

Grade 6

FCAT Mathematics

Sample Answers

This book contains answers to the FCAT Mathematics sample questions, as well as explanations for the answers. It also gives the Sunshine State Standards benchmark assessed by each item. In September 2007, the State Board of Education adopted updated benchmarks. These new benchmarks are included in this booklet to provide teachers with additional information. For more information follow the link to the Florida Standards website at <http://www.floridastandards.org/index.aspx>.

In addition, one or more possible approaches to solving the questions are provided. Students may use approaches other than these and still receive credit if they also obtain a correct answer.

Multiple-choice and gridded-response items are scored by awarding one point for each correct answer.

The intent of these sample test materials is to orient teachers and students to the types of questions on FCAT tests. By using these materials, students will become familiar with the types of items and response formats that they will see on the actual test. The sample test materials are not intended to demonstrate the length of the actual test, nor should student responses be used as an indicator of student performance on the actual test. Additional information about test items can be found in the *FCAT Test Item Specifications* at <http://fcat.fldoe.org/fcatis01.asp> and previously released FCAT tests at <http://fcat.fldoe.org/fcatrelease.asp>.

When the 2010 FCAT Mathematics tests and associated sample test materials were developed, the State of Florida was in the process of revising the Sunshine State Standards in mathematics. These newer standards were not yet approved for use in Florida's schools, so it was not feasible to incorporate these new standards into the 2010 FCAT Mathematics tests. The portion of the 2010 FCAT Mathematics tests that will be used to calculate student results and school grades in 2010 will be composed of items that assess mastery of the 1996 Sunshine State Standards. The 2010 FCAT Mathematics tests will contain field test items that assess mastery of the 2007 Sunshine State Standards. Student performance on these items will not be used to calculate student results or school grades, but data will be gathered and examined so these items can be considered for use on future tests, including those assessing the newer standards.

1 The correct answer is 20.



1996 Strand: Algebraic Thinking

2007 Reporting Category: Algebra

1996 Benchmark: MA.D.2.3.2 The student uses algebraic problem-solving strategies to solve real-world problems involving linear equations and inequalities.

2007 Benchmark: MA.6.A.3.2 Write, solve, and graph one- and two-step linear equations and inequalities. Also assesses MA.6.A.3.4 Solve problems given a formula.

To solve this problem, use the equation given in the item. The amount of fat, c , in 1 cookie can be found by following these steps:

$$2c = 8$$

$$\frac{2c}{2} = \frac{8}{2}$$

$$c = 4$$

There are 4 grams of fat in 1 cookie. To find the number of grams of fat in 5 cookies, multiply 4 by 5.

$$4 \times 5 = 20 \text{ grams of fat.}$$

The correct answer is 20 grams of fat.

			2	0
	/	/	/	
○	○	○	○	○
0	0	0	0	●
1	1	1	1	1
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

2 The correct answer is $A[6(5 + 4)]$.

1996 Strand: Number Sense, Concepts, and Operations

2007 Reporting Category: Algebra

1996 Benchmark: MA.A.3.3.1 The student understands and explains the effects of addition, subtraction, multiplication, and division on whole numbers, fractions, including mixed numbers, and decimals, including the inverse relationships of positive and negative numbers. Also assesses MA.A.3.2.1 The student understands and explains the effects of addition, subtraction, and multiplication on whole numbers, decimals, and fractions, including mixed numbers, and the effects of division on whole numbers, including the inverse relationship of multiplication and division.

2007 Benchmark: MA.6.A.3.1 Write and evaluate mathematical expressions that correspond to given situations.

To solve this problem, note that Jill's garden has 6 rows with 5 bean plants and 6 rows with 4 bean plants. This condition allows the use of the distributive property.

$$6 \text{ rows of } 5 \text{ plants} = 6 \times 5$$

$$6 \text{ rows of } 4 \text{ plants} = 6 \times 4$$

To find the total number of bean plants, add these two products together.

$$(6 \times 5) + (6 \times 4)$$

Using the distributive property, this expression is simplified to $6(5 + 4)$.

3 The correct answer is 25%.

1996 Strand: Number Sense, Concepts, and Operations

2007 Reporting Category: Number and Operations

1996 Benchmark: MA.A.1.3.4 The student understands that numbers can be represented in a variety of equivalent forms, including integers, fractions, decimals, percents, scientific notation, exponents, radicals, and absolute value. Also assesses MA.A.1.3.1 The student associates verbal names, written word names, and standard numerals with integers, fractions, decimals; numbers expressed as percents; numbers with exponents; numbers in scientific notation; radicals; absolute value; and ratios. MA.A.1.3.3 The student understands concrete and symbolic representations of rational numbers and irrational numbers in real-world situations.

3 (continued)

2007 Benchmark: MA.6.A.5.1 Use equivalent forms of fractions, decimals, and percents to solve problems.

To answer this question, change the fraction $\frac{16}{64}$ to a percent. Several methods can be used to perform this calculation.

First Strategy:

Divide the numerator by the denominator ($16 \div 64 = 0.25$) and then change the quotient, which is a decimal, to its equivalent percent ($0.25 = 25\%$).

OR

Second Strategy:

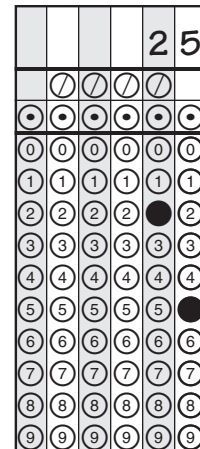
Write the fraction $\frac{16}{64}$ in simplest form. Divide the numerator and denominator by its greatest common factor (GCF), 16.

$$\frac{16 \div 16}{64 \div 16} = \frac{1}{4}$$

Then $\frac{1}{4}$ can be either changed into a percent, as indicated in the first method, or equated to twenty-five hundredths ($\frac{25}{100}$), which is easily recognized as 25%.

$$\frac{16}{64} = \frac{1}{4} = \frac{25}{100} = 25\%$$

A correct gridded response is 25.



4 The correct answer is G ($\frac{1}{5}$).

1996 Strand: Data Analysis and Probability

2007 Reporting Category: N/A

1996 Benchmark: MA.E.2.3.1 The student compares experimental results with mathematical expectations of probabilities.

2007 Benchmark: This benchmark will no longer be assessed in Grade 6 after 2010.

To solve this problem, apply the definition of probability. Probability is the number of favorable outcomes divided by the total number of possible outcomes.

4 (continued)

In this case, there are 5 congruent sections on a spinner, and these sections are labeled with the names of 5 different colors. There are a total of 5 possible outcomes. There is only 1 section labeled “Brown,” the favorable outcome.

Using the definition of probability, the likelihood of the pointer landing on the “Brown” section is 1 (1 section) divided by 5 (a total of 5 possible different sections), or $\frac{1}{5}$. Whether it is the first spin, tenth spin, or 100th spin, this probability will always remain the same.

5 The correct answer is 400.

1996 Strand: Measurement

2007 Reporting Category: Geometry and Measurement

1996 Benchmark: MA.B.1.3.1 The student uses concrete and graphic models to derive formulas for finding perimeter, area, surface area, circumference, and volume of two- and three-dimensional shapes, including rectangular solids and cylinders. Also assesses MA.B.1.2.2 The student solves real-world problems involving length, weight, perimeter, area, capacity, volume, time, temperature, and angles. 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.

2007 Benchmark: 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 Solve problems given a formula.

To solve this problem, study the diagram and then determine the dimensions of the storeroom. Use the formula on the Grades 6–8 FCAT Mathematics Reference Sheet to calculate its area.

$$A = bh \text{ (Area = base } \times \text{ height)}$$

The diagram of the computer lab and the science lab shows two squares with bases of 40 feet and heights of 40 feet. Subtracting the given dimension of 20 feet from the science lab’s known height of 40 feet leaves 20 feet as the height of the storeroom. Subtracting the given dimension of 20 feet from the science lab’s known base of 40 feet leaves 20 feet as the base of the storeroom.

5 (continued)

Substitute these dimensions into the formula:

$$A = 20 \times 20$$

$$A = 400 \text{ square feet}$$

The correct answer is 400 square feet.

4	0	0		
	/	/	/	
•	•	•	•	•
0	•	•	0	0
1	1	1	1	1
2	2	2	2	2
3	3	3	3	3
•	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

6 The correct answer is C (25).

1996 Strand: Data Analysis and Probability

2007 Reporting Category: Data Analysis

1996 Benchmark: MA.E.1.3.2 The student understands and applies the concepts of range and central tendency (mean, median, and mode). Also assesses MA.E.1.3.3 The student analyzes real-world data by applying appropriate formulas for measures of central tendency and organizing data in a quality display, using appropriate technology, including calculators and computers.

2007 Benchmark: MA.6.S.6.1 Determine the measures of central tendency (mean, median, mode) and variability (range) for a given set of data.

Note: Although this benchmark will be assessed in Grade 6, the sample provided is not indicative of the way in which the new benchmark will be assessed at Grade 6 in 2011.

To solve this problem, the data from the line plot must be placed in numerical order:

18, 19, 20, 25, 26, 28, 28

The median is the middle number in the ordered list, or the sum of the two middle numbers divided by 2.

In this case, there is only one middle number, 25. This is the median and the correct answer.

7 The correct answer is F (Great Britain, United States, Japan, the Netherlands).

1996 Strand: Number Sense, Concepts, and Operations

2007 Reporting Category: Number and Operations

1996 Benchmark: MA.A.1.3.2 The student understands the relative size of integers, fractions, and decimals; numbers expressed as percents; numbers with exponents; numbers in scientific notation; radicals; absolute value; and ratios.

2007 Benchmark: MA.6.A.5.2 Compare and order fractions, decimals, and percents, including finding their approximate location on a number line.

To solve this problem, the four numbers displayed in the glass bottles may be converted to one numerically equivalent form. The equivalent representations may be fractions, decimals, or percents. Once the four numbers have been converted, they can be ordered from least to greatest and matched with the appropriate country. The result of this process is shown in the following table.

Fraction form:	$\frac{17}{100}$	$\frac{20}{100}$	$\frac{55}{100}$	$\frac{57}{100}$
Decimal form:	0.17	0.2	.55	0.57
Percent form:	17%	20%	55%	57%

The correct answer is Great Britain, United States, Japan, the Netherlands.

8 The correct answer is 4.



1996 Strand: Measurement

2007 Reporting Category: N/A

1996 Benchmark: MA.B.1.3.3 The student understands and describes how the change of a figure in such dimensions as length, width, height, or radius affects its other measurements such as perimeter, area, surface area, and volume. Also assesses 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.

8 (continued)

2007 Benchmark: This benchmark will not be assessed in Grade 6 after 2010.

To solve this problem, refer to the Grades 6–8 FCAT Mathematics Reference Sheet and use the formula for the area of a rectangle.

$$A = bh \text{ (Area = base } \times \text{ height)}$$

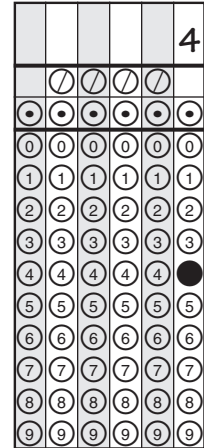
The area of the gym banner is $8 \times 8 = 64$.

The area of the new banner can be calculated by multiplying a base and height that are each $\frac{1}{2}$ the sides of the gym banner; that is, $4 \times 4 = 16$.

To determine how many times larger the area of the gym banner is, divide its area by the area of the new banner.

$$64 \div 16 = 4$$

The area of the gym banner is 4 times larger than the area of the new banner.



9 The correct answer is 9.



1996 Strand: Algebraic Thinking

2007 Reporting Category: Algebra

1996 Benchmark: MA.D.1.3.2 The student creates and interprets tables, graphs, equations, and verbal descriptions to explain cause-and-effect relationships. Also assesses MA.A.5.3.1 The student uses concepts about numbers, including primes, factors, and multiples, to build number sequences.

2007 Benchmark: MA.6.A.3.2 Write, solve, and graph one- and two-step linear equations and inequalities. Also assesses MA.6.A.3.4 Solve problems given a formula.

To solve this problem, determine the relationship between the number of apples and the number of pounds of caramel.

9 (continued)

In this case, if each number in the “Number of Caramel Apples” column is divided by 4, the quotient will equal the number in the adjacent “Pounds of Caramel” column. This holds true for all values given.

Using this relationship, divide 36 by 4 to find the number of pounds of caramel that Roberto needs.

$$36 \div 4 = 9 \text{ pounds of caramel.}$$

The correct answer is 9 pounds of caramel.

					9
	7	7	7	7	
	0	0	0	0	0
	1	1	1	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	●

10 The correct answer is B (17).

1996 Strand: Number Sense, Concepts, and Operations

2007 Reporting Category: Number and Operations

1996 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.

2007 Benchmark: MA.6.A.1.3 Solve real-world problems involving multiplication and division of fractions and decimals. Also assesses MA.6.A.1.2 Multiply and divide fractions and decimals efficiently.

Divide $25\frac{1}{2}$ by $1\frac{1}{2}$ to find how many $1\frac{1}{2}$ cups are in $25\frac{1}{2}$ cups.

$$25\frac{1}{2} \div 1\frac{1}{2} = \frac{51}{2} \div \frac{3}{2} = \frac{51}{3}$$

10 (continued)

To simplify the fraction, multiply the numerator and denominator by the multiplicative inverse of the fraction in the denominator. This results in a denominator of 1, which is the multiplicative identity. This results in the shortcut method commonly known as “invert and multiply.”

$$\frac{\frac{51}{2}}{\frac{3}{2}} \cdot \frac{2}{3} = \frac{\frac{51}{2} \cdot \frac{2}{3}}{\frac{3}{2} \cdot \frac{2}{3}} = \frac{\frac{51}{2} \cdot \frac{2}{3}}{\frac{6}{6}} = \frac{\frac{51}{2} \cdot \frac{2}{3}}{1} = \frac{51}{2} \cdot \frac{2}{3} = \frac{51}{3} = 17$$

The correct answer is 17.

11 The correct answer is H ($6x + 2.50$).

1996 Strand: Algebraic Thinking

2007 Reporting Category: Algebra

1996 Benchmark: MA.D.2.3.1 The student represents and solves real-world problems graphically, with algebraic expressions, equations, and inequalities. Also assesses MA.A.1.3.3 The student understands concrete and symbolic representations of rational numbers and irrational numbers in real-world situations.

2007 Benchmark: MA.6.A.3.1 Write and evaluate mathematical expressions that correspond to given situations. Also assesses MA.6.A.3.3 Works backward with two-step function rules to undo expressions.

Since the total cost is dependent upon the variable x , the number of days the video recorder is rented, $6x$ represents the cost to rent the video recorder for x number of days at the price of 6 dollars per day.

Note that the \$2.50 cleaning fee is a one-time fee; therefore, the value 2.50 is a constant that is added to the $6x$.

The correct expression is $6x + 2.50$.

12 The correct answer is A (15).

1996 Strand: N/A

2007 Reporting Category: Number and Operations

1996 Benchmark: No 1996 benchmark assesses this type of item.

2007 Benchmark: MA.6.A.2.1 Use reasoning about multiplication and division to solve ratio and rate problems.

To solve this problem, the rate of success for each player needs to be determined.

Karla's rate of success can be expressed as the fraction: $\frac{8}{24}$ or $\frac{1}{3}$.

Becky's rate of success can be expressed as the fraction: $\frac{5}{20}$ or $\frac{1}{4}$.

Because Karla will be successful in about $\frac{1}{3}$ of her 180 attempts, find $\frac{1}{3}$ of 180.

$$\frac{1}{3} \times 180 = 60$$

Because Becky will be successful in about $\frac{1}{4}$ of her 180 attempts, find $\frac{1}{4}$ of 180.

$$\frac{1}{4} \times 180 = 45$$

To find how much more successful Karla would be than Becky for 180 throws, subtract $60 - 45 = 15$.

The correct answer is 15.

13 The correct answer is I (34-Watt Cool White).

1996 Strand: N/A

2007 Reporting Category: Number and Operations

1996 Benchmark: No 1996 benchmark assesses this type of item.

2007 Benchmark: MA.6.A.2.2 Interpret and compare ratios and rates.

To determine the cost per light bulb for each type, first divide the total cost for each type of bulb by the quantity purchased.

10-Watt Clear	$\$ 14.85 \div 9 = \1.65
13-Watt Warm White	$\$119.40 \div 60 = \1.99
20-Watt Capsule Bulb	$\$ 10.74 \div 6 = \1.79
34-Watt Cool White	$\$147.60 \div 90 = \1.64

The 34-Watt Cool White costs the least per light bulb.

14 The correct answer is C (63.6 square meters).

1996 Strand: N/A

2007 Reporting Category: Geometry and Measurement

1996 Benchmark: No 1996 benchmark assesses this type of item.

2007 Benchmark: 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 Solve problems given a formula.

First strategy:

To find the area of a circle, use the formula $A = \pi r^2$ from the reference sheet.

If the diameter of the circle is 9 meters, the radius of the circle can be expressed as 4.5 m.

Using 3.14 as π , $a = 3.14(4.5)^2 = 3.14(20.25) = 63.585 \approx 63.6\text{m}^2$

OR

Second strategy:

Find a low estimate, using 4 for the radius, and 3.14 for π ; $3.14 \times 4 \times 4 = 50.24$.

Then find a high estimate, using 5 for the radius, and 3.14 for π ; $3.14 \times 5 \times 5 = 78.50$.

The actual area should be about halfway between 50.24 and 78.50. Halfway between 50 and 80 is close to $50 + 80 = 130 \div 2 = 65$, so the area is 63.6.

OR

Third strategy:

Use the formula for area, and express the radius and π as fractions:

$$A = \frac{22}{7} \cdot \frac{9}{2} \cdot \frac{9}{2} = \frac{11 \cdot 9 \cdot 9}{7 \cdot 2} = \frac{891}{14} \approx 64$$

The correct answer is 63.6 square meters.

- 15** The correct answer is G (multiply $\frac{1}{2}$ by 50).

1996 Strand: N/A

2007 Reporting Category: Number and Operations

1996 Benchmark: No 1996 benchmark assesses this type of item.

2007 Benchmark: MA.6.A.5.3 Estimate the results of computations with fractions, decimals, and percents, and judge the reasonableness of the results.

First Strategy:

Since the fractions in the problem can be easily converted to percents, percents can be used to find an estimate of his time.

$\frac{1}{5}$ is 20% and $\frac{1}{3}$ is close to 33%.

Mr. Madsen spent about 20% + 33%, or about 53% of his time in meetings and on the phone with customers.

53% is close to 50% or $\frac{1}{2}$. Because 49 hours is close to 50 hours, the most reasonable estimation method would be to multiply $\frac{1}{2}$ by 50.

OR

Second Strategy:

To solve this problem, the sum of the fractions $\frac{1}{5}$ and $\frac{1}{3}$ can be estimated to be about $\frac{1}{2}$.

$$\frac{1}{5} = \frac{3}{15} \text{ and } \frac{1}{3} = \frac{5}{15}$$

$$\frac{3}{15} + \frac{5}{15} = \frac{8}{15}, \text{ which is close to } \frac{1}{2}$$

The most reasonable estimate would be to multiply $\frac{1}{2}$ by 50.

16 The correct answer is B, as shown below.

1996 Strand: Number Sense, Concepts, and Operations

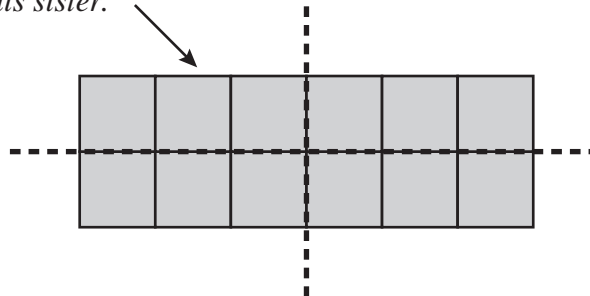
2007 Reporting Category: Number and Operations

1996 Benchmark: MA.A.3.3.1 The student understands and explains the effects of addition, subtraction, multiplication, and division on whole numbers, fractions, including mixed numbers, and decimals, including the inverse relationships of positive and negative numbers.

2007 Benchmark: MA.6.A.1.1 Explain and justify procedures for multiplying and dividing fractions and decimals.

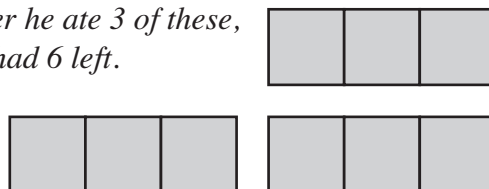
Since Akeem gave his sister $\frac{1}{4}$ of the chocolate bar, divide the chocolate bar into 4 equal parts, as shown below. After dividing the bar into 4 equal parts, remove $\frac{1}{4}$ of the bar (or the 3 pieces) that he gave his sister.

He gave these 3 to his sister.



Now, divide the remaining part of the bar into 3 equal parts. If he ate $\frac{1}{3}$ of the remaining 9 pieces, he has 6 pieces left.

After he ate 3 of these, he had 6 left.





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