

## FCAT Sample Test Materials

These sample test materials are designed to help students prepare to answer FCAT questions. These materials introduce them to the kinds of questions they will answer when they take FCAT and include hints for responding to the different kinds of questions. The FCAT mathematics sample test materials for Grade 10 are composed of the books described below:

- Sample Test and Answer Book**  
Includes a mathematics sample test, a sample answer book, and instructions for completing the sample test. (Copies are available for all students in the tested grade.)
- Sample Answer Key**  
Includes answers and explanations for the questions in the sample test. (Copies are available for classroom teachers only.)

= This book

### Copyright Statement for this Assessment and Evaluation Services Publication

Authorization for reproduction of this document is hereby granted to persons acting in an official capacity within the State System of Public Education as defined in Section 228.041(1), Florida Statutes. The copyright notice at the bottom of this page must be included in all copies.

All brand and product names found in this publication are the trademarks or registered trademarks of their respective companies and are not associated with the publisher of this publication.

Permission is **NOT** granted for distribution or reproduction outside of the State System of Public Education or for commercial distribution of the copyrighted materials without written authorization from the Department of Education. Questions regarding use of these copyrighted materials should be sent to the following:

The Administrator  
Assessment and Evaluation Services  
Florida Department of Education  
Tallahassee, Florida 32399-0400

Copyright © 2000  
State of Florida  
Department of State

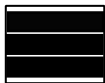
# Answer Key



This book contains answers to the sample test questions. It also gives the *Sunshine State Standards* benchmark assessed by each item on the sample test. 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 “Think, Solve, and Explain” questions allow partial credit for some answers, even if they are not 100% correct. Answers will be scored and points will be given based on the completeness and correctness of the answers. If a portion of an answer is correct, a portion of the points will be awarded.

The scoring rubrics for the short-response questions and the extended-response questions are shown below:



## Rubric for Short-Response 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, despite 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 Extended-Response 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 flaws 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 flaws 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 C (8 feet).

Strand: C—Geometry and Spatial Sense

Benchmark: 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. (Also assesses MA.C.2.4.1 understands geometric concepts such as perpendicularity, parallelism, tangency, congruency, similarity, reflections, symmetry, and transformations including flips, slides, turns, enlargements, rotations, and fractals.)

This is a ratio and proportion problem. The ratio of the scale model's width to length is  $\frac{3 \text{ inches}}{6 \text{ inches}}$ .

The actual width of the boat will be 4 feet. The length of the boat is unknown. It can be called  $x$ .

The ratio of the actual width to actual length will be  $\frac{4 \text{ feet}}{x \text{ feet}}$ .

Since the scale drawing is proportional to the actual boat, the two ratios are set equal to each other.

$$\frac{3 \text{ inches}}{6 \text{ inches}} = \frac{4 \text{ feet}}{x \text{ feet}}$$

Solve the proportion for  $x$ .

$$x = 8 \text{ feet}$$

**2 The correct answer is F (10 meters).**

Strand: C—Geometry and Spatial Sense

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 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; and MA.C.1.3.1 understands the basic properties of, and relationships pertaining to, regular and irregular geometric shapes in two and three dimensions.)

To solve this problem, use the formula for the total surface area of a sphere found on the Mathematics Reference Sheet. Find the picture of the sphere on the reference sheet. To the far right of the sphere is the formula for total surface area, which is shown below.

$$A = 4\pi r^2$$

Since the sphere has a surface area of 1256 square meters, write:

$$1256 = 4\pi r^2$$

Now solve for  $r$ . Use 3.14 for  $\pi$ .

$$4\pi r^2 = 1256 \quad (\text{substitute for } A)$$

$$12.56r^2 = 1256 \quad (\text{multiply 4 by 3.14})$$

$$r^2 = 100 \quad (\text{divide both sides by 12.56})$$

$$\sqrt{r^2} = \sqrt{100} \quad (\text{take the square root of both sides})$$

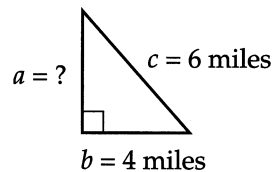
$$r = 10$$

**3** The correct answer is B (4.5 miles).

Strand: C—Geometry and Spatial Sense

Benchmark: 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. (Also assesses MA.C.2.4.1 understands geometric concepts such as perpendicularity, parallelism, tangency, congruency, similarity, reflections, symmetry, and transformations including flips, slides, turns, enlargements, rotations, and fractals.)

Use the Pythagorean theorem to solve this problem. The distance from the work site to the bridge is 4 miles. This distance is one side of a right triangle. The distance across the bridge is the hypotenuse of the same triangle. The length of the third side is the unknown distance.



The Pythagorean theorem states that  $a^2 + b^2 = c^2$ .

$$a^2 + 4^2 = 6^2 \quad (\text{substitute for } b \text{ and } c)$$

$$a^2 + 16 = 36 \quad (\text{square all constants})$$

$$a^2 = 20 \quad (\text{subtract 16 from both sides})$$

$$\sqrt{a^2} = \sqrt{20} \quad (\text{take the square root of both sides})$$

$$a \approx 4.4721359$$

Round to the nearest tenth to get 4.5.

**4** The correct answer is 2 hours.



Strand: B—Measurement

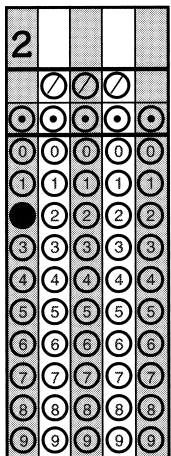
Benchmark: MA.B.2.4.2 The student solves real-world problems involving rated measures (miles per hour, feet per second). (Also assesses MA.B.2.3.2 solves problems involving units of measure and converts answers to a larger or smaller unit within either the metric or customary system.)

There are four 50-mile range rings from the airport to the airplane.

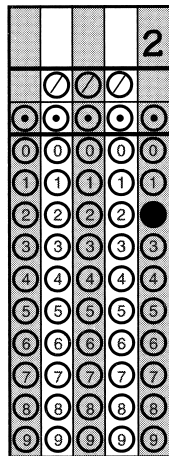
$$4 \text{ rings} \times 50 \frac{\text{miles}}{\text{ring}} = 200 \text{ miles}$$

It is given that the plane is flying at 100 miles per hour.

$$\begin{aligned} \text{time} &= \frac{\text{distance}}{\text{rate}} \\ &= \frac{200 \text{ miles}}{100 \text{ miles/hour}} \\ &= 2 \text{ hours} \end{aligned}$$



OR



**5** The correct answer is \$17.09.



Strand: A—Number Sense, Concepts, and Operations

Benchmark: MA.A.3.4.1 The student understands and explains the effects of addition, subtraction, multiplication, and division on real numbers, including square roots, exponents, and appropriate inverse relationships. (Also assesses MA.A.2.4.2 understands and uses the real number system.)

Because Sarah’s car needs only antifreeze, oil, and a filter, add only the costs for those items.

$$\$5.00 + \$6.00 + \$7.99 = \$18.99$$

Sarah will receive a discount of 10% because she needs three services performed. On a price of \$18.99, 10% is \$1.899 or \$1.90.

$$\text{So } \$18.99 - \$1.90 = \$17.09.$$

1	7	.	0	9
<input type="radio"/>	<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 type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<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"/>	<input 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"/>	<input 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"/>	<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 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"/>	<input checked="" type="radio"/>

**6** The correct answer is  $\frac{17}{32}$  or an equivalent value.



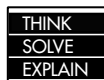
Strand: E—Data Analysis and Probability

Benchmark: MA.E.2.4.2 The student determines the probability for simple and compound events as well as independent and dependent events. (Assessed with MA.E.2.4.1)

There are 32 cans of soda in the ice chest. The probability of selecting a diet cola is  $\frac{5}{32}$  and the probability of selecting a regular cola is  $\frac{12}{32}$ . Therefore, the probability of selecting either type is  $\frac{5}{32} + \frac{12}{32}$ , which is  $\frac{17}{32}$ .

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

**7** The correct response is shown below.



Strand: E—Data Analysis and Probability

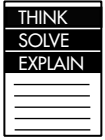
Benchmark: MA.E.3.4.2 The student explains the limitations of using statistical techniques and data in making inferences and valid arguments.

**Explanation:**

The survey does not represent all of the employees in the company because Chris surveyed employees in only one of 14 departments, the marketing department. People in the marketing department cannot be assumed to have similar musical tastes to other people in the company. Therefore, the survey is not representative.

To receive full credit (2 points) the answer should contain an explanation similar to the one shown above. Partially correct answers will receive a score of 1 point.

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

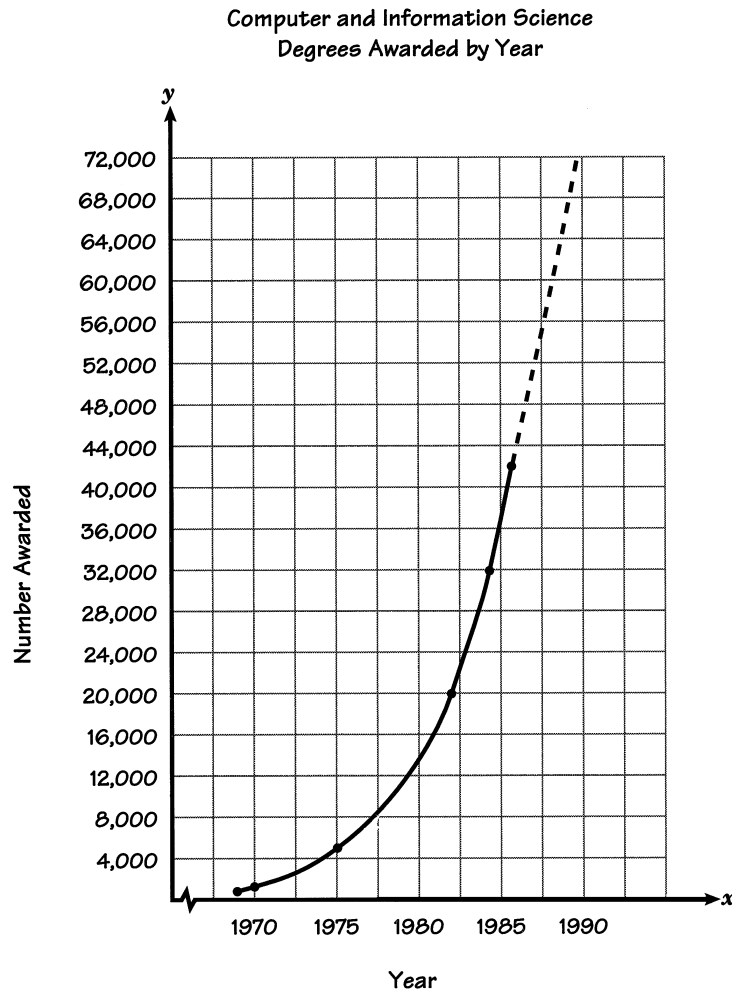


Strand: E—Data Analysis and Probability

Benchmark: MA.E.1.4.1 The student interprets data that has been collected, organized, and displayed in charts, tables, and plots. (Also assesses MA.E.1.3.1 displays data in a variety of forms; and MA.E.1.4.3 makes predictions.)

**Part A**

Plot all the data points and draw a curve that connects them.



**Part B**

Prediction: Any number from 68,000 to 76,000.

Once all the data points have been graphed, extend the curve from the last data point so that it intercepts the vertical grid line at 1990. At the point of intersection, read horizontally to the number on the  $y$ -axis. The intersection occurs at a number near 72,000. This is the prediction of the number of degrees that would be awarded in computer and information science in 1990, based on the previous years of data.

**Part C**

The reason should be similar to the one below.

I made my prediction by looking at where the graph of the data would go if it followed the same trend. The observed data did not follow this trend because many factors, not just what has happened in previous years, may influence what people do.

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

**9** The correct answer is I (11% of 119).

Strand: A—Number Sense, Concepts, and Operations

Benchmark: MA.A.1.4.3 The student understands concrete and symbolic representations of real and complex numbers in real-world situations.

First convert each number to a decimal.

$$\sqrt{119} = \pm 10.908712$$

$$\frac{119}{11} = 10.818181$$

$$0.11 \times 10^2 = 11.00$$

$$11\% \text{ of } 119 = 13.09$$

Then compare the numbers to see which number is the greatest.

**10** The correct answer is D (36).

Strand: D—Algebraic Thinking

Benchmark: MA.D.1.4.1 The student describes, analyzes, and generalizes relationships, patterns, and functions using words, symbols, variables, tables, and graphs.

Set up a table that shows the number of cubes in each layer. Look for a pattern.

Layer	1	2	3	4	5	6
Number of Cubes	1	4	9	16		

Notice that if the layer number is squared, the result is the number of cubes. By following the pattern, the fifth layer would contain 25 cubes, and the sixth layer would contain 36 cubes.

**11** The correct answer is G (1,131 miles).

Strand: B—Measurement

Benchmark: MA.B.2.4.1 The student selects and uses direct (measured) or indirect (not measured) methods of measurement as appropriate.

**First Strategy:**

The length of the hypotenuse of an isosceles right triangle is  $\sqrt{2}$  times the length of a leg. Since it is 800 miles from Tallahassee to Houston, then it is approximately  $\sqrt{2} \times 800 = 1,131$  miles from Tallahassee to Lincoln.

**OR**

**Second Strategy:**

Use the Pythagorean theorem,  $a^2 + b^2 = c^2$ , where  $a$  and  $b$  are the lengths of the two triangle sides and  $c$  is the length of the hypotenuse.

$$800^2 + 800^2 = c^2 \quad (\text{substitute for } a \text{ and } b)$$

$$640,000 + 640,000 = c^2 \quad (\text{square all constants})$$

$$1,280,000 = c^2 \quad (\text{add the constants on the left-hand side})$$

$$\sqrt{1,280,000} = \sqrt{c^2} \quad (\text{take the square root of both sides})$$

$$c = 1,131.3708$$

Round the answer to the nearest whole number.

**12** The correct answer is 5.38 marathons or equivalent answer.



Strand: A—Number Sense, Concepts, and Operations

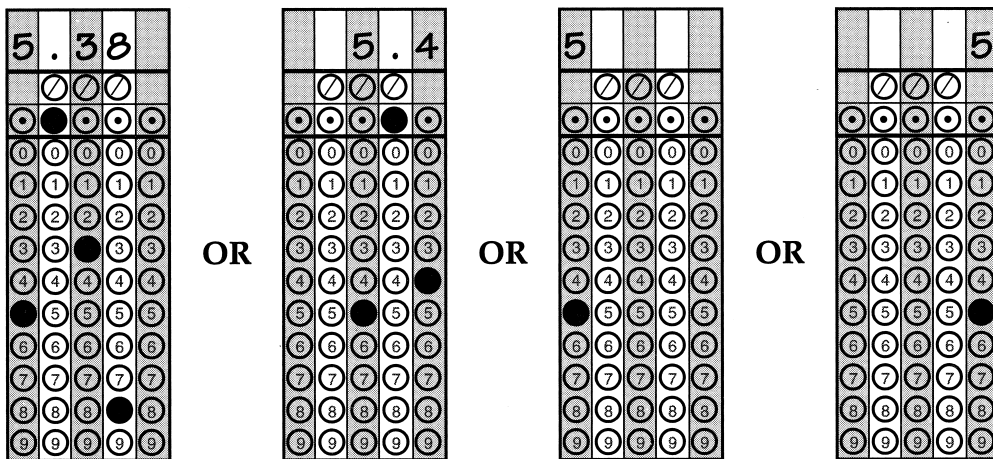
Benchmark: MA.A.3.4.1 The student understands and explains the effects of addition, subtraction, multiplication, and division on real numbers, including square roots, exponents, and appropriate inverse relationships. (Also assesses MA.A.2.4.2 understands and uses the real number system.)

Each week Kelly runs  $5 + 5 + 5 + 10 + 10$  miles, or 35 miles.

In four weeks Kelly runs  $4 \times 35 = 140$  miles.

$140 \div 26 \approx 5.38$  marathons

Kelly has run the equivalent of 5.38 marathons or 5 complete marathons.



**13** The correct response is 10.



Strand: D—Algebraic Thinking

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.2.4.1 represents and solves real-world problem situations using finite graphs, matrices, sequences, series, and recursive relations.)

After a certain number of months ( $m$ ), Juan's and Alex's savings accounts will have the same amount of money in them. The amount in Juan's savings account at that time can be written as:

$$J = 2,000 + 150m$$

where  $J$  is the amount in Juan's savings account.

The amount in Alex's savings account at that time can be written as:

$$A = 1,000 + 250m$$

where  $A$  is the amount in Alex's savings account.

The number of months it will take for the accounts to become equal,  $A = J$ , can be written:

$$1,000 + 250m = 2,000 + 150m$$

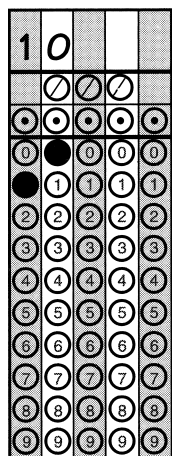
Solving for  $m$  gives the number of months it will take for the accounts to become equal.

$$1,000 + 250m = 2,000 + 150m$$

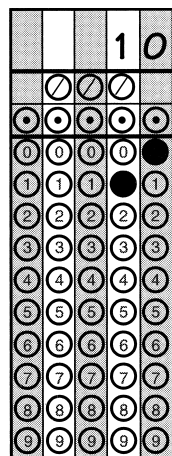
$$250m = 1,000 + 150m \quad (\text{subtract } 1,000 \text{ from both sides})$$

$$100m = 1,000 \quad (\text{subtract } 150m \text{ from both sides})$$

$$m = 10 \text{ months} \quad (\text{divide both sides by } 100)$$



OR



**14** The correct answer is 2,000.



Strand: D—Algebraic Thinking

Benchmark: MA.D.1.4.1 The student describes, analyzes, and generalizes relationships, patterns, and functions using words, symbols, variables, tables, and graphs.

The area of each pentagon is equal to the sum of the areas of the square and the triangle. Since the area of the square remains constant, the area of each triangle is equal to the area of each pentagon minus the area of the square (400). Set up a table that shows the relationship between each pentagon and its triangular portion.

Pentagon	1	2	3	4
Pentagon Area	450	500	600	800
Square Area	400	400	400	400
Triangle Area (pentagon minus square)	50	100	200	400

Notice that the area of each triangle doubles. The pattern in the table would continue as follows:

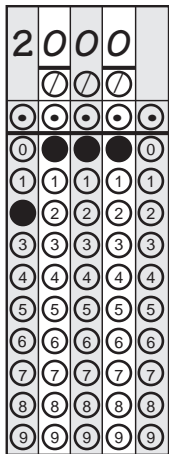
Pentagon	5	6
Pentagon Area	1,200	2,000
Square Area	400	400
Triangle Area (pentagon minus square)	800	1,600

Since the area of the pentagon is the sum of the areas of the square and the triangle, the area of the fifth pentagon can be found with

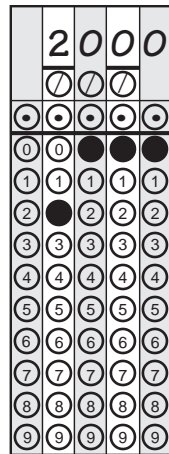
$$400 + 800 = 1,200$$

and the area of the sixth pentagon can be found with

$$400 + 1,600 = 2,000$$



OR



**15** The correct answer is 60.



Strand: A—Number Sense, Concepts, and Operations

Benchmark: MA.A.1.4.4 The student understands that numbers can be represented in a variety of equivalent forms, including integers, fractions, decimals, percents, scientific notation, exponents, radicals, absolute value, and logarithms. (Also assesses MA.A.1.4.1 associates verbal names, written word names, and standard numerals with real and complex numbers; and MA.A.1.4.3 understands concrete and symbolic representations of real and complex numbers in real-world situations.)

To calculate the percent that Alexa plans to save, divide 1.35 by 2.25 to get 0.6, which expressed as a percent is 60.

			6	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
7	7	7	7	7
8	8	8	8	8
9	9	9	9	9

OR

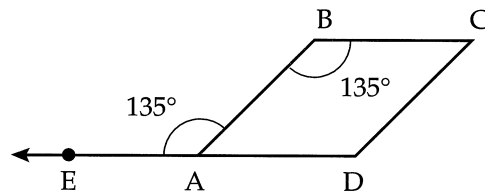
6	0			
	○	○	○	
○	○	○	○	○
0	●	0	0	0
1	1	1	1	1
2	2	2	2	2
3	3	3	3	3
4	4	4	4	4
5	5	5	5	5
●	6	6	6	6
7	7	7	7	7
8	8	8	8	8
9	9	9	9	9

**16** The correct answer is B (135 degrees).

Strand: C—Geometry and Spatial Sense

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 draws and/or models two- and three-dimensional shapes, and uses appropriate geometric vocabulary; and MA.C.1.3.1 understands the basic properties of, and relationships pertaining to, regular and irregular geometric shapes in two and three dimensions.)

Since the polygon is a rhombus, line segment AD and line segment BC must be parallel. Line segment AB acts as a transversal so  $\angle EAB$  and  $\angle ABC$  are alternate interior angles.



Alternate interior angles of parallel lines cut by a transversal are congruent. Therefore,  $\angle ABC$  must be 135 degrees.