2011

FCAT

Florida Comprehensive Assessment Test®

Grade 10/Retake
FCAT Mathematics
Sample Answers

This booklet contains answers to the Grade 10/Retake FCAT Mathematics sample questions, as well as explanations for the answers. It also gives the 1996 Sunshine State Standards benchmark assessed by each item.

In addition, one or more possible approaches to solving the questions may be 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 the 2011 Grade 10/Retake FCAT Mathematics test. 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 questions and answers 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.

Grade 10 students taking the 2011 FCAT Mathematics test and all Retake students taking the FCAT Mathematics test will be taking the computer-based test (CBT) using the TestNav platform. Only students requiring accommodations will use the paper-based test.

The 2011 FCAT Mathematics test for students in Grade 10 that will be used to calculate student results and school grades in 2011 will be composed of items that assess mastery of the 1996 Sunshine State Standards. For Grades 3 through 8, the 2011 FCAT 2.0 Mathematics tests and sample questions and answers are based on the 2007 Next Generation Sunshine State Standards.

1 The correct answer is D (Diagonals of a rhombus bisect each other).

1996 Strand: Geometry and Spatial Sense

1996 Benchmark: MA.C.1.4.1 The student uses properties and relationships of geometric shapes to construct formal and informal proofs. Also assesses MA.C.1.2.1 The student, given a verbal description, draws and/or models two- and three-dimensional shapes and uses appropriate geometric vocabulary to write a description of a figure or a picture composed of geometric figures. 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.

Options A, B, and C, while all true, do not alone lead to $\overline{AE} \cong \overline{EC}$ and the subsequent equation.

Options A and B address the sides of the rhombus, not its diagonals.

Option C addresses the diagonals, but not their lengths.

Option D states that diagonals of a rhombus bisect each other. This would imply that E is the midpoint of $\overline{AC}$ and therefore $\overline{AE} \cong \overline{EC}$. The equation would follow and it can be used to solve for x.

2 **The correct answer is H (The volume of the new compost box is exactly 337.5% of the volume of the original box).**

1996 Strand: Algebraic Thinking

1996 Benchmark: MA.D.1.4.2 The student determines the impact when changing parameters of given functions.

In this approach, the volume of the new, larger cube is divided by the volume of the original, smaller cube.

The volume of the original, smaller cube can be represented as shown below, where *s* is the length of an edge.

$V = (1s)^3 = 1^3 s^3 = s^3$

Because the edge length will be increased by half, the edge length of the new, larger cube is 1.5*s*. The volume of the new, larger cube can then be represented as shown below.

$V = (1.5s)^3 = 1.5^3 s^3 = 3.375s^3$

Dividing these two quantities will yield the increase in size.

$\frac{3.375s^3}{s^3} = 3.375$

$3.375 = 337.5\%$

The volume of the new compost box is exactly 337.5% of the volume of the original box.

3 The correct answer is C (trapezoid).

1996 Strand: Geometry and Spatial Sense

1996 Benchmark: MA.C.2.4.2 The student analyzes and applies geometric relationships involving planar cross-sections (the intersection of a plane and a three-dimensional figure).

Because the cross section is a plane that contains A, B, C, and D, $\overline{AB}$, $\overline{BC}$, $\overline{CD}$, and $\overline{AD}$ are coplanar. Each of these segments is on a unique face of the cube, with the endpoints on an edge of the cube. Together, these two statements imply that the four segments bound the cross section. This implies that the cross section is a quadrilateral and cannot be a pentagon or triangle. Options A and D can be eliminated.

Because C and D are opposite vertices on the bottom face of the cube, and A and B are not opposite vertices on the top face of the cube, $\overline{CD}$ is greater than $\overline{AB}$. These are opposite sides of the quadrilateral and are not congruent, so the cross section cannot be a rectangle. Option B can be eliminated.

Option C is correct because $\overline{AB}$ is parallel to $\overline{CD}$, because when two parallel planes (defined by the top and bottom of the cube) are intersected by a third plane (the cross section), the intersection is two parallel lines; therefore, the cross section is a trapezoid.

4 **The correct answers are 628, 628.6, or 629 cm^3.**

1996 Strand: Measurement

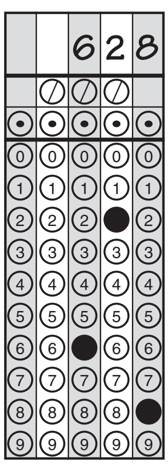
1996 Benchmark: MA.B.1.4.1 The student uses concrete and graphic models to derive formulas for finding perimeter, area, surface area, circumference, and volume of two- and three-dimensional shapes, including rectangular solids, cylinders, cones, and pyramids. Also assesses MA.B.1.2.2 The student solves real-world problems involving length, weight, perimeter, area, capacity, volume, time, temperature, and angles.

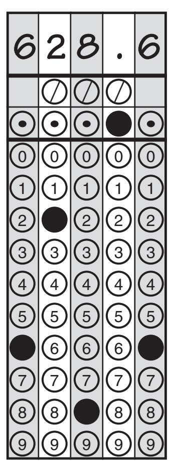
To determine the volume of the sculpture, the volume of one cone must be calculated and doubled. Use the volume formula from the Grade 10/Retake FCAT Mathematics Reference Sheet for a right circular cone.

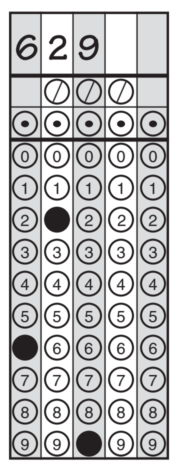
The height of each cone is 12 cm (24 $\div$ 2).

For one cone, $V = \frac{1}{3}(3.14)(5^2)(12) \approx 314$.

The volume of the sculpture is 628 cm^3 (314 $\times$ 2).







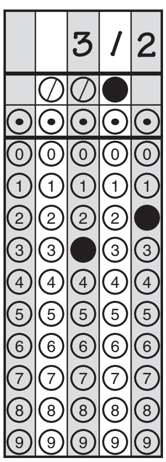
5 **The correct answer is $\frac{3}{2}$.**

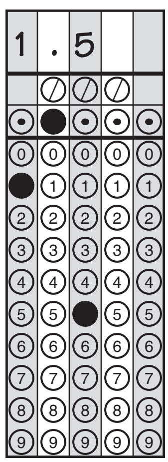
1996 Strand: Geometry and Spatial Sense

1996 Benchmark: MA.C.3.4.2 The student, using a rectangular coordinate system (graph), applies and algebraically verifies properties of two- and three-dimensional figures, including distance, midpoint, slope, parallelism, and perpendicularity. Also assesses MA.C.3.3.2 The student identifies and plots ordered pairs in all four quadrants of a rectangular coordinate system (graph) and applies simple properties of lines. MA.D.2.4.1 The student represents real-world problem situations using finite graphs, matrices, sequences, series, and recursive relations.

The slope of the line containing the east fence is

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{{}^{-}8 - 4}{{}^{-}3 - 5} = \frac{{}^{-}12}{{}^{-}8} = \frac{3}{2}.$$





6 **The correct answer is 1,260.**

1996 Strand: Geometry and Spatial Sense

1996 Benchmark: MA.C.1.4.1 The student uses properties and relationships of geometric shapes to construct formal and informal proofs. Also assesses MA.C.1.2.1 The student, given a verbal description, draws and/or models two- and three-dimensional shapes and uses appropriate geometric vocabulary to write a description of a figure or a picture composed of geometric figures. 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.

The measure of the exterior angle is

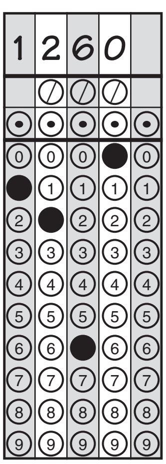
$180° - 140° = 40°$.

The sum of the measures of the exterior angles is 360°. Because the polygon is regular, the number of sides is

$\frac{360°}{40°} = 9$.

Because there are 9 sides, there are 9 interior angles, so the sum of the measures of the interior angles is

$9(140°) = 1{,}260°$.



7 **The correct answer is F (4).**

1996 Strand: Data Analysis and Probability

1996 Benchmark: MA.E.2.4.1 The student determines probabilities using counting procedures, tables, tree diagrams, and formulas for permutations and combinations. Also assesses MA.E.2.4.2 The student determines the probability for simple and compound events as well as independent and dependent events.

The sample space of spinning both spinners and calculating the product of the two numbers on which the spinners may stop can be found by creating a table, as shown below.

	1	**2**	**3**	**4**
1	1	2	3	4
2	2	4	6	8
3	3	6	9	12
4	4	8	12	16

The products of 1, 9, and 16 each occur once.

The products of 2, 3, 6, 8, and 12 each occur twice.

The only product left is 4, which occurs three times; thus, 4 has the greatest probability of occurring.

8 **The correct answer is $15.00 or $15.**

1996 Strand: Algebraic Thinking

1996 Benchmark: MA.D.2.4.2 The student uses systems of equations and inequalities to solve real-world problems graphically, algebraically, and with matrices. Also assesses MA.D.2.3.1 The student represents and solves real-world problems graphically, with algebraic expressions, equations, and inequalities. MA.D.2.3.2 The student uses algebraic problem-solving strategies to solve real-world problems involving linear equations and inequalities. MA.D.2.4.1 The student represents real-world problem situations using finite graphs, matrices, sequences, series, and recursive relations.

To determine the cost, in dollars, of one dozen roses, use your preferred method to solve the system of equations.

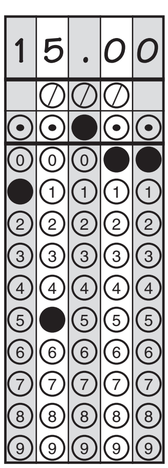
Linear Combination

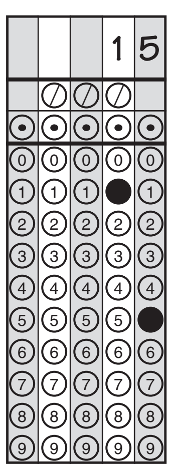
$$\begin{aligned} 20r + 34c &= 504 \\ 15r + 17c &= 327 \end{aligned}$$

Multiply the second equation by 2 and subtract it from the first equation.

$$\begin{array}{rcrcr} 20r & + & 34c & = & 504 \\ \underline{{}^-30r} & \underline{+} & \underline{{}^-34c} & \underline{=} & \underline{{}^-654} \\ {}^-10r & & & = & {}^-150 \\ & & r & = & 15 \end{array}$$

Because $r = 15$, the cost of one dozen roses is $15.00.





9 **The correct answer is $33.50.**

1996 Strand: Algebraic Thinking

1996 Benchmark: MA.D.2.4.2 The student uses systems of equations and inequalities to solve real-world problems graphically, algebraically, and with matrices. Also assesses MA.D.2.3.1 The student represents and solves real-world problems graphically, with algebraic expressions, equations, and inequalities. MA.D.2.3.2 The student uses algebraic problem-solving strategies to solve real-world problems involving linear equations and inequalities. MA.D.2.4.1 The student represents real-world problem situations using finite graphs, matrices, sequences, series, and recursive relations.

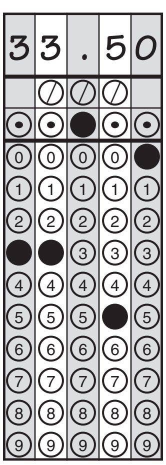
In this approach, a linear equation is used to determine the hourly rate.

Let r = the hourly rate

Find the hourly rate (r) by adding the $45 constant fee for a house call to the cost (or “charge”) for 3 hours of work at r, the hourly rate, and setting it equal to the amount charged, 145.5. Then solve for r.

$$\begin{aligned} 45 + 3r &= 145.5 \\ 3r &= 100.5 \\ r &= 33.5 \end{aligned}$$

The hourly rate is $33.50.



10 **The correct answer is 21.**

1996 Strand: Geometry/Measurement

1996 Benchmark: MA.C.2.4.1 The student understands geometric concepts such as perpendicularity, parallelism, tangency, congruency, similarity, reflections, symmetry, and transformations including flips, slides, turn, enlargements, rotations, and fractals. Also assesses MA.B.1.4.3 The student relates the concepts of measurement to similarity and proportionality in real-world situations. MA.C.1.4.1 The student uses properties and relationships of geometric shapes to construct formal and informal proofs. MA.C.3.4.1 The student represents and applies geometric properties and relationships to solve real-world and mathematical problems including ratio, proportion, and properties of right triangle trigonometry.

First Strategy:

In this approach, a proportion using the similar triangles ACB and AED is solved to find the distance between point *D* and point *E*.

Let d = the distance, in miles, across Lake Okeechobee along segment *DE*. Use a proportion:

$$\frac{14}{32} = \frac{d}{(32+16)}$$

$$d = \frac{14(48)}{32}$$

$$d = 21$$

(continued on next page)

10 (continued)

or

Second Strategy:

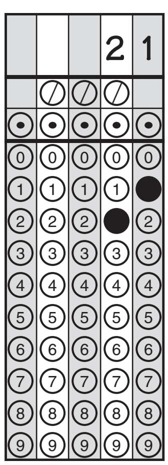
In this approach, a scale factor is used to find the distance between point *D* and point *E*.

Find the scale factor: $\frac{32}{(32+16)} = \frac{32}{48} = \frac{2}{3}$

Let d = the distance, in miles, across Lake Okeechobee along segment *DE*.

Divide the distance, 14 miles, between point *B* and point *C* by the scale factor of $\frac{2}{3}$.

$$\begin{aligned} d &= 14 \div \frac{2}{3} \\ &= (14)\left(\frac{3}{2}\right) \\ &= 21 \end{aligned}$$



Notes

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