NUMBER AND OPERATIONS

Content Standard 1

Demonstrate computational fluency with addition, subtraction, and multiplication of integers.

Item Type

Multiple-choice
Gridded

Additional Information

Only one operation will be required for each item.
Parentheses or the multiplication symbol (•) will be used for multiplication.
The multiplication symbol (×) will not be used.
Negative integers may be in parentheses.
Integers will not exceed four digits in the stem.
Only two integers will be used in the stem.
No word problems/real-life situations will be used.
One of the options may be NH, which means "Not Here."

Sample Multiple-Choice Items

1. $(^-81) + 15 = \square$

$^-66$	$^-99$	66	96
A *	**B**	**C**	**D**

2. $(^-37) \bullet 6 = \square$

$^-31$	$^-132$	222	NH
A	**B**	**C**	**D** *

3. $2633 - (^-837) = \square$

A 1796
B 1806
C 3470 *
D NH

Sample Gridded Items

1. $157 - 284 = \square$

Mark your answer in the answer grid.

2. $57 \bullet (^-7) = \square$

Mark your answer in the answer grid.

3. $(^-74) - (^-46) = \square$

Mark your answer in the answer grid.

4. $(^-46) \bullet (^-3) = \square$

Mark your answer in the answer grid.

5. $225 - (^-653) = \square$

Mark your answer in the answer grid.

6. $(^-580) - 329 = \square$

Mark your answer in the answer grid.

7. $^-34 \bullet ^-5 = \square$

Mark your answer in the answer grid.

Answer Key

Content Standard 1

Sample Multiple-Choice

1. A
2. D
3. C

Sample Gridded

1. -127
2. -399
3. -28
4. 138
5. 878
6. -909
7. 170

NUMBER AND OPERATIONS

Content Standard 2

Use order of operations to evaluate numerical expressions.

Item Type

Multiple-choice
Gridded

Additional Information

More than one set of parentheses may be used.
The four basic operations (addition, subtraction, multiplication, and division) will be required.
Only integers may be used.
Either the division symbol (÷) or the fractional form may be used for division.
Parentheses or the multiplication symbol (•) will be used for multiplication.
The multiplication symbol (×) will not be used.
Brackets ([ ]) may be used for grouping.
No word problems/real-life situations will be used.

Sample Multiple-Choice Items

1. $(6 \bullet 5) - 2(6 - 3) = \square$

A	B	C *	D
168	56	24	10

2. $4(6 + 12) \div 2 = \square$

A	B *	C	D
48	36	30	18

3. $2 \bullet (31 - 11 \bullet 5) + 43 = \square$

A	B	C *	D
286	243	$^-5$	$^-91$

4. $\dfrac{(3 \bullet 3 + 35)}{(2 \bullet 2)} = \square$

A *	B	C	D
11	19	21	22

5. $\dfrac{(3 \bullet 4) + (15 \bullet 4)}{(2 \bullet 3)} = \square$

22	21	18	12
A	**B**	**C**	**D ***

6. $4 + 24 \div 2 - 2 \bullet 2 = \square$

12	16	24	28
A *	**B**	**C**	**D**

7. $\dfrac{5[(^-4 \bullet {}^-3) + (3 \bullet {}^-2)]}{(^-3) \bullet 1} = \square$

$^-15$	$^-10$	10	45
A	**B ***	**C**	**D**

8. $3 \bullet 2 + 16 \div 2 = \square$

11	14	27	44
A	**B ***	**C**	**D**

9. $\dfrac{2[(9 - 4) \bullet (5 \bullet 6)]}{4} = \square$

55	75	120	300
A	**B ***	**C**	**D**

10. Which expression has a value of 54?

A $34 + 11 \bullet 3^2$
B $8 + 10 \div 2 \bullet 6$
C $5 \bullet 4 + 7 \bullet 2$
D $8 - 6 \bullet 3 + 8^2$ *

Sample Gridded Items

1. $\dfrac{36 + 3(9 - 5)}{3(13 - 5)} = \square$

Mark your answer in the answer grid.

2. $\dfrac{77 \bullet 3 + 9}{15 - 3} \div 5 = \square$

Mark your answer in the answer grid.

3. $65 + 60 \bullet 6 \div 3 - (13 - 39) = \square$

Mark your answer in the answer grid.

4. $8(124 - 42) + 5(7 + 6) = \square$

Mark your answer in the answer grid.

Answer Key

Content Standard 2

Sample Multiple-Choice

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

Sample Gridded

1. 2
2. 4
3. 211
4. 721

NUMBER AND OPERATIONS

Content Standard 3

Solve problems requiring the use of operations on rational numbers.

Item Type

Multiple-choice

Additional Information

The four basic operations (addition, subtraction, multiplication, division) will be required.
Word problems/real-life situations may be required.
Money values may be used.
Mixed numbers may be used.
Solving problems involving addition and subtraction of fractions with common and uncommon denominators may be required.
Changing mixed numbers to improper fractions may be required.
Solving problems involving percents may be required.
One of the options may be NH, which means "Not Here."

Sample Multiple-Choice Items

1. $6\frac{1}{3} + 3\frac{7}{9} = \square$

A $9\frac{8}{27}$

B $9\frac{2}{3}$

C $10\frac{1}{9}$ *

D $11\frac{1}{12}$

2. $5\frac{2}{3} - 2\frac{1}{5} = \square$

A $3\frac{7}{15}$ *

B $3\frac{1}{2}$

C $7\frac{13}{15}$

D $7\frac{3}{8}$

3. $3\frac{8}{9} \cdot \frac{6}{7} = \square$

A $1\frac{19}{21}$

B $3\frac{1}{3}$ *

C $3\frac{16}{21}$

D $4\frac{7}{8}$

4. 30 % of 185 = $\square$

A 5.55

B 55.5 *

C 555

D NH

5. $4\frac{3}{8} \div \frac{5}{8} = \square$

A $\frac{175}{64}$

B 7 *

C $\frac{75}{8}$

D 12

6. $252 \div -28 = \square$

4	-4	9	-9
A	**B**	**C**	**D** *

7. Nadir collected an average of 45.36 kilograms of paper from each of 20 people in his neighborhood.

   If Nadir's goal is to collect 1000 kilograms of paper, how many more kilograms of paper does he need to collect?

A 22.68

B 65.36

C 92.8 *

D 907.2

8. Darryl used a total of 715.74 kilograms of flour to fill bags at a local flour mill. He used 22.68 kilograms of flour to completely fill each bag.

   What is the *greatest* number of bags Darryl completely filled?

33	32	31	30
A	**B**	**C** *	**D**

Answer Key

Content Standard 3

Sample Multiple-Choice

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

ALGEBRA

Content Standard 4

Express a pattern shown in a table, graph, or chart as an algebraic equation.

Item Type

Multiple-choice

Additional Information

Determining an algebraic equation for a pattern shown in a table, graph, or chart will be required.
Any representation of a rational number may be used as values in tables or charts.
Any representation of a rational number may be included in the algebraic equation as a coefficient of a variable or a constant.
Word problems/real-life situations may be used.

Sample Multiple-Choice Items

x	y
12	4
3	1
0	0
-6	-2

1. Which equation is true for all pairs of values for x and y given in the table?

A $y = \frac{x}{3}$ *

B $-3y = x$

C $-x = \frac{y}{3}$

D $3x = y$

The table below represents the number of compact discs that a company duplicates in a given amount of time.

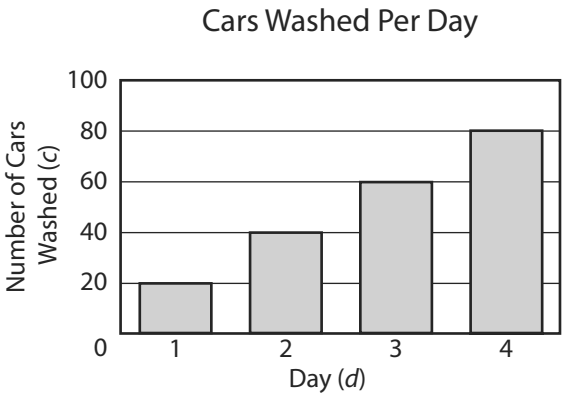
Compact Discs Duplicated

Time (in minutes) (x)	Number of Compact Discs (y)
1.0	120
2.0	240
4.0	480
5.5	660

2. Which equation below *best* represents the number of compact discs duplicated in a given amount of time?

A $x = 120 \div y$
B $x = 120y$
C $y = 120 \div x$
D $y = 120x$ *

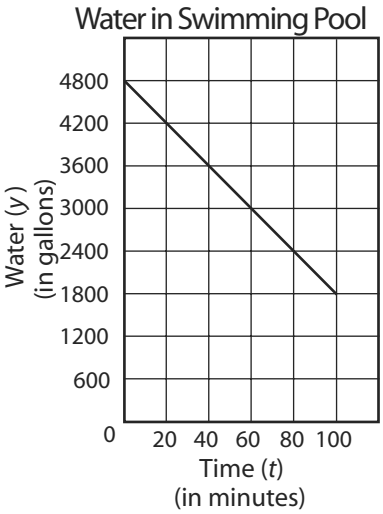
The graph below shows the number of cars washed per day at the local car wash.



3. Which equation below *best* represents the number of cars washed per day at the local car wash?

A $c = 2d + 18$
B $c = \frac{d}{20}$
C $c = 2d + 36$
D $c = 20d$ *

Jake emptied his swimming pool to make repairs. The graph below shows the amount of water in the swimming pool and the amount of time it took to empty it.



4. Which equation below *best* represents the total amount of water in the swimming pool at any given time as Jake emptied it?

A $y = 4800 - 30t$ *
B $y = -30t$
C $y = \frac{t}{30}$
D $y = 30t - 600$

The following table lists the distance completed in a long-distance race for a given amount of time.

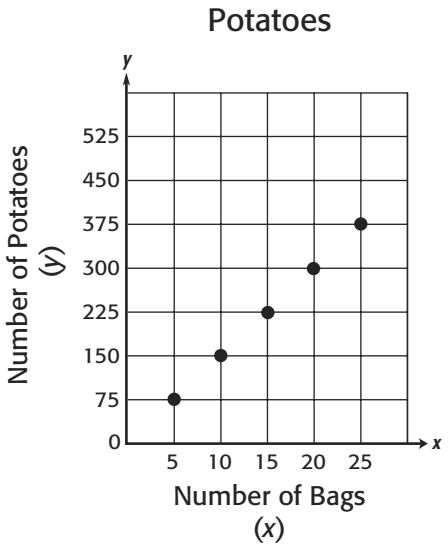
Race Distance

Time (in hours) (x)	**Distance Completed (rounded to nearest mile) (y)**
0.5	4
1.0	8
1.5	12

5. Which equation below represents the distance completed for a given amount of time?

A $x = y \div 4$
B $y = 4x$
C $x = 8y$
D $y = 8x$ *

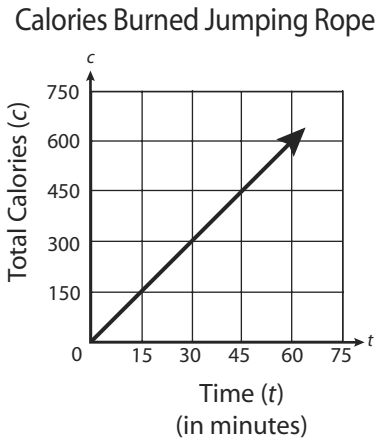
The points graphed below show the total number of potatoes in a specified number of bags at a grocery store.



6. Which equation below *best* represents the total number of potatoes in a specified number of bags?

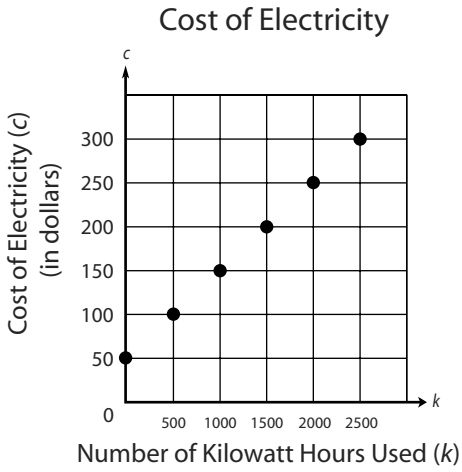
A $x = 15y$
B $x = 5 + 14y$
C $y = 15x$ *
D $y = 5 + 14x$

7. Using the graph below, which of the following equations *best* represents the number of calories (c) in relation to time (t)?



A $c = 10 + t$
B $c = 10t$ *
C $t = 10 + c$
D $t = 10c$

The graph below shows c, the cost of using electricity at a local business, as a function of k, the number of kilowatt hours of electricity used.



8. Which equation below *best* represents the cost of electricity at any specified time?

A $c = 50 + 10k$
B $c = 50 - 10k$
C $c = 50 + 0.1k$ *
D $c = 50 - 0.1k$

The following table lists the amount Janine charges for a given number of hours of babysitting.

Babysitting Charges

Number of hours (x)	**Charges (in dollars) (y)**
1	3.50
2	6.50
3	9.50
4	12.50

9. Which equation below represents the charges (y) for any given number of hours (x)?

A $x = 3.50 \div y$
B $y = 3x + 0.50$ *
C $y = 4x - 0.50x$
D $x = 3.50y$

Answer Key

Content Standard 4

Sample Multiple-Choice

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

ALGEBRA

Content Standard 5

Translate verbal phrases into algebraic expressions and algebraic expressions into verbal phrases.

Item Type

Multiple-choice

Additional Information

Any representation of a rational number may be included in the algebraic equation as a coefficient of a variable or a constant.
Word problems/real-life situations will be used for translating verbal phrases into algebraic expressions.
No word problems/real-life situations will be used for translating algebraic expressions into verbal phrases.

Sample Multiple-Choice Items

1. Which phrase below *best* represents the following expression?

$$4n + 17$$

A 17 more than a number divided by 4
B 4 times the sum of a number and 17
C 17 more than 4 times a number *
D 4 times a number

2. Which of the following is an expression for "four times the difference of 6 and k"?

A $4 \bullet 6 - k$
B $4 - 6k$
C $4 \bullet k - 6$
D $4(6 - k)$ *

3. Which phrase below *best* represents the following expression?

$$3 + \frac{m}{5}$$

A The quotient of a number and 5
B 3 more than the product of 5 and a number
C The product of 5 and 3 more than a number
D 3 more than a number divided by 5 *

4. Manya and Rachel both checked books out of the library. Rachel's book is 32 pages less than 3 times the number of pages in Manya's book.

If the number of pages in Manya's book is represented by m, which expression below *best* represents the number of pages in Rachel's book?

A $32 - 3m$
B $3m - 32$ *
C $32 - m + 3$
D $32m - 3$

5. Tony's fish weighs five pounds more than three times the weight of Mary's fish. Let t represent the weight of Tony's fish, and let m represent the weight of Mary's fish.

Which expression below *best* represents the weight of Tony's fish?

A $3t + 5$
B $3m - 5$
C $3m + 5$ *
D $3t - 5m$

6. Which phrase below *best* represents the following expression?

$$15 - 3y$$

A The difference of 15 and 3 times a number *
B 3 less than 15 times a number
C The sum of 15 and 3 times a number
D 15 less than 3 times a number

7. Which phrase below *best* represents the following expression?

$$\frac{n}{4} + 3n$$

A The sum of a number divided by 4 and the number

B The sum of a number divided by 3 and the number

C The sum of a number divided by 4 and 3 times the number *

D The sum of a number divided by 3 and 4 times the number

8. Which phrase below *best* represents the following expression?

$$(k - 15) \bullet 3$$

A The product of 3 and the difference of a number and 15 *

B 15 less than 3 times a number

C The product of 15 and a number

D 3 more than the product of 15 and a number

9. Which phrase below *best* represents the following expression?

$$(y + 3)(y - 2)$$

A 2 less than 3 more than a number

B 3 more than the product of a number and 2

C The product of a number and 2 less than the number

D The product of 3 more than a number and 2 less than the number *

10. The following expression describes the total cost, in dollars, of ordering x number of DVDs from a website.

$$14.95x - 5.95$$

Which of the following *best* describes the cost for a DVD website order?

A Each DVD costs $14.95, and there is a $5.95 shipping fee per order.

B Each DVD costs $14.95, and there is a $5.95 discount per order. *

C Each DVD costs $14.95, and there is a $5.95 discount per DVD.

D Each DVD costs $14.95, and there is a $5.95 shipping fee per DVD.

Answer Key

Content Standard 5

Sample Multiple-Choice

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

ALGEBRA

Content Standard 6

Solve one- and two-step equations.

Item Type

Multiple-choice

Additional Information

Each equation will include one of the following forms, where x is the variable and a, b, c represent the constant:

a. $x + a = b$
b. $x - a = b$
c. $ax = b$
d. $\frac{x}{a} = b$
e. $ax + b = c$
f. $ax - b = c$
g. $a(x + b) = c$
h. $\frac{x}{a} = c$

Any representation of a rational number may be used as the coefficient of the variable.
The solution of an equation may be any representation of a rational number.

The coefficient of a variable may be written as $\frac{x}{a}$, or $\frac{1}{a}x$, or $x \div a$.

One set of parentheses may be used.

Sample Multiple-Choice Items

1. What value of x makes the following equation true?

$$1025 = 205(3 - x)$$

A $^{-}410$
B $^{-}2$ *
C 3
D 15

2. What value of x makes the following equation true?

$$\frac{x + 6}{2} = 9$$

1	5	12	24
A	**B**	**C** *	**D**

3. What value of x makes the following equation true?

$$31 = x + 14$$

45	27	25	17
A	**B**	**C**	**D** *

4. What value of y makes the following equation true?

$$30 = 6y$$

5	24	36	180
A *	**B**	**C**	**D**

5. What value of x makes the following equation true?

$$94 = 4x + 6$$

84	25	22	$17\frac{1}{2}$
A	**B**	**C** *	**D**

6. What value of x makes the following equation true?

$$\frac{x}{7} = 13$$

21	31	71	91
A	**B**	**C**	**D** *

7. What value of x makes the following equation true?

$$\frac{x}{5} + 2 = 12$$

50	58	62	70
A *	**B**	**C**	**D**

8. What value of x makes the following equation true?

$$11x - 23 = 54$$

66	28	7	3
A	**B**	**C** *	**D**

9. What value of x makes the following equation true?

$$^{-}96 = 4x$$

$^{-}24$	100	24	$^{-}100$
A *	**B**	**C**	**D**

10. What value of x makes the following equation true?

$$48 = \frac{6x}{2}$$

21	16	8	4
A	**B** *	**C**	**D**

11. What value of n makes the following equation true?

$$4n \div 6 = 54$$

12	15	34	81
A	**B**	**C**	**D** *

12. If $7h + 39 = 60$, what is the value of h ?

2	3	4	5
A	**B ***	**C**	**D**

13. What value of x makes the following equation true?

$$32 = x + 13$$

19	25	29	65
A *	**B**	**C**	**D**

14. What value of x makes the following equation true?

$$\frac{x - 15}{5} = 5$$

-5	4	10	40
A	**B**	**C**	**D ***

Answer Key

Content Standard 6

Sample Multiple-Choice

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

GEOMETRY

Content Standard 7

Determine the transformation(s), including translations, reflections, or rotations, used to alter the position of a polygon on the coordinate plane.

Item Type

Multiple-choice

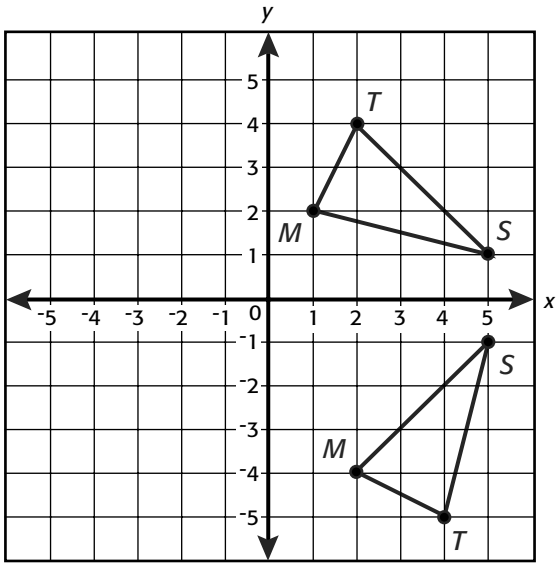
Additional Information

The four options may be four graphs.
The stem of the item may include a graph.
To change the position of a polygon on the coordinate plane may require two transformations.
The identification of a transformation may be required.

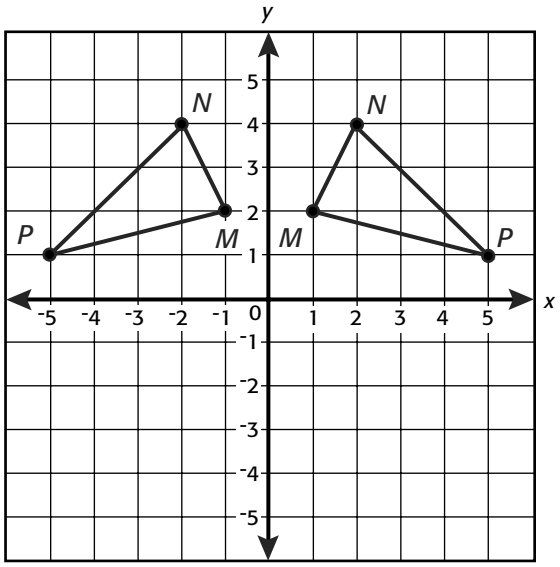
Sample Multiple-Choice Items

(continued on next page)

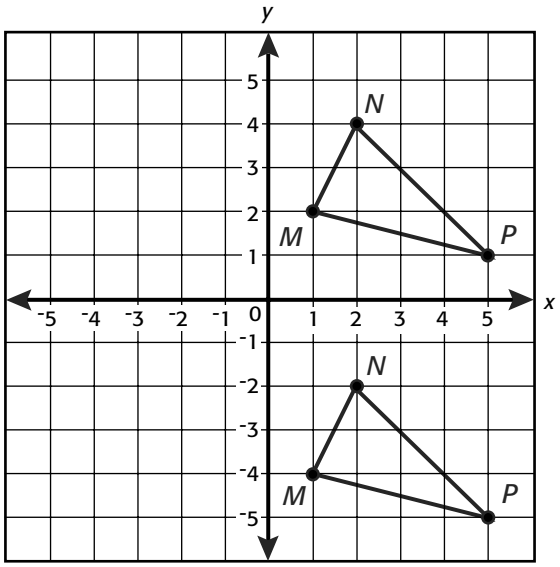
1. Which of the following diagrams shows the reflection of triangle *MPN* across the *x*-axis?



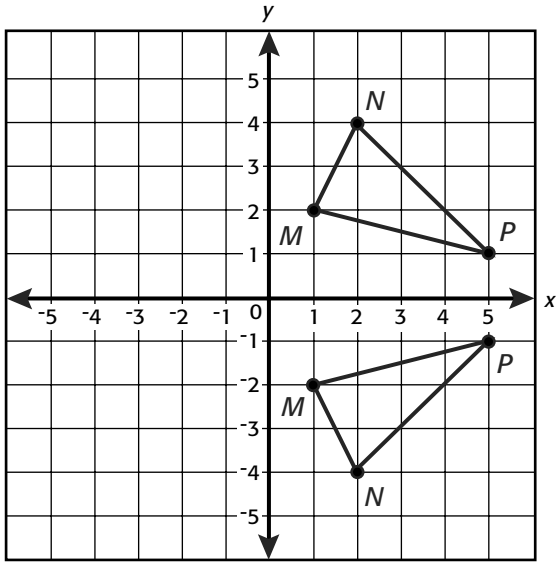
A



C

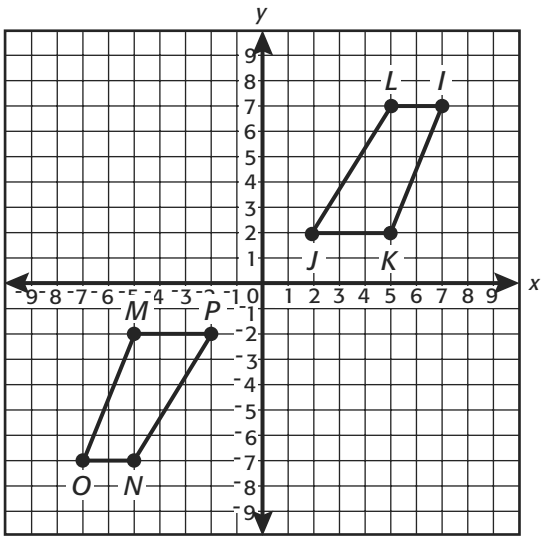


B



D *

2. Using the diagram below, which single transformation will move quadrilateral *LJKI* to quadrilateral *NPMO*?



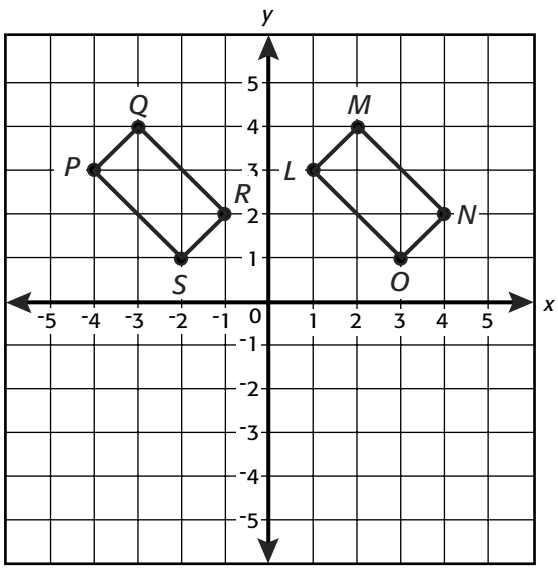
A Rotation of 180° around the origin *

B Reflection over the *x*-axis

C Reflection over the *y*-axis

D Rotation of 90° clockwise around the origin

3. Using the diagram below, which single transformation will move rectangle *LONM* to rectangle *PSRQ*?



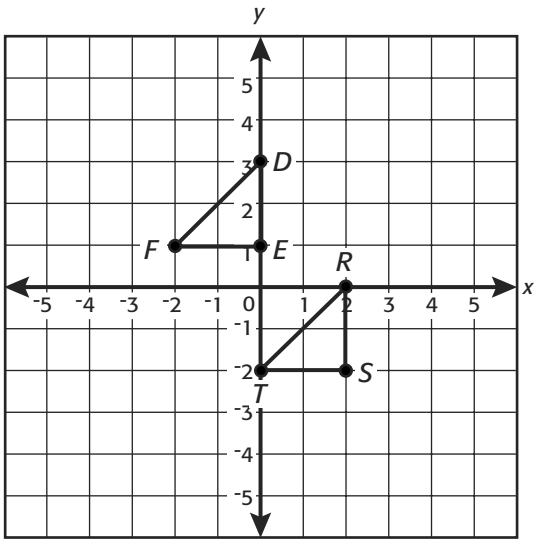
A Reflection across the *x*-axis

B Reflection across the *y*-axis

C Rotation of 90° clockwise around (0, 2)

D Translation of 5 units to the left *

4. Using the diagram below, which translations will move triangle *RTS* to triangle *DFE*?



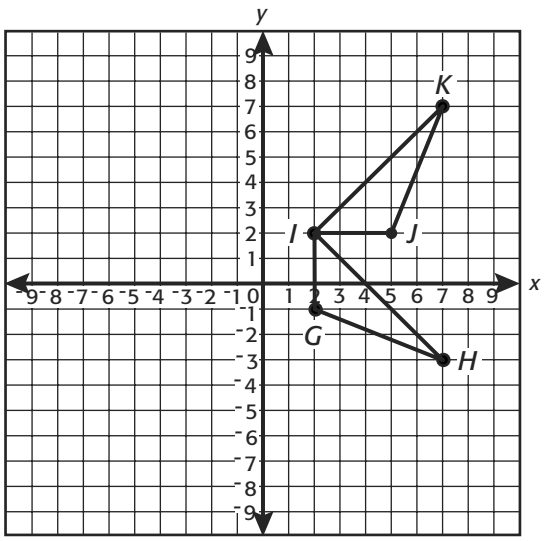
A Translations of 3 units down and 2 units to the right

B Translations of 3 units up and 2 units to the right

C Translations of 3 units up and 2 units to the left *

D Translations of 2 units down and 3 units to the left

5. Using the diagram below, which single transformation will move triangle *IJK* to triangle *IGH*?



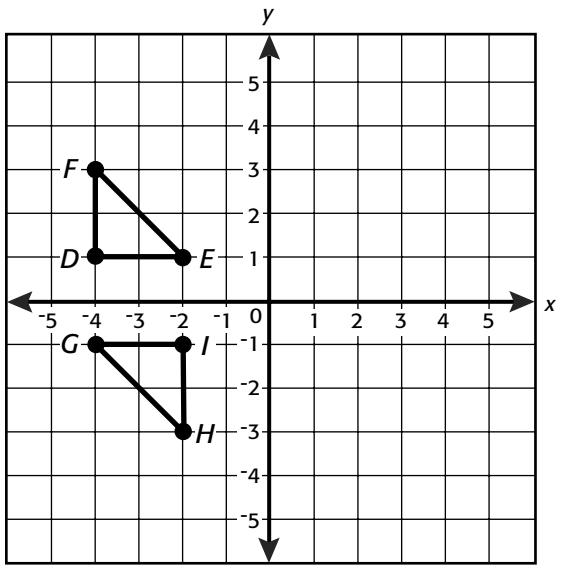
A Rotation of 270° clockwise around point *I*

B Rotation of 90° clockwise around point *I* *

C Rotation of 180° clockwise around point *I*

D Rotation of 90° counterclockwise around point *I*

6. Using the diagram below, which single transformation will move triangle *DEF* to triangle *IGH*?



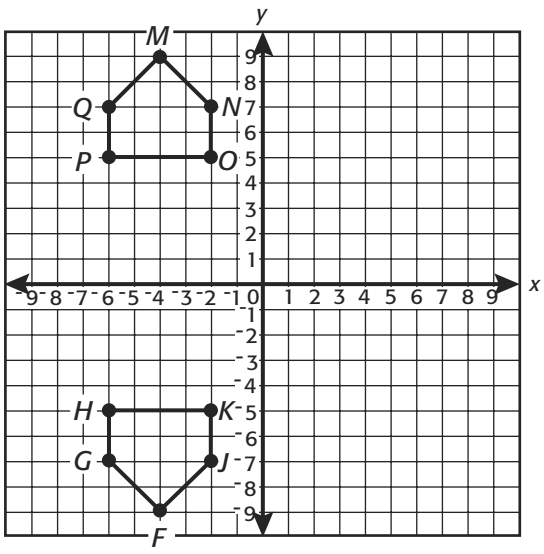
A Reflection over the *x*-axis

B Translation of 4 units down

C Rotation of 90° clockwise around (⁻3, 0)

D Rotation of 180° around (⁻3, 0) *

7. Using the diagram below, which single transformation will move pentagon *MQPON* to pentagon *FGHKJ*?



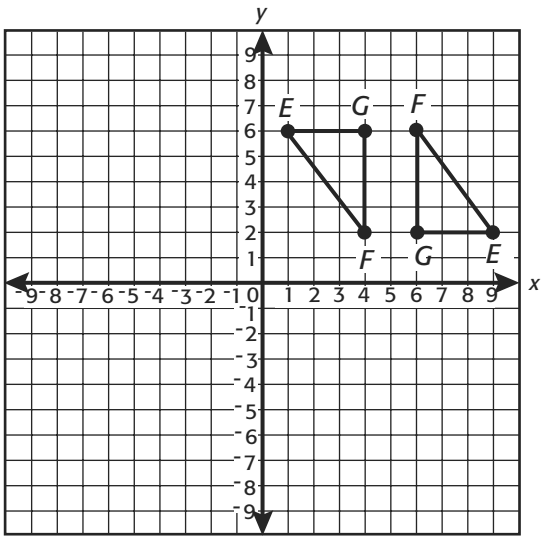
A Reflection across the *x*-axis *

B Reflection across the *y*-axis

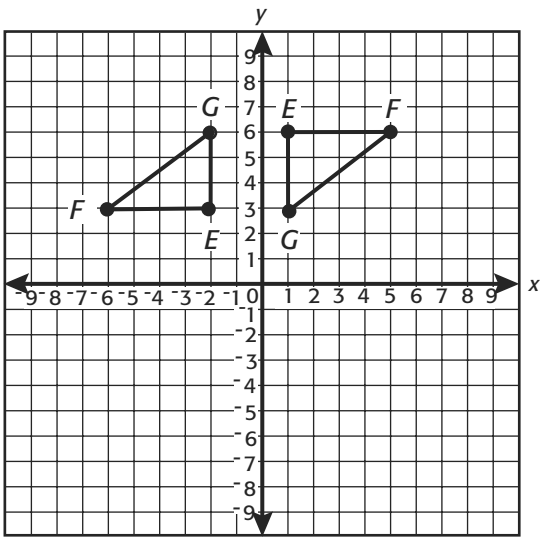
C Transformation 18 units down

D Rotation of 180° around the origin

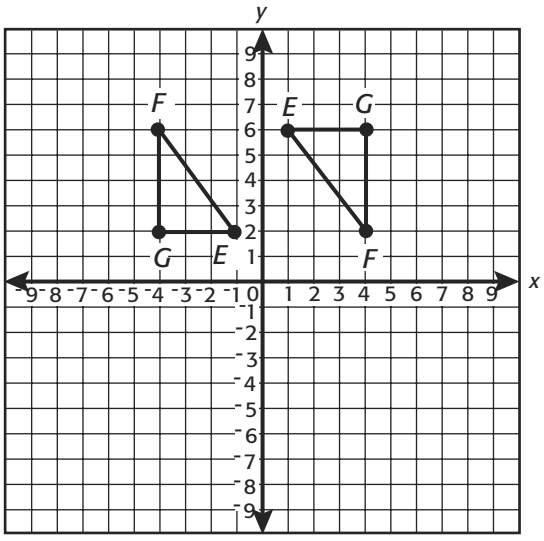
8. Which of the following shows a single rotation of triangle *EGF* of 180° around (6, 4)?



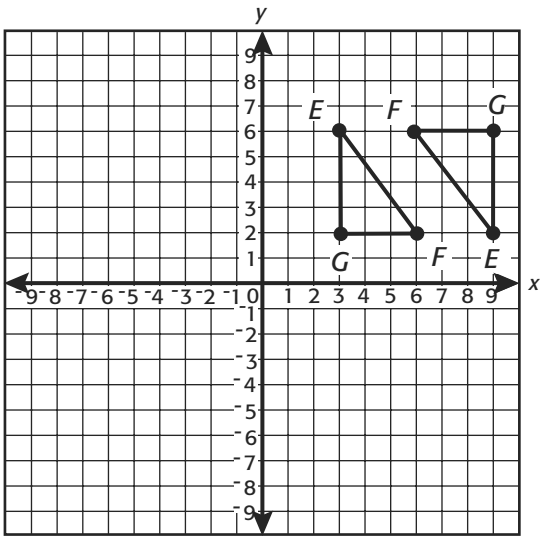
A



C

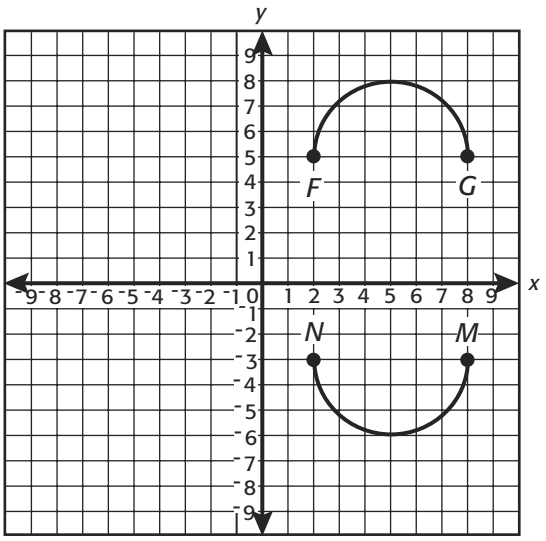


B

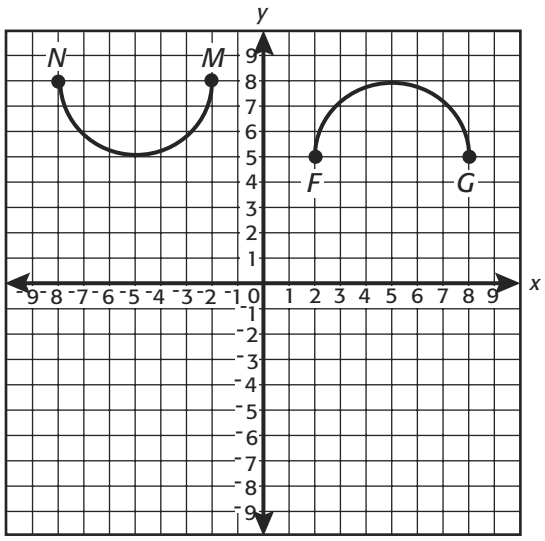


D *

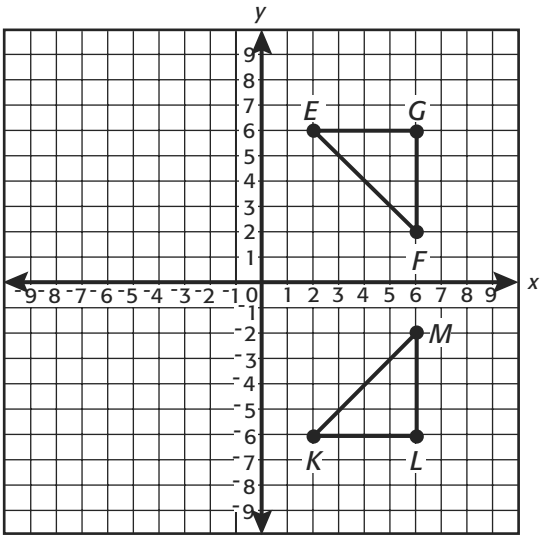
9. The four figures below represent different transformations. Which of these figures represents a reflection across the *x*-axis?



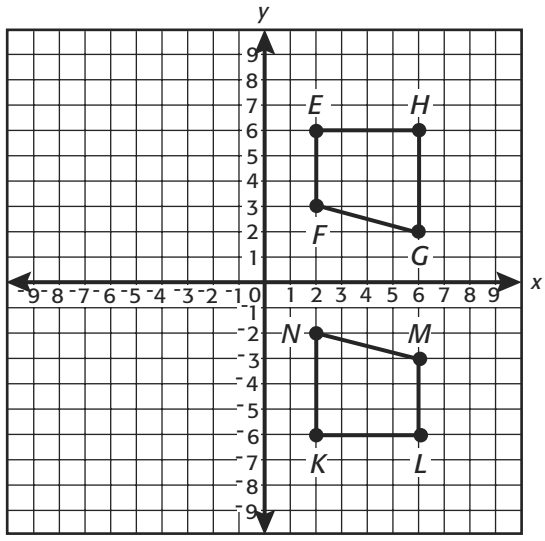
A



C

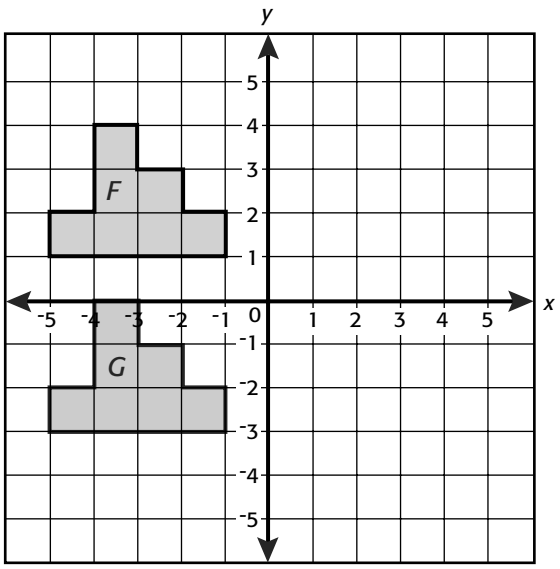


B *



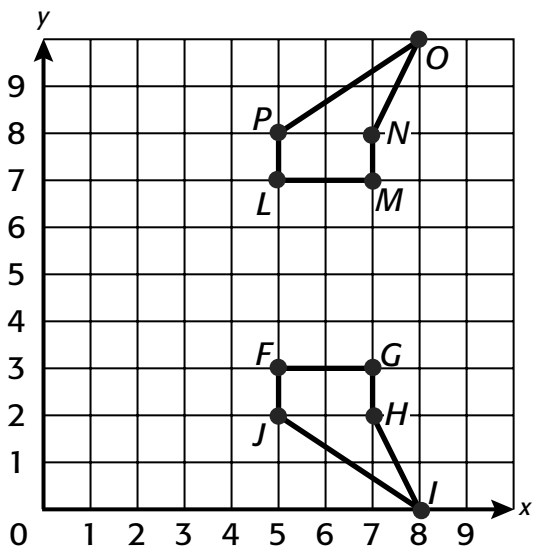
D

10. Using the diagram below, which single transformation will move polygon *F* to polygon *G*?



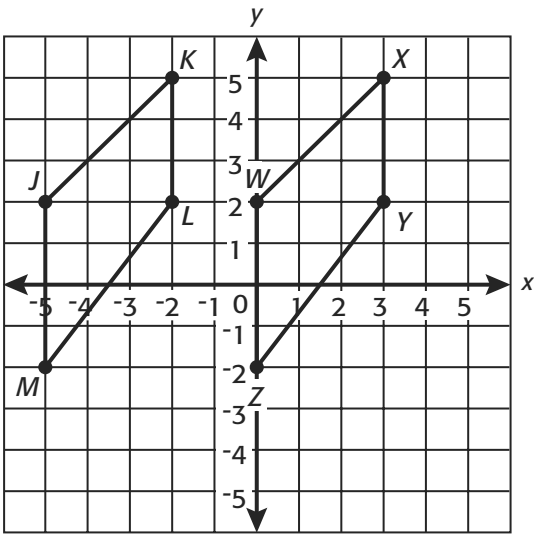
A Reflection across the *x*-axis
B Reflection across the *y*-axis
C Translation of 4 units down *
D Rotation of 180° around (−3, 0)

11. Using the diagram below, which transformation(s) will move polygon *LMNOP* to polygon *FGHIJ*?



A Reflection across the line $y = 5$ *
B Reflection across the line $x = 5$
C Reflection across the line $y = 7$ and translation 3 units down
D Reflection across the line $x = 5$ and translation 3 units down

12. Using the diagram below, which single transformation will move quadrilateral *JKLM* to quadrilateral *WXYZ*?



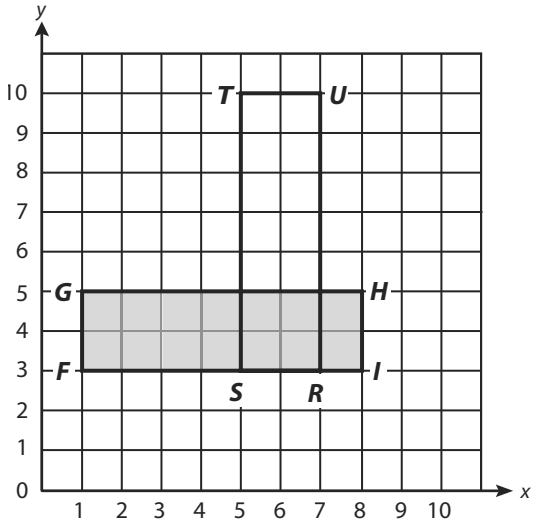
A Translation *

B Rotation

C Reflection

D Dilation

13. Using the diagram below, which single transformation below will move rectangle *FGHI* to rectangle *RSTU*?



A Translation of 4 units to the right

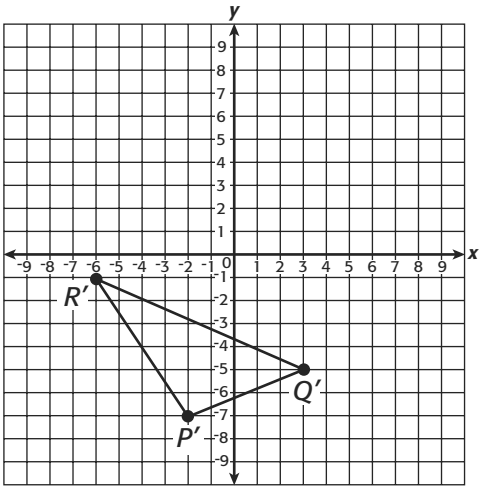
B Counterclockwise rotation of 90° around (4, 6) *

C Translation of 7 units up

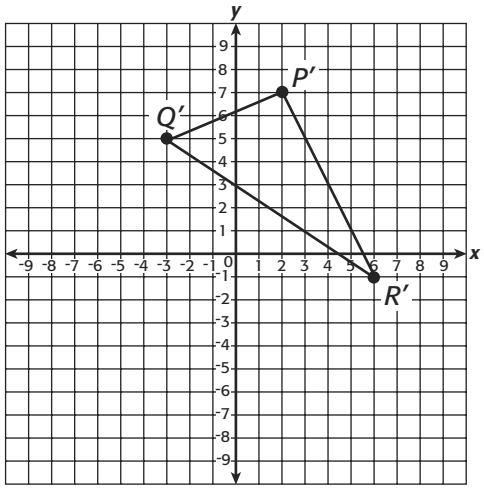
D Clockwise rotation of 90° around (5, 5)

14. ΔPQR has vertices $P(-2, 7)$, $Q(3, 5)$, and $R(-6, -1)$.

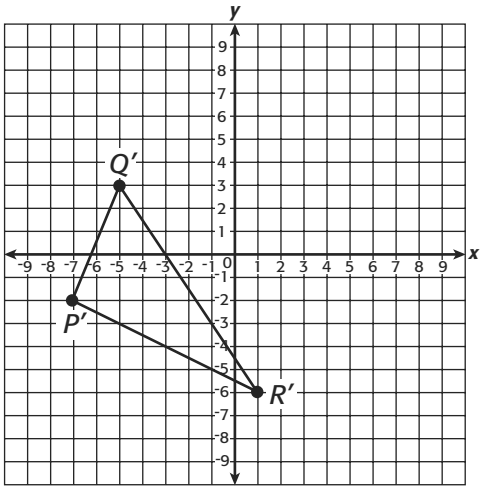
Which of the following best represents a reflection of ΔPQR across the x-axis to become $\Delta P'Q'R'$?



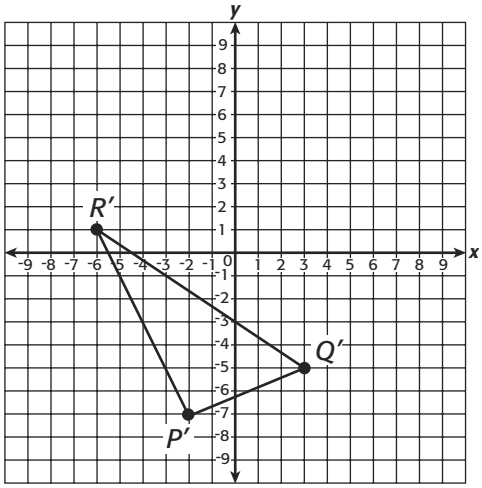
A



C



B



D *

Answer Key

Content Standard 7

Sample Multiple-Choice

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

GEOMETRY

Content Standard 8

Recognize geometric relationships among two-dimensional and three-dimensional objects.

Item Type

Multiple-choice
Open-ended

Additional Information

The drawings of two-dimensional and three-dimensional figures may be included.
The drawings of two-dimensional figures may be on a grid.
A two-dimensional figure may be compared to the same two-dimensional figure, a different two-dimensional figure, or a three-dimensional figure.
A three-dimensional figure may be compared to the same three-dimensional figure, a different three-dimensional figure, or a two-dimensional figure.

Sample Multiple-Choice Items

1. What do Figures A and B below have in common?

Figure A

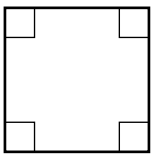


Figure B

A Both figures have four right angles. *
B Both figures have four congruent sides.
C Each angle measures exactly 45°.
D Each figure has four lines of symmetry.

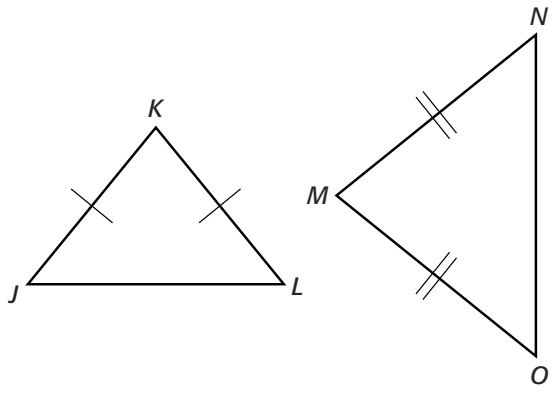
2. Which of the following quadrilaterals has *exactly* two sides that are parallel?

A Rhombus
B Rectangle
C Trapezoid *
D Parallelogram

3. What property does *not* apply to all right rectangular prisms?

A Opposite lateral faces are parallel.
B The lateral faces are all rectangles.
C The bases are right triangles. *
D The bases are parallel.

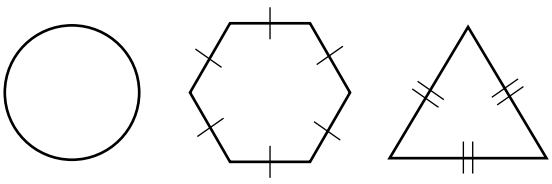
Compare triangles *JKL* and *OMN* as shown below.



4. Which of the statements below is *always* true?

A Both triangles are right.
B Both triangles are isosceles. *
C Both triangles are equilateral.
D Both triangles are scalene.

5. What do the three figures shown below have in common?



A They all have lines of symmetry. *
B They are all equilateral.
C They are all congruent.
D They are all polygons.

6. The quadrilaterals *LMNO* and *HIJK* are congruent.

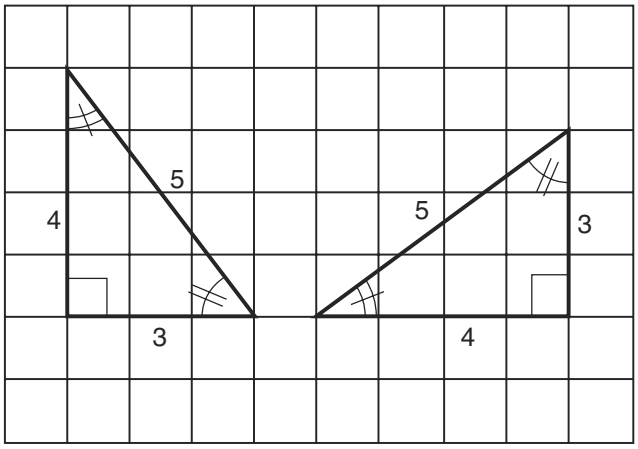
Which of the following statements about the quadrilaterals is *not always* true?

A They have equal corresponding angles.
B They are both the same size.
C They are both the same shape.
D They are equilateral. *

7. Which of the following statements must *always* be true of two similar, non-congruent triangles?

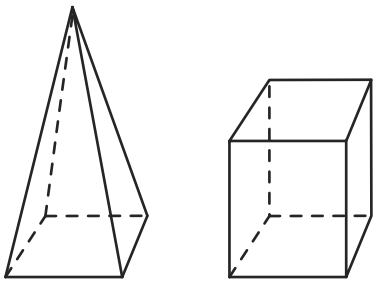
A Both triangles have the same shape. *
B All sides of both triangles are the same length.
C Both triangles have the same shape and the same size.
D All angles of both triangles have the different measures.

8. Which is true about the two triangles below?



A They are congruent triangles. *
B They are equilateral triangles.
C They are isosceles triangles.
D They are acute triangles.

9. What do the figures shown below have in common?

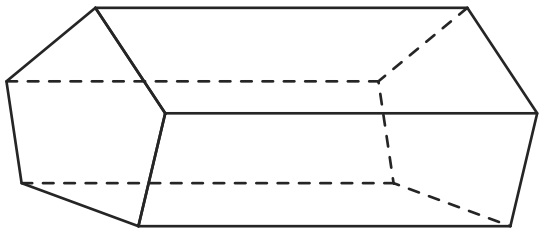


A Both have a triangular base.
B Both have a rectangular base. *
C Both have eight vertices.
D Both have twelve edges.

10. Which of the following three-dimensional objects are always similar to each other?

A Square pyramids
B Rectangular prisms
C Spheres *
D Cylinders

A pentagonal prism is shown below.



11. Which is a property of a pentagonal prism?

A It has two hexagon bases.
B It has five pentagon faces.
C It has exactly seven edges.
D It has exactly ten vertices. *

12. How are figures R and S the same?

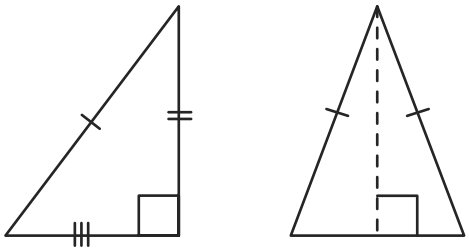
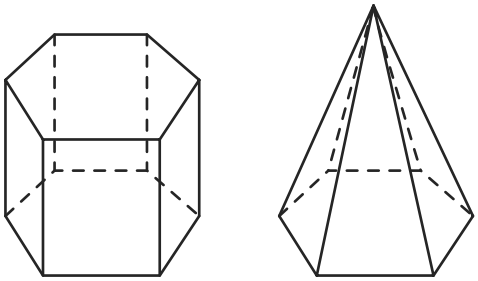


Figure R Figure S

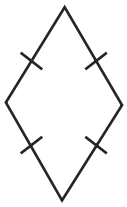
A Both are congruent polygons.
B Both are regular polygons.
C Both have acute angles. *
D Both have obtuse angles.

13. What do the figures shown below have in common?



A Both have parallel faces.
B Both have eight faces.
C Both have a pentagon base.
D Both have a hexagon base. *

14. Which term does *not* apply to the figure below?

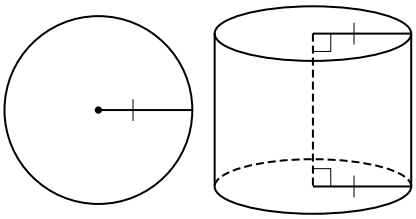


A Rhombus
B Square *
C Quadrilateral
D Parallelogram

Sample Open-Ended Items

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

1. Use the two-dimensional and three-dimensional figures shown below to explain the geometric relationships of the figures.



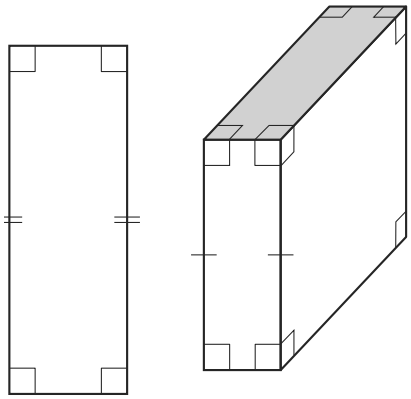
   a. Explain 2 ways the figures shown are the same.

   b. Explain 1 way the figures shown are different.

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

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

2. Use the two-dimensional and three-dimensional figures shown below to explain the geometric relationships of the figures.



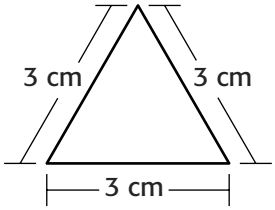
a. Explain 1 way the figures shown are the same.

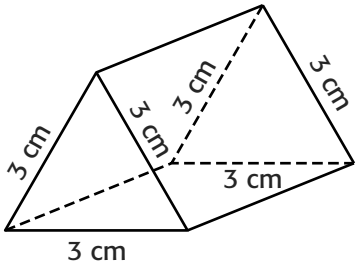
b. Explain 2 ways the figures shown are different.

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

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

3. Use the two-dimensional and three-dimensional figures shown below to explain the geometric relationships of the figures.





a. Explain 2 ways the figures shown above are the same.

b. Explain 1 way they are different.

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

Answer Key

Content Standard 8

Sample Multiple-Choice

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

Sample Open-Ended

1. Sample Response(s):

a. The figures are the same in that the circle and the base of the right cylinder both have equal diameters, equal radii, and equal circumferences.

b. The figures are different because one is two-dimensional (circle) and the other is three-dimensional (cylinder).

Score Point	Response Attributes
3	All is correct.
2	Both logics are correct. OR One logic and both answers are correct.
1	One or both answers are correct. OR One logic is correct.
0	None correct. (Also, blanks, rewrites problem, foreign language, illegible, refusals, off-task, etc., scored as invalid.)

2. Sample Response(s):

a. The figures are the same in that both the figure on the left and the figure on the right are made up of at least one rectangle.

b. The figures are different because the length of one of the sides of the rectangle is different than the length of one of the sides of the rectangular prism. This is known because of the markings. Also the two-dimensional figure has sides and vertices and the three-dimensional figure has faces, edges, and vertices.

Score Point	Response Attributes
3	All is correct.
2	Both logics are correct. OR One logic and both answers are correct.
1	One or both answers are correct. OR One logic is correct.
0	None correct. (Also, blanks, rewrites problem, foreign language, illegible, refusals, off-task, etc., scored as invalid.)

3. Sample Response(s):

a. The figures are the same in that both the triangle and the base of the triangular prism are congruent. Also both figures are made up of at least one triangle.

b. The figures are different because one is two-dimensional (triangle) and the other is three-dimensional (triangular prism).

OR

The two-dimensional figure has sides and vertices and the three-dimensional figure has edges, faces and vertices.

Score Point	Response Attributes
3	All is correct.
2	Both logics are correct. OR One logic and both answers are correct.
1	One or both answers are correct. OR One logic is correct.
0	None correct. (Also, blanks, rewrites problem, foreign language, illegible, refusals, off-task, etc., scored as invalid.)

MEASUREMENT

Content Standard 9

Solve problems involving circumference and area of circles.

Item Type

Multiple-choice
Gridded

Additional Information

Word problems/real-life situations may be used.
The drawing of a circle may be included.
The value of "pi" (π) will be 3.14.
Any representation of a rational number may be used for the dimension of the circle.
The formulas will be given on the reference page.

Sample Multiple-Choice Items

1. Brian is measuring one of his family's round dinner plates so that he can buy more plates of the same size. He found that it is 14 centimeters from the edge of the plate to the center of the plate.

   Which is *closest* to the circumference, in centimeters, of the plate?

A 43.96
B 87.92 *
C 153.86
D 615.44

2. Mr. Brown is building a circular patio in his yard. The diameter of the patio is 16 feet.

   Which is *closest* to the area, in square feet, of Mr. Brown's patio?

30	50	200	800
A	**B**	**C** *	**D**

3. A circle has a radius of 7 inches. Which is the *closest* to the area, in square inches, of the circle?

A 69.02
B 138.03
C 153.86 *
D 615.44

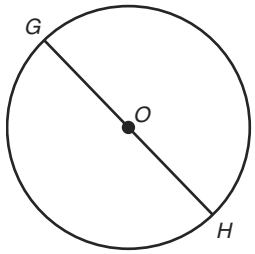
4. Which is *closest* to the area, in square centimeters, of a circle that has a diameter of 15 centimeters?

A 176 *
B 94
C 47
D 24

5. What is the area, to the *nearer* square centimeter, of a circle that has a radius of 11 centimeters?

A 35
B 95
C 380 *
D 1520

$\overline{GH}$ is a diameter of circle O and measures 9 yards in length.



6. Which is *closest* to the circumference of the circle?

A 14 yd
B 28 yd *
C 57 yd
D 64 yd

Sample Gridded Items

1. The radius of a coin is $\frac{1}{2}$ inch.

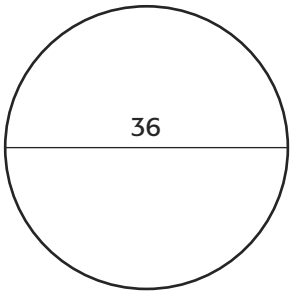
   What is the area, in square inches, of the coin?

Mark your answer in the answer grid.

2. What is the area, to the *nearer* square centimeter, of a circle with a diameter of 70 centimeters?

Mark your answer in the answer grid.

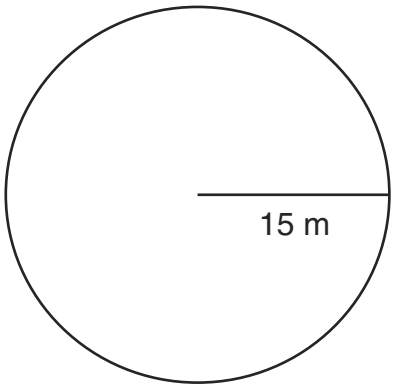
The circle shown below has a diameter of 36 centimeters.



3. What is the circumference, in centimeters, of the circle?

Mark your answer in the answer grid.

The circle shown below has a radius of 15 meters.



4. What is the area, in square meters, of the circle?

Mark your answer in the answer grid.

Answer Key

Content Standard 9

Sample Multiple-Choice

1. B
2. C
3. C
4. A
5. C
6. B

Sample Gridded

1. 0.79, 0.785, or 0.80
2. 3846, 3847, or 3848
3. 113, 113.04, 113.09, or 113.10
4. 706.5, 706.8, 706.9, or 707

MEASUREMENT

Content Standard 10

Find the perimeter of polygons and the area of triangles and trapezoids.

Item Type

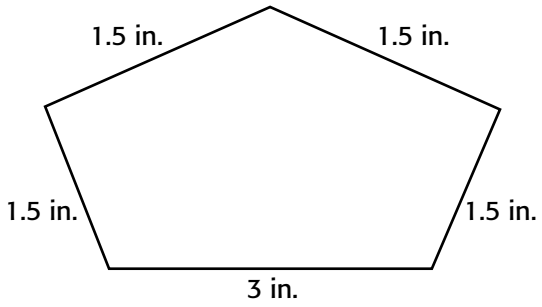
Multiple-choice
Gridded

Additional Information

Drawings may be used.
Any representation of a rational number may be used.
Word problems/real-life situations may be used.
Determining the perimeter of regular polygon may be required.
Unnecessary dimensions may be included.
The properties of all types of triangles may be required to determine the area of a triangle.

Sample Multiple-Choice Items

1. What is the perimeter, in inches, of the pentagon shown below?

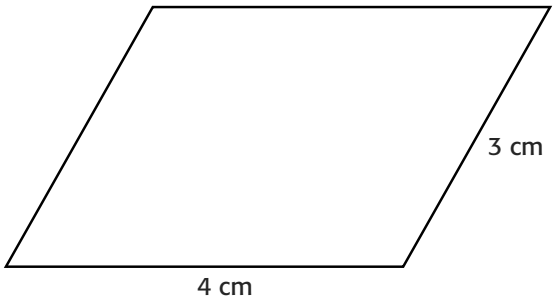


9	7	5	3
A *	**B**	**C**	**D**

2. What is the area, in square centimeters, of a triangle with a base of 3 centimeters and a height of 3 centimeters?

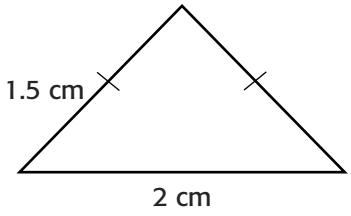
4.5	9	10.5	21
A *	**B**	**C**	**D**

3. What is the perimeter, in centimeters, of the parallelogram shown below?



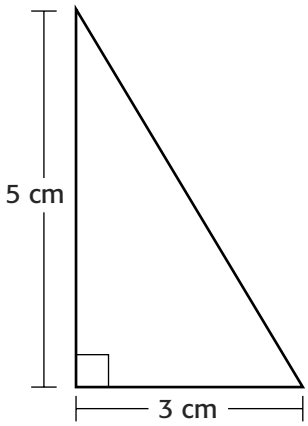
4	7	11	14
A	**B**	**C**	**D ***

4. What is the perimeter, in centimeters, of the isosceles triangle shown below?



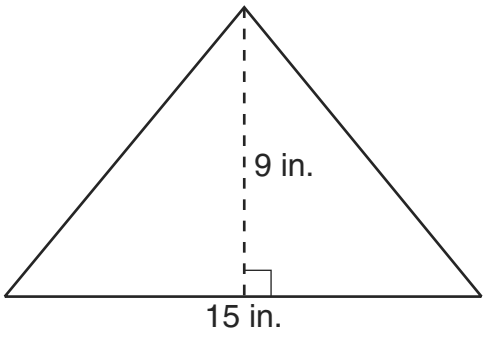
5.5	5	4.5	4
A	**B ***	**C**	**D**

5. What is the area, in square centimeters, of the right triangle shown below?



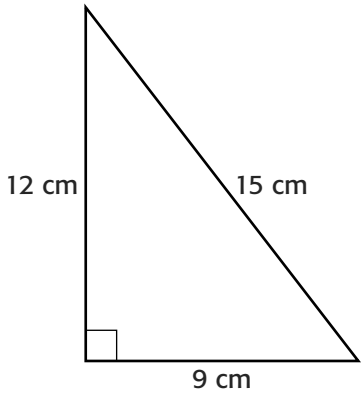
5	7.5	8.5	15
A	**B ***	**C**	**D**

6. What is the area, in square inches, of the triangle shown below?



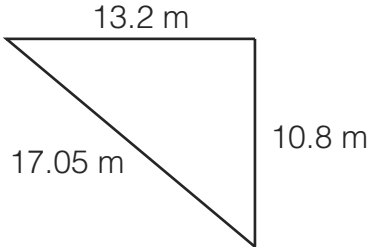
15.5	24	67.5	135
A	**B**	**C ***	**D**

7. What is the area, in square centimeters, of the triangle shown below?



36	54	108	216
A	**B** *	**C**	**D**

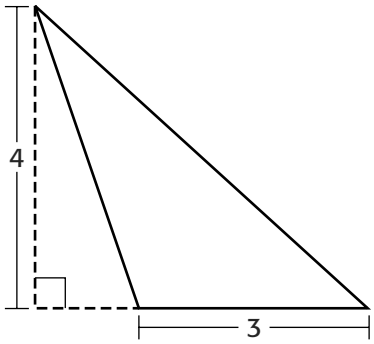
Jill wanted to place rope around three sides of the playground. The sides measure 13.2 meters, 17.05 meters, and 10.8 meters as shown below.



8. What is the *least* amount of rope, in meters, she will need to place around the playground?

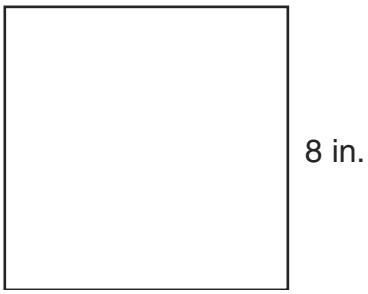
A 27.85
B 30.25
C 40.80
D 41.05 *

9. What is the area, in square units, of the triangle shown below?



12	6	4	3
A	**B ***	**C**	**D**

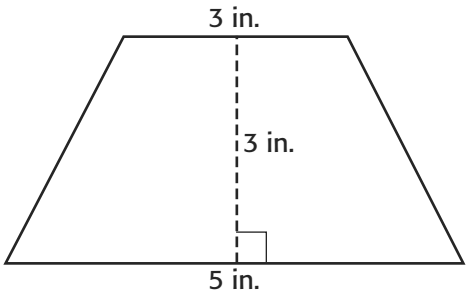
10. What is the perimeter, in inches, of the square shown below?



8	16	32	64
A	**B**	**C ***	**D**

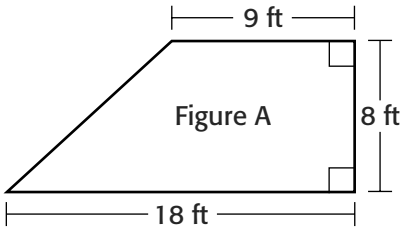
Sample Gridded Items

1. What is the area, in square inches, of the trapezoid shown below?



Mark your answer in the answer grid.

2. What is the area, in square feet, of Figure A shown below?



Mark your answer in the answer grid.

Answer Key

Content Standard 10

Sample Multiple-Choice

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

Sample Gridded

1. 12
2. 108

MEASUREMENT

Content Standard 11

Solve problems involving ratios or rates, using proportional reasoning.

Item Type

Multiple-choice
Open-ended

Additional Information

Tables may be used.
Word problems/real-life situations will be used.
Any representation of a rational number may be used.
Verbal descriptions of proportions may be used.

Sample Multiple-Choice Items

1. Seven of a baseball player's first 28 hits were triples. The baseball player had a total of 140 hits.

   If the baseball player maintained his rate of hitting triples, how many triples did this baseball player hit in all?

7	14	28	35
A	**B**	**C**	**D ***

2. Alabama has 21,653,000 acres of forests and a total land area of 32,480,000 acres.

   If a 210-acre farm has the same ratio of forested land to total land area, approximately how many acres of the farm will be forested?

140	160	180	210
A *	**B**	**C**	**D**

3. In 18 minutes, Karl can run 4 laps around the track at his school.

   If his pace stays the same, how many laps should Karl be able to run in $1\frac{1}{2}$ hours?

5	18	20	48
A	**B**	**C ***	**D**

4. Emma saves 28 cents of every dollar that she earns. Emma earned $75 last week.

   How much money did Emma save last week?

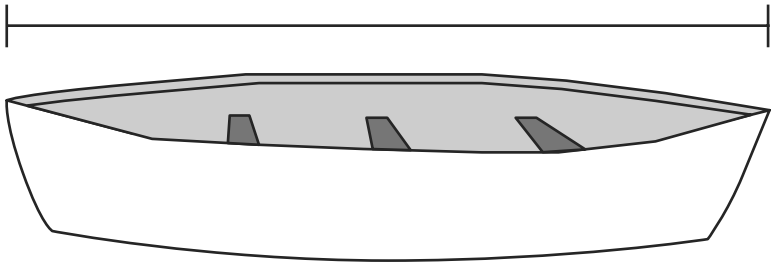
$21	$28	$47	$75
A *	**B**	**C**	**D**

5. The ratio of red candy to green candy in a bag is 3 to 4. If there were 36 pieces of green candy in the bag, how many pieces of candy in the bag were red?

7	9	12	27
A	**B**	**C**	**D ***

Use your inch ruler and this scale drawing to help you work this problem.

Clifton's canoe is 18 feet in length. He created this scale drawing of his canoe.



6. How many feet are represented by 1 inch on Clifton's scale drawing?

9	$4\frac{1}{2}$	2	$1\frac{1}{4}$
A	**B ***	**C**	**D**

Sample Open-Ended

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

1. Jennifer can jump 240 times, without a miss, during 10 minutes of jumping rope. Terry can jump rope 50 times, without a miss, for 2 minutes.
   a. If Jennifer maintains this rate for 15 minutes, how many jumps will she have in all?
   b. Terry says that if he maintains his rate for 15 minutes, he will have more jumps than Jennifer. Jennifer says that she will have more jumps in a 15-minute period. Who is correct? Justify your answer.

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

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

2. Alex owns a car with a gasoline tank that contains a maximum of 16 gallons. On the highway, Alex's car travels 24 miles per gallon of gasoline. Brian owns a car with a gasoline tank that contains a maximum of 12 gallons of gasoline. On the highway, Brian's car travels 32 miles per gallon of gasoline.
   a. How many highway miles can Alex travel on a full tank of gasoline?
   b. Brian says that he can travel farther than Alex on a full tank of gasoline. Alex says that he can travel farther than Brian on a full tank of gasoline. Is Brian or Alex correct? Justify your answer.

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

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

3. Kia is using this recipe to make pralines to sell at the school festival. She has agreed to make 108 pralines. The following ingredients are needed.

Kia's Praline Recipe
(Makes 18 Pralines)

Quantity	Ingredient
1 cup	Sugar
1 cup	Brown sugar
$\frac{1}{2}$ cup	Light cream
$\frac{1}{4}$ teaspoon	Salt
2 tablespoons	Butter
1 cup	Pecan halves

Kia plans to sell her pralines at 4 for $1.50.

a. How much of each ingredient does Kia need?

b. If Kia sells all of her pralines, how much money will she make for the school?

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

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

4. The Math Club is going on a field trip. Taylor, the Math Club president, says that there must be 1 adult for every 5 students on the trip.

   a. If there are 28 students going on the field trip, how many adults are needed?

   b. If 12 students from the Science Club joined the field trip, Gerry, the Science Club president, says that 3 more adults will be needed. Taylor says that only 2 more adults will be needed. Is Taylor or Gerry correct? Justify your answer.

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

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

5. Jacob's motor boat can travel upriver at an average rate of 12 miles per hour. It took Jacob 20 minutes to travel upriver from his boat dock to Oscar's boat dock.

   a. How many miles is Oscar's boat dock from Jacob's boat dock?

   b. On the return trip downriver, the 3 miles per hour rate of the river's current will be added to Jacob's original rate. How many minutes should the downriver trip require?

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

Answer Key

Content Standard 11

Sample Multiple-Choice

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

Sample Open-Ended

1. Sample Response(s):

a. $\frac{240}{10} = \frac{x}{15}$, $240(15) = 10x$, $3600 = 10x$, $x = 360$ jumps.

OR

I divided 10 by 240 for an answer of 24. I took 24 and multiplied it by 15 to get 360.

OR

I used my calculator to multiply 240 and 15. Then I divided by 10. The answer is 360 jumps.

b. Terry is correct. To find Terry's rate: $\frac{50}{2} = \frac{x}{15}$, $50(15) = 2x$,

$750 = 2x$, $x = 375$.

In **part a** Jennifer can jump 360 in 15 minutes and in **part b** Terry can jump 375 in 15 minutes.

OR

I divided 2 by 50 for an answer of 25. Then I took 25 and multiplied it by 15 to get 375.

So Terry is correct because Jennifer can only jump 360 in 15 minutes.

Score Point	Response Attributes
3	All is correct.
2	Both logics are correct. OR One logic and both answers are correct.
1	One or both answers are correct. OR One logic is correct.
0	None correct. (Also, blanks, rewrites problem, foreign language, illegible, refusals, off-task, etc., scored as invalid.)

2. Sample Response(s):

a. 24(16) = 384 miles.

OR

I used my calculator to multiply 24 and 16. Alex can travel 384 miles on a full tank of gas.

b. Neither is correct because they both can travel the same distance. In **part a** Alex can travel 384 miles and in **part b** 32 times 12 is 384.

Score Point	Response Attributes
3	All is correct.
2	Both logics are correct. OR One logic and both answers are correct.
1	One or both answers are correct. OR One logic is correct.
0	None correct. (Also, blanks, rewrites problem, foreign language, illegible, refusals, off-task, etc., scored as invalid.)

3. Sample Response(s):

a. Kia is going to make 108 pralines and the recipe only makes 18 pralines. $\frac{108}{18} = 6$ batches. Everything in the recipe must be multiplied by 6 to find out how much of each ingredient Kia needs.

Sugar = 6 cups

Brown sugar = 6 cups

Light cream = 3 cups

Salt = $1\frac{1}{2}$ teaspoons

Butter = 12 tablespoons

Pecan halves = 6 cups

b. $108 \div 4 = 27$, $27 \times \$1.50 = \$40.50$

OR

$\frac{4}{1.50} = \frac{108}{x} = 4x = 162$, $x = \$40.50$

Score Point	Response Attributes
3	All is correct.
2	Both logics are correct. OR One logic and both answers are correct.
1	One or both answers are correct. OR One logic is correct.
0	None correct. (Also, blanks, rewrites problem, foreign language, illegible, refusals, off-task, etc., scored as invalid.)

4. Sample Response(s):

a. $\frac{1}{5} = \frac{x}{28}$, $5x = 28$, $x = 5.6$, so 6 adults are needed on the trip since you cannot have 0.6 of an adult.

OR

I used my calculator and divided 5 into 28 for an answer of 5.6.
6 adults are needed.

b. Only 2 more adults will be needed because $28 + 12 = 40$. $\frac{1}{5} = \frac{x}{40}$, $5x = 40$, $x = 8$. Since 6 adults are needed in **part a** and 8 adults are needed in **part b**, then Taylor is correct by saying that only 2 more adults are needed. $(8 - 6 = 2)$.

Score Point	Response Attributes
3	All is correct.
2	Both logics are correct. OR One logic and both answers are correct.
1	One or both answers are correct. OR One logic is correct.
0	None correct. (Also, blanks, rewrites problem, foreign language, illegible, refusals, off-task, etc., scored as invalid.)

5. Sample Response(s):

a. $\frac{12 \text{ miles}}{60 \text{ min.}} = \frac{x \text{ miles}}{20 \text{ min.}}$. $12(20) = 60(x)$, $240 = 60x$, therefore $x = 4$ miles.

OR

I used my calculator to divide 60 into 20 to get 0.333333 repeating. I then took this answer and multiplied it by 12 to get an answer of 4.

b. $\frac{15 \text{ miles}}{60 \text{ min.}} = \frac{4 \text{ miles}}{x \text{ min.}}$. $15(x) = 60(4)$, $15x = 240$, therefore $x = 16$ minutes.

OR

I used my calculator to divide 15 into 4 to get .266666666 repeating. I then took this answer and multiplied it by 60 to get an answer of 15.999996 or rounded to 16.

Score Point	Response Attributes
3	All is correct.
2	Both logics are correct. OR One logic and both answers are correct.
1	One or both answers are correct. OR One logic is correct.
0	None correct. (Also, blanks, rewrites problem, foreign language, illegible, refusals, off-task, etc., scored as invalid.)

DATA ANALYSIS AND PROBABILITY

Content Standard 12

Determine measures of central tendency (mean, median, and mode) and the range using a given set of data or graphs, including histograms, frequency tables, and stem-and-leaf plots.

Item Type

Multiple-choice
Gridded
Open-ended

Additional Information

Word problems/real-life situations may be used.
The word "mean" will be used for the arithmetic average.

Sample Multiple-Choice Items

1. The chart below shows the number of books read in a month in each of Mrs. Graham's language arts classes.

Number of Books Read

Class	1st Period	2nd Period	3rd Period	4th Period	5th Period
Number of Books	68	72	53	77	57

What is the mean number of books read per class?

54.0	54.8	65.4	67.4
A	**B**	**C ***	**D**

2. The list below shows the monthly earnings of the employees in a video store.

- $1000
- $1000
- $1300
- $1900
- $2000
- $2300
- $2300

What is the range of these earnings?

A $1300 *
B $1650
C $1700
D $1900

Sample Gridded Items

Mr. Mahoney asked his students to give a source of information about world events. The frequency table below shows his results.

Mr. Mahoney's Data

Source of Information	Number of Students
Listen to radio	8
Watch TV	12
Talk to parents	3
Talk to friends	6
Read a newspaper	4
Other/No response	12

1. What is the mode of the number of students?

Mark your answer in the answer grid.

Kanesha collected data on the number of students served in the cafeteria each day during an 11-day period. The table below shows the results of her research.

Number of Students Served in the Cafeteria

Day	Number of Students
Sept. 12	56
Sept. 13	98
Sept. 14	111
Sept. 15	78
Sept. 16	66
Sept. 19	103
Sept. 20	83
Sept. 21	89
Sept. 22	95
Sept. 23	115
Sept. 26	78

2. What was the median number of students served in the cafeteria over the 11-day period?

Mark your answer in the answer grid.

The table below shows the number of students in attendance at Blanco Middle School for a one-week period.

Blanco Middle School Students

Day	Number of Students in Attendance
Monday	788
Tuesday	872
Wednesday	1014
Thursday	935
Friday	961

3. What is the mean number of students in attendance at Blanco Middle School for the one-week period?

Mark your answer in the answer grid.

The stem-and-leaf plot below shows the scores Leon received on each of his science quizzes.

Leon's Science Quiz Scores

5	7
6	3 9
7	0 6
8	2 4 4
9	5 6 7

5 | 7 represents 57.

4. Use this data set to find the mode of all of Leon's scores.

Mark your answer in the answer grid.

The list below shows the total fat content, in grams, of some menu items at a fast-food restaurant.

Fat Content (in grams)

45	20	34	8	14
32	26	21	10	24
16	4	26	9	36

5. What is the median fat content of the data listed?

Mark your answer in the answer grid.

The teachers of Lee Middle School take attendance at 9:00 A.M. every school day. The stem-and-leaf plot shows the number of students in each teacher's classroom at 9:00 A.M. on one school day.

Number of Students

2	6 7 8
3	1 2 3 5 9
4	2 3
5	
6	
7	7
8	7

2 | 6 represents 26 students.

6. Use this data set to find the mean number of students per classroom on that one day.

Mark your answer in the answer grid.

Sample Open-Ended Items

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

1. The stem-and-leaf plot below shows the total caloric content of several main dishes.

Caloric Content

11	6
12	0 7 9
18	2 4 4 4 9 9
21	8 9

11|6 represents 116

a. Use this data set to find the median of the total caloric content.

b. Use this data set to find the mode of the total caloric content.

c. Use this data set to find the mean of the total caloric content.

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

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

2. The frequency table below shows the total points scored by several high school basketball players for the year.

Basketball Team Points

Player	Points
1	47
2	52
3	41
4	49
5	51
6	58
7	52
8	47
9	63
10	52
11	60

a. Use this data set to determine the median number of points scored by the players.

b. Use this data set to determine the mode of the number of points scored by the players.

c. Use this data set to determine the mean number of points scored by the players.

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

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

3. The frequency table below shows the number of hours Mrs. Rose's students spent watching TV during one specific school week.

Hours Spent Watching TV During One School Week

Number of Hours	Number of Students
0	2
1	2
2	6
3	7
4	8
5	4
6	3

   a. Use this data set to find the mean number of hours the students spent watching TV during that week.

   b. Use this data set to find the median number of hours the students spent watching TV during that week.

   c. Use this data set to find the mode of the number of hours the students spent watching TV during that week.

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

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

4. The table below shows the number of minutes practiced by 5 members of the swim team on Monday, Wednesday, Friday, and Saturday.

Practice Times (in minutes)

Member	Monday	Wednesday	Friday	Saturday
A	56	42	65	45
B	63	51	57	55
C	40	65	76	50
D	65	51	53	68
E	59	45	55	70

a. Use this data set to find the mode of all the practice times.

b. Use this data set to find the median of all the practice times.

c. Use this data set to find the mean of all the practice times.

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

Answer Key

Content Standard 12

Sample Multiple-Choice

1. C
2. A

Sample Gridded

1. 12
2. 89
3. 914
4. 84
5. 21
6. 41.67

Sample Open-Ended

1. Sample Response(s):

a. To find the median, the values in the data set must first be put in ascending order and then find the number that is exactly in the middle.

116, 120, 127, 129, 182, 184, 184, 184, 189, 189, 218, 219

Since there is an even number of data values, the median is the average of the two middle values. Since the two middle values are 184 there is no need to take the average. The median is 184 caloric content.

b. The mode is the value that occurs most often. Since there are three 184s, the mode is 184 caloric content.

c. The mean is the sum of the data values divided by the number of data values.
$116 + 120 + 127 + 129 + 182 + 184 + 184 + 184 + 189 + 189 + 218 + 219 = 2041$
$2041 \div 12 = 170.08\overline{3}$
The mean is approximately 170.08.

Score Point	Response Attributes
3	All is correct.
2	Both logics are correct. OR One logic and both answers are correct.
1	One or both answers are correct. OR One logic is correct.
0	None correct. (Also, blanks, rewrites problem, foreign language, illegible, refusals, off-task, etc., scored as invalid.)

2. Sample Response(s):

a. To find the median, the values in the data set must first be put in ascending order and then find the number that is exactly in the middle.
41, 47, 47, 49, 51, 52, 52, 52, 58, 60, 63

Since there is odd number of data values, the number that is exactly in the middle is 52. The median is 52 points scored.

b. The mode is the value that occurs most often. Since there are three 52 points scored, the mode is 52 points scored.

c. The mean is the sum of the data values divided by the number of data values.
$41 + 47 + 47 + 49 + 51 + 52 + 52 + 52 + 58 + 60 + 63 = 572$,
$572 \div 11 = 52$.
The mean is 52 points scored.

Score Point	Response Attributes
3	All is correct.
2	Both logics are correct. OR One logic and both answers are correct.
1	One or both answers are correct. OR One logic is correct.
0	None correct. (Also, blanks, rewrites problem, foreign language, illegible, refusals, off-task, etc., scored as invalid.)

3. Sample Response(s):

a. The mean is the sum of the data values divided by the number of data values. The mean number of hours is:

$0 + 0 + 1 + 1 + 2 + 2 + 2 + 2 + 2 + 2 + 3 + 3 + 3 + 3 + 3 + 3 + 3 + 4 + 4 + 4 + 4 + 4 + 4 + 4 + 4 + 5 + 5 + 5 + 5 + 6 + 6 + 6 = 105.$

$\frac{105}{32} = 3.28125$ hours, which is approximately 3.3 hours.

OR

$0 \times 2 = 0$

$1 \times 2 = 2$

$2 \times 6 = 12$

$3 \times 7 = 21$

$4 \times 8 = 32$

$5 \times 4 = 20$

$6 \times 3 = 18$

Therefore, $0 + 2 + 12 + 21 + 32 + 20 + 18 = 105$, and $105 \div 32$ is approximately 3.3 hours.

b. To find the median, the values in the data set must first be put in ascending order and then find the number that is exactly in the middle.

0, 0, 1, 1, 2, 2, 2, 2, 2, 2, 3, 3, 3, 3, 3, 3, 3, 4, 4, 4, 4, 4, 4, 4, 4, 5, 5, 5, 5, 6, 6, 6

Since there is an even number of data values, the median is the average of the two middle values. Since the two middle values are both 3, there is no need to take the average. The median is 3 hours.

c. The mode is the value that occurs most often. Since there were 8 students who watched 4 hours of TV during that week, the mode is 4 hours.

Score Point	Response Attributes
3	All is correct.
2	Both logics are correct. OR One logic and both answers are correct.
1	One or both answers are correct. OR One logic is correct.
0	None correct. (Also, blanks, rewrites problem, foreign language, illegible, refusals, off-task, etc., scored as invalid.)

4. Sample Response(s):

a. The mode is the value that occurs most often. Since there were three 65 minutes, the mode is 65 minutes of practice time.

b. To find the median, the values in the data set must first be put in ascending order and then find the number that is exactly in the middle.

40, 42, 45, 45, 50, 51, 51, 53, 55, 55, 56, 57, 59, 63, 65, 65, 65, 68, 70, 76

Since there is an even number of data values, the median is the average of the two middle values. The two middle values are 55 and 56. The average of these two middle values needs to be calculated.

$55 + 56 = 111$

$\frac{111}{2} = 55.5$

The median is 55.5 minutes of practice time.

c. The mean is the sum of the data values divided by the number of data values.

$56 + 42 + 65 + 45 + 63 + 51 + 57 + 55 + 40 + 65 +$
$76 + 50 + 65 + 51 + 53 + 68 + 59 + 45 + 55 + 70 = 1131$

$\frac{1131}{20} = 56.55$

The mean is 56.55 minutes of practice.

Score Point	Response Attributes
3	All is correct.
2	Both logics are correct. OR One logic and both answers are correct.
1	One or both answers are correct. OR One logic is correct.
0	None correct. (Also, blanks, rewrites problem, foreign language, illegible, refusals, off-task, etc., scored as invalid.)

DATA ANALYSIS AND PROBABILITY

Content Standard 13

Determine the probability of a compound event.

Item Type

Multiple-choice
Gridded
Open-ended

Additional Information

The drawing of one or more spinners may be used.
Coins may be used.
Compound events with replacement or without replacement will be required.
Word problems/real-life situations may be used.

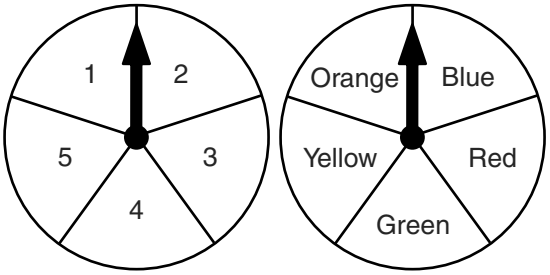
Sample Multiple-Choice Items

1. A jar contains 3 red marbles and 2 black marbles. All the marbles are the same size and there are no other marbles in the jar. On the first selection, a marble is chosen at random and not replaced. Then a second marble is chosen at random.

   What is the probability that the marbles chosen at random will first be a black marble and then a red marble?

$\frac{6}{25}$	$\frac{3}{10}$	$\frac{3}{5}$	$\frac{2}{3}$
A	**B ***	**C**	**D**

The spinners shown below are each divided into 5 equal sections. Each spinner is spun one time.

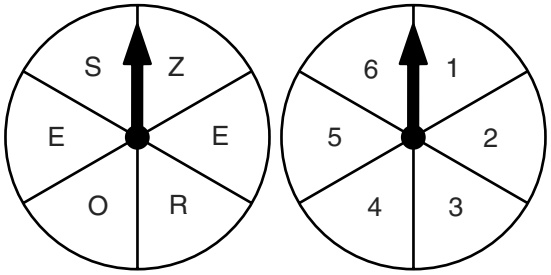


First Spinner Second Spinner

2. What is the probability that the arrow on the first spinner will land on a space with an odd number, and the arrow on the second spinner will land on a space marked blue?

$\frac{3}{5}$	$\frac{2}{5}$	$\frac{3}{10}$	$\frac{3}{25}$
A	**B**	**C**	**D ***

The spinners shown below are divided into 6 equal sections. Each spinner is spun one time.



First Spinner Second Spinner

3. What is the probability that the arrow on the first spinner will land on a space with either the letter R or the letter S, and the arrow on the second spinner will land on a space with an even number?

$\frac{5}{36}$	$\frac{1}{6}$	$\frac{1}{3}$	$\frac{5}{12}$
A	**B ***	**C**	**D**

4. What is the probability of flipping 4 fair coins 1 time and getting all tails?

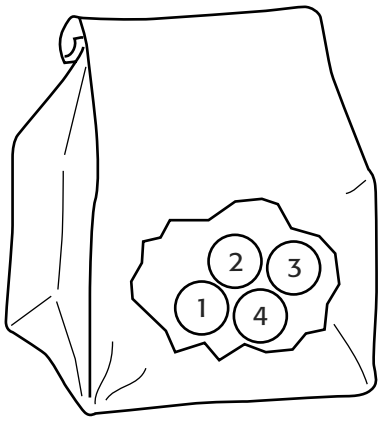
$\frac{1}{4}$	$\frac{1}{8}$	$\frac{1}{16}$	$\frac{1}{32}$
A	**B**	**C ***	**D**

5. What is the probability of flipping 6 fair coins 1 time and getting all heads?

$\frac{1}{64}$	$\frac{1}{36}$	$\frac{1}{12}$	$\frac{1}{6}$
A *	**B**	**C**	**D**

Sample Gridded Items

The bag below contains a total of four chips. The chips are numbered 1 through 4 and are all the same size and texture. A chip is selected at random, its number is recorded, and it is put back into the bag. Then, a second chip is selected at random.



1. What is the probability that the first chip selected was numbered 1 and the second chip selected was numbered 2?

Express your answer as a fraction.

Mark your answer in the answer grid.

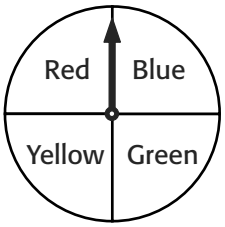
2. A bag contains only 2 green boxes, 2 red boxes, and 3 blue boxes. All of the boxes are the same size and texture. One box is taken from the bag at random and replaced. A second box is taken out at random.

   What is the probability that the first box is green and the second is blue?

Express your answer as a fraction.

Mark your answer in the answer grid.

The spinner below is divided into four equal sections.



3. What is the probability of the arrow on the spinner landing on the space marked blue on the first spin, then landing on a space *not* marked blue on the second spin?

Express your answer as a fraction.

Mark your answer in the answer grid.

Sample Open-Ended Items

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

1. In a probability experiment with her class, Mrs. Jones placed 16 red marbles and 10 white marbles in a bag. There were no other marbles in the bag, and each of the marbles was the same size and shape.

   Mrs. Jones asked Teresa to select 1 marble and hold it in her hand. Then she asked Teresa to select 1 more marble from the bag.

   a. What is the probability that Teresa selected a red marble first and a white marble second?

   After Teresa put the 2 marbles she had drawn back in the bag, Mrs. Jones removed 6 red marbles and 6 white marbles from the bag. Then she asked Teresa to repeat the experiment. This time, before Teresa showed the colors of the two marbles she had chosen, Mrs. Jones asked her class this question.

   "Has the probability that Teresa selected a red marble first and a white marble second changed?"

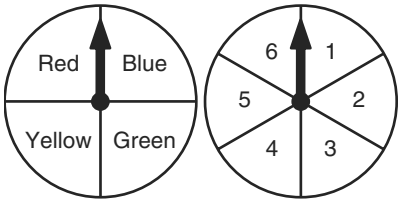
   - Luke said that the probability was less than it was before.
   - Martin said the probability was greater than it was before.
   - Eddie said the probability was the same as before the marbles were removed.

   b. Who is right? Justify your answer.

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

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

2. John is going to perform the same experiment 10 times. He spins the arrows on both spinners at the same time. Spinner A has equal sectors marked red, yellow, green, and blue, and spinner B has equal sectors labeled 1 through 6.



The results for the first 4 times that John tried the experiment are shown in the table below.

John's Experiment

Experiment Number	Result	
	Spinner A	**Spinner B**
1	Blue	6
2	Blue	6
3	Blue	6
4	Blue	6

Before John could perform the next experiment, three of his classmates drew the following conclusions about possible results for Experiment Number 5.

- Spencer said that the probability that John's result will be "blue" on Spinner A and "6" on Spinner B is between 0 and $\frac{1}{6}$.
- Glenn said that the probability that John's result will be "blue" on Spinner A and "6" on Spinner B is zero.
- Morgan said that the probability that John's result will be "blue" on Spinner A and "6" on Spinner B is one.

Which classmate is correct? Justify your answer.

Show all your work and/or explain your reasoning in the space provided in the answer document.

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

3. The sandwich menu at the local sandwich shop in shown below. A customer may choose one type of bread and one type of cheese from the menu.

Sandwich Menu

Bread	Cheese
Wheat White Whole Grain Rye	American Swiss Cheddar

What is the probability of randomly selecting a rye bread with Swiss cheese sandwich?

Show all your work and/or explain your reasoning in the space provided in the answer document.

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

4. Melinda is going to perform the same experiment 6 times. Each experiment consists of flipping a nickel and spinning the arrow of a spinner. The spinner is divided into 4 equal color sectors: blue, red, green, and yellow. The results of her first 5 experiments are shown in the table below.

Melinda's Experiment

Experiment Number	Result	
	Nickel	Spinner
1	Tails	Green
2	Tails	Green
3	Tails	Green
4	Tails	Green
5	Tails	Green

Before Melinda performed the next experiment, three of her classmates made the following predictions about results for experiment number 6.

- Heidi said that there is a 100% probability that Melinda's result will be "tails" on the nickel and "green" on the spinner.
- Lynne said that there is between a 0% and 25% probability that Melinda's result will be "tails" on the nickel and "green" on the spinner.
- Sam said that there is between a 50% and 75% probability that Melinda's result will be "tails" on the nickel and "green" on the spinner.

Which classmate is correct? Justify your answer.

Show all your work and/or explain your reasoning in the space provided in the answer document.

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

5. Five different colored pencils all the same size are placed into a box. The pencil colors are red, green, blue, yellow, and black. Three pencils will be randomly selected one at a time. The pencils are not replaced after each selection.

   What is the probability that the first pencil selected is red, and the second pencil selected is yellow?

Show all your work and/or explain your reasoning in the space provided in the answer document.

Answer Key

Content Standard 13

Sample Multiple-Choice

1. B
2. D
3. B
4. C
5. A

Sample Gridded

1. $\frac{1}{16}$

2. $\frac{6}{49}$

3. $\frac{3}{16}$

Sample Open-Ended

1. Sample Response(s):

a. There is a total of 26 marbles. The first marble Teresa wants to select is red so that is $\frac{16}{26}$. The second marble she wants to select is white and this will be $\frac{10}{25}$. The reason it is 25 in the denominator is that when Teresa selected the first marble she didn't return it to the bag. Multiply these two fractions together:

$\frac{16}{26} \times \frac{10}{25} = \frac{160}{650} = \frac{32}{130} = \frac{16}{65} = .246$ or .25

b. Luke is correct. Since 6 marbles of each color are taken out of the bag, that leaves 10 red and 4 white marbles for a total of 14 marbles. The first marble we want Teresa to select is red so the answer is $\frac{10}{14}$, and the second marble we want her to select is white and the answer is $\frac{4}{13}$. Again it is 13 because she did not replace the first marble selected. Multiply these two fractions together:

$\frac{10}{14} \times \frac{4}{13} = \frac{40}{182} = \frac{20}{91} = .219$ or .22

Therefore Luke is correct because .22 is less than .25.

Score Point	Response Attributes
3	All is correct.
2	Both logics are correct. OR One logic and both answers are correct.
1	One or both answers are correct. OR One logic is correct.
0	None correct. (Also, blanks, rewrites problem, foreign language, illegible, refusals, off-task, etc., scored as invalid.)

2. Sample Response(s):

There is a 1 in 24 chance of getting Spinner A to be blue and Spinner B to be 6.

$\frac{1}{4} \times \frac{1}{6} = \frac{1}{24}$ or 0.042

Therefore, Spencer is correct because $\frac{1}{6}$ is 0.167 and 0.042 lies between 0 and 0.167.

Score Point	Response Attributes
3	All is correct.
2	Both logics are correct. OR One logic and both answers are correct.
1	One or both answers are correct. OR One logic is correct.
0	None correct. (Also, blanks, rewrites problem, foreign language, illegible, refusals, off-task, etc., scored as invalid.)

3. Sample Response(s):

The probability of selecting a rye bread with Swiss cheese is $\frac{1}{12}$. Since there are 4 breads to choose from and 3 cheeses to choose from, then the answer is $\frac{1}{4} \times \frac{1}{3} = \frac{1}{12}$.

Score Point	Response Attributes
3	All is correct.
2	Both logics are correct. OR One logic and both answers are correct.
1	One or both answers are correct. OR One logic is correct.
0	None correct. (Also, blanks, rewrites problem, foreign language, illegible, refusals, off-task, etc., scored as invalid.)

4. Sample Response(s):

There is a $\frac{1}{8}$ probability of getting tails and having the arrow of the spinner land on green. There are 2 sides to the nickel so the answer is $\frac{1}{2}$ and there are 4 sectors of the spinner, so the answer is $\frac{1}{4}$. Multiply these two fractions together $\frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$. This is a decimal of .125. Therefore, Lynne is correct because .125 is 12.5% and that falls within 0% and 25%.

Score Point	Response Attributes
3	All is correct.
2	Both logics are correct. OR One logic and both answers are correct.
1	One or both answers are correct. OR One logic is correct.
0	None correct. (Also, blanks, rewrites problem, foreign language, illegible, refusals, off-task, etc., scored as invalid.)

5. Sample Response(s):

There are five different colored pencils in a box. The probability of first selecting a red pencil is $\frac{1}{5}$ and the probability of selecting a yellow pencil second is $\frac{1}{4}$. The reason it is 4 in the denominator is because the first pencil selected was not replaced. Therefore, the answer is $\frac{1}{5} \times \frac{1}{4} = \frac{1}{20}$.

Score Point	Response Attributes
3	All is correct.
2	Both logics are correct. OR One logic and both answers are correct.
1	One or both answers are correct. OR One logic is correct.
0	None correct. (Also, blanks, rewrites problem, foreign language, illegible, refusals, off-task, etc., scored as invalid.)