Alabama Reading and Mathematics Test<sup>+</sup>

**Item Specifications** 

for

# Mathematics

# Grade 8



Alabama State Department of Education Montgomery, Alabama December 2011

# NUMBER AND OPERATIONS

# **Content Standard 1**

#### Use various strategies and operations to solve problems involving real numbers.

#### **Item Type**

Multiple-choice Gridded

#### **Additional Information**

Estimation may be required. Word problems/real-life situations may be used. Proportional reasoning may be required. Any representation of a real number may be used.

#### Sample Multiple-Choice Items

1.	As the team's fundraisers, Agnes and Betty both sold candy bars. At the end of the fundraiser, Agnes determined that she sold 8 more candy bars than Betty sold. If Agnes and Betty sold a total of 348 candy bars, how many did Betty sell?					
17	170 121 117 81					
A	A*BCD					

<ul> <li>2. Mrs. Salinas is making a test for her history class. There are these types of questions on the test: fill-in-the-blank, multiple-choice, and essay. So far, Mrs. Salinas has written 10 fill-in-the-blank, 21 multiple-choice, and 3 essay questions for the test.</li> <li>Which of the following can be added to the test so that</li> </ul>	<ul> <li>3. A sporting goods store sells soccer balls for a regular price of \$40 each. If a team buys 20 or more soccer balls, the store offers a discount of 15% off the price of each soccer ball.</li> <li>How much more will it cost a team to buy 20 soccer balls than to buy 15 soccer balls?</li> <li>A \$80 *</li> <li>B \$100</li> </ul>
exactly $\frac{3}{5}$ of the test will be multiple-choice questions?	C \$170 D \$200
<ul> <li>A 3 fill-in-the-blank and 2 essay questions</li> <li>B 2 fill-in-the-blank, 3 multiple-choice, and 1 essay question *</li> <li>C 4 multiple-choice and 3 essay questions</li> <li>D 2 fill-in-the-blank, 1 multiple-choice, and 3 essay questions</li> </ul>	<ul> <li>4. Marina's school filled 4 <sup>5</sup>/<sub>6</sub> buses to take people on a trip to the country. Each bus holds 72 people.</li> <li>How many people rode the buses on the trip?</li> </ul>
	432 348 300 288

A

С

D

В\*

5. Which number is <i>closest</i> to 33% of 700?						
400	330	210	100			
A	В	С*	D			

6.	Diana has 4 quarts of water. She poured all the water into pint containers. Each pint container was filled to capacity.
	How many pint containers did she use?

A	в*	C	D
2	8	16	40

 Each student in Mr. Hoffman's class needs 3 sheets of graph paper for the math project. Each packet of graph paper holds 25 sheets. There are 28 students in his class.

What is the fewest number of packets of graph paper Mr. Hoffman will need for his students?

Δ	B	· *	D
2	3	4	5

# 8. Jennifer sold an antique desk at a store. The store takes 20% of the total selling price of the desk. The part of the total selling price Jennifer received was \$400.

What was the total selling price of the desk?

**A** \$480

**B** \$500 \*

- **C** \$720
- **D** \$2,000

9. Ing nur sub bec Wh	<ul> <li>9. Ingrid's favorite number is a prime number between 0 and 50. If 8 is subtracted from the number, it becomes a multiple of 9.</li> <li>What is Ingrid's favorite number?</li> </ul>					
17	17 19 26 53					
A *	A* B C D					

10. Mark shrunk a picture to  $\frac{3}{4}$  of its original size. The height of the original picture was 8  $\frac{1}{4}$  inches.

What is the height of the copy?

**A**  $6\frac{3}{16}$  inches **\* B**  $6\frac{1}{4}$  inches **C**  $6\frac{3}{4}$  inches

**D**  $7\frac{1}{2}$  inches



#### Sample Gridded Items

1. Sydney played a video game 43 times last year. He did *not* lose more than 2 games in a row last year.

What is the *greatest* possible number of video games that Sydney could have lost last year?

Mark your answer in the answer grid.

4. A company that rents cars will rent a small car for \$30 per day. Another company will rent the same type of car for \$20 per day plus \$0.08 for each mile driven.

What is the number of miles per day at which the rental fees will be the same?

Mark your answer in the answer grid.

 Lydia, Sarah, and Denise collected campaign buttons. Lydia had 20 more buttons than Sarah. Denise had 3 times as many buttons as Sarah.

> If the total number of campaign buttons the 3 girls had was 120, how many buttons did Lydia have?

Mark your answer in the answer grid.

3. Larry has 66 music CDs. He has 2 times as many rock CDs as country CDs. He has 3 times as many rock CDs as hip-hop CDs.

How many rock CDs does Larry have?

Mark your answer in the answer grid.

5. A group of 5 adults and 4 children went to the movies. The price for each movie ticket was a whole number dollar amount with tax included. Each adult ticket cost more than each child ticket. A total of \$50 was paid for the tickets.

What is the cost of a child's ticket?

Mark your answer in the answer grid.

6. A movie-rental company has two plans.

The first plan has a charge of \$7 per month and then \$1 per movie rented.

The second plan has a charge of \$20 per month and then \$0.50 per movie rented.

Bill has the first plan and Deanna has the second plan.

Last month, they both paid exactly the same amount of money and rented the same number of movies.

Exactly how much money did Bill and Deanna each pay last month for their movie rentals?

Mark your answer in the answer grid.

7. A basketball team played 35 games last year. The team won 80% of their games. Of the team's wins,  $\frac{1}{4}$  went into overtime.

How many of the basketball team's wins went into overtime?

Mark your answer in the answer grid.

8. There are three different flavors of fruit juice in a cooler. There is the same number of bottles of apple juice as bottles of grapefruit juice. There are 4 more bottles of orange juice than the other kinds of juice combined. There is a total of 60 bottles of juice.

How many bottles of orange juice are in the cooler?

Mark your answer in the answer grid.

# **Answer Key**

## **Content Standard 1**

#### **Sample Multiple-Choice**

- 1. A
- 2. B
- 3. A
- 4. B
- 5. C
- 6. B
- 7. C
- 8. B
- 9. A
- 10. A
- 11. B

#### **Sample Gridded**

- 1. 29
- 2. 40
- 3. 36
- 4. 125
- 5. \$5
- 6. \$33
- 7. 7
- 8. 32

# NUMBER AND OPERATIONS

# **Content Standard 2**

Simplify expressions containing natural number exponents by applying one or more of the laws of exponents.

#### Item Type

Multiple-choice

#### **Additional Information**

Word problems/real-life situations may be used. Scientific notation may be used. Fractions as bases may be used. Answers may have negative exponents.

#### **Sample Multiple-Choice Items**







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6. After 3 years, the value of a savings bond was  $(1.02^4)^3$  times larger than its original value.

What is the simplified form of  $(1.02^4)^3$ ?

- **A** 1.02<sup>7</sup>
- **B** 1.02<sup>12</sup> **\***
- **C**  $3 \cdot 1.02^4$
- **D**  $3 \cdot 1.02^{12}$



8. Natal marke sides notat the ex to rep squar Whic equiv squar squar	Natalie drew a square and marked the lengths of the sides using exponential notation. She then wrote the expression $5^4 \times 5^4$ to represent the area of the square. Which of the following is equivalent to the area, in square units, of Natalie's square?			
5	5 <sup>8</sup>	5 <sup>16</sup>	5 <sup>20</sup>	
Α	в *	С	D	

9. Which of the following is equivalent to 4<sup>16</sup>?
A 4<sup>12</sup>/4<sup>4</sup>
B 4<sup>32</sup>/4<sup>2</sup>
C 4<sup>9</sup> • 4<sup>7</sup> \*
D 4<sup>4</sup> • 4<sup>4</sup>





<ul><li>16. Which of the following is equivalent to (3<sup>4</sup>)<sup>2</sup>?</li></ul>					
32	36	3 <sup>8</sup>	3 <sup>16</sup>		
Α	В	C *	D		





18. A parking lot has an area of  $2^{18}$  square feet.

Which of the following is equivalent to  $2^{18}$ ?

- **A**  $2^{19} \bullet 2^1$
- **B**  $2^6 \cdot 2^3$
- **C**  $2^6 \cdot 2^6 \cdot 2^6 *$
- **D**  $2^9 \cdot 2^2 \cdot 2^1$

# **Answer Key**

# **Content Standard 2**

**Sample Multiple-Choice** 

- 1. C
- 2. B
- 3. B
- 4. D
- 5. A
- 6. B
- 7. C
- 8. B
- 9. C
- 10. A
- 11. A
- 12. D
- 13. C
- 14. D
- 15. D
- 16. C
- 17. A
- 18. C

# NUMBER AND OPERATIONS

# **Content Standard 3**

Use order of operations to evaluate and simplify algebraic expressions.

#### Item Type

Multiple-choice Gridded

#### **Additional Information**

Substitution may be required. Raising a number to a power may be required. Word problems may be used.

#### **Sample Multiple-Choice Items**



2.	If the which to $\frac{6m}{24r}$	If the denominator is not zero, which expression is equivalent to $\frac{6m^2n}{24mn}$ ?				
<u>1</u>	$\frac{n}{4}$	$\frac{m^3n^2}{4}$	$\frac{m^3}{4}$	$\frac{1}{4}$		
A *		В	С	D		

3.	Each side of a square measures $(3k + 5)$ units, and its perimeter can be expressed as $4(3k + 5)$ units. Which of the following is another way of expressing this perimeter?
A	3k + 9 <b>C</b> $12k + 5$
В	12k + 20 * <b>D</b> $7k + 9$

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4. Which is equivalent to the expression shown below? $4y - 2y(y) + 10y \div 2y$	6. Whice expression of the formation of	h is equivale ssion shown 4 • 3b –	ent to the below? $6 \cdot 4b$	
<b>A</b> $y + 5y$	<sup>-</sup> 12b	-3 <i>b</i>	6 <i>b</i>	2 <i>b</i>
<b>B</b> $2y^2 + 5y$	A *	В	С	D
<b>C</b> $-2y + 3y + 12$				
<b>D</b> $-2y^2 + 4y + 5$ <b>*</b>				
5. Which is equivalent to the expression shown below?	7. What belov	t is the value $x$ if $x = 4$ , $p = \frac{x^4 + 8}{2p + 6}$	of the expression of the expression of the expression of $q = 1$ 9, and $q = 1$ $\frac{3}{1} - 5$	ession 2?
14 + 7(4r) - 20	.95	3.8	4.1	7.4
	A	в*	C	D
A $3r - 35$ C $11r + 6$ B $4r + 1$ D $28r - 6$ *				
	8. What belov	t is the value x if $x = 4$ and $3x^3 + 3x^3 +$	of the expression of the expr	ession
	99	108	153	264
	A	В	С	D *

9.	Karl makes a rectangle with a length that is 4 inches longer than its width. He divides the rectangle into 3 smaller rectangles of equal size. The expression below can be used to determine the area of each of the smaller rectangles when the original rectangle has a width of w inches
	rectangle has a width of <i>w</i> inches.

$$\frac{w^2 + 4w}{3}$$

What is the area, in square inches, of each of the smaller rectangles when w = 6 inches?

- **A** 12
- **B** 20 \*
- **C** 36
- **D** 60

10. Thomas and Audrey ordered 1 salad for \$8, 2 pizzas for *x* dollars each, and 2 glasses of juice for \$3 each. Their total cost in dollars can be represented by the expression 8 + 2(x + 3).

Which expression is equivalent to 8 + 2(x + 3)?

- **A** 2x + 11
- **B** 2x + 14 \*
- **C** 10x + 3
- **D** 10x + 30

#### **Sample Gridded Items**

1. If x = 5, y = 2, and z = 3, what is the value of the expression below?

 $2(x + y) - \frac{2z}{5} + 3x^2$ 

Mark your answer in the answer grid.

3. If p = 3 and q = 2, what is the value of the expression below?

 $(p + q)^3$ 

Mark your answer in the answer grid.

2. If m = 4 and n = 5, what is the value of the expression below?

 $2m^3 - 3n^2$ 

Mark your answer in the answer grid.

4. If k = 5 and m = 16, what is the value of the expression below?

$$k^3 + [(m \div 4) + 3^2 \bullet 20]$$

Mark your answer in the answer grid.

5. If m = 4, n = -2, and q = 2, what is the value of the expression below?

$$(2m-n)^2 + q \div 2$$

Mark your answer in the answer grid.

# **Answer Key**

# **Content Standard 3**

**Sample Multiple-Choice** 

- 1. C
- 2. A
- 3. B
- 4. D
- 5. D
- 6. A
- 7. B
- 8. D
- 9. B
- 10. B

#### Sample Gridded

- 1. 87.8 OR  $\frac{439}{5}$  OR 87  $\frac{4}{5}$
- 2. 53
- 3. 125
- 4. 309
- 5. 101

# ALGEBRA

# **Content Standard 4**

#### Graph linear relations by plotting points or by using the slope and y-intercept.

**Item Type** 

Multiple-choice Open-ended

#### **Additional Information**

Identification of a graph given either the slope and *y*-intercept, *x*-intercept and *y*-intercept, ordered pairs, a table of values for *x* and *y*, or equation may be required.Constructing a graph of a linear equation on a coordinate plane may be required.Word problems/real-life situations may be used.Equations may be expressed in standard form.Determining the slopes and *y*-intercepts of a line may be required.Options may be four graphs.

#### **Sample Multiple-Choice Items**

(continued on next page)























#### Sample Open-Ended Items

This problem requires you to show all your work or explain all your reasoning. You may use drawings, words, or numbers in your answer. Your answer should be written so that another person could read it and understand your reasoning.

- 1. Construct a coordinate plane and label the axes. Plot the points M (4, 3), N (0, 5), and K ( $^2$ , 6) on the coordinate plane. Draw a line through the points.
  - a. What are the slope and *y*-intercept of the line?
  - b. Write the equation of the line in slope-intercept form.

Show all your work or explain your reasoning *for each part* in the space provided in the answer document.

This problem requires you to show all your work or explain all your reasoning. You may use drawings, words, or numbers in your answer. Your answer should be written so that another person could read it and understand your reasoning.

2. Wilson is making chocolate milk by adding chocolate syrup to white milk. The table below shows the amount of chocolate syrup needed for the amount of white milk.

Chocolate Milk			
Chocolate Syrup (in teaspoons)	White Milk (in cups)		
6	2		
9	3		
12	4		

- a. Create a coordinate plane and label the axes. Graph the data shown in the table *as a line*.
- b. What is the slope of the line?

- 3. Jenalysa was asked to graph the equation 3x + y = -4.
  - a. Create a table with 4 ordered pairs that are on the line of the equation.
  - b. Create a coordinate plane and label the axes. Graph the equation 3x + y = -4 using the ordered pairs from the table.
  - c. What are the slope and *y*-intercept of the line?

Show all your work or explain your reasoning *for each part* in the space provided in the answer document.

This problem requires you to show all your work or explain all your reasoning. You may use drawings, words, or numbers in your answer. Your answer should be written so that another person could read it and understand your reasoning.

- 4. A movie rental store charges \$5 for a monthly membership and \$3 for every movie rented during the month. The monthly rental cost can be represented by the equation y = 3x + 5, where x is the number of movies rented and y is the total cost for the month.
  - a. Create a table that shows 4 ordered pairs that make the equation true.
  - b. Construct a coordinate plane and label the axes. Graph the equation y = 3x + 5 using the ordered pairs from the table.
  - c. Explain why the function, for this situation, should only exist in Quadrant I.

Show all your work or explain your reasoning *for each part* in the space provided in the answer document.

- 5. Malcolm wants to graph the equation y = x 6.
  - a. What are the slope and *y*-intercept of Malcolm's equation?
  - b. Create a coordinate plane and label the axes. Draw the line of the equation y = x 6 using the slope and *y*-intercept.

Show all your work or explain your reasoning *for each part* in the space provided in the answer document.

This problem requires you to show all your work or explain all your reasoning. You may use drawings, words, or numbers in your answer. Your answer should be written so that another person could read it and understand your reasoning.

- 6. A line has a slope of 2 and a *y*-intercept of -4.
  - a. Create a coordinate plane and label the axes. Draw a line with a slope of 2 and a *y*-intercept of -4.
  - b. Write the equation of the line from **part a** in slope-intercept form.

7. Lou created the table below to show the amount of money he earns, *y*, for mowing a person's lawn based on the number of hours, *x*, he spends mowing. He charges \$15 at the beginning of the summer for expenses.

Number of Hours Spent Mowing	Amount Earned (in dollars)
0	15
2	35
4	55
6	75

#### Lou's Lawn Mowing Service

- a. Create a coordinate plane and label the axes. Graph the data shown in the table *as a line*.
- b. What is the equation of the line in slope-intercept form?

Show all your work or explain your reasoning *for each part* in the space provided in the answer document.

This problem requires you to show all your work or explain all your reasoning. You may use drawings, words, or numbers in your answer. Your answer should be written so that another person could read it and understand your reasoning.

- 8. Abby wants to graph the equation y + 4 = 3x.
  - a. What are the slope and *y*-intercept of the equation?
  - b. Create a coordinate plane and label the axes. Draw the line of the equation y + 4 = 3x using the slope and *y*-intercept.



10. An outdoor fish pond is losing water. The table below shows the number of gallons remaining in the pond each week.

FISH FOND			
Week	Gallons Remaining		
0	30		
1	29 $\frac{3}{4}$		
2	$29\frac{1}{2}$		
3	29 <u>1</u>		

Fish Pond

- a. Create a coordinate plane and label the axes. Graph the data shown in the table *as a line*.
- b. What is the equation of the line in slope-intercept form?
- 11. A taxicab company charges a \$2 fee when a rider enters the taxicab plus \$4 for each mile traveled. The cost for a taxicab ride can be represented by the equation, y = 4x + 2, where x is the number of miles traveled and y is the total cost for the taxicab ride.
  - a. Create a table that shows 4 ordered pairs that make the equation true.
  - b. Construct a coordinate plane and label the axes. Graph the equation y = 4x + 2 using the ordered pairs from the table.

12. Kyle started with 8 baseball figurines. He collects new baseball figurines each month. At the end of each month, he has added a total of 3 new baseball figurines to his collection. He made the table below to show how many baseball figurines he had in his collection after each of the first 3 months.

Month	Figurines Collected
0	8
1	11
2	14
3	17

### **Baseball Figurines Collected**

- a. Construct a coordinate plane and label the axes. Plot the points in the table and draw a line through the points.
- b. What is the slope of the line?
- c. Draw a new line to show the number of baseball figurines Kyle will have collected if he still starts with 8 baseball figurines and adds 2 baseball figurines to his collection each month.

# **Answer Key**

# **Content Standard 4**

### **Sample Multiple-Choice**

- 1. A
- 2. D
- 3. C
- 4. C
- 5. B
- 6. A
- 7. D
- 8. A
- 9. B
- 10. D
- 11. A

# ALGEBRA

# **Content Standard 5**

#### Solve problems involving linear functions.

Item Type

Multiple-choice Gridded

#### **Additional Information**

Equations may be expressed in terms of f(x).

Determining the value of a variable in a linear equation given the values of other variables in the linear equation may be required.

A special relationship between lines on a coordinate plane may be required (same line, intersecting lines, parallel lines, and perpendicular lines).

Word problems/real-life situations may be used.

Determining the equation of a line given two ordered pairs or set of points may be required.

Determining the equation of a line given the line graphed on the coordinate plane may be required. The options may be four equations.

#### **Sample Multiple-Choice Items**



<ul> <li>3. The cost, in dollars go to the art muser by the equation <i>c</i> = How much does it 76 students to go to</li> </ul>	5, for x student 1 m is represent = $2x + 30$ . cost for o the art muse	to ed 5. After canoeing for 5 miles, Andrea hiked at a rate of 4 miles per hour for <i>x</i> hours. Which linear function represents the total distance, $f(x)$ , that Andrea traveled?
\$68 \$152	\$182	5212 <b>A</b> $f(x) = 4(x + 5)$ <b>B</b> $f(x) = 4x + 5$
А В	L *	<b>D B</b> $f(x) = 4x + 5^{-1}$ <b>C</b> $f(x) = 5(x + 4)$
		<b>D</b> $f(x) = 5x + 4$
4. Kelly uses the equat to keep a record of h	ion $y = 12 - \frac{2}{3}$ now many cup	
of cereal, <i>y</i> , remain a number of servings,	after a specified <i>x</i> .	6. If $(x, 5)$ is a solution to the equation $3x + 5y = -5$ , what is the value of <i>x</i> ?
Which ordered pair the equation?	is a solution to	<b>A</b> -10 <b>*</b>
<b>A</b> (4, 6)		<b>B</b> <sup>-</sup> 4
<b>B</b> (8, 6)		<b>C</b> 2
<b>D</b> (16, 6)		<b>D</b> $6\frac{2}{3}$

7. Which statement describes the relationship between the line graphs of the equations below?

$$y = -2x + 4$$

 $y = \frac{1}{2}x + 4$ 

- **A** The line graphs are the same line.
- **B** The line graphs are parallel lines.
- **C** The line graphs are perpendicular lines. **\***
- **D** The line graphs intersect, but are not perpendicular.



A *	В	с	D

9. Jason practices the trumpet  $3\frac{2}{5}$  hours each week. The table below shows the total hours he had practiced at the end of each week.

### **Jason's Trumpet Practice**

Week	Total Hours
1	$3\frac{2}{5}$
2	$6\frac{4}{5}$
3	$10\frac{1}{5}$

In total, how many hours will Jason have practiced at the end of 7 weeks?

$14 \frac{1}{5}$	$20\frac{2}{5}$	$23 \frac{4}{5}$	$27 \frac{1}{5}$
Α	В	C *	D

10. When purchasing a bus pass, the total cost for riding the bus *x* times is represented by the linear function f(x) = 1.25x + 40.

What is the value of f(24)?

30	64	70	80
Α	В	C *	D

#### Sample Gridded Items

1. Vivian is driving from Alabama to Georgia. She is driving at a constant speed on the highway. The table below shows her distance from the Alabama state line.

#### **Distance by Time**

Time of Day	Distance from Alabama State Line (in miles)
1:00 р.м.	20
1:04 р.м.	15

How many minutes after 1:00 <sub>P.M.</sub> will it be when Vivian drives across the Alabama state line?

Mark your answer in the answer grid.

2. Cassidy's pickup truck decreased in value at a constant rate at the start of each successive year. The pickup truck was worth \$16,500.00 in 1996 and \$10,100.00 in 1998. When the pickup truck was worth \$500.00, Cassidy sold it.

In what year did Cassidy sell the pickup truck?

Mark your answer in the answer grid.

3. What is the greatest number in the range of the function f(x) = 3x - 5 when the domain is  $\{-3, -2, -1, 0, 1, 2, 3\}$ ?

Mark your answer in the answer grid.

4. The cost of a magazine subscription increases each year by the same amount. In the first year, the cost of the subscription is \$22. In the fourth year, the cost of the subscription is \$26.50.

In how many years will the subscription cost \$34?

Mark your answer in the answer grid.

# **Answer Key**

# **Content Standard 5**

### **Sample Multiple-Choice**

- 1. B
- 2. D
- 3. C
- **4.** C
- 5. B
- 6. A
- 7. C
- 8. A
- 9. C
- 10. C

#### Sample Gridded

- 1. 16
- 2. 2001
- 3. 4
- 4. 9

61

# ALGEBRA

## **Content Standard 6**

Solve multi-step linear equations, including equations requiring the use of the distributive property.

#### Item Type

Multiple-choice Gridded

#### **Additional Information**

Coefficients may be simple fractions or decimals. One or two sets of parentheses may be used. The solution to the equation may be a fraction or a decimal. "No solution" may be a choice.

#### **Sample Multiple-Choice Items**

1. What equat	t is the value tion below? $\frac{1}{2}(3m + 2) = \frac{1}{2}$	of <i>m</i> in the $\frac{1}{3}(5m + 10)$	)	2. What equat	is the value ion below? $\frac{k+4}{5}$	e of <i>k</i> in the = 11	
-26	-1 4	_ 14		51	35	12	2
26	14	19	1 <u>19</u>	A *	В	С	D
A	В *	C	U				



63

#### **Sample Gridded Items**

1. What is the value of *m* in the equation below?

2m - 3 = m + 6

Mark your answer in the answer grid.

4. What is the value of *y* in the equation below?

$$2\left(\frac{55-y}{3}\right) = 24$$

Mark your answer in the answer grid.

2. What is the value of *x* in the equation below?

2(x + 5) = 16 - 4x

Mark your answer in the answer grid.

$$6(k-2) = \frac{1}{3}(9+3k)$$

Mark your answer in the answer grid.

3. What is the value of *g* in the equation below?

$$9(g) - 13 = \frac{115}{5}$$

Mark your answer in the answer grid.

6. What value of *t* makes the 9. What value of *h* makes the equation below true? equation below true? 3t = t + 2478 - h = 5hMark your answer in the answer grid. Mark your answer in the answer grid. What is the value of *d* in the 7. 10. What is the value of *x* in the equation 5d = 8d - 36? equation below? Mark your answer in the answer grid. 2.1(x+3) = 4x + 1.74Mark your answer in the answer grid. What value of *y* makes the 8. equation below true? 7y = 4(y + 33)11. What is the value of *c* in the equation below? Mark your answer in the answer grid. 0.8(35 - c) = 16

Mark your answer in the answer grid.

# **Answer Key**

# **Content Standard 6**

#### **Sample Multiple-Choice**

- 1. B
- 2. A
- 3. C
- 4. B
- 5. A
- 6. C
- 7. D
- 8. D

#### Sample Gridded

1. 3 2. 1 3. 4 4. 19 5. 3 6. 12 7. 12 8. 44 9. 13 10. 2.4 OR  $2\frac{4}{10}$  OR  $\frac{24}{10}$  OR  $2\frac{2}{5}$  OR  $\frac{12}{5}$ 11. 15

66

# **GEOMETRY**

# **Content Standard 7**

#### Solve problems using the Pythagorean Theorem.

#### **Item Type**

Multiple-choice Gridded Open-ended

#### **Additional Information**

Word problems/real-life situations may be used. Diagrams may be included. Determining the missing leg or hypotenuse of a right triangle may be required. Determining whether a figure is a right triangle may be required. No radical will be included. Extracting a perfect square root may be required.

#### **Sample Multiple-Choice Items**





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5. A rig mea nea leng of th	ght triangle h suring 15 inc suring 9 inch sth, in inches ne triangle?	as a hypoter hes and one les. What is , of the othe	nuse leg the r leg		
3	3 6 10 12				
Α	A B C D*				

A B C* D					
2 9 10 14					
6. Cameron walked 8 blocks due east and then 6 blocks due north. What is the shortest distance, in blocks, from the point where Cameron started to where she ended?					



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#### **Sample Gridded Items**





3. From the front door of his house, Darren walked 9 yards due east and 12 yards due south. What is the shortest distance, in yards, from Darren's starting point to where he stopped?

Mark your answer in the answer grid.



#### **Sample Open-Ended Items**

This problem requires you to show all your work or explain all your reasoning. You may use drawings, words, or numbers in your answer. Your answer should be written so that another person could read it and understand your reasoning.

A company sells two different types of tents. The figures below represent the size and shape of the tents.



- a. For the two-person tent, the height of the tent is 6 feet, and the diagonal side of the tent is 10 feet. What is the width in feet, *x*, of the tent?
- b. For the party tent, the height of the tent is 17 feet, and the width of the tent is 24 feet. What is the length in feet, *y*, of the diagonal side of the tent?

- 2. Devon designed a sign for his company. The sign is in the shape of a triangle with side lengths of 7 feet, 9 feet, and 15 feet.
  - a. Explain how you know that Devon's sign is *not* a right triangle.
  - b. Devon wants to redesign the sign so that it is a right triangle with a hypotenuse of 15 feet. Describe the changes that Devon could make to either or both of the other two sides of the sign.
  - c. Devon wants to design a second sign that is a right triangle with a hypotenuse of 26 feet and a leg of 10 feet. What should be the length, in feet, of the other leg of Devon's second sign?





- a. Using the side lengths, explain why triangle *ABC* is a right triangle.
- b. Mr. Keene erased and relabeled the side lengths of triangle *ABC*. The new lengths were each 5 inches less than the original lengths. Explain why triangle ABC can no longer be called a right triangle.



73

# **Answer Key**

# **Content Standard 7**

#### **Sample Multiple-Choice**

- 1. D
- 2. A
- 3. B
- 4. B
- 5. D
- 6. C
- 7. B

#### **Sample Gridded**

- 1. 5
- 2. 12
- 3. 15

# Sample Open-Ended

(continued on next page)

# **GEOMETRY**

## **Content Standard 8**

Compare quadrilaterals, triangles, and solids using their properties and characteristics.

#### **Item Type**

Multiple-choice

#### **Additional Information**

Identifying the properties and characteristics of all types of quadrilaterals, triangles, and solids will be required.

Identifying the relationships between types of quadrilaterals, triangles, and solids will be required.

#### **Sample Multiple-Choice Items**

- 1. Which of the following statements about quadrilaterals is *always* true?
- **A** All parallelograms are similar.
- **B** All squares are rhombuses. **\***
- **C** All rectangles are congruent.
- **D** All trapezoids are parallelograms.

2.	How much greate the interior angle than the sum of t of a right triangle	r is the sum s of a rhom he interior a ?	ı of bus angles
0°	45°	90°	180°
A	В	C	D *

- 3. Which figure below does *not* have at least 1 rectangular face?
- **A** Triangular pyramid **\***
- **B** Triangular prism
- **C** Square pyramid
- **D** Pentagonal prism
- 4. If the base angles of two isosceles triangles are congruent, which statement is *always* true?
- **A** The triangles are right triangles.
- **B** The triangles are congruent.
- **C** The triangles are equilateral.
- **D** The triangles are similar. **\***
- 5. Which of these statements about triangles is *not* true?
- **A** An isosceles triangle can also be a right triangle.
- **B** An acute triangle can also be an equilateral triangle.
- **C** A right triangle can also be an obtuse triangle. **\***
- **D** An obtuse triangle can also be an isosceles triangle.

- 6. The measure of the side of rhombus *GHIJ* is equal to the measure of the side of square *RSTU*. Which statement about the two quadrilaterals must be true?
- **A** Their angle measures are equal.
- **B** Their diagonal measures are equal.
- **C** Their areas are equal in measure.
- **D** Their perimeters are equal. **\***
- 7. The perimeters of an equilateral triangle and a square are the same.

Which is *always* true about the length of a side of the triangle and the length of a side of the square?

- A The length of a side of the triangle is equal to the length of a side of the square.
- **B** The length of a side of the triangle is less than the length of a side of the square.
- **C** The length of a side of the triangle is two times the length of a side of the square.
- D The length of a side of the triangle is greater than the length of a side of the square.\*



9. Which special q	uadrilateral could be cor	istructed with the side lengths	shown below?
	3 cm	5 cm	
	4 cm	3 cm	
<b>A</b> Rhombus			
<b>B</b> Rectangle			
<b>C</b> Parallelogram			
<b>D</b> Isosceles trapezo	id <b>*</b>		

81

- 10. Which describes a geometric solid with *exactly* 5 faces, 9 edges, and 6 vertices?
- **A** Triangular pyramid
- **B** Rectangular pyramid
- **C** Triangular prism **\***
- **D** Rectangular prism
- 11. Drew has a sticker in the shape of a quadrilateral with *exactly* 2 right angles, *exactly* 1 pair of parallel sides, and no sides that are the same length.

What is the shape of Drew's sticker?

- **A** Rhombus
- **B** Trapezoid \*
- **C** Rectangle
- **D** Parallelogram



83

# **Answer Key**

# **Content Standard 8**

### **Sample Multiple-Choice**

- 1. B
- 2. D
- 3. A
- 4. D
- 5. C
- 6. D
- 7. D
- 8. A
- 9. D
- 10. C
- 11. B
- 12. C

# MEASUREMENT

# **Content Standard 9**

Determine the measures of special angle pairs, including adjacent, vertical, supplementary, and complementary angles, and angles formed by parallel lines cut by a transversal.

#### **Item Type**

Multiple-choice Gridded

#### **Additional Information**

Diagrams may be included. Knowledge of the sum of angles may be required. Determining measurements of angles when the measurements of angles are expressed as algebraic expressions may be required.

#### **Sample Multiple-Choice Items**









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14. Angle <i>R</i> and angle <i>P</i> are vertical angles. The measure of angle <i>R</i> is 43°.					15. What is the measure of the angle that is supplementary to a 55° angle?			
What	is the meas	sure of angle <i>P</i> ?			35°	55°	125°	305°
43°	47°	133°	137°		Α	В	C *	D
A *	В	С	D	-				

91

#### **Sample Gridded Items**












# **Answer Key**

# **Content Standard 9**

### **Sample Multiple-Choice**

- 1. C
- 2. D
- 3. B
- 4. B
- 5. B
- 6. B
- 7. C
- 8. C
- 9. A
- 10. D
- 11. C
- 12. B
- 13. D
- 14. A
- 15. C

### **Sample Gridded**

- 1. 30
- 2. 65
- 3. 143
- 4. 54
- 5. 62
- 6. 30

# MEASUREMENT

## **Content Standard 10**

### Find the perimeter and area of regular and irregular plane figures.

### **Item Type**

Multiple-choice Gridded

### **Additional Information**

Determining the area of a figure when given the perimeter of the figure may be required. Word problems may be used. Drawings may be used. Determining the area of a part of a circle may be required. Options may be left in terms of  $\pi$ . Unnecessary dimensions may be given. Inscribed figures may be used.

### **Sample Multiple-Choice Items**







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#### **Sample Gridded Items**



2. The figure below shows two shaded isosceles triangles in a square. The square has a perimeter of 32 inches.



What is the area, in square inches, of the two shaded isosceles triangles in the square?

Mark your answer in the answer grid.

3. The trapezoid shown below has an area of 60 square centimeters. What is the perimeter, in centimeters, of the trapezoid?



Mark your answer in the answer grid.



# **Answer Key**

# **Content Standard 10**

### **Sample Multiple-Choice**

- 1. C
- 2. D
- 3. C
- 4. A
- 5. C
- 6. A
- 7. B
- 8. A

### Sample Gridded

- 1. 163
- 2. 32
- 3. 36
- 4. 64
- 5. 32
- 6. 64

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# MEASUREMENT

# **Content Standard 11**

### Determine the surface area and volume of rectangular prisms, cylinders, and pyramids.

### **Item Type**

Multiple-choice Open-ended

### **Additional Information**

Word problems/real-life situations may be used. Drawings may be used. A fractional representation of a real number may be used.

### **Sample Multiple-Choice Items**

- 1. What is the effect on the volume of a right cylinder if its radius is tripled?
- **A** The volume is 3 times greater.
- **B** The volume is 6 times greater.
- **C** The volume is 9 times greater. **\***
- **D** The volume is 12 times greater.





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7. Darius is decorating the cylinder shown below.						
	6 in. 9 in.					
	Which is <i>closest</i> to the surface area, in square inches, of the cylinder?					
A	197.82					
В	226.08 *					
С	254.34					
D	365.20					

8.	The bo in the prism. 18 cen 4 cent What centin	ox for Bryan shape of a It is 12 cer timeters lo imeters hig is the surfa neters, of th	n's frozen me rectangular ntimeters wid ng, and h. ce area, in sq ne box?	eal is le, uare
20	4	336	672	864
A		В	C *	D



#### **Sample Open-Ended Items**

This problem requires you to show all your work or explain all your reasoning. You may use drawings, words, or numbers in your answer. Your answer should be written so that another person could read it and understand your reasoning.

Yolanda bought a fish tank in the shape of a right rectangular prism like the one pictured below.
 Image: state of the shape of a right rectangular prism like the one pictured below.
 Image: state of the shape of a right rectangular prism like the one pictured below.
 Image: state of the shape of a right rectangular prism like the one pictured below.
 Image: state of the shape of a right rectangular prism like the one pictured below.
 Image: state of the shape of a right rectangular prism like the one pictured below.
 Image: state of the shape of a right rectangular prism like the one picture of the shape of the sh

2. The drawing shown below represents the cylindrical container a company uses to package a game.



- a. What is the volume of the cylinder?
- b. The lateral surface of the container will be covered with a label. The circular bases will not be covered with the label. What is the *least* area of a label that will cover the lateral surface of the container?
- c. The company is also making a larger version of the game. It will be packaged in a cylinder with the same height as the original, but the radius will be doubled. How many times greater will the volume of the larger cylinder be compared to the original cylinder?

Show all your work or explain your reasoning *for each part* in the space provided in the answer document.

- 3. A puzzle comes in a plastic package in the shape of a rectangular prism. The base of the rectangular prism is a square with side lengths of 5 inches. The package has a height of 2 inches.
  - a. The company that makes the puzzle needs to know the surface area of the package to find the amount of plastic that is needed. What is the surface area of the package?
  - b. What is the volume of the package?
  - c. The puzzle also will come in a package in the shape of a square pyramid. The square pyramid package will have the same base as that of the rectangular prism package. It will also have the same volume as the rectangular prism. What will be the height of the square pyramid package?

Show all your work or explain your reasoning *for each part* in the space provided in the answer document.

4. Hannah is building a model of a square pyramid as shown below.

4. Hannah is building a model of a square pyramid as shown below.

10 in.

a. The base of the pyramid is a square that measures 10 inches on a side. What is the area of the base in square inches?

b. Hannah decides to build the model out of clay. What is the volume of clay, in cubic inches, needed to build the model?

c. Hannah will put her model in a box in the shape of a rectangular prism. The box has the same dimensions for the base and the same height as the square pyramid. How many times greater is the volume of the box than the square pyramid?

Show all your work or explain your reasoning *for each part* in the space provided in the answer document.

- 5. Mrs. Grimes is planning to paint the four walls of her classroom. Some information about the classroom is given below.
  - The four walls are each 8 feet high.
  - The floor is rectangular and is 40 feet long and 30 feet wide.
  - There is one door that is 3 feet wide and 7 feet high.
  - There are 3 windows that are each 3 feet wide and 4 feet high.
  - a. What is the total surface area of the four walls, *including* the door and the windows?
  - b. One can of paint covers 450 square feet. If Mrs. Grimes does not paint the door or the windows, what is the minimum number of cans of paint she will need?

Show all your work or explain your reasoning *for each part* in the space provided in the answer document.

6. Jeremy stores his autographed football in a rectangular prism-shaped container like the one shown below.



- a. What is the surface area of the football container?
- b. What is the volume of the football container?
- c. Jeremy also has an autographed basketball in the shape of a sphere with a diameter of 24 cm. He wants to buy a rectangular prism-shaped container for the basketball with 1.5 times the volume of the football container. Draw or describe a possible container that will hold Jeremy's basketball. Include the lengths of the edges of the container.

Show all your work or explain your reasoning *for each part* in the space provided in the answer document.

# **Answer Key**

# **Content Standard 11**

### **Sample Multiple-Choice**

- 1. C
- 2. A
- 3. B
- 4. D
- 5. B
- 6. C
- 7. B
- 8. C
- 9. D

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# **MEASUREMENT**

## **Content Standard 12**

Determine the lengths of missing sides and measures of angles in similar and congruent figures.

### **Item Type**

Multiple-choice Gridded

### **Additional Information**

Diagrams may be included.

Fraction or decimal representation of a real number may be used.

Determining the measurements of sides when the measurements of the sides are expressed as algebraic expressions may be required.

Inscribed figures may be used.

Reflected figures may be used.

### **Sample Multiple-Choice Items**







A 79.0 inches
B 42.5 inches
C 36.75 inches
D 24.5 inches









### **Sample Gridded Items**













# **Answer Key**

# **Content Standard 12**

### **Sample Multiple-Choice**

- 1. B
- 2. C
- 3. C
- **4.** C
- 5. C
- 6. B
- 7. B
- 8. B
- 9. B

### Sample Gridded

- 1. 10
- 2. 32
- 3. 20
- 4. 20
- 5. 72
- 6. 50

# DATA ANALYSIS AND PROBABILITY

# **Content Standard 13**

### Interpret data from populations using given and collected data.

### **Item Type**

Multiple-choice Open-ended

### **Additional Information**

Word problems/real-life situations may be used. Frequency tables may be used. Constructing a graph to represent the data may be required. Stem-and-leaf plots may be used. Box-and-whisker plots may be used.

### **Sample Multiple-Choice Items**

(continued on next page)





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4.	4. This stem-and-leaf plot shows the number of points scored by basketball players.						
Points Scored by Basketball Players							
		0 5 6	6 8				
		1 0 1	3 3 5 9				
		2 0 1	1 3 7				
		1   4 re	presents 14.				
How many players scored more than 12 points?							
	6	7	8	9			
	Α	В	C	D *			




#### **Sample Open-Ended Items**

This problem requires you to show all your work or explain all your reasoning. You may use drawings, words, or numbers in your answer. Your answer should be written so that another person could read it and understand your reasoning.

1. The number of people at Lula's bus stop each morning for 10 days is listed below.

12, 11, 16, 12, 13, 15, 15, 16, 18, 20

Construct a box-and-whisker plot using the data. Be sure to label the median, the lower quartile, the upper quartile, the minimum value, and the maximum value.

Show all your work or explain your reasoning *for each part* in the space provided in the answer document.

This problem requires you to show all your work or explain all your reasoning. You may use drawings, words, or numbers in your answer. Your answer should be written so that another person could read it and understand your reasoning.

2. The following table shows what Jeremiah charges to baby-sit for a given number of hours.

Baby-Sitting					
Charge (in dollars)	7	12	22	27	
Number of hours	1	2	4	5	

- a. Make a scatter plot to represent this data. Clearly label your graph.
- b. Using your graph, indicate whether there is or is not a relationship between the charge and the number of hours Jeremiah baby-sits.
- c. Using this table and your graph, predict the charge if Jeremiah baby-sits for 8 hours.

Show all your work or explain your reasoning *for each part* in the space provided in the answer document.

This problem requires you to show all your work or explain all your reasoning. You may use drawings, words, or numbers in your answer. Your answer should be written so that another person could read it and understand your reasoning.

3. A store recorded the number of coats it sold each month and the average temperature for the month in the table shown below.

Average Monthly Temperature (in °F)	Number of Coats Sold		
32	75		
43	70		
50	61		
56	55		
60	45		
68	38		

## **Monthly Coat Sales**

- a. Construct a scatter plot to represent the data. Clearly label your graph.
- b. The next month the average temperature is expected to be 72°F. Based on the data, predict the number of coats sold by the store and justify your prediction.

Show all your work or explain your reasoning *for each part* in the space provided in the answer document.

This problem requires you to show all your work or explain all your reasoning. You may use drawings, words, or numbers in your answer. Your answer should be written so that another person could read it and understand your reasoning.



# **Answer Key**

## **Content Standard 13**

#### **Sample Multiple-Choice**

- 1. D
- 2. B
- 3. B
- 4. D
- 5. B
- 6. C
- 7. D

## **Sample Open-Ended**



# DATA ANALYSIS AND PROBABILITY

## **Content Standard 14**

#### Determine the theoretical probability of an event.

## **Item Type**

Multiple-choice Gridded

#### **Additional Information**

Both "and" and "or" situations may be included. Fraction and percent may be used. Word problems/real-life situations may be used.

## **Sample Multiple-Choice Items**

<ol> <li>Mrs. Zepeda has 11 boys and 9 girls in her history class. She will randomly select 1 student to help her grade papers.</li> <li>What is the probability Mrs. Zepeda will select a girl to help her grade papers?</li> </ol>			e t	<ul> <li>2. Callie has 8 red marbles, 6 green marbles, 5 yellow marbles, and 6 blue marbles in a bag. There are no other marbles in the bag. All the marbles are the same size and shape.</li> <li>Without looking. Callie will</li> </ul>
$\frac{11}{100}$	$\frac{11}{20}$	$\frac{9}{10}$	$\frac{9}{20}$	randomly select 1 marble from the bag.
A	В	C	D *	What is the probability that Callie will select either a green or a blue marble from the bag?

$\frac{3}{25}$	$\frac{6}{25}$	$\frac{12}{25}$	$\frac{13}{25}$
Α	В	C *	D

1 F

<ul> <li>3. There are 12 players on Justin's basketball team. The coach randomly selects 2 of the players to lead warm-ups before practice today.</li> <li>What is the probability that Justin is selected to lead warm-ups today?</li> </ul>		's vers ice ustin oday?	5. Kerrio 5 blu beans a jar. same If Ker rando proba a red	e places 6 red e jelly beans, s, and 5 black All jelly bean shape and si rrie chooses 1 om from the ability that sh jelly bean?	jelly beans 4 green jell 5 jelly beans 15 are the 2e. jelly bean a jar, what is 16 will choo	y s in at the se	
12 <b>A</b>	6 <b>B *</b>	5 C	2 D	$\frac{6}{11}$	$\frac{3}{10}$	$\frac{1}{4}$	$\frac{1}{5}$
	's quiz team o	coach has					
4. John	- 1						
4. John 4 geo quest The c 1 que	graphy and 6 ions written coach randon estion to read	6 current eve on note car aly selects to the team bility that t	ents ds. 1.	6. Annie 2 pur penci select	e has 6 green ple, and 8 bla il case. Annie ts one of the p	, 4 red, 4 bla ack pencils randomly pencils.	ue, in her
4. John 4 geo quest The c 1 que What coach	graphy and 6 ions written coach randon estion to read t is the proba n selects a geo	6 current even on note car- nly selects to the team bility that the ography que	ents ds. 1. he estion?	6. Annie 2 pur penci select What select	e has 6 green ple, and 8 bla il case. Annie is one of the p t is the proba	, 4 red, 4 bla ack pencils randomly pencils. bility that A a black pen	ue, in her Annie acil?

16 • *	8 R	4 C	2 D			
$\frac{1}{16}$	$\frac{1}{2}$	$\frac{1}{1}$	$\frac{1}{2}$			
What will f heads	t is the proba lip a coin 4 t s all 4 times?	ability that St imes and get	uart			
7. Zach clean 4 tim	Zach said he would help Stuart clean his room if Stuart flips a coin 4 times and gets heads all 4 times.					

8. A restaurant has a soup-and-salad lunch with the choices listed in the table below. A soup and a salad are selected at random.

#### **Lunch Choices**

So	Soup		d	
Vegetable Beef		Garden		
Tomato    Chicken N	loodle	Caesar		
What is the probability that tomato soup and a garden salad are selected?				
$\frac{1}{6}$	$\frac{1}{5}$	$\frac{1}{3}$	$\frac{5}{6}$	
A *	В	C	D	

9. For breakfast Amanda has oatmeal with fruit. She has 3 flavors of oatmeal: brown sugar, maple, and cinnamon. She has 3 types of fruit: raisins, cranberries, and blueberries. Each flavor of oatmeal and each type of fruit has an equal chance of being selected.

What is the probability that<br/>Amanda randomly selects<br/>cinnamon oatmeal with raisins? $\frac{1}{9}$  $\frac{1}{6}$  $\frac{4}{9}$  $\frac{2}{3}$ 

A *	В	С	D
9	6	9	3

#### **Sample Gridded Items**

1. Caleb has 11 red marbles, 15 green marbles, 8 yellow marbles, 5 white marbles, 9 blue marbles, and 2 black marbles in a bag. There are no other marbles in the bag.

What is the probability that Caleb will select at random either a red or a black marble?

Mark your answer in the answer grid.

2. In Mr. Jackson's class, 70% of the students turned in their homework early, and 50% of those students are male.

If a student is selected at random from Mr. Jackson's class, what is the probability the student will be a male who turned his homework in early?

Mark your answer in the answer grid.

3. In Mrs. Troyer's class, 20% of the girls wear glasses, and 15% of these girls have red hair.

If one girl is selected at random from Mrs. Troyer's class, what is the probability the girl will have red hair and wear glasses?

Mark your answer in the answer grid.

4. Peter has 4 Alabama, 1 New York, and 2 Minnesota state quarters in his pocket. He reaches into his pocket and randomly takes out 1 quarter.

What is the probability that Peter takes out an Alabama or a Minnesota state quarter?

Mark your answer in the answer grid.

5. Jenna has 5 shirts: 1 red, 1 yellow, 1 blue, 1 green, and 1 black.

She also has 3 pairs of pants: 1 black, 1 brown, and 1 blue.

If Jenna selects 1 shirt and 1 pair of pants at random, what is the probability she will select a black shirt and a pair of black pants?

Mark your answer in the answer grid.

# **Answer Key**

# **Content Standard 14**

## **Sample Multiple-Choice**

- 1. D
- **2.** C
- 3. B
- 4. C
- 5. B
- 6. D
- 7. A
- 8. A
- 9. A

## Sample Gridded

- 1.  $\frac{13}{50}$  OR 0.26 OR 26%
- 2.  $\frac{7}{20}$  OR  $\frac{35}{100}$  OR 0.35 OR 35%
- 3.  $\frac{3}{100}$  OR 0.03 OR 3%
- 4.  $\frac{6}{7}$  OR 0.857 OR 85.7%
- 5.  $\frac{1}{15}$  OR 0.067 OR 6.7%