

# FCAT Mathematics Sample Test

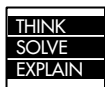
## Scoring Guide and Answer Key: Grade



### Scoring the “Think, Solve, and Explain” Questions

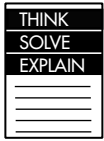
The “Think, Solve, and Explain” questions allow you to receive partial credit for your answers, even if they are not 100% correct. Your answers will be read and points will be given based on the correctness and completeness of your answers. If you get half of an answer correct, you will get half the points. Your answers to the “Think, Solve, and Explain” questions will be scored by two people who have been trained to read student answers. The final score for an answer will be the average of both scores.

Your answer to a “Think, Solve, and Explain” question may be slightly different from another student’s answer, and that is okay. The people who read your answers will use a scoring guide, called a *rubric*, to score your answer. This makes scoring fair for all students. The scoring rubrics for the short-answer questions and the long-answer questions are shown below:



#### Rubric for Short-Answer Questions

- 2 points     A score of two indicates that the student has demonstrated a thorough understanding of the mathematics concepts and/or procedures embodied in the task. The student has completed the task correctly, in a mathematically sound manner. When required, student explanations and/or interpretations are clear and complete. The response may contain minor flaws that do not detract from the demonstration of a thorough understanding.
- 1 point     A score of one indicates that the student has provided a response that is only partially correct. For example, the student may provide a correct solution, but may demonstrate some misunderstanding of the underlying mathematical concepts or procedures. Conversely, a student may provide a computationally incorrect solution but could have applied appropriate and mathematically sound procedures, or the student’s explanation could indicate an understanding of the task, even in light of the error.
- 0 points     A score of zero indicates that the student has provided a completely incorrect solution or uninterpretable response, or no response at all.



### Rubric for Long-Answer Questions

- 4 points** A score of four is a response in which the student demonstrates a thorough understanding of the mathematics concepts and/or procedures embodied in the task. The student has responded correctly to the task, used mathematically sound procedures, and provided clear and complete explanations and interpretations.
- The response may contain minor flaws that do not detract from the demonstration of a thorough understanding.
- 3 points** A score of three is a response in which the student demonstrates an understanding of the mathematics concepts and/or procedures embodied in the task. The student's response to the task is essentially correct with the mathematical procedures used and the explanations and interpretations provided demonstrating an essential but less than thorough understanding.
- The response may contain minor errors that reflect inattentive execution of mathematical procedures or indications of some misunderstanding of the underlying mathematics concepts and/or procedures.
- 2 points** A score of two indicates that the student has demonstrated only a partial understanding of the mathematics concepts and/or procedures embodied in the task. Although the student may have used the correct approach to obtaining a solution or may have provided a correct solution, the student's work lacks an essential understanding of the underlying mathematical concepts.
- The response contains errors related to misunderstanding important aspects of the task, misuse of mathematical procedures, or faulty interpretations of results.
- 1 point** A score of one indicates that the student has demonstrated a very limited understanding of the mathematics concepts and/or procedures embodied in the task. The student's response is incomplete and exhibits many flaws. Although the student's response has addressed some of the conditions of the task, the student reached an inadequate conclusion and/or provided reasoning that was faulty or incomplete.
- The response exhibits many errors or may be incomplete.
- 0 points** A score of zero indicates that the student has provided a completely incorrect solution or uninterpretable response, or no response at all.



**1 The correct answer is 16 (C).**

Strand: D — Algebraic Thinking

Benchmark MA.D.1.3.1 The student describes a wide variety of patterns, relationships, and functions through models, such as manipulatives, tables, graphs, expressions, equations, and inequalities. (Incorporate MA.A.5.3.1: The student uses concepts about numbers, including primes, factors, and multiples, to build number sequences.)

*You may have solved this problem using one of the strategies shown below or another one you know.*

**First Strategy:**

To find the value of  $y$ , look for a pattern in the  $y$  values. Notice the  $y$  value increases by 3 each time. If you follow the pattern, when  $x = 4$ , the value of  $y$  is 13. When  $x = 5$ , the value of  $y$  is 16.

**OR**

**Second Strategy:**

To find the value of  $y$ , look for a relationship between  $x$  and  $y$ . Multiply  $x$  by 3 and add 1 each time to get the  $y$  values. When  $x = 5$ , the  $y$  value is  $5 \times 3 + 1$ , or 16.



**2 The correct answer is \$6,961 (G).**

Strand: A — Number Sense, Concepts, and Operations

Benchmark: MA.A.3.3.3 The student adds, subtracts, multiplies, and divides whole numbers, decimals, and fractions, including mixed numbers, to solve real-world problems, using appropriate methods of computing, such as mental mathematics, paper and pencil, and calculator.

*You may have solved this problem using one of the strategies shown below or another one you know.*

**First Strategy:**

Change 28% to its decimal equivalent of 0.28. Next, multiply \$5,438 by 0.28 to get \$1,522.64. This is the amount of increase. Finally, add \$5,438 and \$1,522.64 together to get the new cost of \$6,960.64. Round your answer to the nearest dollar to get the correct answer.

**OR**

**Second Strategy:**

Use the addition and percent functions of the calculator to perform \$5,438 plus 28% of \$5,438 to get the new cost of \$6,960.64. Round your answer to the nearest dollar to get the correct answer.

**OR**

**Third Strategy:**

Change 28% to its decimal equivalent of 0.28. Next, multiply \$5,438 by 1.28 to get the new cost of \$6,960.64. Round your answer to the nearest dollar to get the correct answer.



**3 The correct answer is 6.9 inches (D).**

Strand: B — Measurement

Benchmark: MA.B.2.3.2 The student solves problems involving units of measure and converts answers to a larger or smaller unit within either the metric or customary system.

*You may have solved this problem using one of the strategies shown below or another one you know.*

**First Strategy:**

Multiply 5.75 feet by the number of inches in one foot, 12, to get the number of inches in 5.75 feet. Then divide that answer by 10 to get the number of inches in each piece.

$$5.75 \times 12 = 69 \text{ and } 69 \div 10 = 6.9 \text{ inches per piece}$$

**OR**

**Second Strategy:**

Divide 5.75 feet by 10 to get the measure of each piece in feet. Then multiply that number by 12, the number of inches in one foot, to find the number of inches in each piece.

$$5.75 \div 10 = 0.575 \text{ feet per piece, and } 0.575 \times 12 = 6.9 \text{ inches per piece}$$





**5 The correct answer is 5.2.**



Strand: B — Measurement

Benchmark: MA.B.1.3.4 The student constructs, interprets, and uses scale drawings such as those based on number lines and maps to solve real-world problems. (Incorporate MA.B.2.3.1: The student uses direct [measured] and indirect [not measured] measures to compare a given characteristic in either metric or customary units.)

*You may have solved this problem using one of the strategies shown below or another one you know.*

**First Strategy:**

Divide 31.2 million miles by 6 million miles to find the number of centimeters between the paths.

$$31.2 \div 6 = 5.2$$

**OR**

**Second Strategy:**

Set up and solve a proportion equivalent to the one shown below.

$$\frac{1 \text{ (cm)}}{6 \text{ (million miles)}} = \frac{x \text{ (cm)}}{31.2 \text{ (million miles)}}$$

Solve the proportion using cross multiplication.

$$6x = 1(31.2)$$

Divide both sides by 6.

$$\frac{6x}{6} = \frac{31.2}{6}$$

$$x = 5.2 \text{ centimeters}$$

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**OR**

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**6** The correct answer is \$2,000.



Strand: D — Algebraic Thinking

Benchmark: MA.D.2.3.2 The student uses algebraic problem-solving strategies to solve real-world problems involving linear equations and inequalities.

You may have solved this problem using the strategy shown below or another one you know.

To solve this equation, start by subtracting 250 from both sides of the equation.

$$\begin{array}{r} 250 + 0.08s = 410 \\ -250 \qquad \qquad -250 \\ \hline \end{array}$$

Simplify to get  $0.08s = 160$ .  
Now divide both sides by 0.08.

$$\frac{0.008}{0.008} s = \frac{160}{0.008}$$

The solution is  $s = \$2,000.00$ .

NOTE: There is not a dollar symbol (\$) on the grid. For answers in dollars, just grid the number. For answers in dollars and cents, be sure to include and grid the decimal point.

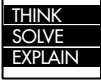
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**7** The correct answer is 1.5 inches including correct work or explanation.



Strand: D — Algebraic Thinking

Benchmark: MA.D.1.3.2 The student creates and interprets tables, graphs, equations, and verbal descriptions to explain cause-and-effect relationships.

*You may have solved this problem using one of the strategies shown below or another one you know.*

**First Strategy** (Show your work):

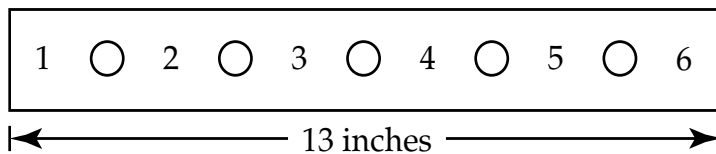
Determine the amount of space taken up by the 5 holes, each of which is  $\frac{3}{4}$  inch in diameter.

$$5 \times \frac{3}{4} = 3 \frac{3}{4} \text{ inches}$$

Now subtract this value from the total length.

$$12 \frac{3}{4} - 3 \frac{3}{4} = 9 \text{ inches}$$

There are 9 inches of space between all the holes and between the ends of the boards. Using the drawing, count a total of 6 spaces found between the ends of the rack and between each hole.



To find the space between each hole, divide 9 inches by 6.

$$9 \div 6 = 1.5 \text{ inches of space between any two holes}$$

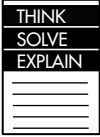


**OR**

**Second Strategy (Explanation):**

“I multiplied 5 times  $\frac{3}{4}$  and subtracted that value from  $12\frac{3}{4}$  to find the number of inches left for the spaces between the holes. Then, using the diagram, I counted 6 spaces between the holes and between the ends of the board. I divided 9 inches by 6 spaces to get 1.5 inches of space between each hole.”

To receive full credit (2 points) for this question your answer should include the correct answer (1.5 inches) and an example or explanation of how you solved the problem. Partially correct answers will receive a score of 1.

**8** The correct answer is shown below.

Strand: E — Data Analysis and Probability

Benchmark: MA.E.1.3.1 The student collects, organizes, and displays data in a variety of forms, including tables, line graphs, charts, and bar graphs, to determine how different ways of presenting data can lead to different interpretations. (Incorporate MA.E.1.3.3: The student analyzes real-world data by organizing data in a quality display.)

*You may have solved this problem using one of the strategies shown below or another one you know.*

**Part A**

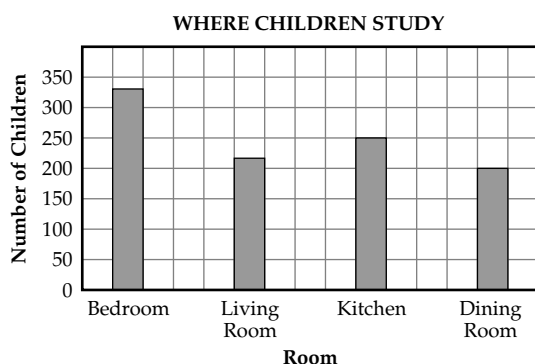
To create the bar graph:

- Title the graph.
- Label the horizontal axis with the word “Room.”
- Write the name of each room along the axis where each bar will be drawn.
- Label the vertical axis “Number of Children.”
- Determine the scale numbers for the  $y$ -axis by looking at the data in the table to see the range of numbers. The numbers go from 200 to 330, therefore a scale from zero to more than 330 is needed. There are 15 lines on the grid, so divide 330 by 15 to find the smallest unit that would fit the grid ( $330 \div 15 = 22$ ). So you can set up the scale by counting by 30s or 50s.

NOTE: The labels and scale do not have to match this answer key, but they should be appropriate for the data.



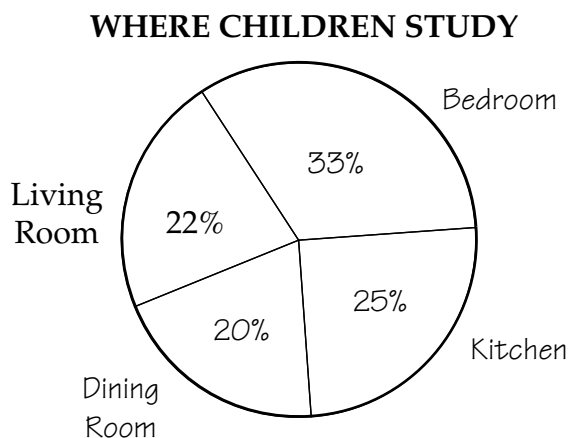
Finally, create the bars using the information from the table. The number of children who prefer to study in the bedroom is 330. Draw the bar for 330 (between 300 and 350, but closer to 350). Continue in this way to draw the bars for the living room (220), the kitchen (250), and the dining room (200). When you have completed the bar graph, go back to the instructions and make sure you have included all of the information and have graphed the data correctly.



NOTE: The bar graph also could have been drawn correctly with horizontal bars and the *x*-axis showing the number of children.

**Part B**

First make a title for the graph, then label each section of the graph. To complete the sections of the circle graph, you must determine the percentage of children who study in each room. First, add all of the numbers to find the total number of children. You should get a total of 1,000 children. From your calculations you find that 33% of the children prefer to study in the bedroom, 25% prefer the kitchen, and 20% prefer the dining room. In the circle graph, look for the largest section and label it "Bedroom 33%," since 33% is the largest percent. Look for the section that is larger than 22% and about 25% or one quarter of the circle. Label it "Kitchen 25%." Label the last section "Dining Room 20%."





**Part C**

Your explanation to the final question should be similar to one of these below.

**First Explanation:**

The circle graph is best because it gives you information based on the percentage of children who prefer to study in certain rooms. From this graph, I can see more clearly that more than 50% of children prefer to study in the bedroom or the kitchen. In fact, I can see that 58% prefer these rooms. To use the bar graph I would have to calculate the percent of the total for the number shown by each bar.

**OR**

**Second Explanation:**

The circle graph is the best because it shows the group of children as a whole circle, and the sections for the bedroom and the kitchen together take up more than half of the circle, so more than half (more than 50%) of the children prefer to study in the bedroom or the kitchen.

To receive full credit (4 points) for this question your answers should include answers that are equivalent to those shown above. Partially correct answers will receive a score of 3, 2, or 1.

**9 The correct answer is 8.3 million square miles (H).**

Strand: E — Data Analysis and Probability

Benchmark MA.E.1.3.2 The student understands and applies the concepts of range and central tendency (mean, median, and mode). (Incorporate MA.E.1.3.3: The student analyzes real-world data by applying appropriate formulas for measures of central tendency.)

*You may have solved this problem using the strategy shown below or another one you know.*

The mean area is the same as the average area. To find the mean area, first add all the numbers in the table.

$$9.4 + 6.9 + 3.8 + 17.3 + 11.7 + 3.3 + 5.4 = 57.8$$

Then, divide that sum by the number of continents, 7.

$$57.8 \div 7 = 8.2571428$$

Round your answer to the nearest tenths place to get the correct answer.

**10 The correct answer is 50 degrees (A).**

Strand: C — Geometry and Spatial Sense

Benchmark: MA.C.1.3.1 The student understands the basic properties of, and relationships pertaining to, regular and irregular geometric shapes in two and three dimensions.

*You may have solved this problem using the strategy shown below or another one you know.*

The three angles form a straight line (angle). Straight angles equal 180 degrees. To find the third angle, add the other two angles together and subtract the total from 180.

$$65 + 65 = 130$$

$$180 - 130 = 50 \text{ degrees}$$

**11 The correct answer is 35 feet (H).**

Strand: C — Geometry and Spatial Sense

Benchmark: MA.C.2.3.1 The student understands the geometric concepts of symmetry, reflections, congruency, similarity, perpendicularity, parallelism, and transformations, including flips, slides, turns, and enlargements.

*You may have solved this problem using the strategy shown below or another one you know.*

Similar triangles can be used to calculate the heights of objects you cannot measure. Jasmine and her shadow form two sides of a right triangle. The boat and its shadow also form two sides of a right triangle. Since the right triangles are similar (the shadows are formed at the same time of day), you can set up a proportion to find the height of the sailboat.

Two proportions are shown below. Either of these is correct.

$$\frac{\text{Jasmine's height}}{\text{height of Jasmine's shadow}} = \frac{\text{boat's height}}{\text{height of boat's shadow}}$$

$$\frac{\text{height of Jasmine's shadow}}{\text{height of boat's shadow}} = \frac{\text{Jasmine's height}}{\text{boat's height}}$$

NOTE: Any equivalent proportion may be used.

First, write the proportion. Using the first proportion above, you would write:

$$\frac{5}{6} = \frac{h}{42}$$

Then, solve the proportion using cross multiplication.

$$5 \times 42 = 6 \times h$$

$$210 = 6h$$

Now divide both sides by 6.

$$\frac{210}{6} = \frac{6h}{6}$$

$$35 = h$$



**12** The correct answer is any estimate in the range of 5–6 boxes with an appropriate estimation strategy.



Strand: A — Number Sense, Concepts, and Operations

Benchmark: MA.A.4.3.1 The student uses estimation strategies to predict results and to check the reasonableness of results. (Incorporate MA.B.3.3.1: The student solves real-world and mathematical problems involving estimates of measurements including length, time, weight/mass, temperature, money, perimeter, area, and volume, in either customary or metric units. Incorporate MA.B.2.3.1: The student uses direct [measured] and indirect [not measured] measures to compare a given characteristic in either metric or customary units.)

*You may have solved this problem using one of the strategies shown below or another one you know.*

To solve this problem you should have completed the following:

- Estimate the number of sections in the table top. It would be reasonable to divide the circle into 10 to 12 sections.
- Round the number of pieces in Section 1 to 55 or 60, or just use 57.
- Round the number of pieces in a box to 130, or just use 125.
- Round your answer up to the next whole number of boxes.

**First Strategy** (Showing work):

Estimate the number of sections in the circular table top to be 10. Round the number of pieces in Section 1 to 60. Then multiply to find the number of tiles needed for the entire table top.

$$60 \times 10 = 600$$

Divide by the estimated number of tiles in a box to find the number of boxes needed.

$$600 \div 130 \approx 4.62$$

Round the answer up to 5.

*Estimate:* 5 boxes of tiles



**OR**

**Second Strategy** (Showing work):

$$60 \times 12 = 720$$

(Estimate the number of sections in the circular table top to be 12. Round the number of pieces in Section 1 to 60. Then multiply to find the number of tiles needed.)

$$720 \div 125 = 5.76$$

(Divide by the number of tiles in a box to find the number of boxes of tiles needed.)

Round the answer up to 6.

*Estimate:* 6 boxes of tiles

**OR**

**Third Strategy** (Providing an explanation):

I determined that there were about 10 equal sections in the circular table top. Next I rounded the number of pieces in one section to 60 and multiplied that by 10 to get an estimate of 600 tiles needed for the mosaic. Then, I divided 600 by 125 to get 4.8 boxes. Since I can only get whole boxes, I rounded this to 5 boxes of tiles.

*Estimate:* 5 boxes of tiles

To receive full credit (2 points) for this question your answers should include the correct answer (5 or 6 boxes) and an example or explanation of how you solved the problem. Partially correct answers will receive a score of 1.



**13** The correct answer is  $\frac{2}{16}$  or equivalent.



Strand: A — Number Sense, Concepts, and Operations

Benchmark: MA.A.3.3.2 The student selects the appropriate operation to solve problems involving addition, subtraction, multiplication, and division of rational numbers, ratios, proportions, and percents, including the appropriate application of the algebraic order of operations.

You may have solved this problem using the strategy shown below or another one you know.

First, find the value of the numerator.

$$(3 - 1) = 2$$

Using the correct order of operations, find the value of the denominator.

$$4 + 8 \div 2 \times 3 =$$

$$4 + 4 \times 3 =$$

$$4 + 12 = 16$$

The correct answer is  $\frac{2}{16}$ .

NOTE: The correct answer,  $\frac{2}{16}$ , may be gridded or the reduced form,  $\frac{1}{8}$ , or the decimal equivalent, 0.125, may be gridded.

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**15** The correct answer is  $\frac{3}{30}$  or equivalent.



Strand: E — Data Analysis and Probability

Benchmark: MA.E.2.3.2 The student determines odds for and odds against a given situation. (Incorporate MA.E.2.2.2: The student predicts the likelihood of simple events occurring.)

*You may have solved this problem using one of the strategies shown below or another one you know.*

**First Strategy:**

If 27 out of 30 people are right-handed, then 3 out of 30 are left-handed.

This can be represented as  $\frac{3}{30}$ , or can be simplified to  $\frac{1}{10}$ .

**OR**

**Second Strategy:**

Divide 3 by 30 to get 0.1.

NOTE: Any of the representations,  $\frac{3}{30}$ ,  $\frac{1}{10}$ , or 0.1 would be counted correct.

|                       |                                  |                       |                                  |                                  |
|-----------------------|----------------------------------|-----------------------|----------------------------------|----------------------------------|
|                       | 3                                | /                     | 30                               |                                  |
| <input type="radio"/> | <input checked="" type="radio"/> | <input type="radio"/> | <input type="radio"/>            | <input type="radio"/>            |
| <input type="radio"/> | <input type="radio"/>            | <input type="radio"/> | <input type="radio"/>            | <input type="radio"/>            |
| 0                     | 0                                | 0                     | 0                                | <input checked="" type="radio"/> |
| 1                     | 1                                | 1                     | 1                                | 1                                |
| 2                     | 2                                | 2                     | 2                                | 2                                |
| 3                     | <input checked="" type="radio"/> | 3                     | <input checked="" type="radio"/> | 3                                |
| 4                     | 4                                | 4                     | 4                                | 4                                |
| 5                     | 5                                | 5                     | 5                                | 5                                |
| 6                     | 6                                | 6                     | 6                                | 6                                |
| 7                     | 7                                | 7                     | 7                                | 7                                |
| 8                     | 8                                | 8                     | 8                                | 8                                |
| 9                     | 9                                | 9                     | 9                                | 9                                |

**OR**

|                       |                                  |                       |                                  |                                  |
|-----------------------|----------------------------------|-----------------------|----------------------------------|----------------------------------|
|                       | 1                                | /                     | 10                               |                                  |
| <input type="radio"/> | <input checked="" type="radio"/> | <input type="radio"/> | <input type="radio"/>            | <input type="radio"/>            |
| <input type="radio"/> | <input type="radio"/>            | <input type="radio"/> | <input type="radio"/>            | <input type="radio"/>            |
| 0                     | 0                                | 0                     | 0                                | <input checked="" type="radio"/> |
| 1                     | <input checked="" type="radio"/> | 1                     | <input checked="" type="radio"/> | 1                                |
| 2                     | 2                                | 2                     | 2                                | 2                                |
| 3                     | 3                                | 3                     | 3                                | 3                                |
| 4                     | 4                                | 4                     | 4                                | 4                                |
| 5                     | 5                                | 5                     | 5                                | 5                                |
| 6                     | 6                                | 6                     | 6                                | 6                                |
| 7                     | 7                                | 7                     | 7                                | 7                                |
| 8                     | 8                                | 8                     | 8                                | 8                                |
| 9                     | 9                                | 9                     | 9                                | 9                                |

**OR**

|                                  |                                  |                                  |                       |                       |
|----------------------------------|----------------------------------|----------------------------------|-----------------------|-----------------------|
|                                  | 0                                | .                                | 1                     |                       |
| <input type="radio"/>            | <input type="radio"/>            | <input type="radio"/>            | <input type="radio"/> | <input type="radio"/> |
| <input type="radio"/>            | <input checked="" type="radio"/> | <input type="radio"/>            | <input type="radio"/> | <input type="radio"/> |
| <input checked="" type="radio"/> | 0                                | 0                                | 0                     | 0                     |
| 1                                | 1                                | <input checked="" type="radio"/> | 1                     | 1                     |
| 2                                | 2                                | 2                                | 2                     | 2                     |
| 3                                | 3                                | 3                                | 3                     | 3                     |
| 4                                | 4                                | 4                                | 4                     | 4                     |
| 5                                | 5                                | 5                                | 5                     | 5                     |
| 6                                | 6                                | 6                                | 6                     | 6                     |
| 7                                | 7                                | 7                                | 7                     | 7                     |
| 8                                | 8                                | 8                                | 8                     | 8                     |
| 9                                | 9                                | 9                                | 9                     | 9                     |

