates, or situations.

Sample Item 41 **MC**

The table below shows the land area, in square miles, of four states in the southeast.

LAND AREA OF SOUTHEASTERN STATES

State	Area (in square miles)
Alabama	50,744
Georgia	57,906
Florida	53,927
South Carolina	30,109

Which is the best estimate of a range of numbers for the **total** land area, in square miles, of the four states listed in the table?

A. 100,000 to 125,000
B. 125,000 to 150,000
C. 150,000 to 175,000
★ **D.** 175,000 to 200,000

Item Context Social Studies/Consumerism

Specifications for Grade 5

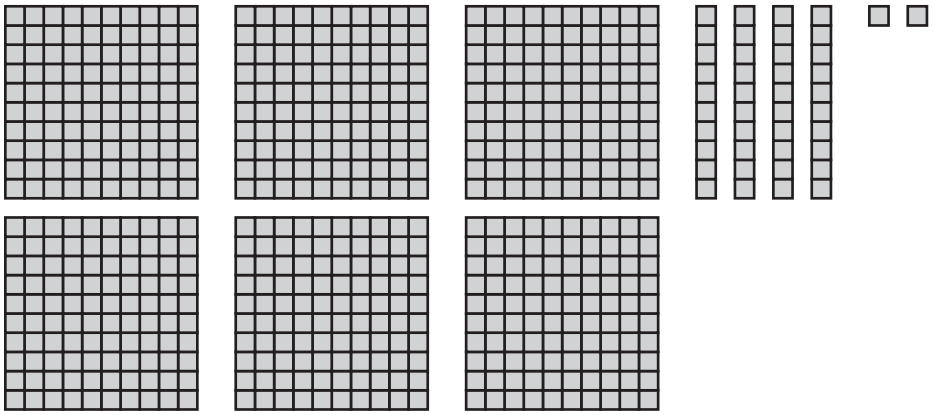
Benchmark MA.5.A.1.1

Reporting Category	Number: Base Ten and Fractions
Standard	**Big Idea 1** Develop an understanding of and fluency with division of whole numbers.
Benchmark	**MA.5.A.1.1 Describe the process of finding quotients involving multi-digit dividends using models, place value, properties, and the relationship of division to multiplication.**
Item Types	At Grade 5, this benchmark will be assessed using MC and GR items.
Benchmark Clarifications	Students will identify models or representations of multi-digit division. Students will demonstrate the understanding of the distributive property used in a division problem [e.g., 639 ÷ 3 can be expressed as (600 + 30 + 9) ÷ 3]. Students will use the standard algorithm to describe one or more steps of a division problem or missing steps of a partially completed division problem.
Content Limits	Items may include one-digit or two-digit divisors and dividends of up to four digits. Items will not include quotients with remainders.
Stimulus Attribute	Items may be set in either a real-world or a mathematical context.

Sample Item 42 **MC**

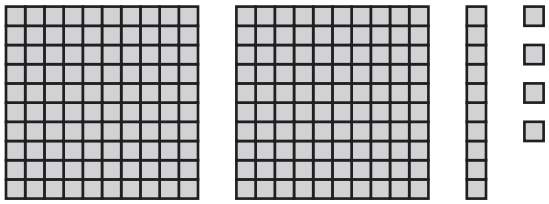
Ella needs to sort the base-ten blocks shown below into 3 equal groups.

Ella's Base-Ten Blocks

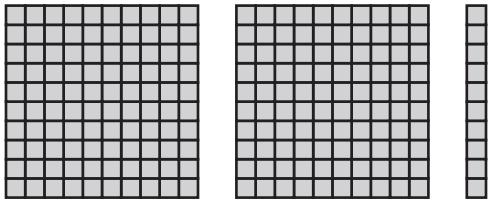


Which model could represent one of the groups of base-ten blocks?

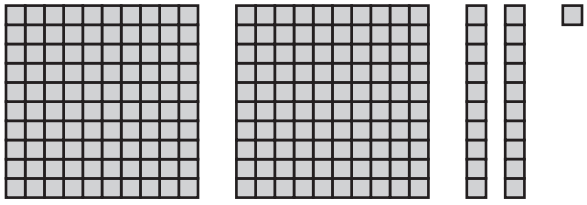
★ A.



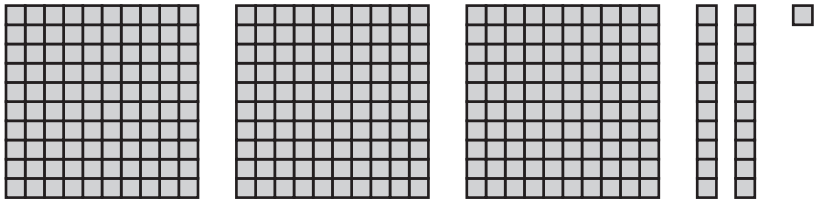
B.



C.



D.



Item Context Mathematics

Sample Item 43 **MC**

Joseph wanted to sell roses for a fundraiser. He placed 156 roses into 12 vases. The expression below can be used to determine the total number of roses he placed into each vase.

$$156 \div 12$$

Which of the following is equivalent to the above expression?

A. $(156 \div 10) + (156 \div 2)$
B. $(15 \div 10) + (6 \div 2)$
C. $(12 \div 12) + (36 \div 12)$
★ **D.** $(120 \div 12) + (36 \div 12)$

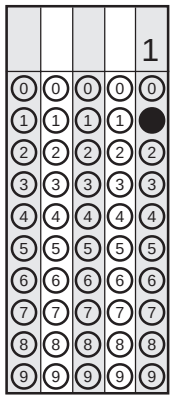
Item Context Social Studies/Consumerism

Sample Item 44 **GR**

Marcy's teacher wrote the division problem shown below, using two shapes to represent missing digits.

$$\begin{array}{r} 35\square \\ 1\triangle\overline{)\,5616} \\ -48 \\ \hline 81 \\ -80 \\ \hline 16 \\ -16 \\ \hline 0 \end{array}$$

What number can replace the □ in the quotient to correctly complete the division problem shown above?



Sample Response 1

Item Context Mathematics

Benchmark MA.5.A.1.4

Reporting Category	Number: Base Ten and Fractions
Standard	**Big Idea 1** Develop an understanding of and fluency with division of whole numbers.
Benchmark	**MA.5.A.1.4 Divide multi-digit whole numbers fluently, including solving real-world problems, demonstrating understanding of the standard algorithm, and checking the reasonableness of results.** Also assesses MA.5.A.1.2 Estimate quotients or calculate them mentally depending on the context and numbers involved. Also assesses MA.5.A.1.3 Interpret solutions to division situations, including those with remainders, depending on the context of the problem.
Item Types	At Grade 5, this benchmark will be assessed using MC and GR items.
Benchmark Clarifications	Students will solve real-world division problems and check for reasonableness of results. Students will interpret solutions to division situations, including those with remainders, depending on the context of the problem. Quotients may include fractions or decimals. Students may use estimation strategies in problems involving division and check for reasonableness of results. Students may use the standard algorithm to solve real-world division problems.
Content Limits	Divisors may have up to two digits and dividends may have up to four digits. Dividends may have up to four digits representing dollars and may include two zeroes representing cents (e.g., $372.00 ÷ 24). Decimals in the context of money may be used only for the dividend or quotient. Items may require the use of two operations to solve the problem if at least one operation is division.
Stimulus Attribute	MC and GR items may be set in either a real-world or mathematical context.

Sample Item 45 **MC**

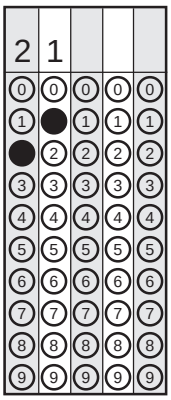
In our galaxy, a star is formed every 18 days. There are 365 days in 1 year. Based on these numbers, which is closest to the total number of stars formed in our galaxy in 1 year?

A. 18
B. 19
★**C.** 20
D. 21

Item Context Science

Sample Item 46 **GR**

A cafeteria manager baked 500 cupcakes for a school carnival and will place them in boxes. Each box holds 24 cupcakes. What is the least number of boxes the cafeteria manager will need to hold all 500 cupcakes?



Sample Response 21

Item Context Social Studies/Consumerism

Benchmark MA.5.A.2.1

Reporting Category	Number: Base Ten and Fractions
Standard	**Big Idea 2** Develop an understanding of and fluency with addition and subtraction of fractions and decimals.
Benchmark	**MA.5.A.2.1 Represent addition and subtraction of decimals and fractions with like and unlike denominators using models, place value, or properties.** Also assesses MA.5.A.6.1 Identify and relate prime and composite numbers, factors, and multiples within the context of fractions.
Item Types	At Grade 5, this benchmark will be assessed using MC and GR items.
Benchmark Clarifications	Students will add and subtract fractions or decimals using graphic representations, place value, or the commutative or associative properties.
Content Limits	Items may include graphic representations of models. Items may include decimals through the thousandths place or in the context of money. Items may assess the commutative and/or associative properties. Denominators of fractions in the stimulus must be less than or equal to 12. Items may include mixed numbers and/or fractions. Items may include fractions represented as parts of sets (e.g., $\frac{1}{2}$ dozen + $\frac{1}{3}$ dozen). Regrouping in subtraction problems or finding a mixed number may be included. Items will not include more than three addends. Students may be required to apply concepts from MA.5.A.6.1, but this benchmark will not be assessed in isolation.

Stimulus Attribute Graphic representations will be used in most items.

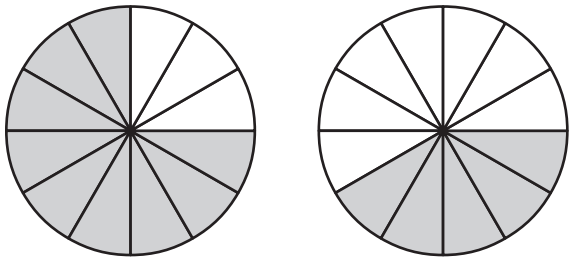
Response Attributes Response to GR items may not be fractions.

Responses may contain fractions that are not simplified or in lowest terms. When a fraction must be simplified, the stem must indicate that the answer must be simplified or expressed in lowest terms.

Sample Item 47 **MC**

Mrs. Bradford served part of a pie for dessert. The shaded parts of the pictures below show how much of the pie was in the pie plate before and after dessert.

Before Dessert **After Dessert**



What fraction of the whole pie, expressed in lowest terms, was eaten for dessert?

★ **A.** $\frac{1}{3}$

B. $\frac{5}{12}$

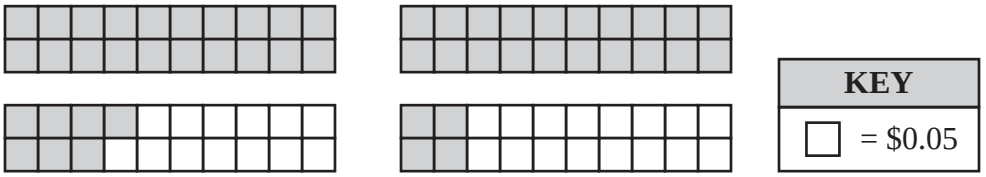
C. $\frac{7}{12}$

D. $\frac{3}{4}$

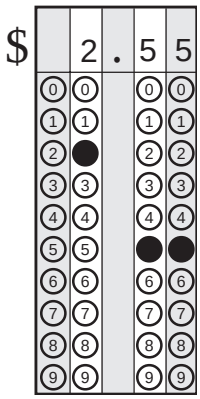
Item Context Mathematics

Sample Item 48 **GR**

Both Alex and Stephanie have some coins in their pockets. The shaded areas in the diagrams below represent the value of the coins they have.



What is the total value, in dollars, of the coins that Alex and Stephanie have?



Sample Response 2.55

Item Context Social Studies/Consumerism

Benchmark MA.5.A.2.2

Reporting Category	Number: Base Ten and Fractions
Standard	**Big Idea 2** Develop an understanding of and fluency with addition and subtraction of fractions and decimals.
Benchmark	**MA.5.A.2.2 Add and subtract fractions and decimals fluently, and verify the reasonableness of results, including in problem situations.** Also assesses MA.5.A.2.3 Make reasonable estimates of fraction and decimal sums and differences, and use techniques for rounding. Also assesses MA.5.A.6.1 Identify and relate prime and composite numbers, factors, and multiples within the context of fractions.
Item Types	At Grade 5, this benchmark will be assessed using MC and GR (decimals only) items.
Benchmark Clarifications	Students will add and subtract fractions (like/unlike denominators) and decimals. Items may assess adding and subtracting decimals in the context of money. Students will verify the reasonableness of results in problem situations. Students may apply the mathematical properties to facilitate computation.
Content Limits	Items may include up to two mixed numbers. Items may include up to three fractions, which may contain unlike denominators. Denominators of fractions may be 1–12, 14, 15, 16, 18, 21, 24, 25, 32, 35, 36, 45, 75, or any multiple of 10 through 100. Items may include decimals through the thousandths place or in money. Fractions and decimals may not be used in the same item.
Stimulus Attributes	Items should be set in a real-world context. Items will not include graphic representations to assist in finding solutions. In items involving measurements, conversions among measurements will not be required.

Stimulus Attributes Students may be required to use benchmark fractions and decimals in making estimates. For example, students know that $\frac{7}{8} + \frac{11}{12}$ is close to 2 because $\frac{7}{8}$ and $\frac{11}{12}$ are both close to 1 (MA.5.A.2.3).

Response Attributes Responses may be exact answers or estimates.

Responses may contain fractions that are not simplified or in lowest terms. When a fraction must be simplified, the stem must indicate that the answer must be simplified or in lowest terms.

Sample Item 49 **MC**

Some of the ingredients for a chocolate chip cookie recipe are shown below.

$\frac{1}{2}$ cup butter

$\frac{2}{3}$ cup sugar

$1\frac{1}{8}$ cups flour

What is the minimum capacity of a bowl that can hold the total of all three of these ingredients?

A. $1\frac{1}{6}$ cups

B. $1\frac{4}{13}$ cups

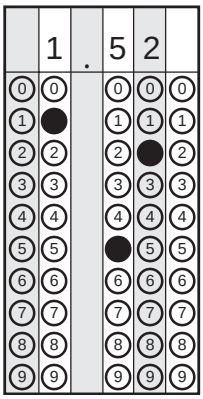
C. $2\frac{1}{7}$ cups

★ **D.** $2\frac{7}{24}$ cups

Item Context Mathematics

Sample Item 50 **GR**

Mindy is hiking on a trail that has a total length of 3.5 miles. After hiking 1.98 miles, she stops for lunch. After lunch, Mindy will continue hiking until she reaches the end of the trail. How much farther, **in miles**, will Mindy need to hike after lunch?



Sample Response 1.52

Item Context Health/Physical Education

Benchmark MA.5.A.2.4

Reporting Category	Number: Base Ten and Fractions
Standard	**Big Idea 2** Develop an understanding of and fluency with addition and subtraction of fractions and decimals.
Benchmark	**MA.5.A.2.4 Determine the prime factorization of numbers.** Also assesses MA.5.A.6.1 Identify and relate prime and composite numbers, factors, and multiples within the context of fractions.
Item Type	At Grade 5, this benchmark will be assessed using MC items.
Benchmark Clarifications	Students will factor composite numbers and express them as the product of prime factors. Students will identify reasons why a number is prime or composite or identify numbers that are prime or composite.
Content Limits	Expressions with a base of 2, 3, or 4 may have exponents up to 5, 4, or 3 respectively. Expressions with a base of 5 through 10 may be raised to the second power. Items will not include factoring numbers greater than 100.
Stimulus Attributes	Items may be in a real-world or a mathematical context. Items may use factor trees.

Sample Item 51 **MC**

Which of the following shows the prime factorization of 24?

A. $2 \times 3 \times 4$
★ **B.** $2^3 \times 3$
C. $4^2 \times 3$
D. 4×6

Item Context Mathematics

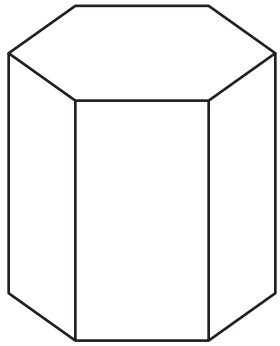
Benchmark MA.5.G.3.1

Reporting Category	Geometry and Measurement
Standard	**Big Idea 3** Describe three-dimensional shapes and analyze their properties, including volume and surface area.
Benchmark	**MA.5.G.3.1 Analyze and compare the properties of two-dimensional figures and three-dimensional solids (polyhedra), including the number of edges, faces, vertices, and types of faces.**
Item Type	At Grade 5, this benchmark will be assessed using MC items.
Benchmark Clarifications	Students will analyze the properties of three-dimensional solids. Students will determine the two-dimensional figure, or net, which can be used to form a three-dimensional solid or determine the three-dimensional solid that can be formed from a two-dimensional net. Students will identify and determine the types of faces and the numbers of edges, faces, and vertices in three-dimensional solids. Students will identify and name a three-dimensional solid given two-dimensional views or net (see content limits below).
Content Limits	Items may include the following terms: pyramid, prism, solid, face, edge, vertex, net, right, polyhedron, and vocabulary from previous grades. Items will not include assessing properties of two-dimensional figures in isolation; items must include a three-dimensional figure. Polyhedra used in items must be prisms or pyramids with bases having no more than eight sides or composite three-dimensional figures constructed from only cubes. Items dealing with composite three-dimensional solids will not require students to determine the number of edges, sides, or faces; however, students may be asked to identify different views of the solid or the number of cubes used to build the solid. Items will not assess vocabulary or properties of oblique polyhedrons, spheres, cones, or cylinders.
Stimulus Attributes	Graphics will be used in most items. Items that are set in real-world context may use length and width as dimensions as well as base and height as dimensions.
Response Attribute	Responses may include only graphics.

Sample Item 52 **MC**

Penelope has an aquarium in the shape of a hexagonal prism. The front view of a hexagonal prism is shown below.

Top-Front View of Hexagonal Prism



Which of the following are the correct numbers of faces, edges, and vertices in a hexagonal prism?

A. 4 faces, 13 edges, 10 vertices
B. 8 faces, 13 edges, 10 vertices
C. 6 faces, 18 edges, 12 vertices
★ **D.** 8 faces, 18 edges, 12 vertices

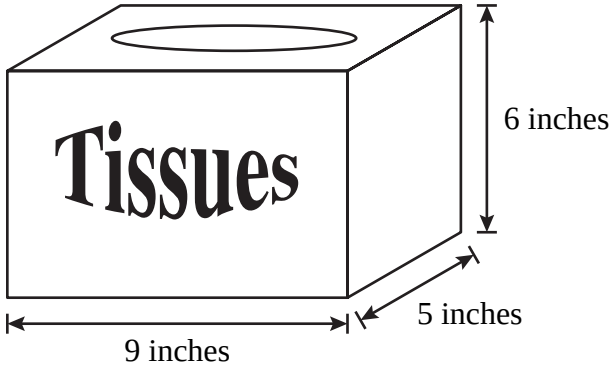
Item Context Science

Benchmark MA.5.G.3.2

Reporting Category	Geometry and Measurement
Standard	**Big Idea 3** Describe three-dimensional shapes and analyze their properties, including volume and surface area.
Benchmark	**MA.5.G.3.2 Describe, define, and determine surface area and volume of prisms by using appropriate units and selecting strategies and tools.**
Item Types	At Grade 5, this benchmark will be assessed using MC and GR items.
Benchmark Clarification	Students will find the volume and/or surface area of rectangular prisms and cubes.
Content Limits	Dimensions of prisms must be whole numbers no larger than 12, or the surface area or calculated volume must be less than 1,000. Items will not include volume and surface areas of nonrectangular prisms (e.g., triangular prisms). Items involving surface area must include a net or a graphic of the assessed three-dimensional shape.
Stimulus Attributes	Graphics must be used in all these items. Items that are set in a real-world context may use the terms *length* and *width* as dimensions as well as *base* and *height* as dimensions.
Response Attribute	Responses may be numerals, expressions, or equations.

Sample Item 53 **MC**

A box of tissues is in the shape of a rectangular prism and has the dimensions shown below.



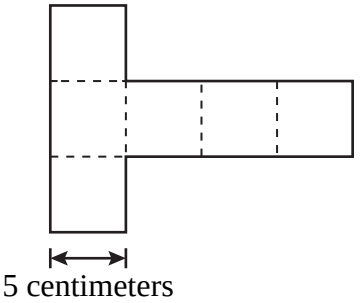
What is the volume of the box of tissues?

A. 258 square inches
B. 258 cubic inches
C. 270 square inches
★ **D.** 270 cubic inches

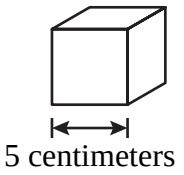
Item Context Mathematics

Sample Item 54 **GR**

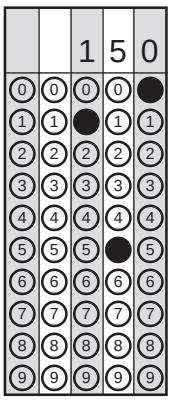
Marcella cut the net shown below from a sheet of graph paper.



Marcella folded the paper on the dashed lines to create the cube shown below.



What is the surface area, **in square centimeters**, of the cube Marcella created?



Sample Response 150

Item Context Mathematics

Benchmark MA.5.A.4.1

Reporting Category	Expressions, Equations, and Statistics
Standard	**Supporting Idea** Algebra
Benchmark	**MA.5.A.4.1 Use the properties of equality to solve numerical and real-world situations.**
Item Types	At Grade 5, this benchmark will be assessed using MC and GR items.
Benchmark Clarifications	Students will solve real-world problems that involve equality. Students may translate a written description or graphic to an equation or identify steps for finding a solution to an equation.
Content Limits	Problems may involve equalities that have no more than two operations. Properties of equality may include substituting a quantity of equal value for another quantity within a situation. Equations may have up to two variables. When a two-variable equation is given in the stem, the value of one of the variables must be provided. (Students are not expected to solve for **two** variables.) Coefficients of variables must be whole numbers. Items will not include naming the property of equality. Numbers used in situations and their solutions must be whole numbers less than or equal to 150.
Stimulus Attributes	Items must be set in a real-world context. Items requiring students to solve equations should include an explanation of the equation in the prompt.

Sample Item 55 **MC**

Both Mrs. Carmen and Mr. Davis worked the same total number of hours on the weekend. Mrs. Carmen worked 5 hours on Saturday and 7 hours on Sunday. Mr. Davis worked 8 hours on Saturday.

Which equation can be used to find d, the number of hours Mr. Davis worked on Sunday?

A. $5 + 7 + 8 = d$
B. $7 - 5 = 8 - d$
★ **C.** $7 + 5 = 8 + d$
D. $8 + 5 = d - 7$

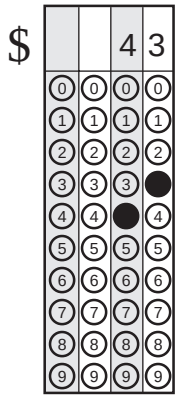
Item Context Social Studies/Consumerism

Sample Item 56 **GR**

Mrs. Jackson purchased two identical jackets for her twin sons from an online store. The cost for shipping was $1, and the total amount Mrs. Jackson paid was $87. The equation below can be used to find *j*, the price for one jacket.

$$2j + 1 = 87$$

What was the price, in dollars, of one jacket?



Sample Response 43

Item Context Social Studies/Consumerism

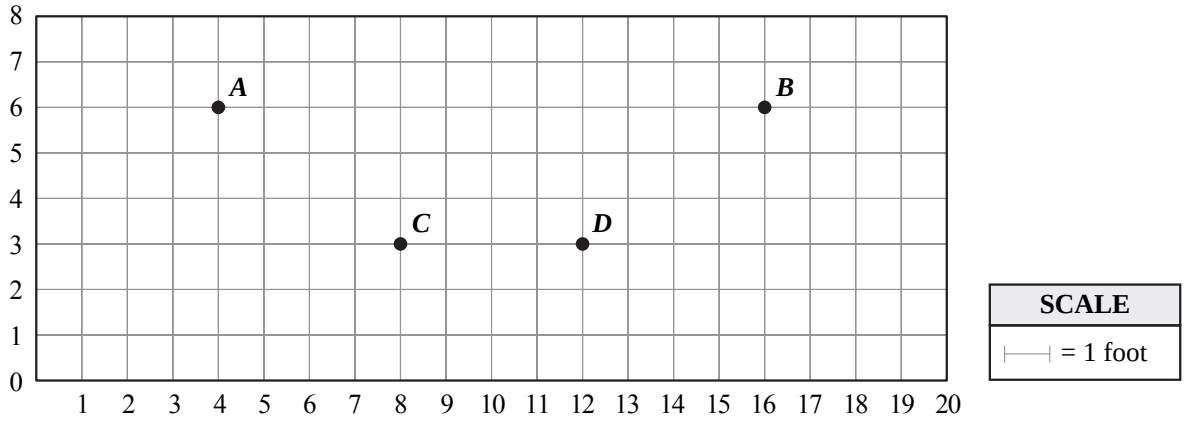
Benchmark MA.5.G.5.1

Reporting Category	Geometry and Measurement
Standard	**Supporting Idea** Geometry and Measurement
Benchmark	**MA.5.G.5.1 Identify and plot ordered pairs on the first quadrant of the coordinate plane.**
Item Type	At Grade 5, this benchmark will be assessed using MC items.
Benchmark Clarifications	Students will identify the ordered pair that describes the location of a point on a coordinate plane. Students will identify the point on a coordinate plane that corresponds to a given ordered pair. Students may identify the location of a point on a coordinate plane that is equidistant from two points. Items will not include finding a specific distance between points. Students will describe the horizontal and vertical movements necessary to get from one point to another on a coordinate plane.
Content Limit	Items may include the following terms: *coordinates*, *coordinate plane*, *ordered pairs*, *midpoint*, *x-axis*, and *y-axis*, but items will not assess the vocabulary of these terms.
Stimulus Attributes	All *x*- and *y*-coordinates must be whole numbers. Coordinate grids may have the *x*- and *y*-axes labeled. Coordinate grids may have arrows at the end of each axis. Items including the use of compass directions must include a compass rose. All coordinate grids must use a scale of one unit. Items may be set in either a real-world or a mathematical context. Graphics should be used in all these items.

Sample Item 57 **MC**

The letters on the coordinate grid below represent the locations of paintings hanging on a wall of an art gallery.

GALLERY WALL



The manager wants to hang another painting exactly halfway between points *A* and *B*. Which ordered pair best describes the location of the new painting?

A. (6, 10)
B. (10, 3)
★ **C.** (10, 6)
D. (11, 6)

Item Context The Arts

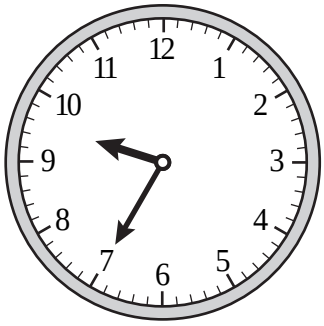
Benchmark MA.5.G.5.2

Reporting Category	Geometry and Measurement
Standard	**Supporting Idea** Geometry and Measurement
Benchmark	**MA.5.G.5.2 Compare, contrast, and convert units of measure within the same dimension (length, mass, or time) to solve problems.**
Item Types	At Grade 5, this benchmark will be assessed using MC and GR items.
Benchmark Clarification	Students will compare, contrast, and convert units of measure within the same measurement system (i.e., either customary or metric).
Content Limits	Items may include linear measure, weight/mass, time, or elapsed time (to the nearest minute). Items will not include time zones. Items may include either analog or digital clocks but not both within the same item. Items will not include the use of proportions or equivalent ratios to convert between different measurement systems. Items may include up to two conversions within the same system of measurement. Items may include multiplying or dividing by multiples of ten. Items involving the metric system may include decimals. Items may require students to add and subtract measurements.
Stimulus Attributes	Items must be set in a real-world context. Items will not require students to divide by decimals. Items that are set in a real-world context may use *length* and *width* as dimensions as well as *base* and *height* as dimensions.
Response Attribute	Responses may include decimals up to five digits (e.g., 250 centimeters = 2.5 meters).

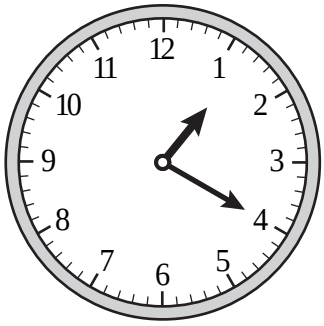
Sample Item 58 **MC**

The students in Mrs. Zavala's fifth grade class went on a field trip to the zoo. They arrived at the zoo in the morning and left the zoo in the afternoon. The clocks below show the time when the class arrived at the zoo and the time the class left the zoo.

Time Mrs. Zavala's Class Arrived at the Zoo



Time Mrs. Zavala's Class Left the Zoo



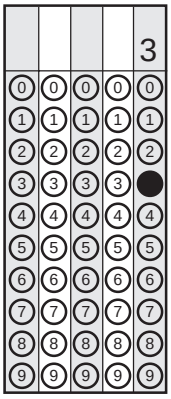
Based on the times shown, for how long was Mrs. Zavala's class at the zoo?

A. 3 hours 15 minutes
★ **B.** 3 hours 45 minutes
C. 4 hours 15 minutes
D. 4 hours 45 minutes

Item Context Science

Sample Item 59 **GR**

The vending machine shown below can hold up to 48 bags of snacks. Each bag of snacks weighs 1 ounce. What is the total number of **pounds** of snacks in 48 bags of this size?



Sample Response 3

Item Context Social Studies/Consumerism

Benchmark MA.5.G.5.3

Reporting Category	Geometry and Measurement
Standard	**Supporting Idea** Geometry and Measurement
Benchmark	**MA.5.G.5.3 Solve problems requiring attention to approximation, selection of appropriate measuring tools, and precision of measurement.**
Item Type	At Grade 5, this benchmark will be assessed using MC items.
Benchmark Clarifications	Students will determine when an approximate measure or a more precise measure is more appropriate. Students will select the appropriate measurements, unit of measure, or tool needed for measures of weight/mass, capacity/volume, length, area, temperature, and time.
Content Limits	Linear measures in inches may be to the nearest $\frac{1}{16}$ inch. Items may include measurement tools such as: scales, rulers, yardsticks, tape measures, meter sticks, measuring cups, analog and digital clocks, thermometers, and their related units of measure. For a complete list of units for items involving measurement, see the Grade 5 FCAT 2.0 Mathematics Reference Sheet located in Appendix G. Items dealing with length should focus on precision, not on the tool used to measure length. Metric measures of mass may be to the nearest milligram. Linear metric measures may be to the nearest millimeter. Capacity metric measures may be to the nearest milliliter. Elapsed time may be to the nearest minute.
Stimulus Attributes	A linear measurement may be indicated with a dimension line in a graphic. Items that are set in a real-world context may use *length* and *width* as dimensions as well as *base* and *height* as dimensions. Items will not require students to measure.

Sample Item 60 **MC**

A carpenter is measuring the width of a window in a house. Which of the following methods would provide him with the most precise measurement?

A. He should measure the width of the window to the nearest foot.

B. He should measure the width of the window to the nearest inch.

C. He should measure the width of the window to the nearest $\frac{1}{4}$ foot.

★ **D.** He should measure the width of the window to the nearest $\frac{1}{2}$ inch.

Item Context Mathematics

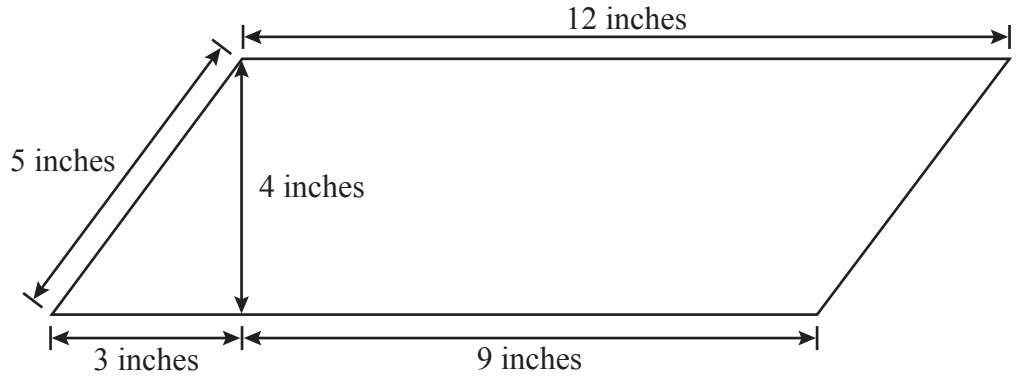
Benchmark MA.5.G.5.4

Reporting Category	Geometry and Measurement
Standard	**Supporting Idea** Geometry and Measurement
Benchmark	**MA.5.G.5.4 Derive and apply formulas for areas of parallelograms, triangles, and trapezoids from the area of a rectangle.**
Item Types	At Grade 5, this benchmark will be assessed using MC and GR items.
Benchmark Clarifications	Students will find the areas of parallelograms, triangles, and trapezoids. Students will justify the area formulas for parallelograms, triangles, and trapezoids using the area formula for rectangles.
Content Limits	Items assessing areas of trapezoids must use only isosceles trapezoids. Areas must include whole numbers with three or fewer significant digits and up to a maximum of five digits.
Stimulus Attributes	Graphics must be used in all these items. Items that are set in a real-world context may use *length* and *width* as dimensions as well as *base* and *height* as dimensions. Graphics of figures may include dashed lines that show how a shape can be decomposed and recomposed to form a rectangle. Figures should be presented on grids, when appropriate.

Sample Item 61 **MC**

Diana drew a parallelogram with the dimensions shown below and then cut it into 2 figures.

Diana's Parallelogram



Diana rearranged the 2 figures to form a rectangle that has the same area as the parallelogram. Which of the following could be the dimensions of the rectangle that Diana made from her parallelogram?

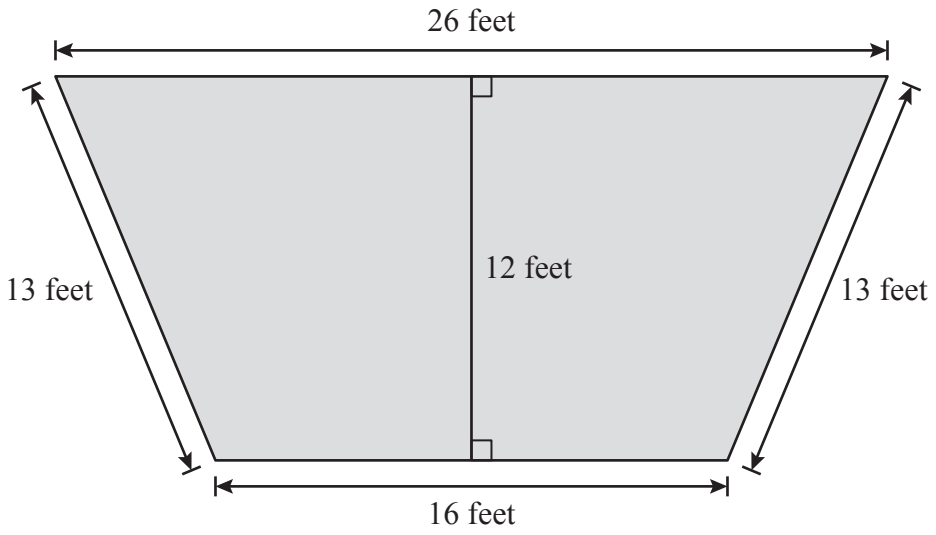
A. 4×9
B. 5×9
★ **C.** 4×12
D. 5×12

Item Context Mathematics

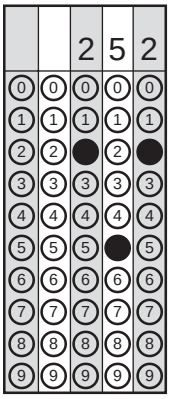
Sample Item 62 **GR**

A drama teacher drew up plans for a stage he wants to build. A diagram of the stage, which is in the shape of a trapezoid, is shown below.

Stage



What is the area of the stage **in square feet**?



Sample Response 252

Item Context The Arts

Benchmark MA.5.A.6.2

Reporting Category	Expressions, Equations, and Statistics
Standard	**Supporting Idea** Number and Operations
Benchmark	**MA.5.A.6.2 Use the order of operations to simplify expressions, which include exponents and parentheses.**
Item Types	At Grade 5, this benchmark will be assessed using MC and GR items.
Benchmark Clarification	Students will simplify expressions that may include exponents and/or parentheses.
Content Limits	Items will include no more than five whole numbers (including exponents) within the expression. Numbers raised to a power must be single-digit numbers. Exponents may not be applied to the entire quantity within parentheses. Exponents used on numbers must be either 2 or 3. Division will not be shown as a fraction.
Stimulus Attribute	Items may be set in either a real-world or mathematical context.
Response Attribute	Responses may not include negative numbers.

Sample Item 63 **MC**

Yvonne needed to evaluate the expression shown below using the order of operations.

$$54 \div (9 - 3) + 1 \times 6$$

What is the value of the above expression?

A. 8
★ **B.** 15
C. 20
D. 50

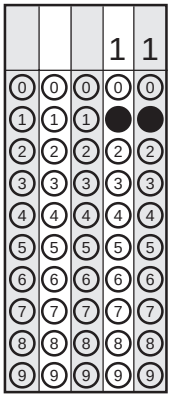
Item Context Mathematics

Sample Item 64 **GR**

The value of the expression below is equal to the distance, in feet, between a ball and the ground, 2 seconds after the ball is dropped from a height of 75 feet.

$$75 - 16 \times 2^2$$

What is the value of this expression?



Sample Response 11

Item Context Science

Benchmark MA.5.A.6.3

Reporting Category	Number: Base Ten and Fractions
Standard	**Supporting Idea** Number and Operations
Benchmark	**MA.5.A.6.3 Describe real-world situations using positive and negative numbers.**
Item Type	At Grade 5, this benchmark will be assessed using MC items.
Benchmark Clarifications	Students will solve real-world problems involving positive or negative numbers. Items may include, but are not limited to, situations of owing money, measuring elevations above and below sea level, riding elevators up and down, temperature, ascending and descending mountains, football yardage, etc.
Content Limit	Items may include integers from ⁻500 through 500.
Stimulus Attributes	Items must be set in a real-world context. Graphics may be used.
Response Attribute	Responses may include positive and/or negative integers.

Sample Item 65 **MC**

In one day, Sam and his family drove from Bakersfield, California, to Death Valley, California. The elevation in Bakersfield is 408 feet above sea level, and the elevation in Death Valley is 282 feet below sea level. What is the difference in elevation between these two places?

A. 126 feet
B. 282 feet
C. 680 feet
★ **D.** 690 feet

Item Context Social Studies/Consumerism

Benchmark MA.5.A.6.4

Reporting Category	Number: Base Ten and Fractions
Standard	**Supporting Idea** Number and Operations
Benchmark	**MA.5.A.6.4 Compare, order, and graph integers, including integers shown on a number line.**
Item Type	At Grade 5, this benchmark will be assessed using MC items.
Benchmark Clarifications	Students will compare or order integers. Students will compare or order integers using inequalities. Students will compare and order or identify integers on a number line. Items may include, but are not limited to, rocket countdowns, elevations, temperatures, etc.
Content Limits	Items may include integers from $^{-}500$ through 500. Items may include the inequality symbols ($>$, $<$, $\leq$, $\geq$, $\neq$). Items will not include compound inequalities. Items will not include timelines (years).
Stimulus Attribute	Items may be set in either a real-world or mathematical context.

Sample Item 66 **MC**

The table below shows the lowest recorded temperature for four states in the U.S. as of December 2007.

LOWEST RECORDED TEMPERATURES

State	Temperature (in °F)
Delaware	-17
Florida	-2
Hawaii	12
Mississippi	-19

Which of these lists the temperatures shown in the table in order from **lowest to highest**?

A. -2, 12, -17, -19
★ **B.** -19, -17, -2, 12
C. 12, -2, -17, -19
D. -2, -17, -19, 12

Item Context Science

Benchmark MA.5.A.6.5

Reporting Category	Number: Base Ten and Fractions
Standard	**Supporting Idea** Number and Operations
Benchmark	**MA.5.A.6.5 Solve non-routine problems using various strategies including "solving a simpler problem" and "guess, check, and revise."**
Item Types	At Grade 5, this benchmark will be assessed using MC and GR items.
Benchmark Clarification	Students will solve nonroutine problems using strategies including, but not limited to, drawing diagrams, making tables or lists, looking for patterns, using models, estimating, solving a simpler problem, and/or guess, check, and revise strategies.
Content Limits	Items may include multistep problems with no more than three operations. Items may include concepts from other benchmarks within the Number and Operations strands. Students should be able to choose their own strategies to solve the problems.
Stimulus Attribute	Items must be set in a real-world context.

Sample Item 67 **MC**

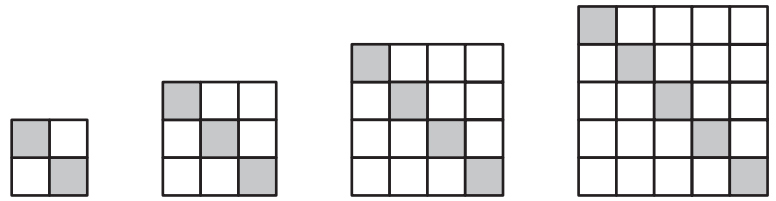
A discount music store sells compact discs (CDs) for $6 each. When a customer purchases 3 CDs, the customer receives 1 free CD. Marisa went to the music store and spent $36 on CDs. How many free CDs did Marisa receive?

A. 1
★ **B.** 2
C. 6
D. 8

Item Context Social Studies/Consumerism

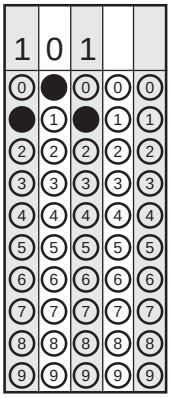
Sample Item 68 **GR**

Pedro used white and gray square tiles to make models of some floor designs. The first 4 floor designs are shown below.



Floor 1 **Floor 2** **Floor 3** **Floor 4**

If Pedro continues making these floor designs, what will be the total number of gray tiles in the 100th floor design?



Sample Response 101

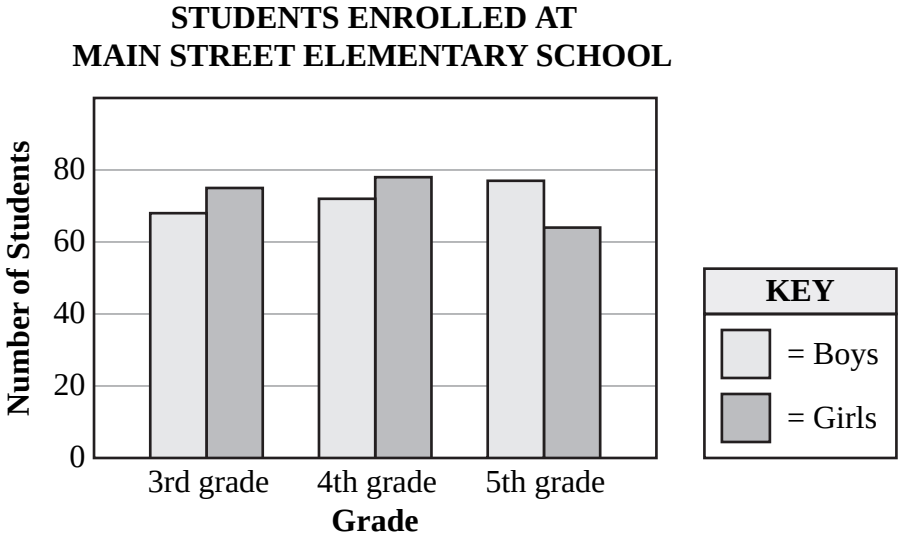
Item Context The Arts

Benchmark MA.5.S.7.1

Reporting Category	Expressions, Equations, and Statistics
Standard	**Supporting Idea** Data Analysis
Benchmark	**MA.5.S.7.1 Construct and analyze line graphs and double bar graphs.** Also assesses MA.5.A.4.2 Construct and describe a graph showing continuous data, such as a graph of a quantity that changes over time.
Item Type	At Grade 5, this benchmark will be assessed using MC items.
Benchmark Clarifications	Students will identify line graphs or double bar graphs to represent a given set of data. Students will interpret, analyze, and compare data represented on line graphs or double bar graphs. Students will identify, interpret, or describe a graph that shows a quantity that changes over time.
Content Limits	Items may require students to predict if the line graph represents data that are increasing or decreasing. (Students at Grade 5 are NOT expected to use the word *trend*.) Analysis may include making and stating conclusions and predictions based on data, comparing data, determining appropriate scale increments dependent upon the range of the data, or identifying different parts of a graph. Items should not require students to determine the type of graph to use. Items should contain no more than 20 items of raw data that must be categorized or displayed. Students may be expected to perform addition, subtraction, multiplication, or division when identifying and/or analyzing graphs.
Stimulus Attributes	Items should be set in a real-world context. Graphics will be used in all these items.

Sample Item 69 **MC**

The graph below shows the number of boys and girls enrolled in three grades at Main Street Elementary School.



Based on the graph, which of the following statements is true about the enrollment at Main Street Elementary School?

A. The total number of 4th grade students is approximately 70.
★ **B.** The total number of 5th grade students is approximately 140.
C. The number of 4th grade boys is less than the number of 3rd grade boys.
D. The number of 5th grade girls is greater than the number of 5th grade boys.

Item Context Mathematics

Benchmark MA.5.S.7.2

Reporting Category	Expressions, Equations, and Statistics
Standard	**Supporting Idea** Data Analysis
Benchmark	**MA.5.S.7.2 Differentiate between continuous and discrete data, and determine ways to represent those using graphs and diagrams.** Also assesses MA.5.A.4.2 Construct and describe a graph showing continuous data, such as a graph of a quantity that changes over time.
Item Type	At Grade 5, this benchmark will be assessed using MC items.
Benchmark Clarifications	Students will identify the appropriate graph to represent a set of continuous or discrete data. Students will identify a set of discrete or continuous data. Students will identify reasons why a set of data is discrete or continuous.
Content Limits	Items may include only the first quadrant in a graph. Items may include the terms *continuous* and *discrete*. Items may include frequency tables, single bar graphs, double bar graphs, pictographs, line plots, line graphs, and/or Venn diagrams.
Stimulus Attribute	Graphics must be used in all these items.
Response Attributes	Options may include graphic displays of a set of data. Items will not include data that result in negative values.

Sample Item 70 **MC**

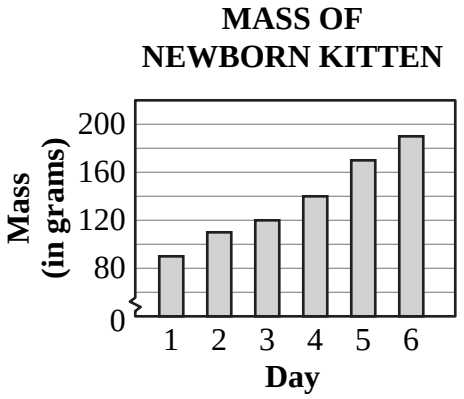
A veterinarian measured the mass of a newborn kitten each day for 6 days. The results are shown in the table below.

MASS OF NEWBORN KITTEN

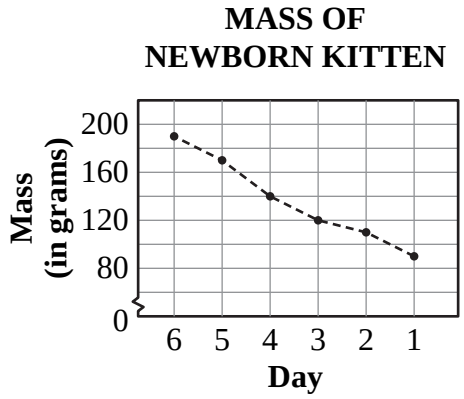
Day	1	2	3	4	5	6
Mass (in grams)	90	110	120	140	170	190

Which graph is the best representation of the data in the table?

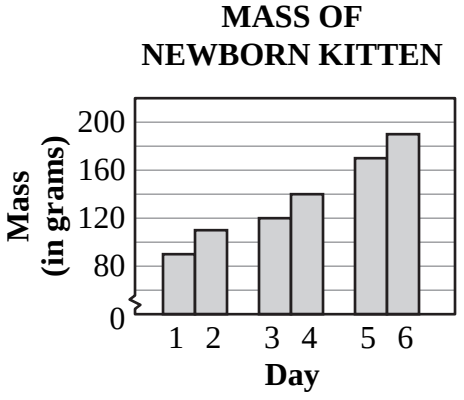
A.



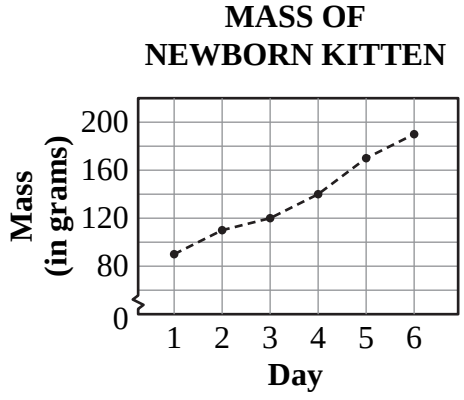
C.



B.



★ D.



Item Context Science

FCAT 2.0 and EOC Topics Florida's NGSSS

Topics, or item contexts, for FCAT 2.0 assessment items can be found on the DOE website at: http://fcat.fldoe.org/fcat2/pdf/MathematicsAppendixA.pdf.

Mathematics Content Assessed by the FCAT 2.0 and Item Types by Benchmark Grades 3–5

Grade 3					
Big Idea 1 Develop understandings of multiplication and division and strategies for basic multiplication facts and related division facts.					
MA.3.A.1.1 Model multiplication and division, including problems presented in context: repeated addition, multiplicative comparison, array, how many combinations, measurement, and partitioning. **MC**	**MA.3.A.1.2** Solve multiplication and division fact problems by using strategies that result from applying number properties. **MC**	**MA.3.A.1.3** Identify, describe, and apply division and multiplication as inverse operations. **MC**			
Big Idea 2 Develop an understanding of fractions and fraction equivalence.					
MA.3.A.2.1 Represent fractions, including fractions greater than 1, using area, set, and linear models. **MC**	**MA.3.A.2.2** Describe how the size of the fractional part is related to the number of equal-sized pieces in the whole. Assessed with MA.3.A.2.3.	**MA.3.A.2.3** Compare and order fractions, including fractions greater than 1, using models and strategies. Also assesses MA.3.A.2.2. **MC**	**MA.3.A.2.4** Use models to represent equivalent fractions, including fractions greater than 1, and identify representations of equivalence. **MC**		

Prior Knowledge: Items may require the student to apply mathematical knowledge described in NGSSS benchmarks from lower grades; however, the benchmarks from lower grades will not be assessed in isolation.

MC = Multiple choice GR = Gridded response

Mathematics Content Assessed by the FCAT 2.0 and Item Types by Benchmark Grades 3–5

Grade 3					
Big Idea 3 Describe and analyze properties of two-dimensional shapes.					
MA.3.G.3.1 Describe, analyze, compare, and classify two-dimensional shapes using sides and angles–including acute, obtuse, and right angles–and connect these ideas to the definition of shapes. **MC**	**MA.3.G.3.2** Compose, decompose, and transform polygons to make other polygons, including concave and convex polygons with three, four, five, six, eight, or ten sides. **MC**	**MA.3.G.3.3** Build, draw, and analyze two-dimensional shapes from several orientations in order to examine and apply congruence and symmetry. **MC**			
Supporting Idea Algebra					
MA.3.A.4.1 Create, analyze, and represent patterns and relationships using words, variables, tables, and graphs. **MC**					
Supporting Idea Geometry and Measurement					
MA.3.G.5.1 Select appropriate units, strategies, and tools to solve problems involving perimeter. **MC**	**MA.3.G.5.2** Measure objects using fractional parts of linear units such as $\frac{1}{2}$, $\frac{1}{4}$, and $\frac{1}{10}$. **MC**	**MA.3.G.5.3** Tell time to the nearest minute and to the nearest quarter hour, and determine the amount of time elapsed. **MC**			

Prior Knowledge: Items may require the student to apply mathematical knowledge described in NGSSS benchmarks from lower grades; however, the benchmarks from lower grades will not be assessed in isolation.

MC = Multiple choice GR = Gridded response

Mathematics Content Assessed by the FCAT 2.0 and Item Types by Benchmark Grades 3–5

Grade 3					
Supporting Idea	**Number and Operations**				
MA.3.A.6.1 Represent, compute, estimate, and solve problems using numbers through hundred thousands. **MC**	**MA.3.A.6.2** Solve non-routine problems by making a table, chart, or list and searching for patterns. **MC**				
Supporting Idea	**Data Analysis**				
MA.3.S.7.1 Construct and analyze frequency tables, bar graphs, pictographs, and line plots from data, including data collected through observations, surveys, and experiments. **MC**					

Prior Knowledge: Items may require the student to apply mathematical knowledge described in NGSSS benchmarks from lower grades; however, the benchmarks from lower grades will not be assessed in isolation.

MC = Multiple choice GR = Gridded response

Mathematics Content Assessed by the FCAT 2.0 and Item Types by Benchmark Grades 3–5

Grade 4					
Big Idea 1 Develop quick recall of multiplication facts and related division facts and fluency with whole number multiplication.					
MA.4.A.1.1 Use and describe various models for multiplication in problem-solving situations, and demonstrate recall of basic multiplication and related division facts with ease. Assessed with MA.4.A.1.2.	**MA.4.A.1.2** Multiply multi-digit whole numbers through four digits fluently, demonstrating understanding of the standard algorithm and checking for reasonableness of results, including solving real-world problems. Also assesses MA.4.A.1.1. **MC, GR**				
Big Idea 2 Develop an understanding of decimals, including the connection between fractions and decimals.					
MA.4.A.2.1 Use decimals through the thousandths place to name numbers between whole numbers. Assessed with MA.4.A.2.3 and MA.4.A.2.4.	**MA.4.A.2.2** Describe decimals as an extension of the base-ten number system. Assessed with MA.4.A.2.3 and MA.4.A.2.4.	**MA.4.A.2.3** Relate equivalent fractions and decimals with and without models, including locations on a number line. Also assesses MA.4.A.2.1 and MA.4.A.2.2. **MC, GR**	**MA.4.A.2.4** Compare and order decimals, and estimate fraction and decimal amounts in real-world problems. Also assesses MA.4.A.2.1 and MA.4.A.2.2. **MC**		

Prior Knowledge: Items may require the student to apply mathematical knowledge described in NGSSS benchmarks from lower grades; however, the benchmarks from lower grades will not be assessed in isolation.

MC = Multiple choice GR = Gridded response

Mathematics Content Assessed by the FCAT 2.0 and Item Types by Benchmark Grades 3–5

Grade 4					
Big Idea 3 Develop an understanding of area and determine the area of two-dimensional shapes.					
MA.4.G.3.1 Describe and determine area as the number of same-sized units that cover a region in the plane, recognizing that a unit square is the standard unit for measuring area. **MC**	**MA.4.G.3.2** Justify the formula for the area of the rectangle "area = base × height." **MC**	**MA.4.G.3.3** Select and use appropriate units, both customary and metric, strategies, and measuring tools to estimate and solve real-world area problems. **MC, GR**			
Supporting Idea Algebra					
MA.4.A.4.1 Generate algebraic rules and use all four operations to describe patterns, including nonnumeric growing or repeating patterns. **MC, GR**	**MA.4.A.4.2** Describe mathematics relationships using expressions, equations, and visual representations. **MC, GR**	**MA.4.A.4.3** Recognize and write algebraic expressions for functions with two operations. **MC**			

Prior Knowledge: Items may require the student to apply mathematical knowledge described in NGSSS benchmarks from lower grades; however, the benchmarks from lower grades will not be assessed in isolation.

MC = Multiple choice GR = Gridded response

Mathematics Content Assessed by the FCAT 2.0 and Item Types by Benchmark Grades 3–5

Grade 4					
Supporting Idea	**Geometry and Measurement**				
MA.4.G.5.1 Classify angles of two-dimensional shapes using benchmark angles (45°, 90°, 180°, and 360°). **MC**	**MA.4.G.5.2** Identify and describe the results of translations, reflections, and rotations of 45, 90, 180, 270, and 360 degrees, including figures with line and rotational symmetry. **MC**	**MA.4.G.5.3** Identify and build a three-dimensional object from a two-dimensional representation of that object and vice versa. **MC**			
Supporting Idea	**Number and Operations**				
MA.4.A.6.1 Use and represent numbers through millions in various contexts, including estimation of relative sizes of amounts or distances. **MC, GR**	**MA.4.A.6.2** Use models to represent division as: • the inverse of multiplication • as partitioning • as successive subtraction **MC**	**MA.4.A.6.3** Generate equivalent fractions and simplify fractions. **MC**	**MA.4.A.6.4** Determine factors and multiples for specified whole numbers. **MC**	**MA.4.A.6.5** Relate halves, fourths, tenths, and hundredths to decimals and percents. **MC, GR**	**MA.4.A.6.6** Estimate and describe reasonableness of estimates; determine the appropriateness of an estimate versus an exact answer. **MC**

Prior Knowledge: Items may require the student to apply mathematical knowledge described in NGSSS benchmarks from lower grades; however, the benchmarks from lower grades will not be assessed in isolation.

MC = Multiple choice GR = Gridded response

Mathematics Content Assessed by the FCAT 2.0 and Item Types by Benchmark Grades 3–5

Grade 5					
Big Idea 1 Develop an understanding of and fluency with division of whole numbers.					
MA.5.A.1.1 Describe the process of finding quotients involving multi-digit dividends using models, place value, properties, and the relationship of division to multiplication. **MC, GR**	**MA.5.A.1.2** Estimate quotients or calculate them mentally depending on the context and numbers involved. Assessed with MA.5.A.1.4.	**MA.5.A.1.3** Interpret solutions to division situations, including those with remainders, depending on the context of the problem. Assessed with MA.5.A.1.4.	**MA.5.A.1.4** Divide multi-digit whole numbers fluently, including solving real-world problems, demonstrating understanding of the standard algorithm, and checking the reasonableness of results. Also assesses MA.5.A.1.2 and MA.5.A.1.3. **MC, GR**		

Prior Knowledge: Items may require the student to apply mathematical knowledge described in NGSSS benchmarks from lower grades; however, the benchmarks from lower grades will not be assessed in isolation.

MC = Multiple choice GR = Gridded response

Mathematics Content Assessed by the FCAT 2.0 and Item Types by Benchmark Grades 3–5

Grade 5					
Big Idea 2 Develop an understanding of and fluency with addition and subtraction of fractions and decimals.					
MA.5.A.2.1 Represent addition and subtraction of decimals and fractions with like and unlike denominators using models, place value, or properties. Also assesses MA.5.A.6.1. **MC, GR**	**MA.5.A.2.2** Add and subtract fractions and decimals fluently, and verify the reasonableness of results, including in problem situations. Also assesses MA.5.A.2.3 and MA.5.A.6.1. **MC, GR**	**MA.5.A.2.3** Make reasonable estimates of fraction and decimal sums and differences, and use techniques for rounding. Assessed with MA.5.A.2.2.	**MA.5.A.2.4** Determine the prime factorization of numbers. Also assesses MA.5.A.6.1. **MC**		
Big Idea 3 Describe three-dimensional shapes and analyze their properties, including volume and surface area.					
MA.5.G.3.1 Analyze and compare the properties of two-dimensional figures and three-dimensional solids (polyhedra), including the number of edges, faces, vertices, and types of faces. **MC**	**MA.5.G.3.2** Describe, define, and determine surface area and volume of prisms by using appropriate units and selecting strategies and tools. **MC, GR**				

Prior Knowledge: Items may require the student to apply mathematical knowledge described in NGSSS benchmarks from lower grades; however, the benchmarks from lower grades will not be assessed in isolation.

MC = Multiple choice GR = Gridded response

Mathematics Content Assessed by the FCAT 2.0 and Item Types by Benchmark Grades 3–5

Grade 5					
Supporting Idea	**Algebra**				
MA.5.A.4.1 Use the properties of equality to solve numerical and real-world situations. **MC, GR**	**MA.5.A.4.2** Construct and describe a graph showing continuous data, such as a graph of a quantity that changes over time. Assessed with MA.5.S.7.1 and MA.5.S.7.2.				
Supporting Idea	**Geometry and Measurement**				
MA.5.G.5.1 Identify and plot ordered pairs on the first quadrant of the coordinate plane. **MC**	**MA.5.G.5.2** Compare, contrast, and convert units of measure within the same dimension (length, mass, or time) to solve problems. **MC, GR**	**MA.5.G.5.3** Solve problems requiring attention to approximation, selection of appropriate measuring tools, and precision of measurement. **MC**	**MA.5.G.5.4** Derive and apply formulas for areas of parallelograms, triangles, and trapezoids from the area of a rectangle. **MC, GR**		

Prior Knowledge: Items may require the student to apply mathematical knowledge described in NGSSS benchmarks from lower grades; however, the benchmarks from lower grades will not be assessed in isolation.

MC = Multiple choice GR = Gridded response

Mathematics Content Assessed by the FCAT 2.0 and Item Types by Benchmark Grades 3–5

Grade 5					
Supporting Idea	**Number and Operations**				
MA.5.A.6.1 Identify and relate prime and composite numbers, factors, and multiples within the context of fractions. Assessed with MA.5.A.2.2 and MA.5.A.2.4.	**MA.5.A.6.2** Use the order of operations to simplify expressions, which include exponents and parentheses. **MC, GR**	**MA.5.A.6.3** Describe real-world situations using positive and negative numbers. **MC**	**MA.5.A.6.4** Compare, order, and graph integers, including integers shown on a number line. **MC**	**MA.5.A.6.5** Solve non-routine problems using various strategies including "solving a simpler problem" and "guess, check, and revise." **MC, GR**	
Supporting Idea	**Data Analysis**				
MA.5.S.7.1 Construct and analyze line graphs and double bar graphs. Also assesses MA.5.A.4.2. **MC**	**MA.5.S.7.2** Differentiate between continuous and discrete data, and determine ways to represent those using graphs and diagrams. Also assesses MA.5.A.4.2. **MC**				

Prior Knowledge: Items may require the student to apply mathematical knowledge described in NGSSS benchmarks from lower grades; however, the benchmarks from lower grades will not be assessed in isolation.

MC = Multiple choice GR = Gridded response

Reporting Categories for FCAT 2.0 Mathematics and End-of-Course Assessments

Reporting Categories

The following table represents the content reporting categories for the FCAT 2.0 Mathematics Assessments along with the approximate percentage of raw-score points derived from each content category.

Grade				
3	Number: Operations, Problems, and Statistics 50%	Geometry and Measurement 30%	Number: Fractions 20%	
4	Number: Operations and Problems 45%	Geometry and Measurement 30%	Number: Base Ten and Fractions 25%	
5	Number: Base Ten and Fractions 50%	Geometry and Measurement 30%	Expressions, Equations, and Statistics 20%	
6	Fractions, Ratios/Proportional Relationships, and Statistics 40%	Expressions and Equations 40%	Geometry and Measurement 20%	
7	Geometry and Measurement 30%	Ratios/Proportional Relationships 25%	Number: Base Ten 25%	Statistics and Probability 20%
8	Expressions, Equations, and Functions 40%	Geometry and Measurement 35%	Number: Operations, Problems, and Statistics 25%	

FCAT 2.0 Mathematics Glossary
Grades 3–5

The following glossary is a reference list provided for item writers and is **not** intended to comprise a comprehensive vocabulary list for students. The terms defined in this glossary pertain to the NGSSS in mathematics for Grades 3–5 and the content assessed on FCAT 2.0 Mathematics.

Acute angle—An angle with a measure less than 90° and greater than 0°.

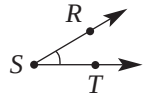
Addend—Any number being added.

Algebraic order of operations—The order of performing computations is first parentheses, then exponents, followed by multiplication and/or division (as read from left to right), then addition and/or subtraction (as read from left to right). For example:
$5^2 + (12 - 2) \div 2 - 3 \times 2$
$5^2 + 10 \div 2 - 3 \times 2$
$25 + 10 \div 2 - 3 \times 2$
$25 + 5 - 6$
$30 - 6$
24

Algebraic rule—A mathematical expression that contains variables and describes a pattern or relationship.

Altitude—The perpendicular distance from a vertex in a polygon to its opposite side. Altitude may also be used to refer to an elevation in some real-world contexts.

Angle (∠)—A figure formed by two rays with the same endpoint (vertex). Angles are measured in degrees. In the figure, the angle can be named ∠*RST*, ∠*TSR*, or ∠*S*.



Approximate value—A number or measurement that is close to or near its exact value.

Area—The measure, in square units, of the inside region of a closed two-dimensional figure (e.g., a rectangle with sides of 4 units by 6 units has an area of 24 square units).
Area = base × height

Array—A set of objects arranged in rows and columns.

Associative property—The way in which three or more numbers are grouped for addition or multiplication does not change their sum or product, respectively [e.g., $(5 + 6) + 9 = 5 + (6 + 9)$ or $(2 \times 3) \times 8 = 2 \times (3 \times 8)$].

Attribute—A quality or characteristic, such as color, thickness, shape, or size.

Axis (of a graph) (*pl*. axes)**—**The horizontal and vertical number lines used in a coordinate plane system.

FCAT 2.0 Mathematics Glossary Grades 3–5

Bar graph—A graph that uses either vertical or horizontal bars to display countable or discrete data.

Base (algebraic)—The number used as a factor in exponential form. For example, 2^3 is the exponential form of $2 \times 2 \times 2$. The numeral two (2) is called the base, and the numeral three (3) is called the exponent.

Base (geometric)—The line segment or face of a geometric figure that is perpendicular to the height.

Benchmark—A point of reference from which other measurements or values may be made or judged.

Benchmark angles—The angles 0°, 45°, 90°, 180°, 270°, and 360°.

Benchmark fractions—The fractions 0, $\frac{1}{10}$, $\frac{1}{5}$, $\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$, and 1.

Break—A zigzag on the *x*- or *y*-axis in a line or bar graph indicating that the data displayed do not include all of the values that exist on the number line used. Also called a squiggle.

Capacity—The amount of space that can be filled in a container. Both capacity and volume are used to measure three-dimensional spaces; however, capacity usually refers to fluid measures, whereas volume is described as cubic units.

Chart—A data display that presents information in columns and rows.

Closed figure—A two-dimensional figure that divides the plane into two parts—the part inside the figure and the part outside the figure (e.g., circles, squares, rectangles).

Coefficient—The number that multiplies the variable(s) in an algebraic expression (e.g., 4*xy*). If no number is specified, the coefficient is 1.

Commutative property—The order in which two numbers are added or multiplied does not change their sum or product, respectively (e.g., $2 + 3 = 3 + 2$, or $4 \times 7 = 7 \times 4$).

Compatible numbers—Numbers that are easy to compute mentally.

Compose—To form by putting together (e.g., a geometric figure or a number).

Composite figure—A figure made up of several different figures.

Composite number—A whole number that has more than two factors.

Concave polygon—A polygon with one or more diagonals that have points outside the polygon.

FCAT 2.0 Mathematics Glossary
Grades 3–5

Congruent—Having exactly the same shape and size.

Continuous data—Data that can take any of an infinite number of values between whole numbers.

Continuous graph—A graph in which there are no gaps or holes (e.g., a line graph).

Convex polygon—A polygon with each interior angle measuring less than 180°. All diagonals of a convex polygon lie inside the polygon.

Coordinate grid or plane—A two-dimensional network of horizontal and vertical lines that are parallel and evenly spaced; especially designed for locating points, displaying data, or drawing maps.

Coordinates—Numbers that correspond to points on a coordinate plane in the form (x, y), or a number that corresponds to a point on a number line. Also called ordered pairs.

Cube—A solid figure with six congruent square faces.

Customary units—The units of measure developed and used in the United States.
- **Customary units** for length may include inches, feet, yards, and miles.
- **Customary units** for weight may include ounces, pounds, and tons.
- **Customary units** for volume may include cubic inches, cubic feet, and cubic yards.
- **Customary units** for capacity may include fluid ounces, cups, pints, quarts, and gallons.

Data displays/graphs—Different ways of displaying data in charts, tables, or graphs; including pictographs, single- or double-bar graphs, line graphs, line plots, or Venn diagrams.

Decompose—To separate into parts or elements (e.g., geometric figures or numbers).

Degree—The unit of measure for angles or temperature (°).

Depth—The distance or length from front to back of a three-dimensional object or the quality of being deep (e.g., body of water).

Diagonal—A line segment that joins two nonadjacent vertices of a polygon.

Difference—A number that is the result of subtraction.

Dimension—A measure in one direction (e.g., length, width, height, or depth.)

Direct measure—Obtaining the measure of an object by using measuring devices, either standard devices of the customary or metric systems, or nonstandard devices such as paper clips or pencils.

FCAT 2.0 Mathematics Glossary Grades 3–5

Discrete data—Distinct values that are not connected by intermediate values and are a finite set of values.

Distributive property—The product of a number and the sum or difference of two numbers is equal to the sum or difference of the two products [e.g., $x(a + b) = ax + bx$].

Dividend—A quantity that is to be divided.

Divisible—Capable of being divided by another number without a remainder.

Divisor—The number by which another number is divided.

Dozen—A quantity made of twelve items.

Edge—A line segment where two faces of a polyhedron meet.

Elevation—The height or altitude above sea level.

Equal—Having the same value (=).

Equation—A mathematical statement that two expressions are equal.

Equidistant—Equally distant.

Equilateral triangle—A triangle with three congruent sides.

Equivalent—Having or naming the same value.

Equivalent expressions—Expressions that have the same value but are presented in a different format using the properties of numbers.

Equivalent forms of a number—The same number expressed in different forms (e.g., $\frac{3}{4}$, 0.75, 75%).

Estimation—The use of strategies to determine a reasonably accurate approximation, without calculating an exact answer (e.g., clustering, rounding, grouping, using benchmarks).

Evaluate an algebraic expression—Substitute numbers for the variables and follow the algebraic order of operations to find the numerical value of the expression.

Expanded form—A form of writing numbers that shows the value of each digit (e.g., 426 = 400 + 20 + 6).

FCAT 2.0 Mathematics Glossary
Grades 3–5

Exponent—The number of times the base occurs as a factor. For example, 2^3 is the exponential form of $2 \times 2 \times 2$. The numeral two (2) is called the base, and the numeral three (3) is called the exponent.

Expression—A mathematical phrase or part of a number sentence that combines numbers, operation signs, and sometimes variables. An expression does not contain equal or inequality signs.

Face—One of the plane surfaces bounding a three-dimensional figure; a side.

Factor—A number or expression that divides evenly into another number (e.g., 1, 2, 4, 5, 10, and 20 are factors of 20.)

Figure—A shape in two or three dimensions.

Fraction—A rational number expressed in the form $\frac{a}{b}$, where a is called the numerator and b is called the denominator.

Frequency table—A table that shows how often each item, number, or range of numbers occurs in a set of data.

Function—A relationship in which every element of one set has one assigned element in the other set.

Greatest common factor (GCF)—The greatest number that is a factor of two or more numbers.

Grid—See coordinate grid or plane.

Gross—A quantity made of 144 items.

Height—A line segment extending from the apex or a vertex of a figure to its base and forming a right angle with the base or plane that contains the base.

Horizontal—Parallel to, or in the plane of the horizon.

Identity property of addition—The sum of a number and zero is always that number (e.g., $a + 0 = a$).

Identity property of multiplication—The product of a number and one is always that number (e.g., $a \times 1 = a$).

Increment (interval)—On a graph, the distance between numbers from one grid line to another.

FCAT 2.0 Mathematics Glossary Grades 3–5

Indirect measure—The measurement of an object through the known measure of another object.

Inequality—A sentence that states one expression is greater than ($>$), greater than or equal to ($\geq$), less than ($<$), less than or equal to ($\leq$), or not equal to ($\neq$), another expression (e.g., $a \neq 5$ or $x < 7$ or $2y + 3 \geq 11$).

Integers—The numbers in the set $\{. . . {}^{-}4, {}^{-}3, {}^{-}2, {}^{-}1, 0, 1, 2, 3, 4 . . .\}$.

Intersect—To meet or cross.

Intersection—The point at which lines or curves meet; the line where planes meet.

Interval—See increment.

Inverse operation—An operation that is the opposite, or "undoes" the first operation (e.g., subtraction is the inverse operation of addition, and multiplication is the inverse operation of division).

Isosceles triangle—A triangle with two congruent sides and two congruent angles.

Kite—A quadrilateral with two distinct pairs of adjacent congruent sides.

Labels (for a graph)—The titles given to a graph, the axes of a graph, or the scales on the axes of a graph.

Lateral face—A face of a prism or pyramid that is not a base.

Least common multiple (LCM)—The lowest number that is a multiple of two or more numbers.

Length—A one-dimensional measure that is the measurable property of line segments.

Line—A collection of an infinite number of points in a straight pathway with unlimited length and having no width.

Line graph—A graph that displays continuous data using connected line segments.

Line plot—A diagram or graph showing frequency of data on a number line.

Line segment—A portion of a line that consists of two defined endpoints and all the points in between.

FCAT 2.0 Mathematics Glossary
Grades 3–5

Linear measure (length)—A one-dimensional measure that is the measurable property of line segments.

Mass—The amount of matter in an object.

Maximum—The greatest or highest value or quantity.

Metric units—The units of measure developed in Europe and used in most of the world. Like the decimal system, the metric system uses the base 10.
- **Metric units** for length may include millimeters, centimeters, meters, and kilometers.
- **Metric units** for mass may include milligrams, grams, and kilograms.
- **Metric units** for volume may include cubic millimeters, cubic centimeters, and cubic meters.
- **Metric units** for capacity may include milliliters, centiliters, liters, and kiloliters.

Midpoint of a line segment—The point on a line segment equidistant from the endpoints.

Minimum—The least or lowest value or quantity.

Multiples—The numbers that result from multiplying a whole number by the set of whole numbers (e.g., the multiples of 15 are 0, 15, 30, 45, 60, 75, etc.).

Negative integer—Any integer that is less than 0.

Net—A two-dimensional diagram that can be folded or made into a three-dimensional figure.

Nonroutine problem—A problem that can be solved more than one way, rather than a set procedure; these problems may include multiple decision points and multiple steps (grade-level dependent).

Nonstandard units of measure—Objects such as blocks, paper clips, crayons, or pencils that can be used to obtain a measure.

Number line—A line on which ordered numbers can be written or visualized and may include negative numbers.

Obtuse angle—An angle with a measure greater than 90° and less than 180°.

Operation—Any mathematical process, such as addition, subtraction, multiplication, division, or raising to a power.

Ordered pair—The location of a single point on a rectangular coordinate system where the first and second values represent the position relative to the *x*-axis and *y*-axis, respectively [e.g., (x, y) or (3, 4)]. See also coordinates.

FCAT 2.0 Mathematics Glossary Grades 3–5

Organized data—Data arranged in a display that is meaningful and that assists in the interpretation of the data. See data displays/graphs.

Origin—The point of intersection of the *x*- and *y*-axes in a rectangular coordinate system, where the *x*-coordinate and *y*-coordinate are both zero (0).

Parallel—A relationship between lines, line segments, rays or planes that are a constant distance apart.

Parallelogram—A quadrilateral in which both pairs of opposite sides are parallel.

Partial product—An intermediary product leading to the final result of multiplying two numbers (e.g., $20 \times 3 = 60$ is a partial product for 24×13).

Partitive division—In division, partitioning, or separating a quantity so that there is an equal amount in each group (e.g., dividing 20 pennies into 4 groups with the same number of pennies in each group).

Pattern—A predictable or prescribed sequence of numbers, objects, etc.

Percent—A special-case ratio that compares numbers to 100 (the second term). For example, 25% means the ratio of 25 to 100.

Perimeter—The distance around a figure.

Perpendicular—Lines, line segments, rays, or planes that intersect to form a right angle.

Pictograph—A data display constructed with pictures or symbols to represent and compare data.

Place value—The value of a digit in a number, based on the location of the digit.

Plane—An infinite two-dimensional geometric surface defined by three nonlinear points or two distinct parallel or intersecting lines.

Plane figure—A two-dimensional figure that lies entirely within a single plane.

Point—A specific location in space having no discernible length or width.

Polygon—A closed plane figure, having at least three sides that are line segments and are connected at their endpoints.

Polyhedron (*pl.* polyhedra)—A solid figure bounded by polygons.

Positive integer—Any integer that is greater than 0.

FCAT 2.0 Mathematics Glossary
Grades 3–5

Precision (of measurement)—An indication of how exact, or "finely," a measurement was made.

Prime factorization—The expression of a number as the product of prime factors.

Prime number—Any positive integer with only two whole-number factors, 1 and itself (e.g., 2, 3, 5, 7, 11, etc.).

Prism—A polyhedron that has two congruent and parallel faces joined by faces that are parallelograms. Prisms are named by their bases.

Procedural step—An action taken to solve a problem (e.g., there are three procedural steps to solve the following expression: $2(7 + 5)$, which has two operations).

Product—The result of multiplying numbers together.

Properties of equality—1) A balanced equation will remain balanced if you add, subtract, multiply, or divide both sides by the same number. 2) A quantity equal to another quantity can be substituted for it.

Pyramid—A three-dimensional figure in which the base is a polygon and the faces are triangles with a common vertex.

Quadrant—Any of the four regions formed by the axes in a rectangular coordinate system.

Quadrilateral—Any polygon with four sides and four angles, including parallelogram, rhombus, rectangle, square, trapezoid, and kite.

Quotient—The result of dividing two numbers.

Ray—A portion of a line that begins at an endpoint and goes on indefinitely in one direction.

Real-world problem—A problem that is an application of a real-life situation involving mathematics.

Rectangle—A parallelogram with four right angles.

Rectangular prism—A three-dimensional figure (polyhedron) with congruent rectangular parallel bases and lateral faces that are parallelograms.

Reflection—A transformation that produces the mirror image of a geometric figure over a line of reflection. Also called a flip.

FCAT 2.0 Mathematics Glossary Grades 3–5

Regular polygon—A polygon that is both equilateral (all sides congruent) and equiangular (all angles congruent).

Relation—A table that relates inputs to outputs or a set of ordered pairs (x, y).

Relative size—The size of one number in comparison to the size of another number or numbers.

Remainder—In a whole-number division problem, the final undivided part that is less than the **divisor** and left over after dividing.

Rhombus (*pl*. rhombi)—A parallelogram with four congruent sides.

Right angle—An angle that measures exactly 90°.

Right prism—A prism in which all lateral faces and edges are perpendicular to the bases.

Right rectangular prism (Rectangular solid)—A polyhedron with congruent rectangular parallel bases, joined by faces that are also rectangles. The lateral edges of the faces are perpendicular to the bases.

Right triangle—A triangle having one right angle.

Rotation—A transformation of a figure by turning it about a point or axis. The amount of rotation is usually expressed in the number of degrees (e.g., a 90° rotation). The direction of the rotation is usually expressed as clockwise or counterclockwise. Also called a turn.

Rule—A general statement written in numbers, symbols, or words that describes how to determine any term in a pattern or relationship.

Scalar drawing (or model)—A drawing (or model) that uses proportional lengths in the drawing (or model) and the actual image.

Scale—The numeric values, set at fixed intervals, assigned to the axes of a graph.

Scalene triangle—A triangle having no congruent sides.

Sequence—An ordered list of numbers with either a constant difference (arithmetic) or a constant ratio (geometric).

SI units (International System of Units)—Scientific method of expressing the magnitudes or quantities of important natural phenomena. Base units acceptable for elementary mathematics items are meter, kilogram, and second.

FCAT 2.0 Mathematics Glossary
Grades 3–5

Side—The edge of a polygon (e.g., a triangle has three sides), the face of a polyhedron, or one of the rays that make up an angle.

Simplify—The process of converting a fraction or mixed number to an equivalent fraction or mixed number, in which the greatest common factor of the numerator and the denominator of the fraction is one.

Solid figure—A three-dimensional figure that completely encloses a portion of space (e.g., a rectangular prism, cube, sphere, and pyramid).

Sphere—A three-dimensional figure in which all points on the figure are equidistant from a center point.

Square—A rectangle with four congruent sides; also, a rhombus with four right angles.

Squiggle—See break.

Standard algorithm (for division)—A procedure for finding a two- or more-place quotient of a division problem when a two- or more-step procedure is used (steps include dividing, multiplying, comparing, subtracting, and regrouping).

Standard units of measure—Accepted measuring devices and units of the customary or metric system.

Straight angle—An angle that measures exactly 180°.

Successive subtraction—A method of repeatedly subtracting the same amount to solve a division problem, including measurement models of division.

Sum—The result of adding numbers together.

Surface area of a geometric solid—The sum of the areas of the faces and any curved surfaces of the figure that create a geometric solid figure.

Symmetry—A term describing the result of a line drawn through the center of a figure such that the two halves of the figure are reflections of each other across the line (line symmetry). When a figure is rotated about a point and fits exactly on itself, the figure has rotational symmetry.

Table—A data display that organizes information about a topic into categories.

Tally chart (or table)—A chart, or table, consisting of tallies, or slash marks, having a one-to-one correspondence between the number of objects and the number of slash marks (e.g., 6 = 𝍸 /).

FCAT 2.0 Mathematics Glossary Grades 3–5

Three-dimensional figure—A figure having length, height, and width (depth).

Transformation—An operation on a geometric figure by which an image is created. Common transformations include reflections (flips), translations (slides), and rotations (turns).

Translation—A transformation in which every point in a figure is moved in the same direction and by the same distance. Also called a slide.

Trapezoid—A quadrilateral with exactly one pair of parallel sides.

Two-dimensional figure—A figure having length and width.

Variable—Any symbol, usually a letter, which could represent a number.

Venn diagram—A diagram that shows relationships among sets of objects.

Vertex (pl. vertices)—The point common to the two rays that form an angle; the point common to any two sides of a polygon; the point common to three or more edges of a polyhedron.

Vertical—Perpendicular to the plane of the horizon.

Volume—The amount of space occupied in three dimensions and expressed in cubic units. Both capacity and volume are used to measure empty spaces; however, capacity usually refers to fluid measures, whereas volume is described as cubic units.

Weight—Measures that represent the force of gravity on an object.

Whole numbers—The numbers in the set {0, 1, 2, 3, 4 . . .}.

Width—One of the dimensions of a two- or three-dimensional figure.

***x*-axis**—The horizontal number line on a rectangular coordinate system.

***y*-axis**—The vertical number line on a rectangular coordinate system.

Instructions for Item Review

Directions: A series of questions numbered 1–9 are presented below. These questions are designed to assist with your evaluation of the quality of FCAT 2.0 test items you will be reviewing. The attached chart is an example of the one you will use to record your rating of each item. You will review the items independently before discussing each item with other committee members. If you identify any problem area in the item during the independent review, you should put a crossmark (✘) in the appropriate column. Crossmarks (✘) will indicate problem areas, and blank spaces or checks (✓) will indicate no problems.

Questions 1–9

1. Does the test item measure the benchmark?
2. Does the content measured by the item meet the content limits of the *FCAT 2.0 Mathematics Test Item Specifications*?
3. Is the wording/context of the item (stem and stimulus) appropriate for the grade level?
4. In your professional judgment, what is the cognitive complexity of the item for students who have attained the benchmark at the grade level being assessed? In other words, is the item best categorized as low complexity (L), moderate complexity (M), or high complexity (H)? Use the cognitive complexity handouts in making this judgment.
5. In your professional judgment, what is the level of difficulty of the item for students who have attained the benchmark at the grade level being assessed?
   Use: E = easy (more than 70% of the students should get the item correct)
   A = average (between 40% and 70% of the students should get this item correct)
   C = challenging (less than 40% of the students should get this item correct)
6. Is the NGSSS topic appropriate for the item?
7. Is the assigned content focus appropriate for the item? Is there a better content focus available for the assigned benchmark (using DOE's content focus spreadsheet)?
8. Is the keyed response the correct, best, and only answer? For gridded-response items: Does the problem result in an answer that will fit in the grid? Do other acceptable answers need to be identified in the answer key?
9. Are the multiple-choice options appropriate, parallel (both grammatically and conceptually to the keyed response), and plausible?

Overall Quality: Rate the overall quality of each test item using the following rating definitions and codes.

Overall Quality

A (Accept) **AM** (Accept with Metadata changes) **AR** (Accept as Revised)
RR (Revise and Re-present, including art) **D** (Delete)

Please provide a brief explanation of ratings of AR, RR, and D in the comment section.

After the group discussion and possible revision of an item, you may wish to change your overall rating. If so, place a slash (/) through your original rating and give the item a new rating.

FCAT 2.0 Mathematics Item Rating Form

Page # of Item	Item ID Number	Measures Benchmark	Adheres to Content Limits	Is Appropriate for Grade	Appropriate Cognitive Complexity (L, M, H)	Estimated Item Difficulty (E, A, C)	Appropriate FCAT 2.0 Topic	Appropriate Content Focus	Only One Correct Answer	Appropriate MC Options	Overall Rating A/AM/AR/RR/D	Additional Comments
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
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14												
15												
16												
17												
18												
19												
20												

Students in my (classroom, school, district) [circle one] are given the opportunity to learn the material that these items test, except as noted in my comments.	**Signature** _____ **Date** _____

FCAT 2.0 Mathematics, Algebra 1 EOC, and Geometry EOC Test Design Summary

Item Types and Numbers

The data in this table give ranges for the approximate number of items by item type on the FCAT 2.0 Mathematics. These ranges include both operational and field-test items.

Assessment	Item Types
3	50–55 MC
4	35–40 MC 10–15 GR
5	35–40 MC 10–15 GR
6	35–40 MC 10–15 GR
7	35–40 MC 10–15 GR
8	35–40 MC 20–25 GR
Algebra 1 EOC	35–40 MC 20–25 FR
Geometry EOC	35–40 MC 20–25 FR

Duration of Tests

The table below displays the number of minutes allowed for regular test takers for FCAT 2.0 Mathematics. All tests are administered in two sessions with the exception of the Mathematics Retake, which must be taken in one day.

Assessment	Duration (in minutes)
3	140
4	140
5	140
6	140
7	140
8	140
Alg 1 EOC	160
Geom EOC	160

Lengths of Tests

This table provides an approximate range for the number of items on each test.

Assessment	Number of Items
3	50–55
4	50–55
5	50–55
6	50–55
7	50–55
8	60–65
Alg 1 EOC	60–65
Geom EOC	60–65

Grade 5 FCAT 2.0 Mathematics Reference Sheet

Area

Rectangle	$A = bh$
Parallelogram	$A = bh$
Triangle	$A = \frac{1}{2}bh$ or $A = (bh) \div 2$
Trapezoid	$A = \frac{1}{2}h(b_1 + b_2)$ or $A = h(b_1 + b_2) \div 2$

KEY	
b = base	A = area
h = height	B = area of base
w = width	V = volume
	$S.A.$ = surface area

Volume of Rectangular Prism

$V = bwh$ or $V = Bh$

Surface Area of Rectangular Prism

$S.A. = 2bh + 2bw + 2hw$

Customary Conversions	Customary Conversions
1 foot = 12 inches 1 yard = 3 feet 1 mile = 5,280 feet 1 mile = 1,760 yards 1 acre = 43,560 square feet	1 cup = 8 fluid ounces 1 pint = 2 cups 1 quart = 2 pints 1 gallon = 4 quarts 1 pound = 16 ounces 1 ton = 2,000 pounds
Metric Conversions	**Metric Conversions**
1 centimeter = 10 millimeters 1 meter = 100 centimeters 1 meter = 1000 millimeters 1 kilometer = 1000 meters	1 liter = 1000 milliliters 1 liter = 1000 cubic centimeters 1 gram = 1000 milligrams 1 kilogram = 1000 grams
Time Conversions	
1 minute = 60 seconds 1 hour = 60 minutes 1 day = 24 hours 1 week = 7 days 1 year = 365 days 1 year = 52 weeks	

**Note:* Metric numbers with four digits are presented without a comma (e.g., 9960 kilometers). For metric numbers greater than four digits, a space is used instead of a comma (e.g., 12 500 liters).

Grades 6–8 FCAT 2.0 Mathematics Reference Sheet

Area

Rectangle	$A = bh$
Parallelogram	$A = bh$
Triangle	$A = \frac{1}{2}bh$
Trapezoid	$A = \frac{1}{2}h(b_1 + b_2)$
Circle	$A = \pi r^2$

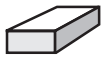
KEY

b	= base	A	= area
h	= height	B	= area of base
w	= width	C	= circumference
d	= diameter	V	= volume
r	= radius	P	= perimeter of base
ℓ	= slant height	$S.A.$	= surface area

Use 3.14 or $\frac{22}{7}$ for π.

Circumference

$C = \pi d$ or $C = 2\pi r$

		Volume/Capacity	Total Surface Area
	Rectangular Prism	$V = bwh$ or $V = Bh$	$S.A. = 2bh + 2bw + 2hw$ or $S.A. = Ph + 2B$
	Right Circular Cylinder	$V = \pi r^2 h$ or $V = Bh$	$S.A. = 2\pi rh + 2\pi r^2$ or $S.A. = 2\pi rh + 2B$
	Right Square Pyramid	$V = \frac{1}{3}Bh$	$S.A. = \frac{1}{2}P\ell + B$
	Right Circular Cone	$V = \frac{1}{3}\pi r^2 h$ or $V = \frac{1}{3}Bh$	$S.A. = \frac{1}{2}(2\pi r)\ell + B$

Sum of the measures of the interior angles of a polygon = $180(n - 2)$

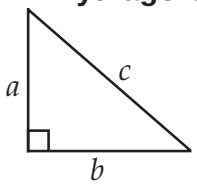
Measure of an interior angle of a regular polygon = $\frac{180(n - 2)}{n}$

where:

n represents the number of sides

Grades 6–8 FCAT 2.0 Mathematics Reference Sheet

Pythagorean theorem



$a^2 + b^2 = c^2$

Simple interest formula

$I = prt$

where p = principal, r = rate, t = time

Slope-intercept form of a linear equation

$y = mx + b$

where m = slope and $b = y$-intercept

Distance, rate, time formula

$d = rt$

where d = distance, r = rate, t = time

Conversions within a System of Measure

1 yard = 3 feet
1 mile = 1,760 yards = 5,280 feet
1 acre = 43,560 square feet

1 cup = 8 fluid ounces
1 pint = 2 cups
1 quart = 2 pints
1 gallon = 4 quarts
1 pound = 16 ounces
1 ton = 2,000 pounds

1 meter = 100 centimeters = 1000 millimeters
1 kilometer = 1000 meters

1 liter = 1000 milliliters = 1000 cubic centimeters
1 gram = 1000 milligrams
1 kilogram = 1000 grams

1 minute = 60 seconds
1 hour = 60 minutes
1 year = 52 weeks = 365 days

Conversions between Systems of Measure

When converting from Customary to Metric, use these approximations.

1 inch = 2.54 centimeters
1 foot = 0.305 meter
1 mile = 1.61 kilometers

1 cup = 0.24 liter
1 gallon = 3.785 liters
1 ounce = 28.35 grams
1 pound = 0.454 kilogram

When converting from Metric to Customary, use these approximations.

1 centimeter = 0.39 inch
1 meter = 3.28 feet
1 kilometer = 0.62 mile

1 liter = 4.23 cups
1 liter = 0.264 gallon
1 gram = 0.0352 ounce
1 kilogram = 2.204 pounds

Temperature conversions between Celsius and Fahrenheit

$°C = (°F - 32) \div 1.8$
$°F = (°C \times 1.8) + 32$

Algebra 1 End-of-Course and Geometry End-of-Course Assessments Reference Sheet

Area

Parallelogram	$A = bh$
Triangle	$A = \frac{1}{2}bh$
Trapezoid	$A = \frac{1}{2}h(b_1 + b_2)$
Circle	$A = \pi r^2$
Regular Polygon	$A = \frac{1}{2}aP$

KEY

b	= base	A	= area
h	= height	B	= area of base
w	= width	C	= circumference
d	= diameter	V	= volume
r	= radius	P	= perimeter of base
ℓ	= slant height		
a	= apothem	$S.A.$	= surface area

Use 3.14 or $\frac{22}{7}$ for π.

Circumference

$C = \pi d$ or $C = 2\pi r$

		Volume/Capacity	Total Surface Area
	Rectangular Prism	$V = bwh$ or $V = Bh$	$S.A. = 2bh + 2bw + 2hw$ or $S.A. = Ph + 2B$
	Right Circular Cylinder	$V = \pi r^2 h$ or $V = Bh$	$S.A. = 2\pi rh + 2\pi r^2$ or $S.A. = 2\pi rh + 2B$
	Right Square Pyramid	$V = \frac{1}{3}Bh$	$S.A. = \frac{1}{2}P\ell + B$
	Right Circular Cone	$V = \frac{1}{3}\pi r^2 h$ or $V = \frac{1}{3}Bh$	$S.A. = \frac{1}{2}(2\pi r)\ell + B$
	Sphere	$V = \frac{4}{3}\pi r^3$	$S.A. = 4\pi r^2$

Sum of the measures of the interior angles of a polygon $= 180(n-2)$

Measure of an interior angle of a regular polygon $= \frac{180(n-2)}{n}$

where:

n represents the number of sides

Algebra 1 End-of-Course and Geometry End-of-Course Assessments Reference Sheet

Slope formula

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

where m = slope and (x_1, y_1) and (x_2, y_2) are points on the line

Slope-intercept form of a linear equation

$$y = mx + b$$

where m = slope and b = y-intercept

Point-slope form of a linear equation

$$y - y_1 = m(x - x_1)$$

where m = slope and (x_1, y_1) is a point on the line

Distance between two points

$P_1(x_1, y_1)$ and $P_2(x_2, y_2)$

$$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Midpoint between two points

$P_1(x_1, y_1)$ and $P_2(x_2, y_2)$

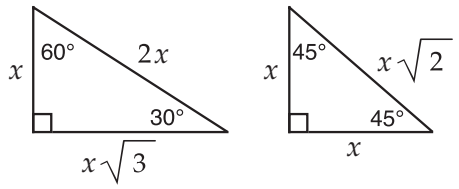
$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

Quadratic formula

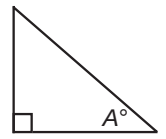
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

where a, b, and c are coefficients in an equation of the form $ax^2 + bx + c = 0$

Special Right Triangles



Trigonometric Ratios



$$\sin A° = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\cos A° = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\tan A° = \frac{\text{opposite}}{\text{adjacent}}$$

Conversions

1 yard = 3 feet
1 mile = 1,760 yards = 5,280 feet
1 acre = 43,560 square feet
1 hour = 60 minutes
1 minute = 60 seconds

1 cup = 8 fluid ounces
1 pint = 2 cups
1 quart = 2 pints
1 gallon = 4 quarts
1 pound = 16 ounces
1 ton = 2,000 pounds

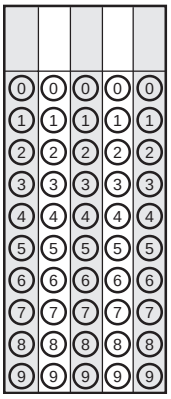
1 meter = 100 centimeters = 1000 millimeters
1 kilometer = 1000 meters
1 liter = 1000 milliliters = 1000 cubic centimeters
1 gram = 1000 milligrams
1 kilogram = 1000 grams

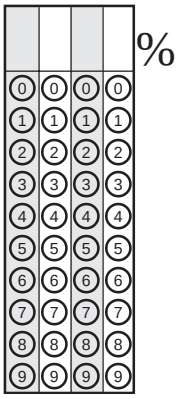
Response Grids

FCAT 2.0 Mathematics GR and FR items are written with consideration for the number of columns in the grid. Grids contain either four, five, six, or seven columns. Columns in which students may bubble a numeral contain the digits 0 through 9 enclosed in bubbles. All grids include light shading in alternate columns. At Grades 4 and 5, the grid format is designed for items that require a positive numeric solution (whole numbers, decimals, or percents). Items in Grades 7–8, Algebra 1 EOC, and Geometry EOC require either a positive or negative numeric solution. For more information about the grids, see the Item Style and Format section of this book.

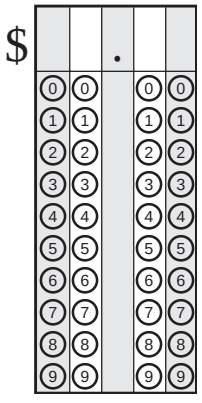
Grades 4 and 5

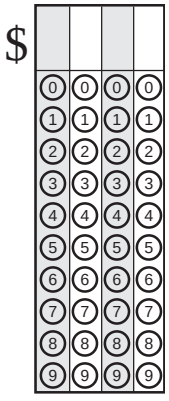
Four- or five-column grids are used for Grades 4 and 5 and may be preceded with a dollar sign ($) or followed by a percent sign (%), as appropriate.



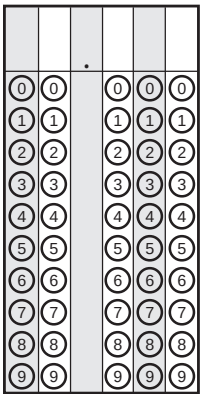


There are two types of currency grids for Grades 4 and 5. The five-column grid includes a fixed decimal point for dollars and cents. The four-column grid does not include a decimal point. Both grids have a dollar sign preceding the grid.



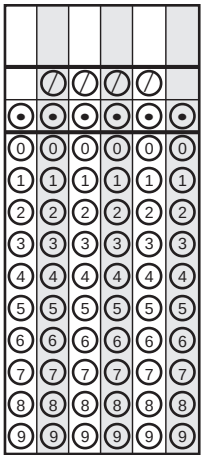


A special grid is provided at Grades 4 and 5 for gridding decimal numbers. It is six columns wide with a fixed decimal point in the third column from the left.



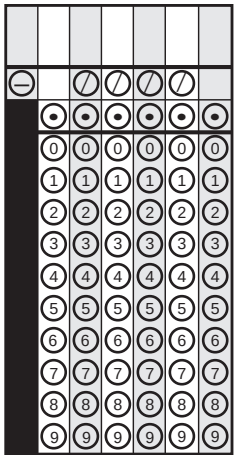
Grades 6 and 7

Grades 6 and 7 use a six-column grid that includes the digits 0 through 9 plus two symbols: a decimal point (.) and a fraction bar (/) for gridding fractions.



Grades 7–8

Grades 7 (two benchmarks) and 8 use a seven-column grid that includes the digits 0 through 9, plus two symbols: the decimal point (.) and the fraction bar (/), and a seventh column to allow for the negative sign.



Algebra 1 EOC and Geometry EOC

The Algebra 1 EOC and Geometry EOC will be computer based and use a seven-column fill-in response grid.

The Florida Department of Education and its test contractors currently employ strategies to protect the environment in the production and destruction of FCAT materials. The Department encourages schools and districts to recycle non-secure FCAT interpretive publications after use.