

New York NYSTP 2016 Grade 6 Math

Reference Materials
Page 2

Exam Materials
Pages 3 - 35

Answer Key Materials
Pages 36 - 37

Rubric Materials
Pages 38 - 142

Grade 6 Mathematics Reference Sheet

CONVERSIONS

1 inch = 2.54 centimeters

1 meter = 39.37 inches

1 mile = 5,280 feet

1 mile = 1,760 yards

1 mile = 1.609 kilometers

1 kilometer = 0.62 mile

1 pound = 16 ounces

1 pound = 0.454 kilogram

1 kilogram = 2.2 pounds

1 ton = 2,000 pounds

1 cup = 8 fluid ounces

1 pint = 2 cups

1 quart = 2 pints

1 gallon = 4 quarts

1 gallon = 3.785 liters

1 liter = 0.264 gallon

1 liter = 1,000 cubic centimeters

FORMULAS

Triangle

$$A = \frac{1}{2}bh$$

Right Rectangular Prism

$$V = Bh \text{ or } V = lwh$$

Name: _____



New York State *Testing Program*

2016 Common Core Mathematics Test Book 1

Grade **6**

April 13–15, 2016

Released Questions

Book 1



TIPS FOR TAKING THE TEST

Here are some suggestions to help you do your best:

- Read each question carefully and think about the answer before choosing your response.
- You have been provided with mathematics tools (a ruler and a protractor) and a reference sheet to use during the test. It is up to you to decide when each tool and the reference sheet will be helpful. You should use mathematics tools and the reference sheet whenever you think they will help you to answer the question.
- Plan your time.

11

Jason has a coupon for \$2.50 off any electronic book from an online book store. If the original price, in dollars, of an electronic book is p and the discounted price, in dollars, is d , which table shows the relationship between p and d ?

A

p	3.00	4.00	5.00	6.00
d	0.50	1.50	2.50	3.50

B

p	3.00	4.00	5.00	6.00
d	5.50	6.50	7.50	8.50

C

p	3.00	4.00	5.00	6.00
d	2.50	2.50	2.50	2.50

D

p	3.00	4.00	5.00	6.00
d	7.50	10.00	12.50	15.00

GO ON

12 Which pair of expressions below are equivalent?

- A $7(2x)$ and $9x$
- B $3x + 5x$ and $15x$
- C $4(2x - 6)$ and $8x - 24$
- D $x + x + x + x$ and x^4

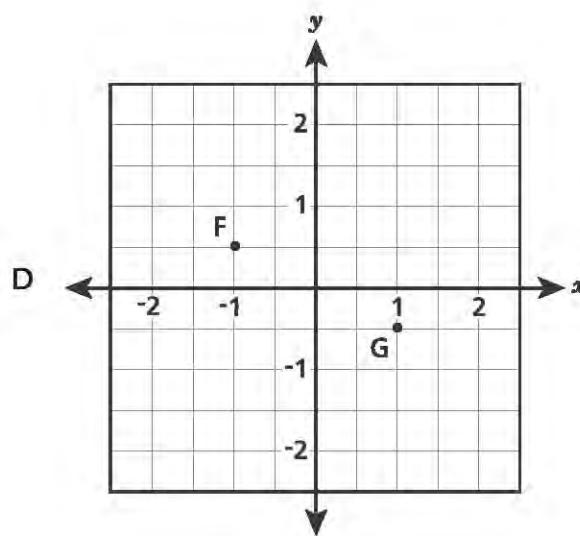
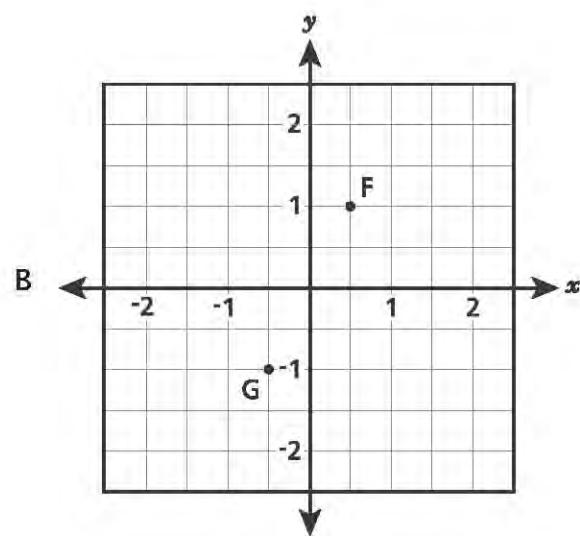
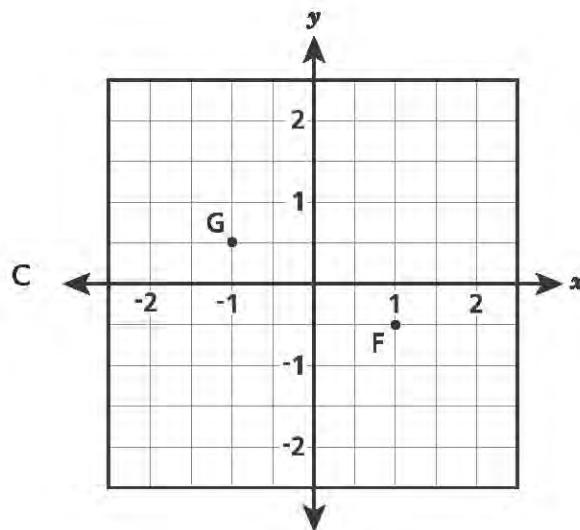
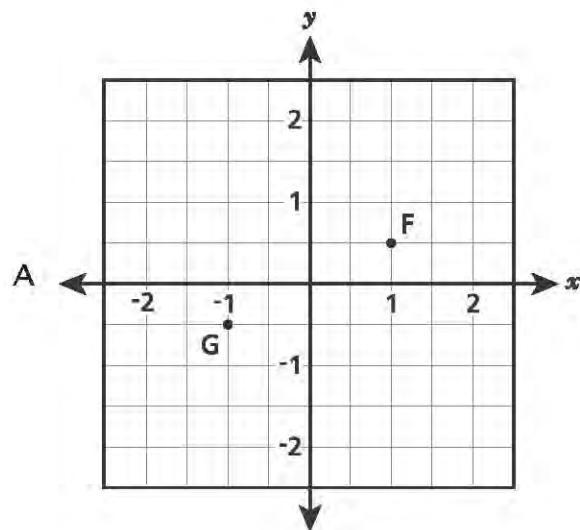
13 An art teacher had $\frac{2}{3}$ gallon of paint to pour into containers. If he poured $\frac{1}{8}$ gallon of paint into each container until he ran out of paint, how many containers had paint in them, including the one that was partially filled?

- A 1
- B 3
- C 5
- D 6

GO ON

14

The coordinates of point F are $(1, 0.5)$ and the coordinates of point G are $(-1, -0.5)$. Which coordinate plane below correctly shows the locations of points F and G?



GO ON

15

Last year, Chesa made 32 one-cup servings of soup for a school party. This year, she will make two times the amount of soup that she made last year. How many gallons of soup will Chesa make this year?

- A 64
- B 16
- C 4
- D 2

16

A shelf has four books on it. The weight, in pounds, of each of the four books on the shelf is listed below.

2.5, 3.2, 2.7, 2.3

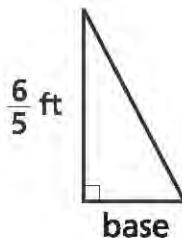
Which inequality represents the weight, w , of any book chosen from the shelf?

- A $w > 2.3$
- B $w < 2.4$
- C $w > 3.2$
- D $w < 3.3$

GO ON

17

The area of the triangle below is $\frac{2}{5}$ square foot.



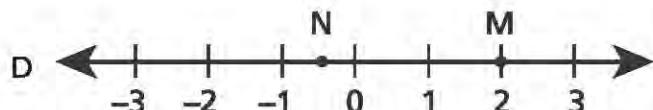
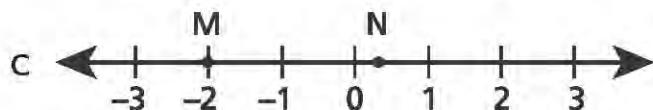
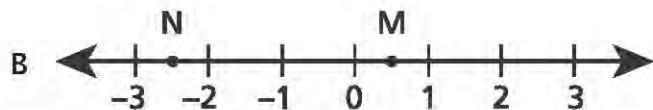
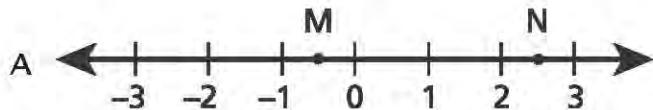
What is the length, in feet, of the base of the triangle?

- A $\frac{24}{25}$
- B $\frac{25}{24}$
- C $\frac{2}{3}$
- D $\frac{3}{2}$

GO ON

18

- Point M represents the opposite of $-\frac{1}{2}$ and point N represents the opposite of $\frac{5}{2}$. Which number line correctly shows points M and N?



19

- The weight of an object on the moon, m , is about $\frac{1}{6}$ of the object's weight on Earth, e. Which equation represents the approximate weight of an object on the moon in terms of the object's weight on Earth?

A $m = \frac{1}{6} + e$

B $m = \frac{e}{6}$

C $m = 6 + e$

D $m = 6e$

GO ON

20

The table below shows different possibilities for the number of games a team would need to win to maintain a certain percentage of wins.

**POSSIBLE BASEBALL
GAMES WON**

Number of Games Won	Number of Games Played
6	10
24	40
36	60
42	70

Which ratio of the number of games won to the number of games played could also be included in this table?

- A 18 : 20
- B 30 : 20
- C 18 : 30
- D 50 : 30

GO ON

21

The table below lists the coordinates of four points.

COORDINATES

<i>x</i>	<i>y</i>
1	5
2	7
3	9
4	11

If x represents any number in the first column, which expression can always be used to find the value of y in the second column?

- A $5x$
- B $x + 2$
- C $x + 4$
- D $2x + 3$

22

Which expression is represented by the phrase “the square of y decreased by the quotient of 28 and 7”?

- A $\frac{28}{7} - y^2$
- B $y^2 - \frac{28}{7}$
- C $\frac{28}{7-y^2}$
- D $\frac{28}{y^2-7}$

GO ON

Book 2

TIPS FOR TAKING THE TEST

Here are some suggestions to help you do your best:

- Read each question carefully and think about the answer before choosing your response.
- You have been provided with mathematics tools (a ruler, protractor, and calculator) and a reference sheet to use during the test. It is up to you to decide when each tool and the reference sheet will be helpful. You should use mathematics tools and the reference sheet whenever you think they will help you to answer the question.
- Plan your time.

27

A recipe for lemonade calls for 1 cup of sugar and 5 cups of water. How much sugar is used per cup of water?

A $\frac{1}{6}$ cup

B $\frac{1}{5}$ cup

C $\frac{1}{4}$ cup

D $\frac{5}{1}$ cup

28

Sam paid \$8.28 for 18 stamps. At this rate, how much would it cost Sam to buy 12 stamps?

A \$2.19

B \$2.28

C \$3.72

D \$5.52

29

John's friend told him that he could earn \$49 for handing out flyers at a local concert. John wants to calculate the hourly rate. If he works a total of 3.5 hours, the equation $3.5x = 49$ can be used to determine his hourly rate. What would John's hourly rate be, in dollars?

A \$1.40

B \$14.00

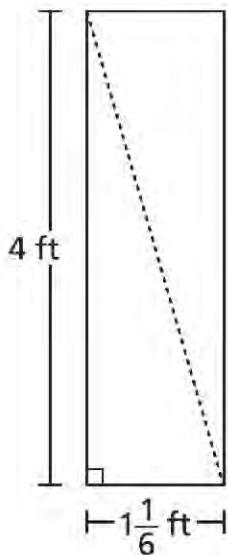
C \$45.50

D \$171.50

GO ON

30

Theo made sails for a model boat. He cut along the diagonal of a rectangular piece of cloth to make two sails, as shown below.



What was the area, in square feet, of one sail?

- A $9\frac{1}{3}$
- B $4\frac{2}{3}$
- C $2\frac{7}{12}$
- D $2\frac{1}{3}$

GO ON

34

The area of an airplane's wings is related to the airplane's lifting force, which holds the airplane in the air. The table below lists several wing areas and the corresponding lifting forces.

AIRPLANE LIFTING FORCE

Area of Wings (square feet)	Lifting Force (pounds)
125	1,875
150	2,250
175	2,625
250	3,750
x	5,625
420	y

The ratio of lifting force to area is equivalent for all pairs in the table. What are the values of x and y ?

- A $x = 375$ square feet and $y = 7,500$ pounds
- B $x = 335$ square feet and $y = 7,500$ pounds
- C $x = 375$ square feet and $y = 6,300$ pounds
- D $x = 335$ square feet and $y = 6,300$ pounds

GO ON

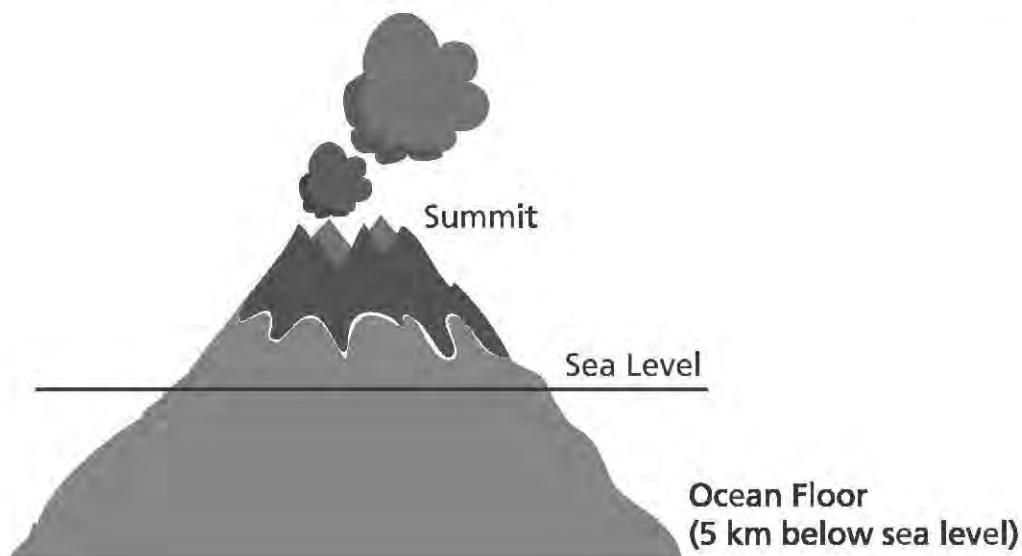
36

Simon used 3 pears and 9 apples to make a fruit salad. What was the ratio of the number of pears to the number of apples in the fruit salad?

- A 1 : 3
- B 1 : 4
- C 1 : 6
- D 1 : 9

37

The summit of a volcano is 10 kilometers (km) above the ocean floor, as shown below.



If the ocean floor has an elevation of -5 kilometers, which statement describes the elevation of sea level and the summit?

- A The elevation of sea level is 0 km and the elevation of the summit is 5 km.
- B The elevation of sea level is 5 km and the elevation of the summit is 5 km.
- C The elevation of sea level is 0 km and the elevation of the summit is 10 km.
- D The elevation of sea level is 5 km and the elevation of the summit is 10 km.

GO ON

38

The Frenchtown Roller Rink charges a \$5 entrance fee and an hourly rate for roller skating. The total cost for roller skating depends on the number of hours a person skates. The table below represents the total cost of skating for different numbers of hours.

ROLLER SKATING COST

Number of Hours (h)	Total Cost in Dollars (c)
0	5
1	8
2	11
3	14
4	17

Which equation represents the relationship between the cost, c , and the number of hours, h ?

- A $c = 8h$
- B $c = 5h + 3$
- C $c = 2h + 7$
- D $c = 3h + 5$

39

Fei Yen's dog eats 8 ounces of dog food each day. Fei Yen bought a 28-pound bag of dog food. How many 8-ounce servings are in a 28-pound bag of dog food?

- A 14
- B 56
- C 224
- D 448

GO ON

40

Point A and point B are placed on a number line. Point A is located at -20 and point B is 5 less than point A. Which statement about point B is true?

- A It is located at -25 and is to the right of point A on the number line.
- B It is located at -15 and is to the right of point A on the number line.
- C It is located at -25 and is to the left of point A on the number line.
- D It is located at -15 and is to the left of point A on the number line.

41

Chakan worked at the warehouse after school. He earned $\$9.25$ per hour stacking boxes. Which equation correctly relates Chakan's total earnings, d , to the number of hours he worked, h ?

A $d = 9.25h$

B $h = 9.25d$

C $d = \frac{9.25}{h}$

D $h = \frac{9.25}{d}$

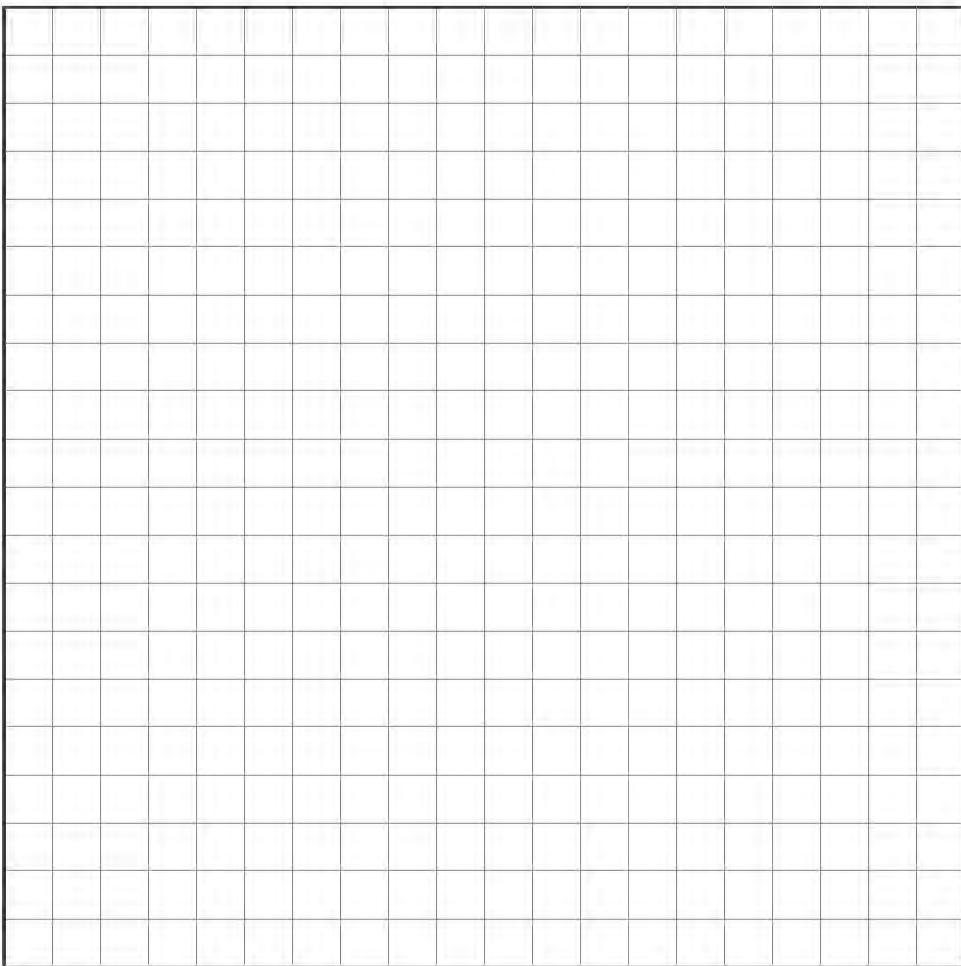
GO ON

42

Bronson is using a coordinate plane to design a rectangular swimming pool. He will plot points on the coordinate plane to mark the vertices of the rectangular pool bottom. If Bronson plots the first three points at (5, 3), (5, 13), and (30, 13), what would be the coordinates of the fourth point?

- A (30, 5)
- B (20, 13)
- C (5, 28)
- D (30, 3)

You may use the grid below to help you solve the problem.



GO ON

43

Residents of a small city voted on whether to allow a developer to build a shopping center. The number of votes in favor of the shopping center was 4,400. The number of votes against the shopping center was 17,600. What percent of the voters were in favor of building the shopping center?

- A 20%
- B 25%
- C 40%
- D 44%

44

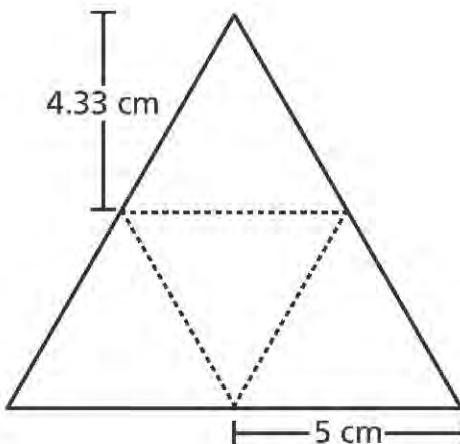
Maddy had a piece of ribbon that was $3\frac{1}{2}$ yards long. She used this ribbon to make bows. Each bow was made from a piece of the ribbon that was $\frac{3}{4}$ yard long. This situation can be represented by the equation $3\frac{1}{2} \div \frac{3}{4} = 4\frac{2}{3}$. Which statement **best** describes what the quotient $4\frac{2}{3}$ represents in the situation above?

- A Maddy had bows that were each $4\frac{2}{3}$ yards long.
- B Maddy had $4\frac{2}{3}$ yards of ribbon left after making the bows.
- C Maddy made 4 bows from the piece of ribbon and had $\frac{2}{3}$ of a yard left.
- D Maddy made 4 bows from the piece of ribbon and had enough left for $\frac{2}{3}$ of a bow.

GO ON

45

The figure below shows the net of a triangular pyramid. The given height is rounded to the nearest hundredth.



If all the triangles are equilateral, what is the surface area of the pyramid in square centimeters?

- A 86.6
- B 43.3
- C 32.48
- D 10.83

46

Zelma buys p pounds of bananas for 40 cents per pound. She pays the clerk with a twenty-dollar bill. The clerk subtracts the total cost of the bananas from the twenty-dollar bill to determine the amount of change to give Zelma.

Which expression represents the amount of change Zelma should receive?

- A $p - 20$
- B $20 - 40p$
- C $20 - 0.40p$
- D $0.40p - 20$

GO ON

47

The table below lists four masses and their corresponding approximate weights on Earth.

MASSES AND CORRESPONDING WEIGHTS

Mass (kilograms)	Weight (Newtons)
20	196
50	490
x	1078
130	1274
140	1372

The ratio of weight to mass is constant. Which statement describes the ratio of weight to mass and the value of x in the table?

- A The ratio is $\frac{98}{10}$; $x = 90$
- B The ratio is $\frac{98}{10}$; $x = 110$
- C The ratio is $\frac{10}{98}$; $x = 90$
- D The ratio is $\frac{10}{98}$; $x = 110$

48

What value of y makes the equation below true?

$$y + 2.9 = 11$$

- A 8.1
- B 8.9
- C 9.1
- D 13.9

GO ON

49

A scientist studied the migration patterns of two types of whales.

- The humpback whales traveled 2,240 miles in 28 days.
- The gray whales traveled 2,368 miles in 32 days.

If the humpback whales had traveled at the same rate for 32 days, how many more miles would they have traveled than the gray whales?

- A 128
- B 192
- C 280
- D 408

GO ON

Book 3

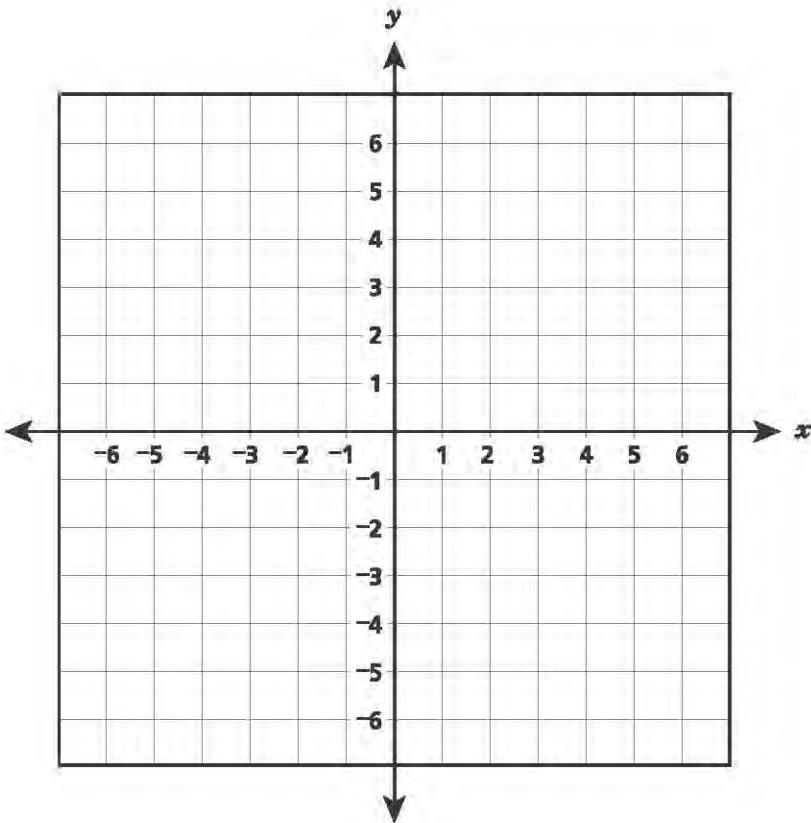
TIPS FOR TAKING THE TEST

Here are some suggestions to help you do your best:

- Read each question carefully and think about the answer before writing your response.
- You have been provided with mathematics tools (a ruler, a protractor, and a calculator) and a reference sheet to use during the test. It is up to you to decide when each tool and the reference sheet will be helpful. You should use mathematics tools and the reference sheet whenever you think they will help you to answer the question.
- Be sure to show your work when asked.
- Plan your time.

52

The coordinate grid below represents a town. Curtis's house is at $(-4, -6)$ and Jean's house is at $(-4, 3)$. Plot the points where Curtis's house and Jean's house are located.



Each unit on the grid represents 1 mile. If Curtis can ride his bike at a constant rate of 12 miles per hour, how many minutes would it take Curtis to ride from his house to Jean's house?

Answer _____ minutes

GO ON

53

On Saturday, a minor league baseball team gave away baseball cards to each person entering the stadium. One group received 28 baseball cards. A second group received 68 baseball cards. If **each person** entering the stadium received the same number of cards, what was the **greatest** possible number of baseball cards that each person could have received?

Show your work.

Answer _____ baseball cards

GO ON

54

Expressions *A*, *B*, and *C* are shown below.

A
 $20^2 - 18^2$

B
 $8(4^2) + 2^4$

C
 $15^2 - 3^4$

Which expression or expressions have the same value as 12^2 ?

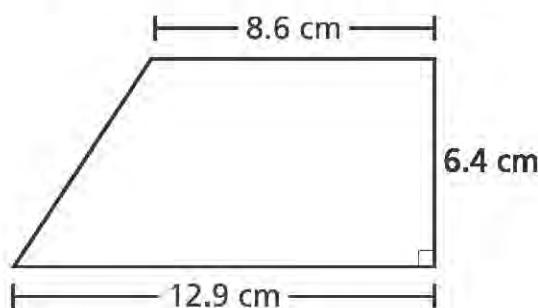
Show your work.

Answer _____

GO ON

55

What is the area, in square centimeters, of the trapezoid below?



Show your work.

Answer _____ square centimeters

GO ON

56

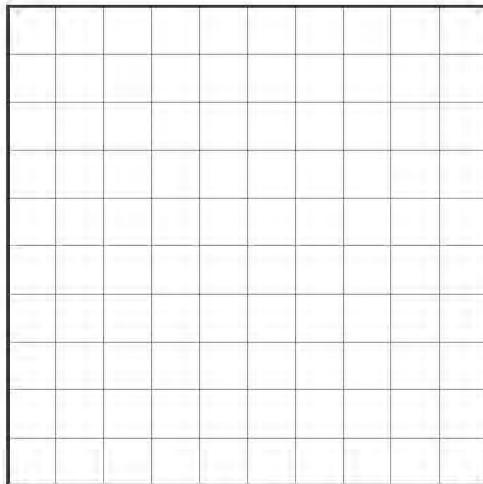
A park planner is designing a dog park. He wants to use a metal fence to enclose a kennel at the dog park. The vertices of the fence are shown below. The units on the coordinate plane are yards.

- Point A (4, -4)
- Point B (-4, -4)
- Point C (-4, 3)
- Point D (1, 3)
- Point E (1, -1)
- Point F (4, -1)

The park planner wants to add a gate between points A and F. He will not put metal fencing on that side. What is the total number of yards of metal fencing that will be needed for the kennel at the dog park?

Show your work.

You may use the grid below to help you solve the problem.

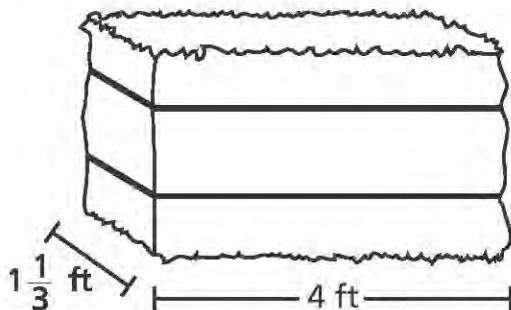


Answer _____ yards

GO ON

57

A farmer stacked hay bales. The length and width of each hay bale are shown below.



The volume of each hay bale is $10\frac{2}{3}$ cubic feet. The farmer stacked eight hay bales on top of one another. What is the height, in feet, of the stacked hay bales?

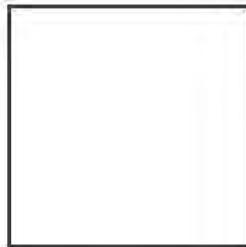
Show your work.

Answer _____ feet

GO ON

58

A square with one side length represented by an expression is shown below.



$$6(3x + 8) + 32 + 12x$$

Use the properties of operations to write three different equivalent expressions to represent the lengths of the other three sides of the square. One of your expressions should contain only two terms.

Show your work.

Answer

GO ON

59

A carpenter built three bookcases, A, B, and C, to stand next to each other along a wall. The total length of the wall is 456 centimeters. The carpenter will build two more bookcases, D and E, along the same wall. These two bookcases will have equal widths. The widths of bookcases A, B, and C are shown in the table below.

WIDTHS OF BOOKCASES

Bookcase	Width (centimeters)
A	132
B	94
C	108
D	w
E	w

Write and solve an equation to determine w , the greatest possible width for bookcases D and E.

Show your work.

Answer $w =$ _____ centimeters

GO ON

60

Darnell's car used 8 gallons of gasoline to travel 340 miles. After a mechanic worked on the car, it used 7 gallons of gasoline to travel 350 miles. If the price of gasoline was approximately \$4.00 per gallon, how much less, to the nearest cent per mile, did it cost to run the car after the mechanic worked on it?

Show your work.

Answer _____ cent(s) per mile

GO ON

61

The circus had one performance at the Dewey Civic Center and one at the Atlantic Auditorium. The Dewey Civic Center has 1,600 seats. Tickets for 85% of the total number of seats were sold. How many tickets were sold?

Show your work.

Answer _____ tickets

Atlantic Auditorium has 850 seats. Tickets were sold for 816 of the seats. For what percent of the seats were tickets sold?

Show your work.

Answer _____ %

STOP

THE STATE EDUCATION DEPARTMENT
THE UNIVERSITY OF THE STATE OF NEW YORK / ALBANY, NY 12234
2016 Mathematics Tests Map to the Standards
Released Questions Available on EngageNY

Grade 6

Question	Type	Key	Points	Standard	Cluster	Secondary Standard(s)	Multiple Choice Questions:		Constructed Response Questions:	
							Percentage of Students Who Answered Correctly (P-Value)	Average Points Earned	P-Value (Average Points Earned ÷ Total Possible Points)	
Book 1										
11	Multiple Choice	A	1	CCSS.Math.Content.6.EE.C.9	Expressions and Equations			0.62		
12	Multiple Choice	C	1	CCSS.Math.Content.6.EE.A.4	Expressions and Equations			0.54		
13	Multiple Choice	D	1	CCSS.Math.Content.6.NS.A.1	The Number System			0.47		
14	Multiple Choice	A	1	CCSS.Math.Content.6.NS.C.6c	The Number System			0.77		
15	Multiple Choice	C	1	CCSS.Math.Content.6.RP.A.3d	Ratios and Proportional Relationships			0.35		
16	Multiple Choice	D	1	CCSS.Math.Content.6.EE.B.8	Expressions and Equations			0.38		
17	Multiple Choice	C	1	CCSS.Math.Content.6.NS.A.1	The Number System	CCSS.Math.Content.6.G.A.1		0.48		
18	Multiple Choice	B	1	CCSS.Math.Content.6.NS.C.6a	The Number System	CCSS.Math.Content.6.NS.C.6c		0.64		
19	Multiple Choice	B	1	CCSS.Math.Content.6.EE.C.9	Expressions and Equations			0.47		
20	Multiple Choice	C	1	CCSS.Math.Content.6.RP.A.3a	Ratios and Proportional Relationships			0.62		
21	Multiple Choice	D	1	CCSS.Math.Content.6.EE.B.6	Expressions and Equations			0.54		
22	Multiple Choice	B	1	CCSS.Math.Content.6.EE.A.2a	Expressions and Equations			0.59		
Book 2										
27	Multiple Choice	B	1	CCSS.Math.Content.6.RP.A.2	Ratios and Proportional Relationships			0.82		
28	Multiple Choice	D	1	CCSS.Math.Content.6.RP.A.3b	Ratios and Proportional Relationships			0.71		
29	Multiple Choice	B	1	CCSS.Math.Content.6.EE.B.7	Expressions and Equations	CCSS.Math.Content.6.RP.A.3b		0.72		
30	Multiple Choice	D	1	CCSS.Math.Content.6.G.A.1	Geometry			0.38		
34	Multiple Choice	C	1	CCSS.Math.Content.6.RP.A.3a	Ratios and Proportional Relationships			0.62		
36	Multiple Choice	A	1	CCSS.Math.Content.6.RP.A.1	Ratios and Proportional Relationships	CCSS.Math.Content.6.RP.A.3		0.78		
37	Multiple Choice	A	1	CCSS.Math.Content.6.NS.C.5	The Number System			0.29		

Grade 6

Released Questions Available on EngageNY

Question	Type	Key	Points	Standard	Cluster	Secondary Standard(s)	Multiple Choice Questions:	Constructed Response Questions:	
							Percentage of Students Who Answered Correctly (P-Value)	Average Points Earned	P-Value (Average Points Earned ÷ Total Possible Points)
38	Multiple Choice	D	1	CCSS.Math.Content.6.EE.C.9	Expressions and Equations		0.46		
39	Multiple Choice	B	1	CCSS.Math.Content.6.RP.A.3d	Ratios and Proportional Relationships		0.41		
40	Multiple Choice	C	1	CCSS.Math.Content.6.NS.C.7a	The Number System		0.46		
41	Multiple Choice	A	1	CCSS.Math.Content.6.EE.C.9	Expressions and Equations		0.59		
42	Multiple Choice	D	1	CCSS.Math.Content.6.G.A.3	Geometry	CCSS.Math.Content.6.NS.C.6c	0.68		
43	Multiple Choice	A	1	CCSS.Math.Content.6.RP.A.3c	Ratios and Proportional Relationships		0.34		
44	Multiple Choice	D	1	CCSS.Math.Content.6.NS.A.1	The Number System		0.26		
45	Multiple Choice	B	1	CCSS.Math.Content.6.G.A.4	Geometry		0.40		
46	Multiple Choice	C	1	CCSS.Math.Content.6.EE.A.2a	Expressions and Equations		0.48		
47	Multiple Choice	B	1	CCSS.Math.Content.6.RP.A.3a	Ratios and Proportional Relationships	CCSS.Math.Content.6.RP.A.1	0.42		
48	Multiple Choice	A	1	CCSS.Math.Content.6.EE.B.5	Expressions and Equations	CCSS.Math.Content.6.NS.B.3	0.85		
49	Multiple Choice	B	1	CCSS.Math.Content.6.RP.A.3b	Ratios and Proportional Relationships	CCSS.Math.Content.6.RP.A.2	0.54		
Book 3									
52	Constructed Response		2	CCSS.Math.Content.6.NS.C.8	The Number System	CCSS.Math.Content.6.RP.A.3		1.10	0.55
53	Constructed Response		2	CCSS.Math.Content.6.NS.B.4	The Number System			0.82	0.41
54	Constructed Response		2	CCSS.Math.Content.6.EE.A.1	Expressions and Equations			1.11	0.55
55	Constructed Response		2	CCSS.Math.Content.6.G.A.1	Geometry	CCSS.Math.Content.6.NS.B.3		0.70	0.35
56	Constructed Response		2	CCSS.Math.Content.6.NS.C.8	The Number System	CCSS.Math.Content.6.G.A.3		0.79	0.39
57	Constructed Response		2	CCSS.Math.Content.6.G.A.2	Geometry	CCSS.Math.Content.6.EE.A.2c		0.56	0.28
58	Constructed Response		3	CCSS.Math.Content.6.EE.A.3	Expressions and Equations			0.59	0.20
59	Constructed Response		3	CCSS.Math.Content.6.EE.B.7	Expressions and Equations			1.01	0.34
60	Constructed Response		3	CCSS.Math.Content.6.RP.A.2	Ratios and Proportional Relationships			0.37	0.12
61	Constructed Response		3	CCSS.Math.Content.6.RP.A.3c	Ratios and Proportional Relationships			1.24	0.41

*This item map is intended to identify the primary analytic skills necessary to successfully answer each question. However, some questions measure proficiencies described in multiple standards, including a balanced combination of procedural and conceptual understanding.

2-Point Holistic Rubric

2 Point	<p>A two-point response includes the correct solution to the question and demonstrates a thorough understanding of the mathematical concepts and/or procedures in the task.</p> <p>This response</p> <ul style="list-style-type: none">• indicates that the student has completed the task correctly, using mathematically sound procedures• contains sufficient work to demonstrate a thorough understanding of the mathematical concepts and/or procedures• may contain inconsequential errors that do not detract from the correct solution and the demonstration of a thorough understanding
1 Point	<p>A one-point response demonstrates only a partial understanding of the mathematical concepts and/or procedures in the task.</p> <p>This response</p> <ul style="list-style-type: none">• correctly addresses only some elements of the task• may contain an incorrect solution but applies a mathematically appropriate process• may contain the correct solution but required work is incomplete
0 Point*	<p>A zero-point response is incorrect, irrelevant, incoherent, or contains a correct solution obtained using an obviously incorrect procedure. Although some elements may contain correct mathematical procedures, holistically they are not sufficient to demonstrate even a limited understanding of the mathematical concepts embodied in the task.</p>

*Condition Code A is applied whenever a student who is present for a test session leaves an entire constructed-response question in that session completely blank (no response attempted).

3-Point Holistic Rubric

Score Points:

3 Point	A three-point response includes the correct solution(s) to the question and demonstrates a thorough understanding of the mathematical concepts and/or procedures in the task. This response <ul style="list-style-type: none">• indicates that the student has completed the task correctly, using mathematically sound procedures• contains sufficient work to demonstrate a thorough understanding of the mathematical concepts and/or procedures• may contain inconsequential errors that do not detract from the correct solution(s) and the demonstration of a thorough understanding
2 Point	A two-point response demonstrates a partial understanding of the mathematical concepts and/or procedures in the task. This response <ul style="list-style-type: none">• appropriately addresses most, but not all aspects of the task using mathematically sound procedures• may contain an incorrect solution but provides sound procedures, reasoning, and/or explanations• may reflect some minor misunderstanding of the underlying mathematical concepts and/or procedures
1 Point	A one-point response demonstrates only a limited understanding of the mathematical concepts and/or procedures in the task. This response <ul style="list-style-type: none">• may address some elements of the task correctly but reaches an inadequate solution and/or provides reasoning that is faulty or incomplete• exhibits multiple flaws related to misunderstanding of important aspects of the task, misuse of mathematical procedures, or faulty mathematical reasoning• reflects a lack of essential understanding of the underlying mathematical concepts• may contain the correct solution(s) but required work is limited
0 Point*	A zero-point response is incorrect, irrelevant, incoherent, or contains a correct solution obtained using an obviously incorrect procedure. Although some elements may contain correct mathematical procedures, holistically they are not sufficient to demonstrate even a limited understanding of the mathematical concepts embodied in the task.

*Condition Code A is applied whenever a student who is present for a test session leaves an entire constructed-response question in that session completely blank (no response attempted).

2016 2-and 3-Point Mathematics Scoring Policies

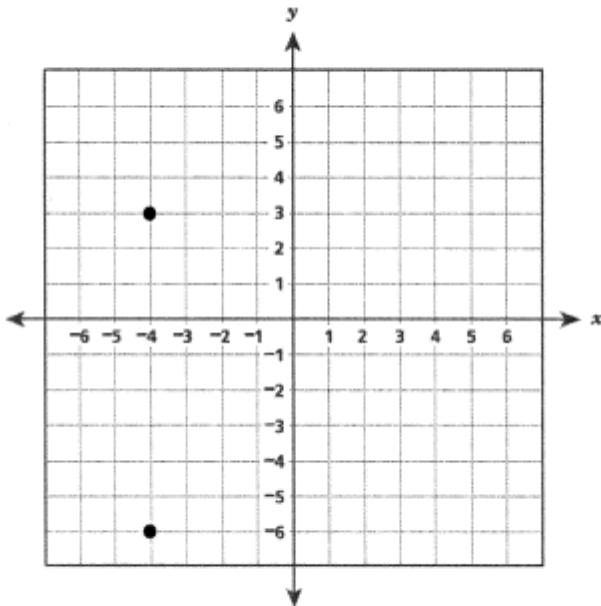
Below are the policies to be followed while scoring the mathematics tests for all grades:

1. If a student does the work in other than a designated “Show your work” area, that work should still be scored. (Additional paper is an allowable accommodation for a student with disabilities if indicated on the student’s Individual Education Program or Section 504 Accommodation Plan.)
2. If the question requires students to show their work, and the student shows appropriate work and clearly identifies a correct answer but fails to write that answer in the answer blank, the student should still receive full credit.
3. In questions that provide ruled lines for students to write an explanation of their work, mathematical work shown elsewhere on the page should be considered and scored.
4. If the student provides one legible response (and one response only), teachers should score the response, even if it has been crossed out.
5. If the student has written more than one response but has crossed some out, teachers should score only the response that has **not** been crossed out.
6. Trial-and-error responses are **not** subject to Scoring Policy #5 above, since crossing out is part of the trial-and-error process.
7. If a response shows repeated occurrences of the same conceptual error within a question, the student should **not** be penalized more than once.
8. In questions that require students to provide bar graphs,
 - in Grades 3 and 4 only, touching bars are acceptable
 - in Grades 3 and 4 only, space between bars does **not** need to be uniform
 - in all grades, widths of the bars must be consistent
 - in all grades, bars must be aligned with their labels
 - in all grades, scales must begin at 0, but the 0 does **not** need to be written
9. In questions requiring number sentences, the number sentences must be written horizontally.
10. In pictographs, the student is permitted to use a symbol other than the one in the key, provided that the symbol is used consistently in the pictograph; the student does not need to change the symbol in the key. The student may **not**, however, use multiple symbols within the chart, nor may the student change the value of the symbol in the key.
11. If students are not directed to show work, any work shown will not be scored. This applies to items that do not ask for any work and items that ask for work for one part and do not ask for work in another part.
12. Condition Code A is applied whenever a student who is present for a test session leaves an entire constructed-response question in that session completely blank (no response attempted). This is not to be confused with a score of zero wherein the student does respond to part or all of the question but that work results in a score of zero.

EXEMPLARY RESPONSE

52

The coordinate grid below represents a town. Curtis's house is at $(-4, -6)$ and Jean's house is at $(-4, 3)$. Plot the points where Curtis's house and Jean's house are located.



Each unit on the grid represents 1 mile. If Curtis can ride his bike at a constant rate of 12 miles per hour, how many minutes would it take Curtis to ride from his house to Jean's house?

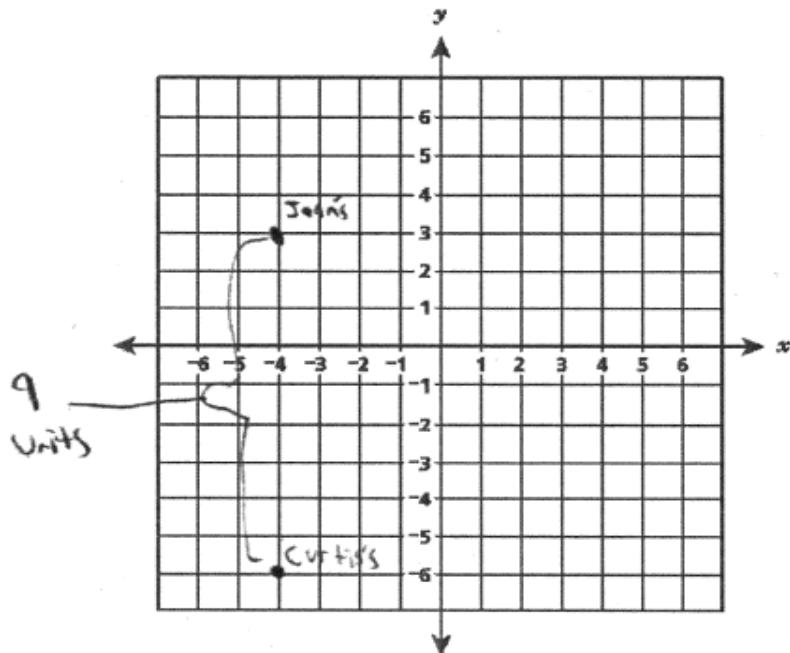
Answer 45 minutes

GUIDE PAPER 1

Additional

52

The coordinate grid below represents a town. Curtis's house is at $(-4, -6)$ and Jean's house is at $(-4, 3)$. Plot the points where Curtis's house and Jean's house are located.



Each unit on the grid represents 1 mile. If Curtis can ride his bike at a constant rate of 12 miles per hour, how many minutes would it take Curtis to ride from his house to Jean's house?

$$\begin{array}{r} 6 \text{ half hr} \\ 2 \cancel{\times} 2 \text{ hr} \end{array}$$

$$\begin{array}{r} 3 = 25 \text{ min.} \\ 2 \cancel{\times} 6 = \text{half hr} \end{array}$$

$$\begin{array}{r} 30 \\ + 15 \\ \hline 45 \end{array}$$

Answer 45 minutes

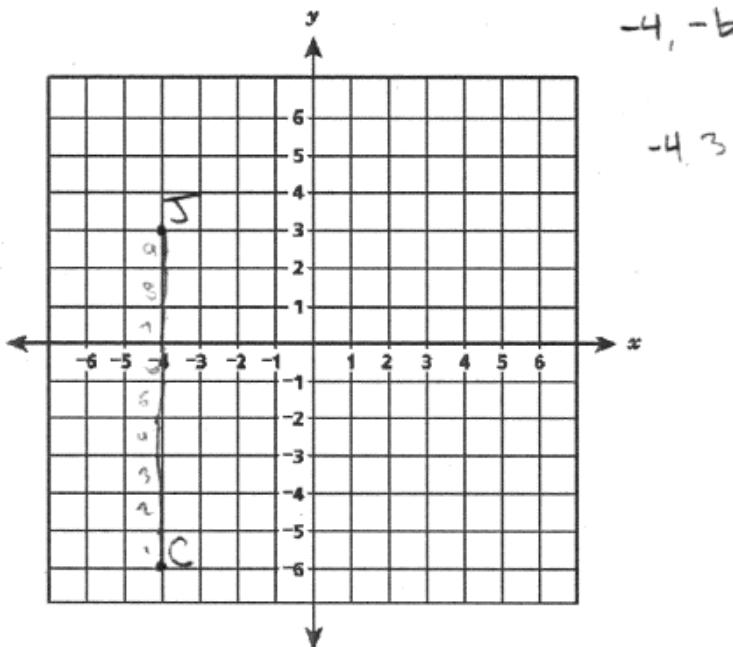
Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The two points are correctly plotted and the time to travel is correctly calculated.

GUIDE PAPER 2

52

The coordinate grid below represents a town. Curtis's house is at $(-4, -6)$ and Jean's house is at $(-4, 3)$. Plot the points where Curtis's house and Jean's house are located.



Each unit on the grid represents 1 mile. If Curtis can ride his bike at a constant rate of 12 miles per hour, how many minutes would it take Curtis to ride from his house to Jean's house?

$$\begin{array}{r} 45 \\ \times 2 \\ \hline 90 \\ 80 \\ \hline 180 \end{array}$$

45 mins 9 miles $\frac{60}{12.0} = .2$

Answer 45 minutes

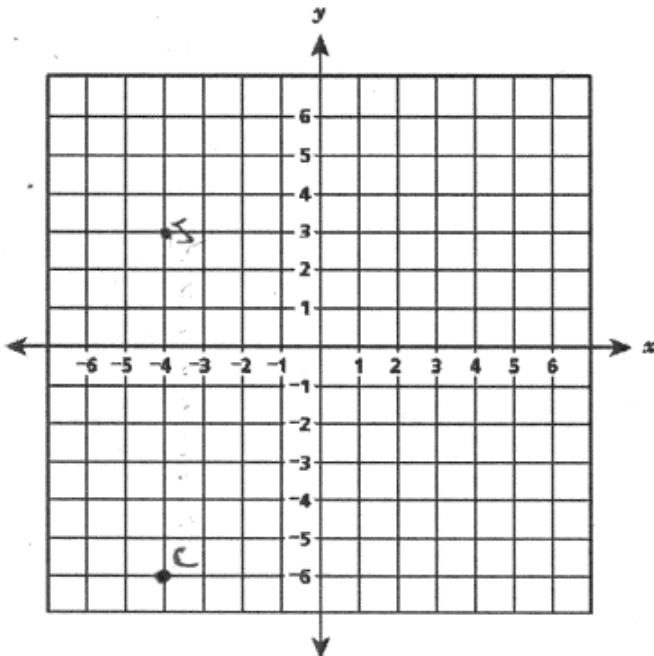
Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The two points are correctly plotted and the time to travel is correctly calculated.

GUIDE PAPER 3

52

The coordinate grid below represents a town. Curtis's house is at $(-4, -6)$ and Jean's house is at $(-4, 3)$. Plot the points where Curtis's house and Jean's house are located.



Each unit on the grid represents 1 mile. If Curtis can ride his bike at a constant rate of 12 miles per hour, how many minutes would it take Curtis to ride from his house to Jean's house?

12⁵
120

1 box = 5 mins.

9 boxes \times 5 mins.
45 mins.

Answer 45 minutes

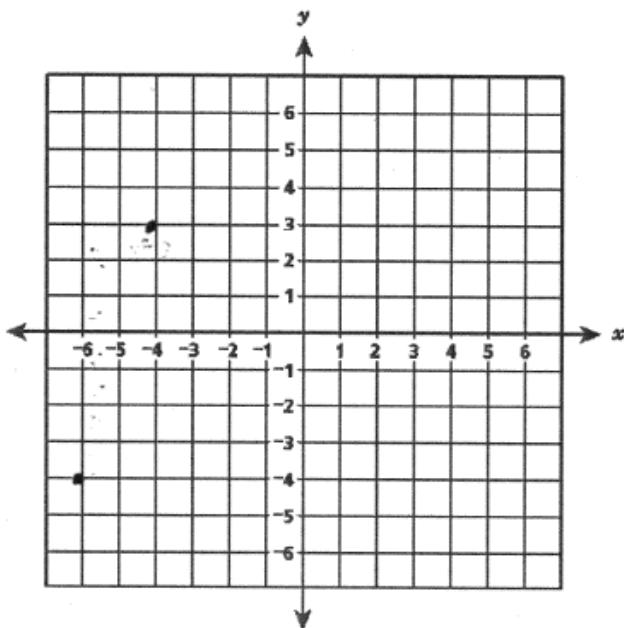
Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The two points are correctly plotted and the time to travel is correctly calculated.

GUIDE PAPER 4

52

The coordinate grid below represents a town. Curtis's house is at $(-4, -6)$ and Jean's house is at $(-4, 3)$. Plot the points where Curtis's house and Jean's house are located.



Each unit on the grid represents 1 mile. If Curtis can ride his bike at a constant rate of 12 miles per hour, how many minutes would it take Curtis to ride from his house to Jean's house?

Answer 45 minutes

$$\begin{aligned}5 &= 1 \text{ mile} & 35 \\10 &= 2 \text{ miles} & 40 \\15 &= 3 \text{ miles} & 45 \\20 &= 4 \text{ miles} \\25 &= 5 \text{ miles} \\30 &= 6 \text{ miles}\end{aligned}$$

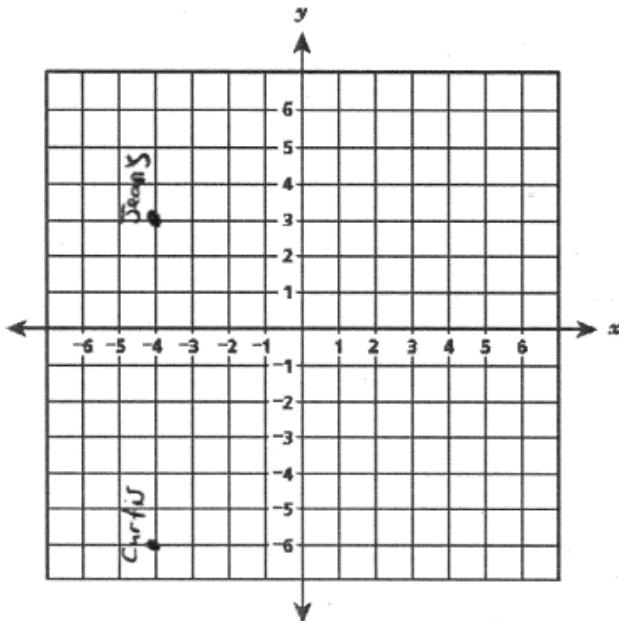
Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the mathematical concepts in the task. Only one correct point is plotted on the graph $(-4, 3)$: the other point is incorrectly plotted using transposed x - and y -coordinates $(-6, -4)$. The time to travel is correctly calculated. The response correctly addresses only some elements of the task.

GUIDE PAPER 5

52

The coordinate grid below represents a town. Curtis's house is at $(-4, -6)$ and Jean's house is at $(-4, 3)$. Plot the points where Curtis's house and Jean's house are located.



Each unit on the grid represents 1 mile. If Curtis can ride his bike at a constant rate of 12 miles per hour, how many minutes would it take Curtis to ride from his house to Jean's house?

$$\begin{array}{r} 12 \\ \times 9 \\ \hline 108 \end{array}$$

Answer 108 minutes

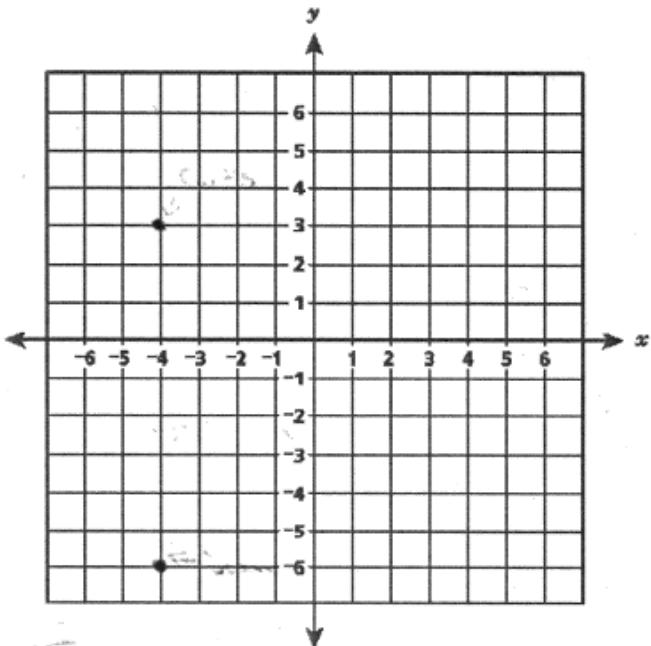
Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the mathematical concepts in the task. The two points are correctly plotted on the graph; however, the solution of 108 minutes is incorrect. The response correctly addresses only some elements of the task.

GUIDE PAPER 6

52

The coordinate grid below represents a town. Curtis's house is at $(-4, -6)$ and Jean's house is at $(-4, 3)$. Plot the points where Curtis's house and Jean's house are located.



Each unit on the grid represents 1 mile. If Curtis can ride his bike at a constant rate of 12 miles per hour, how many minutes would it take Curtis to ride from his house to Jean's house?

$$\begin{array}{r} 5 \\ \times 12 \\ \hline 60 \\ -60 \\ 0 \end{array}$$

Answer 5 minutes

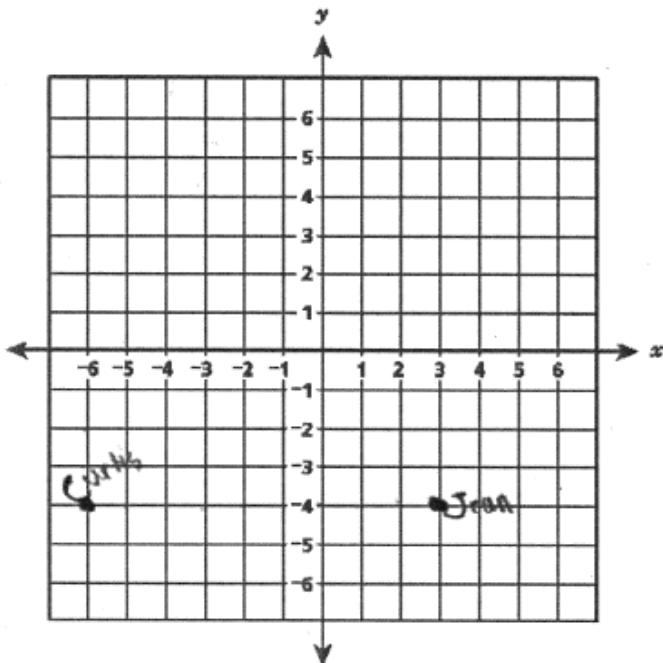
Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the mathematical concepts in the task. The two points are correctly plotted on the graph; however, the response only finds the number of minutes it takes to ride 1 mile rather than 9 miles. The response correctly addresses only some elements of the task.

GUIDE PAPER 7

52

The coordinate grid below represents a town. Curtis's house is at $(-4, -6)$ and Jean's house is at $(-4, 3)$. Plot the points where Curtis's house and Jean's house are located.



Each unit on the grid represents 1 mile. If Curtis can ride his bike at a constant rate of 12 miles per hour, how many minutes would it take Curtis to ride from his house to Jean's house?

12
10
min.

Answer 22 minutes

Score Point 0 (out of 2 points)

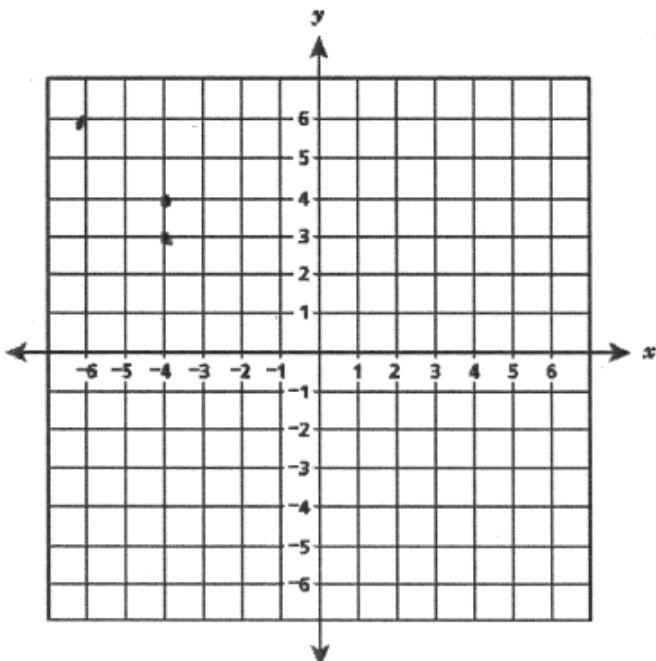
This response is not sufficient to demonstrate even a limited understanding of the mathematical concepts in the task. Both points are incorrectly plotted using transposed x - and y -coordinates and the solution of 22 minutes is incorrect.

GUIDE PAPER 8

Additional

52

The coordinate grid below represents a town. Curtis's house is at $(-4, -6)$ and Jean's house is at $(-4, 3)$. Plot the points where Curtis's house and Jean's house are located.



Each unit on the grid represents 1 mile. If Curtis can ride his bike at a constant rate of 12 miles per hour, how many minutes would it take Curtis to ride from his house to Jean's house?

$$\begin{array}{r} 12 \\ + 1 \\ \hline 13 \end{array}$$

Answer 13 minutes

Score Point 0 (out of 2 points)

This response is not sufficient to demonstrate even a limited understanding of the mathematical concepts in the task. Although one of the points is plotted correctly at $(-4, 3)$, three points are plotted rather than two points. In addition, the solution of 13 minutes is incorrect.

EXEMPLARY RESPONSE

53

On Saturday, a minor league baseball team gave away baseball cards to each person entering the stadium. One group received 28 baseball cards. A second group received 68 baseball cards. If each person entering the stadium received the same number of cards, what was the greatest possible number of baseball cards that each person could have received?

Show your work.

$$\begin{aligned}2 \times 2 \times 7 &= 28 \\2 \times 2 \times 17 &= 68\end{aligned}$$

So $2 \times 2 = 4$ Cards

OR

$$\begin{aligned}28 \div 2 &= 14 \\14 \div 2 &= 7\end{aligned}$$

$$\begin{aligned}68 \div 2 &= 34 \\34 \div 2 &= 17\end{aligned}$$

So $2 \times 2 = 4$ Cards

OR other valid process

Answer 4 baseball cards

GUIDE PAPER 1

Additional

53

On Saturday, a minor league baseball team gave away baseball cards to each person entering the stadium. One group received 28 baseball cards. A second group received 68 baseball cards. If each person entering the stadium received the same number of cards, what was the greatest possible number of baseball cards that each person could have received?

Show your work.

$$\begin{array}{c} 68 \\ \diagup \quad \diagdown \\ 2 \cdot 34 \\ \diagup \quad \diagdown \\ 2 \cdot 17 \end{array}$$
$$\begin{array}{c} 28 \\ \diagup \quad \diagdown \\ 2 \cdot 14 \\ \diagup \quad \diagdown \\ 2 \cdot 7 \end{array}$$
$$\begin{array}{r} 68 \quad 28 \\ \diagup \quad \diagdown \\ 2 \cdot 2 \quad 2 \cdot 2 \\ \diagup \quad \diagdown \\ 2 \cdot 2 = 4 \end{array}$$

Answer 4 baseball cards

Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of mathematical concepts in the task. 28 and 68 are correctly factored and the greatest common factor correctly identified.

GUIDE PAPER 2

53

On Saturday, a minor league baseball team gave away baseball cards to each person entering the stadium. One group received 28 baseball cards. A second group received 68 baseball cards. If each person entering the stadium received the same number of cards, what was the greatest possible number of baseball cards that each person could have received?

Show your work.

$$\begin{array}{ll} 28: 1, 2, \cancel{4}, 7, 14, 28 \\ 68: 1, 2, \cancel{4}, 17, 34, 68 \end{array}$$

Answer 4 baseball cards

Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of mathematical concepts in the task. All factors of 28 and 68 are correctly listed and the greatest in common between them correctly identified.

GUIDE PAPER 3

53

On Saturday, a minor league baseball team gave away baseball cards to each person entering the stadium. One group received 28 baseball cards. A second group received 68 baseball cards. If each person entering the stadium received the same number of cards, what was the greatest possible number of baseball cards that each person could have received?

Show your work.

$$\begin{array}{r} 7 \\ 4 \overline{)28} \\ \end{array}$$

7 people each
got 4 cards

$$\begin{array}{r} 17 \\ 4 \overline{)68} \\ \end{array}$$

17 people each
got 4 cards

Answer 4 baseball cards

Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of mathematical concepts in the task. 28 and 68 are both correctly divided by 4 resulting in prime numbers as quotients, confirming that 4 is the greatest common factor.

GUIDE PAPER 4

53

On Saturday, a minor league baseball team gave away baseball cards to each person entering the stadium. One group received 28 baseball cards. A second group received 68 baseball cards. If each person entering the stadium received the same number of cards, what was the greatest possible number of baseball cards that each person could have received?

Show your work.

$$\begin{array}{r} \cancel{4} \cancel{5} \cancel{0} \cancel{8} \\ \cancel{4} \cancel{5} \cancel{0} \cancel{8} \\ \hline 28 \\ 00 \\ \hline \end{array}$$
$$\begin{array}{r} 17 \\ \cancel{4} \cancel{6} \cancel{8} \\ \cancel{4} \cancel{6} \cancel{8} \\ \hline 68 \\ 4 \\ 28 \\ 28 \\ 00 \\ \hline \end{array}$$
$$\begin{array}{r} 2 \\ \cancel{4} \\ \cancel{4} \\ \hline 9 \\ 70 \\ 56 \\ \hline \end{array}$$
$$\begin{array}{r} 1 \\ 14 \\ 4 \\ \hline 56 \\ 56 \\ 0 \\ \hline \end{array}$$

Answer 17 baseball cards

Score Point 1 (out of 2 points)

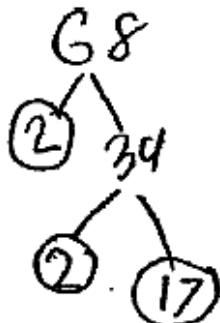
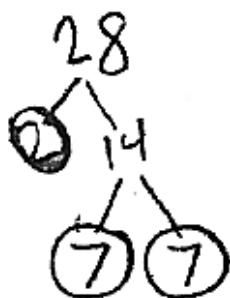
This response demonstrates only a partial understanding of the mathematical concepts in the task. 28 and 68 are both correctly divided by the greatest common factor of 4 resulting in prime numbers as quotients; however, the value of 17 is chosen as the solution rather than 4.

GUIDE PAPER 5

53

On Saturday, a minor league baseball team gave away baseball cards to each person entering the stadium. One group received 28 baseball cards. A second group received 68 baseball cards. If each person entering the stadium received the same number of cards, what was the greatest possible number of baseball cards that each person could have received?

Show your work.



$$28 = 2 \cdot 7 \cdot 7$$
$$68 = 2 \cdot 2 \cdot 17$$

2

Answer 2 baseball cards

Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the mathematical concepts in the task. 68 is correctly factored; however, an error when factoring 28 ($14 = 7 \cdot 7$) results in an incorrect solution of 2 cards. Although the solution is incorrect, an appropriate process is applied.

GUIDE PAPER 6

53

On Saturday, a minor league baseball team gave away baseball cards to each person entering the stadium. One group received 28 baseball cards. A second group received 68 baseball cards. If each person entering the stadium received the same number of cards, what was the greatest possible number of baseball cards that each person could have received?

Show your work.

$$\begin{array}{r} \overline{28} \\ \overline{68} \\ \hline 28 \end{array}$$

$$\begin{array}{r} \overline{14} \\ \overline{28} \\ \hline 08 \\ \hline 0 \end{array}$$

$$\begin{array}{r} \overline{34} \\ \overline{68} \\ \hline 6 \\ \hline 68 \\ \hline 68 \\ \hline 0 \end{array}$$

Answer 2 baseball cards

Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the mathematical concepts in the task. 28 and 68 are correctly factored once via division by a common factor of 2; however, the work fails to recognize that the quotients of 14 and 34 can be further factored by another common factor of 2. The response correctly addresses only some elements of the task.

GUIDE PAPER 7

53

On Saturday, a minor league baseball team gave away baseball cards to each person entering the stadium. One group received 28 baseball cards. A second group received 68 baseball cards. If each person entering the stadium received the same number of cards, what was the greatest possible number of baseball cards that each person could have received?

Show your work.

$$\begin{array}{r} 68 \\ - 63 \\ \hline 5 \end{array}$$
$$\begin{array}{r} 7 \\ \times 4 \\ \hline 28 \end{array}$$

Answer 4 baseball cards

Score Point 0 (out of 2 points)

This response is not sufficient to demonstrate even a limited understanding of the mathematical concepts in the task. Although the correct solution of 4 cards is given, it was obtained using an obviously incorrect procedure. The multiplication $7 \times 4 = 28$ only establishes 7 and 4 as factors of one of the groups attending the baseball game and not as common factors of both groups.

GUIDE PAPER 8

Additional

53

On Saturday, a minor league baseball team gave away baseball cards to each person entering the stadium. One group received 28 baseball cards. A second group received 68 baseball cards. If each person entering the stadium received the same number of cards, what was the greatest possible number of baseball cards that each person could have received?

Show your work.

$$\begin{array}{r} 28 \\ + 68 \\ \hline 96 \end{array}$$

$$\begin{array}{r} 48 \\ \hline 2) 96 \end{array}$$

48 baseball cards

Answer 48 baseball cards

Score Point 0 (out of 2 points)

This response is irrelevant and not sufficient to demonstrate even a limited understanding of the mathematical concepts in the task. The size of the groups are inappropriately added together then divided by 2.

EXEMPLARY RESPONSE

54

Expressions A, B, and C are shown below.

A

$$20^2 - 18^2$$

B

$$8(4^2) + 2^4$$

C

$$15^2 - 3^4$$

Which expression or expressions have the same value as 12^2 ?

Show your work.

Expression A:

$$20^2 - 18^2 = 400 - 324 = 76$$

Expression B:

$$8(4^2) + 2^4 = 8(16) + 16 = 128 + 16 = \boxed{144}$$

Expression C:

$$15^2 - 3^4 = 225 - 81 = \boxed{144}$$

$$12^2 = \boxed{144}$$

or other equivalent processes

Answer Expressions B and C are equivalent to 12^2

GUIDE PAPER 1

Additional

54

Expressions A, B, and C are shown below.

$$A \\ 20^2 - 18^2$$

$$B \\ 8(4^2) + 2^4$$

$$C \\ 15^2 - 3^4$$

Which expression or expressions have the same value as 12^2 ? $12^2 = 12 \cdot 12 = 144$

Show your work.

$$A \\ \cancel{20^2} - \cancel{18^2} \\ 400 - 324 = 76 \\ 76 \neq 12^2$$

$$\frac{96}{\cancel{16}} - \frac{48\cancel{4}}{\cancel{32}\cancel{4}} = \frac{48}{76} = \frac{24}{38}$$

$$\frac{96}{\cancel{16}} - \frac{48\cancel{4}}{\cancel{32}\cancel{4}} = \frac{48}{76} = \frac{24}{38}$$

$$B \\ \cancel{8(4^2)} + 2^4 \\ 8 \cdot \cancel{16} + \cancel{16} \\ 128 + 16 = 144 \\ 144 = 12^2$$

$$\begin{array}{r} 8 \cdot 2 \cdot 2 \cdot 2 \\ \cancel{4} \cdot \cancel{2} \cdot \cancel{2} \\ \hline 8 \cdot 2 = 16 \end{array} \quad \begin{array}{r} 12^2 \\ \cancel{16} \\ \hline 144 \end{array}$$

$$4^2 = 4 \cdot 4 = 16$$

$$C \\ \cancel{15^2} - \cancel{3^4} \\ 225 - 81 = 144 \\ 144 = 12^2$$

$$\begin{array}{r} 15 \\ \times 15 \\ \hline 225 \end{array} \quad \begin{array}{r} 12 \\ \times 12 \\ \hline 144 \end{array}$$

$$3^4 = 3 \cdot 3 \cdot 3 \cdot 3 \\ \cancel{9} \cdot \cancel{3} \cdot \cancel{3} \\ 27 \cdot 3 = 81$$

$$\frac{27}{\cancel{3}} = \frac{9}{\cancel{3}} = \frac{3}{\cancel{1}} = 3$$

Answer: Expressions B and C are equal to 12^2 .

Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. All expressions are correctly evaluated and expressions B and C are correctly chosen as equivalent to 12^2 . The response also shows the work for 12^2 , although this is not required for full credit.

GUIDE PAPER 2

54

Expressions A, B, and C are shown below.

$$\cancel{20^2 - 18^2}$$

$$8(4^2) + 2^4$$

$$15^2 - 3^4$$

Which expression or expressions have the same value as 12^2 ?

Show your work.

A

$$\begin{array}{r} 20 \\ \times 18 \\ \hline 160 \\ 400 \\ \hline 360 \end{array}$$

$$\begin{array}{r} 20^2 - 18^2 \\ \hline 400 - 324 \\ \hline 76 \end{array}$$

$$\begin{array}{r} 18 \\ \times 18 \\ \hline 144 \\ 180 \\ \hline 324 \end{array}$$

$$\begin{array}{r} 3910 \\ \times 00 \\ \hline 3910 \\ 324 \\ \hline 76 \end{array}$$

$$8(4^2) + 2^4$$

$$8 \cdot 16 + 2^4$$

$$\begin{array}{r} 8 \cdot 16 + 16 \\ \hline 128 + 16 \end{array}$$

$$\begin{array}{r} 128 \\ + 16 \\ \hline 144 \end{array}$$

$$\begin{array}{r} 416 \\ \times 3 \\ \hline 128 \\ + 16 \\ \hline 144 \end{array}$$

$$128$$

$$\begin{array}{r} 144 \\ \hline \end{array}$$

C

$$\begin{array}{r} 15^2 - 3^4 \\ \hline 225 - 81 \end{array}$$

$$\begin{array}{r} 75 \\ \times 75 \\ \hline 525 \\ 525 \\ \hline 305 \end{array}$$

$$\begin{array}{r} 525 \\ \cancel{+ 75} \\ \hline 184 \end{array}$$

Answer: B + C

Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. All expressions are correctly evaluated and expressions B and C are correctly chosen as equivalent to 12^2 .

GUIDE PAPER 3

54

Expressions A, B, and C are shown below.

$$A: 20^2 - 18^2$$

$$B: 8(4^2) + 2^4$$

$$C: 15^2 - 3^4$$

Which expression or expressions have the same value as 12^2 ?

Show your work.

$$20^2 - 18^2$$

$$\begin{array}{r} 20 \\ \times 20 \\ \hline 400 \\ 40 \\ \hline 340 \\ 324 \\ \hline 16 \\ 16 \\ \hline 144 \\ 18 \\ \hline 324 \end{array}$$

$$8(4^2) + 2^4$$

$$\begin{array}{r} 8(16) + 16 \\ 128 + 16 \\ \hline 144 \end{array}$$

$$\begin{array}{r} 2 \times 2 \times 2 \times 2 \\ 4 \times 2 \\ 8 \times 2 \\ 4 \times 4 \\ \hline 128 \\ + 16 \\ \hline 144 \end{array}$$

$$15^2 - 3^4$$

$$\begin{array}{r} 15 \\ \times 15 \\ \hline 75 \\ 15 \\ \hline 225 \\ - 81 \\ \hline 144 \end{array}$$

$$\begin{array}{r} 3 \times 3 \times 3 \\ 9 \times 3 \\ 27 \times 3 \\ + 3 \\ \hline 81 \end{array}$$

Answer: B and C

Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. All expressions are correctly evaluated and expressions B and C are correctly chosen as equivalent to 12^2 .

GUIDE PAPER 4

54

Expressions A, B, and C are shown below.

A
20² - 18²

$$8(4^2) + 2^4$$

C

Which expression or expressions have the same value as 12^2 ?

Show your work.

$$\begin{array}{r}
 A \quad 20^2 - 18^2 \\
 400 - 162 \\
 \boxed{238} \\
 \hline
 20 \quad 18 \\
 20 \quad 18 \\
 00 \quad 18 \\
 \hline
 400 \quad 18 \\
 \hline
 162
 \end{array}$$

$$\begin{array}{r}
 C \quad \begin{array}{r} 15^2 - 3^4 \\ 225 - 81 \\ \hline 144 \end{array} \quad \begin{array}{r} 3 \times 3 = 9 \\ 9 \times 3 = 27 \\ 27 \times 3 = 81 \\ + 15 \\ \hline 325 \end{array} \quad \begin{array}{r} 2^2 15 \\ 2 \times 15 = 30 \\ + 15 \\ \hline 45 \end{array} \quad \begin{array}{r} 12^2 25 \\ 12 \times 2 = 24 \\ - 81 \\ \hline 144 \end{array}
 \end{array}$$

$$12^2 = 144$$

Answer: B and C

Score Point 1 (out of 2 points)

Expressions B and C are correctly evaluated and chosen as equivalent to 12^2 ; however, a calculation error in expression A ($20^2 - 18^2 = 400 - 162$) results in an incorrect value. The response correctly addresses some elements of the task.

GUIDE PAPER 5

54

Expressions A, B, and C are shown below.

$$\frac{A}{20^2 - 10^2}$$

$$8(4^2) + 2^4$$

c

Which expression or expressions have the same value as 12^3 ?

Show your work.

A) $\frac{20^2 - 18^2}{400 + 36}$

$$\begin{array}{r} 20 \\ \times 20 \\ \hline 400 \\ 18 \\ \hline 32 \\ 18 \\ \hline 144 \\ 36 \\ \hline 480 \\ 480 \\ \hline 0 \end{array}$$

(76)

B) $8(4^2) + 24$

$$\begin{array}{r} 8 \\ \times 16 \\ \hline 128 \\ 16 \\ \hline 144 \\ 24 \\ \hline 168 \end{array}$$

(44)

$$\begin{array}{r} 12^2 \\ 144 \\ \hline +120 \\ \hline 144 \end{array}$$

Answer: B) 144

Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the mathematical concepts in the task. Expressions A and B are correctly evaluated and expression B chosen as equivalent to 12^2 ; however, expression C is not addressed. The response addresses only some elements of the task.

GUIDE PAPER 6

54

Expressions A, B, and C are shown below.

$$A: 20^2 - 18^2$$

$$B: 8(4^2) + 2^4$$

$$C: 15^2 - 3^4$$

Which expression or expressions have the same value as 12^2 ?

Show your work.

$$\begin{array}{r} 12^2 \\ \hline 144 \end{array}$$

$$\begin{array}{r} 2^7 \\ \times 2 \\ \hline 8^2 \\ 128 + 8 = 136 \end{array}$$

X X C ✓

$$\begin{array}{r} 400 - 324 \\ 200 \\ 99 \\ 218 \\ \hline 144 \\ 180 \\ \hline 324 \end{array}$$

$$\begin{array}{r} 2^4 \\ \times 9 \\ \hline 15 \\ 15 \\ \hline 75 \\ 150 \\ \hline 225 - 81 = 4 \end{array}$$

$$\begin{array}{r} 2^4 \\ \times 9 \\ \hline 15 \\ 15 \\ \hline 75 \\ 150 \\ \hline 225 - 81 = 4 \end{array}$$

Answer:

C

Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the mathematical concepts in the task. The work for expressions A and C is correct and expression C chosen as equivalent to 12^2 ; however, an error in expression B ($2^4 = 8$) results in an incorrect value and a misstatement appears in the work for expression C ($225 - 81 = 4$, though it is also calculated correctly elsewhere). The response correctly addresses only some elements of the task.

GUIDE PAPER 7

54

Expressions A, B, and C are shown below.

$$A: 20^2 - 18^2$$

$$B: 8(4^2) + 2^4$$

$$C: 15^2 - 3^4$$

$$\begin{array}{r} 16 \\ \times 15 \\ \hline 240 \\ +12 \\ \hline 230 \end{array}$$

$$\begin{array}{r} 4 \\ \times 4 \\ \hline 16 \\ +16 \\ \hline 32 \end{array}$$

$$\begin{array}{r} 18 \\ \times 2 \\ \hline 36 \\ +36 \\ \hline 72 \end{array}$$

Which expression or expressions have the same value as 12^2 ?

Show your work.

$$\begin{array}{r} 8 \\ \times 8 \\ \hline 64 \\ \times 6 \\ \hline 288 \end{array}$$

$$\begin{array}{r} 12 \\ \times 12 \\ \hline 24 \\ +12 \\ \hline 144 \end{array}$$

Answer:

Score Point 0 (out of 2 points)

Although expression B is circled and could be identified as a partially correct solution, the work shown does not correctly evaluate any of the expressions and reflects faulty reasoning, nor does it support a choice of expression B. Holistically, this response is not sufficient to demonstrate even a limited understanding of the concepts in the task.

GUIDE PAPER 8

Additional

54

Expressions A, B, and C are shown below.

$$A \\ 20^2 - 18^2$$

$$B \\ 8(4^2) + 2^4$$

$$C \\ 15^2 - 3^4$$

Which expression or expressions have the same value as 12^2 ?

Show your work.

$$\begin{array}{r} 20 \\ \times 18 \\ \hline 320 \\ 180 \\ \hline 324 \end{array}$$

$$\begin{array}{r} 400 \\ -324 \\ \hline 76 \end{array}$$

$$\begin{array}{r} 16 \\ + 16 \\ \hline 32 \\ + 4 \\ \hline 40 \end{array}$$

$$\begin{array}{r} 15 \\ \times 15 \\ \hline 15 \\ 15 \\ \hline 225 \end{array}$$

$$\begin{array}{r} 3 \\ \times 3 \\ \hline 9 \\ \times 3 \\ \hline 27 \end{array}$$

$$\begin{array}{r} 3 \\ \times 3 \\ \hline 9 \\ \times 3 \\ \hline 27 \\ 225 \\ \hline 18 \end{array}$$

Answer:

d

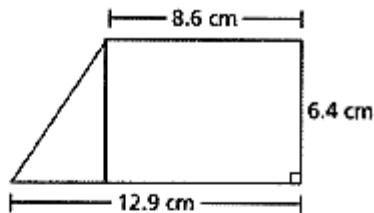
Score Point 0 (out of 2 points)

Although expression A is correctly evaluated and some parts of the work for expressions B and C contain correct procedures, expression A is incorrectly chosen as equivalent to 12^2 . Holistically, this response is not sufficient to demonstrate even a limited understanding of the mathematical concepts in the task.

EXEMPLARY RESPONSE

55

What is the area, in square centimeters, of the trapezoid below?



Show your work.

$$12.9 - 8.6 = 4.3$$

$$4.3 \times 6.4 \div 2 = 13.76$$

$$8.6 \times 6.4 = 55.04$$

$$13.76 + 55.04 = 68.80$$

OR other valid process

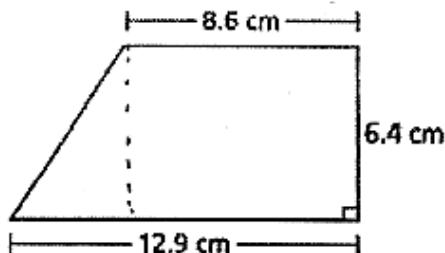
Answer 68.8 square centimeters

GUIDE PAPER 1

Additional

55

What is the area, in square centimeters, of the trapezoid below?



Show your work.

Square

$$A = lw$$

$$A = 8.6 \cdot 6.4$$

$$A = 55.04$$

Triangle

$$A = \frac{1}{2}lw$$

$$A = \frac{1}{2} \cdot 8.6 \cdot 6.4$$

$$A = 27.52$$

$$A = 13.76$$

$$\begin{array}{r} 12.9 \\ - 8.6 \\ \hline 4.3 \end{array}$$

$$\begin{array}{r} 55.04 \\ + 13.76 \\ \hline 68.80 \end{array}$$

$$A = 68.8$$

Answer 68.8 square centimeters

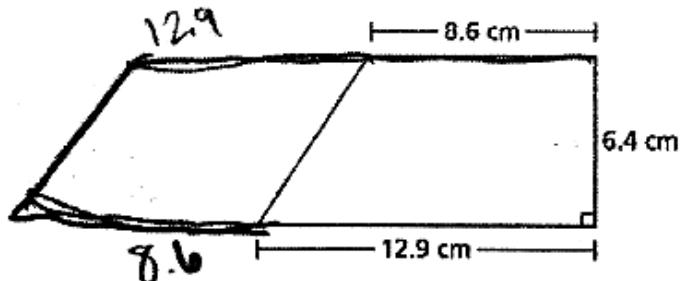
Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The area of the trapezoid is appropriately and correctly found by splitting the problem into the combined area of a triangle and a rectangle.

GUIDE PAPER 2

55

What is the area, in square centimeters, of the trapezoid below?



Show your work.

$$\frac{B \times h}{2}$$

$$8.6 + 12.9 = 21.5$$

$$21.5 \times 6.4 = \frac{137.6}{2} \\ 68.8$$

Answer 68.8 square centimeters

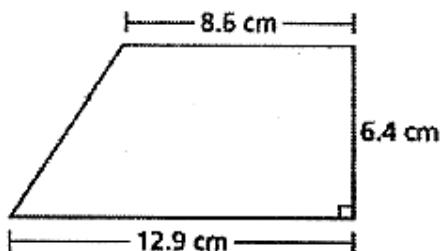
Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The area of the trapezoid is appropriately and correctly found by using the equation for the area of a trapezoid, where the variable B is implied to be the sum of both bases.

GUIDE PAPER 3

55

What is the area, in square centimeters, of the trapezoid below?



Show your work.

$$8.6 \times 6.4 = 55.04$$

$$55.04 + 13.76 = 68.8$$

$$12.9 - 8.6 = 4.3$$

$$6.4 \times 4.3 \div 2 = 13.76$$

Answer 68.8 square centimeters

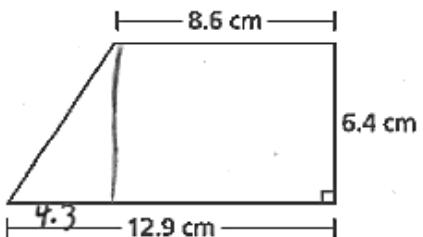
Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The area of the trapezoid is appropriately and correctly found by splitting the problem into the combined area of a triangle and a rectangle.

GUIDE PAPER 4

55

What is the area, in square centimeters, of the trapezoid below?



Show your work.

$$8.6 \times 6.4 = 55.04$$

$$12.9 - 8.6 = 4.3$$

$$4.3 \times 6.4 \div 2 = 13.76$$

$$\begin{array}{r} 55.04 \\ + 13.76 \\ \hline 53.80 \end{array}$$

Answer 53.80 square centimeters

Score Point 1 (out of 2 points)

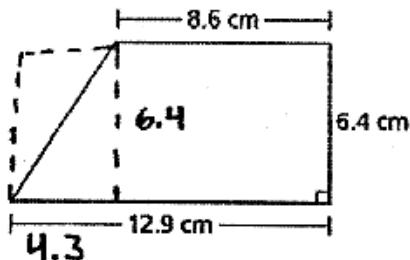
This response demonstrates only a partial understanding of the mathematical concepts in the task. The area of the trapezoid is appropriately found by splitting the problem into the combined area of a triangle and a rectangle; however, a calculation error occurs when adding the subareas ($55.04 + 13.76 = 53.80$) resulting in an incorrect solution. Although the solution is incorrect, appropriate procedures are applied.

GUIDE PAPER 5

55

What is the area, in square centimeters, of the trapezoid below?

68.80



Show your work.

$$\begin{array}{r} 0.22.9 \\ - 8.6 \\ \hline 4.3 \end{array}$$

$$\begin{array}{r} 55.04 \\ + 13.76 \\ \hline 68.80 \end{array}$$

Answer 68.80 square centimeters

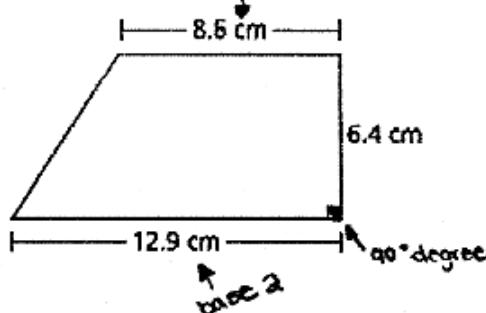
Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the mathematical concepts in the task. The area of the trapezoid is appropriately and correctly found by splitting the problem into the combined area of a triangle and a rectangle; however, the required work is incomplete. No work is shown for how the values of the subareas (55.04 and 13.76) were obtained.

GUIDE PAPER 6

55

What is the area, in square centimeters, of the trapezoid below?



Show your work.

$$\begin{aligned}A &= \frac{1}{2} \times (b_1 + b_2) \\A &= \frac{1}{2} \times (8.6 + 12.9) \\A &= \frac{1}{2} \times 21.5 \text{ or } \frac{21.5}{2} \\A &= 10.75 \text{ cm.}\end{aligned}$$

Answer 10.75 square centimeters

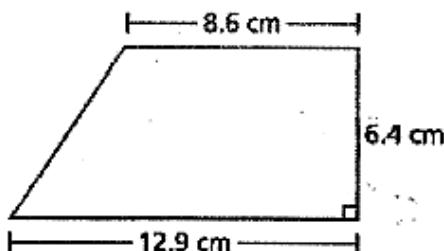
Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the mathematical concepts in the task. An attempt is made to appropriately use the formula for the area of a trapezoid; however, the height h is omitted from the formula [$A = \frac{1}{2} \times (b_1 + b_2)h$]. The response correctly addresses only some elements of the task.

GUIDE PAPER 7

55

What is the area, in square centimeters, of the trapezoid below?



$$\begin{aligned}A &= bh \\A &= 12.9 \times 6.4 \\A &= 82.56\end{aligned}$$

Show your work.

Answer 82.56 square centimeters

Score Point 0 (out of 2 points)

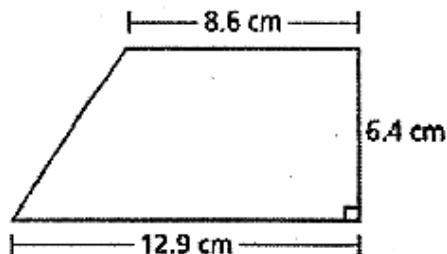
This response is not sufficient to demonstrate even a limited understanding of the mathematical concepts in the task. The length of the longer base is inappropriately used in the formula for a rectangle rather than the formula for a trapezoid.

GUIDE PAPER 8

Additional

55

What is the area, in square centimeters, of the trapezoid below?



Show your work.

$$\begin{array}{r} \times 12.9 \\ \underline{\times 8.6} \\ \times 110.94 \\ \underline{\quad 6.4} \\ 710.016 \end{array}$$

Answer 710.016 square centimeters

Score Point 0 (out of 2 points)

This response is not sufficient to demonstrate even a limited understanding of the mathematical concepts in the task. All three given dimensions are inappropriately multiplied together.

EXEMPLARY RESPONSE

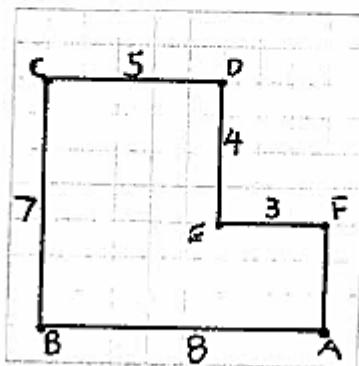
56

A park planner is designing a dog park. He wants to use a metal fence to enclose a kennel at the dog park. The vertices of the fence are shown below. The units on the coordinate plane are yards.

- Point A (4, -4)
- Point B (-4, -4)
- Point C (-4, 3)
- Point D (1, 3)
- Point E (1, -1)
- Point F (4, -1)

The park planner wants to add a gate between points A and E. He will not put metal fencing on that side. What is the total number of yards of metal fencing that will be needed for the kennel at the dog park?

Show your work.



$$\begin{aligned} & 8+7+5+4+3 \\ & 15+12 \\ & 27 \end{aligned}$$

OR OTHER VALID PROCESS

Answer 27 yards

GUIDE PAPER 1

Additional

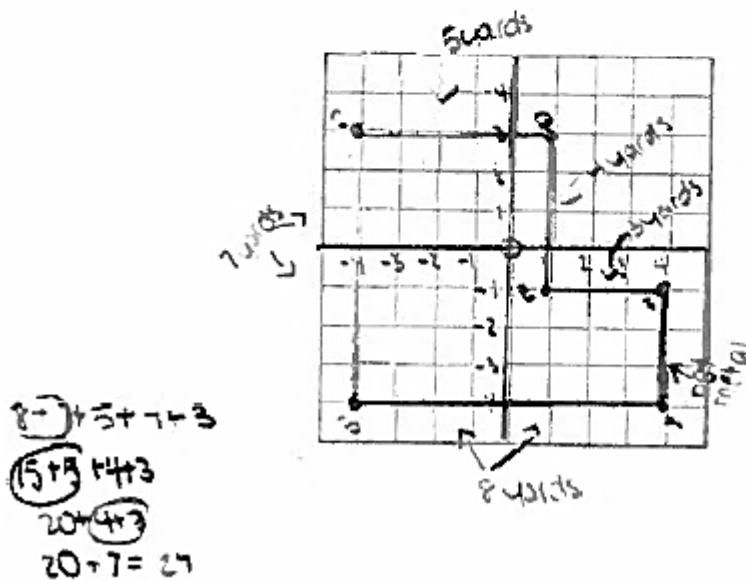
56

A park planner is designing a dog park. He wants to use a metal fence to enclose a kennel at the dog park. The vertices of the fence are shown below. The units on the coordinate plane are yards.

- Point A (4, -4)
- Point B (-4, -4)
- Point C (-4, 3)
- Point D (1, 3)
- Point E (1, -1)
- Point F (4, -1)

The park planner wants to add a gate between points A and F. He will not put metal fencing on that side. What is the total number of yards of metal fencing that will be needed for the kennel at the dog park?

Show your work.



Answer 27

yards

Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The vertices are correctly plotted and the metal sides summed to arrive at a correct solution.

GUIDE PAPER 2

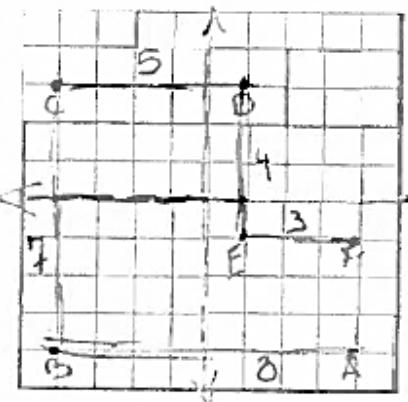
56

A park planner is designing a dog park. He wants to use a metal fence to enclose a kennel at the dog park. The vertices of the fence are shown below. The units on the coordinate plane are yards.

- Point A (4, -4)
- Point B (-4, -4)
- Point C (-4, 3)
- Point D (1, 3)
- Point E (1, -1)
- Point F (4, -1)

The park planner wants to add a gate between points A and F. He will not put metal fencing on that side. What is the total number of yards of metal fencing that will be needed for the kennel at the dog park?

Show your work.



Answer

25

yards

Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The vertices are correctly plotted and the lengths of the metal sides labeled. The addition of the sides to find the total length is not shown explicitly, but this step is acceptable to be performed mentally and the correct solution is given.

GUIDE PAPER 3

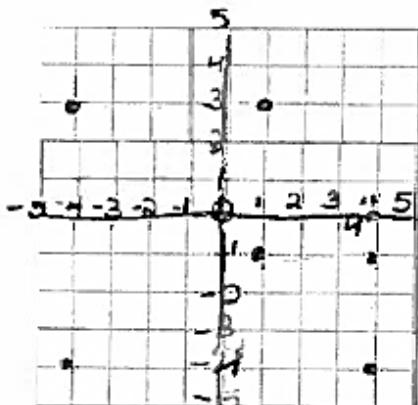
56

A park planner is designing a dog park. He wants to use a metal fence to enclose a kennel at the dog park. The vertices of the fence are shown below. The units on the coordinate plane are yards.

- Point A (4, -4)
- Point B (-4, -4)
- Point C (-4, 3)
- Point D (1, 3)
- Point E (1, -1)
- Point F (4, -1)

The park planner wants to add a gate between points A and E. He will not put metal fencing on that side. What is the total number of yards of metal fencing that will be needed for the kennel at the dog park?

Show your work.



Answer

27

yards

Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The vertices are correctly plotted. Although the points are not connected by lines nor is the addition of the metal sides shown explicitly, these steps are acceptable to be performed mentally and the correct solution is given.

GUIDE PAPER 4

56

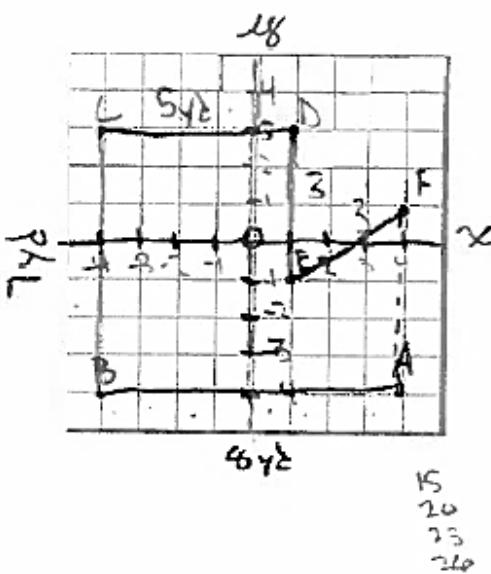
A park planner is designing a dog park. He wants to use a metal fence to enclose a kennel at the dog park. The vertices of the fence are shown below. The units on the coordinate plane are yards.

- Point A (4, -4)
- Point B (-4, -4)
- Point C (-4, 3)
- Point D (1, 3)
- Point E (1, -1)
- Point F (4, -1)

The park planner wants to add a gate between points A and F. He will not put metal fencing on that side. What is the total number of yards of metal fencing that will be needed for the kennel at the dog park?

Show your work.

$$\begin{array}{r} 7 \\ + 8 \\ \hline 15 \\ + 5 \\ \hline 20 \\ + 3 \\ \hline 23 \\ + 3 \\ \hline 26 \end{array}$$



Answer

26

yards

Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the mathematical concepts in the task. The metal sides are correctly summed to arrive at a total length; however, point F is incorrectly plotted at (4, 1) resulting in an incorrect final solution. Although the solution is incorrect, an appropriate process is applied.

GUIDE PAPER 5

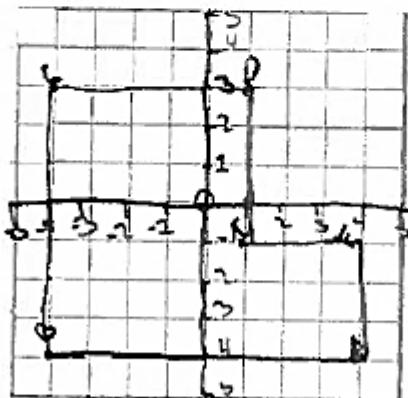
56

A park planner is designing a dog park. He wants to use a metal fence to enclose a kennel at the dog park. The vertices of the fence are shown below. The units on the coordinate plane are yards.

- Point A (4, -4)
- Point B (-4, -4)
- Point C (-4, 3)
- Point D (1, 3)
- Point E (1, -1)
- Point F (4, -1)

The park planner wants to add a gate between points A and F. He will not put metal fencing on that side. What is the total number of yards of metal fencing that will be needed for the kennel at the dog park?

Show your work.



Answer

30

yards

Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the mathematical concepts in the task. The vertices are correctly plotted; however, the solution of 30 yards is incorrect. The response correctly addresses only some elements of the task.

GUIDE PAPER 6

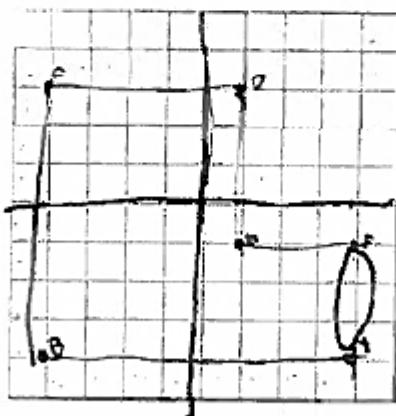
56

A park planner is designing a dog park. He wants to use a metal fence to enclose a kennel at the dog park. The vertices of the fence are shown below. The units on the coordinate plane are yards.

- Point A $(1, -4)$
- Point B $(-4, -4)$
- Point C $(-4, 3)$
- Point D $(1, 3)$
- Point E $(1, -1)$
- Point F $(4, -1)$

The park planner wants to add a gate between points A and F. He will not put metal fencing on that side. What is the total number of yards of metal fencing that will be needed for the kennel at the dog park?

Show your work.



Answer

29

yards

Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the mathematical concepts in the task. The vertices are correctly plotted; however, the solution of 29 yards is incorrect. The response correctly addresses only some elements of the task.

GUIDE PAPER 7

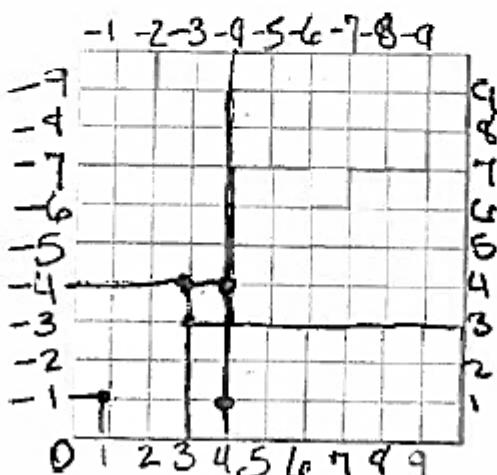
56

A park planner is designing a dog park. He wants to use a metal fence to enclose a kennel at the dog park. The vertices of the fence are shown below. The units on the coordinate plane are yards.

- Point A (4, -4)
- Point B (-4, -4)
- Point C (-4, 3)
- Point D (1, 3)
- Point E (1, -1)
- Point F (4, -1)

The park planner wants to add a gate between points A and F. He will not put metal fencing on that side. What is the total number of yards of metal fencing that will be needed for the kennel at the dog park?

Show your work.



Answer

42

yards

Score Point 0 (out of 2 points)

This response is not sufficient to demonstrate even a limited understanding of the mathematical concepts in the task. The solution of 42 yards is incorrect and no points are plotted correctly.

GUIDE PAPER 8

Additional

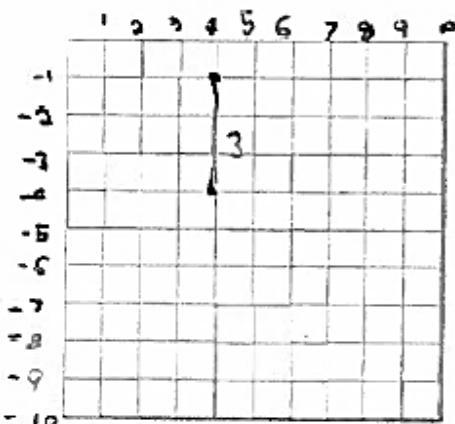
56

A park planner is designing a dog park. He wants to use a metal fence to enclose a kennel at the dog park. The vertices of the fence are shown below. The units on the coordinate plane are yards.

- Point A (4, -4)
- Point B (-4, -4)
- Point C (-4, 3)
- Point D (1, 3)
- Point E (1, -1)
- Point F (4, -1)

The park planner wants to add a gate between points A and F. He will not put metal fencing on that side. What is the total number of yards of metal fencing that will be needed for the kennel at the dog park?

Show your work.



Answer

3

yards

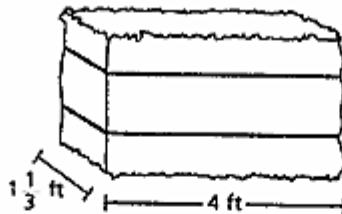
Score Point 0 (out of 2 points)

Although points A and F are correctly plotted according to the labeling of the axes, they are the only two points plotted and the length of the non-metal side joining them is incorrectly understood as the solution. Holistically, this response is not sufficient to demonstrate even a limited understanding of the mathematical concepts in the task.

EXEMPLARY RESPONSE

57

A farmer stacked hay bales. The length and width of each hay bale are shown below.



The volume of each hay bale is $10\frac{2}{3}$ cubic feet. The farmer stacked eight hay bales on top of one another. What is the height, in feet, of the stacked hay bales?

Show your work.

$$v = l \times w \times h$$

$$\frac{32}{3} = \frac{4}{3} \times 4 \times h \quad \frac{32}{3} = \frac{16}{3} \times h \quad \frac{3}{16} \times \frac{32}{3} = h$$

$$h = \frac{32}{16} \quad h = 2 \text{ ft the height of one bale}$$

height of 8 bales is $2 \times 8 = 16 \text{ ft}$

Or other valid process

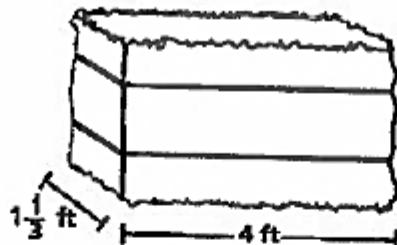
Answer 16 feet

GUIDE PAPER 1

Additional

57

A farmer stacked hay bales. The length and width of each hay bale are shown below.



The volume of each hay bale is $10\frac{2}{3}$ cubic feet. The farmer stacked eight hay bales on top of one another. What is the height, in feet, of the stacked hay bales?

Show your work.

Let x be the height of one hay bale.

$$1\frac{1}{3} \cdot 4x = 10\frac{2}{3}$$

$$\frac{1\frac{1}{3} \cdot 4x}{\frac{4}{3}} = \frac{10\frac{2}{3}}{\frac{4}{3}}$$

$$4x = \frac{32}{3} \cdot \frac{x}{4}$$

$$\frac{4x}{4} = \frac{8}{4}$$

$$x = 2$$

$$8 \cdot 2 \text{ ft} \\ = 16 \text{ ft}$$

Answer

16 feet

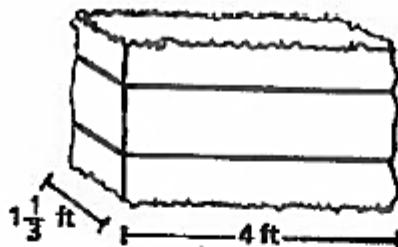
Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The volume is appropriately divided by the area of the base to find the height of a single bale, which is then multiplied by 8 to arrive at the correct solution of 16 feet.

GUIDE PAPER 2

57

A farmer stacked hay bales. The length and width of each hay bale are shown below.



The volume of each hay bale is $10\frac{2}{3}$ cubic feet. The farmer stacked eight hay bales on top of one another. What is the height, in feet, of the stacked hay bales?

Show your work.

$$\begin{aligned}V &= l \cdot w \cdot h \\10\frac{2}{3} &= 4 \cdot 1\frac{1}{3} \cdot h \quad [1] \\10\frac{2}{3} &= 4 \cdot \frac{4}{3} \cdot h \quad [2] \\(10\frac{2}{3}) \cdot \frac{3}{4} &= 4 \cdot h \quad [3] \\2\frac{1}{2} &= h\end{aligned}$$

Answer

16
feet

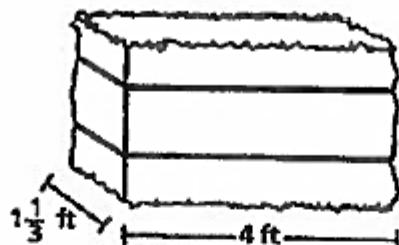
Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The volume is appropriately divided by the area of the base to find the height of a single bale which is then multiplied by 8 to arrive at the correct solution of 16 feet.

GUIDE PAPER 3

57

A farmer stacked hay bales. The length and width of each hay bale are shown below.



The volume of each hay bale is $10\frac{2}{3}$ cubic feet. The farmer stacked eight hay bales on top of one another. What is the height, in feet, of the stacked hay bales?

Show your work.

$$10\frac{2}{3} \div \left(\frac{1}{3} \times 4\right) = 2$$

$$\begin{array}{r} 2 \\ \times 8 \\ \hline 16 \end{array}$$

Answer

16 feet

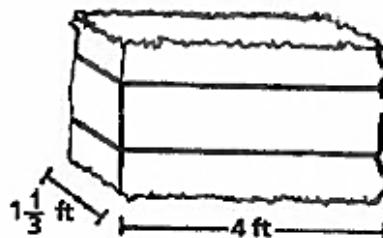
Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The volume is appropriately divided by the area of the base to find the height of a single bale which is then multiplied by 8 to arrive at the correct solution of 16 feet.

GUIDE PAPER 4

57

A farmer stacked hay bales. The length and width of each hay bale are shown below.



The volume of each hay bale is $10\frac{2}{3}$ cubic feet. The farmer stacked eight hay bales on top of one another. What is the height, in feet, of the stacked hay bales?

Show your work.

$$V = lwh$$

$$10\frac{2}{3} = 4 \times 1\frac{1}{3}h$$

$$\frac{10\frac{2}{3}}{2} = \frac{5\frac{1}{3}h}{2}$$

$$4 \times 1\frac{1}{3}$$

$$4 \times \frac{4}{3} = \frac{16}{3}$$

$$3 \overline{)16}$$

$$10\frac{2}{3} = 5\frac{1}{3}$$

$$\frac{32}{3} \div \frac{16}{3}$$

$$\frac{2\frac{32}{3}}{3} \times \frac{\frac{16}{3}}{1} = 2$$

Answer

2

feet

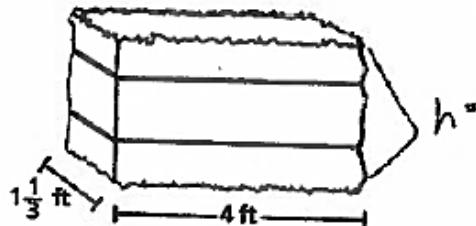
Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the mathematical concepts in the task. The volume is appropriately divided by the area of the base to find the height of a single bale; however, this is taken as the final solution and no attempt is made to solve for the height of the entire stack. The response addresses only some elements of the task.

GUIDE PAPER 5

57

A farmer stacked hay bales. The length and width of each hay bale are shown below.



The volume of each hay bale is $10\frac{2}{3}$ cubic feet. The farmer stacked eight hay bales on top of one another. What is the height, in feet, of the stacked hay bales?

Show your work.

$$\left| \frac{1}{3} \times 4 = \right.$$

$$\frac{5}{3} \times \frac{4}{1} = \frac{20}{3} \text{ (in } \frac{2}{3})$$

$$V = lwh$$

$$V = \frac{1}{3} \times 4 \times h$$



$$V = \cancel{\frac{1}{3}} \times \cancel{4} \times h = 10\frac{2}{3}$$

$$\cancel{\frac{2}{3}} \quad \cancel{6\frac{2}{3}}$$

1 hay bale

$$10\frac{2}{3} \div 6\frac{2}{3}$$

$$\frac{32}{3} \times \frac{32}{3} = \frac{640}{9} = 7\frac{1}{9}$$

$$\begin{array}{r} 7\frac{32}{3} \\ \times \frac{32}{3} \\ \hline 640 \\ 640 \\ \hline 192 \end{array}$$

$$4\frac{1}{3}$$

feet

Answer

Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the mathematical concepts in the task. The length and width are appropriately multiplied to find the area of the base of a single bale and an attempt is made to divide the value of the volume by the value of the area of the base; however, in the calculations the value $\frac{20}{3}$ is not reciprocated resulting in the volume and base being multiplied instead of divided and the value of $4\frac{1}{3}$ written in the answer blank is incorrect.

GUIDE PAPER 6

57

A farmer stacked hay bales. The length and width of each hay bale are shown below.



The volume of each hay bale is $10\frac{2}{3}$ cubic feet. The farmer stacked eight hay bales on top of one another. What is the height, in feet, of the stacked hay bales?

Show your work.

$$\begin{array}{r} \text{goat} \\ \frac{32}{3} \times \frac{8}{1} = \frac{256}{3} = 85\frac{1}{3} \\ - \quad \frac{15}{3} \\ \hline - \quad \frac{256}{255} \\ \hline \end{array} \quad \frac{16}{3} \times \frac{16}{1} = \frac{256}{3} =$$
$$\begin{array}{r} \frac{4}{3} \times \frac{4}{1} = \frac{16}{3} = 5\frac{1}{3} \quad \frac{16}{3} \times \frac{156}{3} \\ - \quad \frac{15}{3} \\ \hline - \quad \frac{16}{1} \end{array} \quad \frac{16}{3} \times \frac{3}{256} = \frac{48}{768} = \frac{16}{16} = \frac{3}{48}$$
$$\begin{array}{r} \frac{16}{3} \times \frac{48}{768} = \frac{768}{2304} \end{array}$$

Answer

16

feet

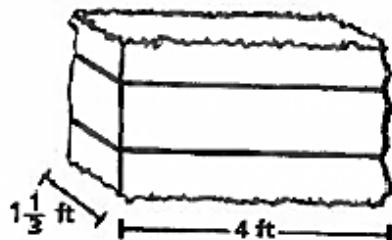
Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the mathematical concepts in the task. The volume of a single bale is appropriately multiplied by 8 to find the total volume of the stack and the length and width are correctly multiplied to find the area of the base of the stack. However, although a correct solution of 16 feet is written on the answer blank, the work incorrectly attempts to divide the volume and the base in reverse order and it is not clear how the value of 16 was obtained. Holistically, the response is not sufficient to receive full credit, but it does correctly address some elements of the task.

GUIDE PAPER 7

57

A farmer stacked hay bales. The length and width of each hay bale are shown below.



The volume of each hay bale is $10\frac{2}{3}$ cubic feet. The farmer stacked eight hay bales on top of one another. What is the height, in feet, of the stacked hay bales?

Show your work.

2 = height of 1 hay bale
16
8

Answer

16

feet

Score Point 0 (out of 2 points)

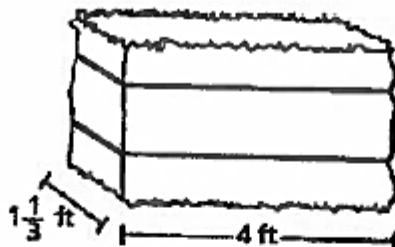
Although the height of a single bale is correctly identified as 2 feet and this is then appropriately multiplied by 8 to arrive at the correct solution of 16 feet, no additional work is shown to provide support for how these values were obtained. Holistically, the response is not sufficient to demonstrate even a limited understanding of the concepts in the task.

GUIDE PAPER 8

Additional

57

A farmer stacked hay bales. The length and width of each hay bale are shown below.



The volume of each hay bale is $10\frac{2}{3}$ cubic feet. The farmer stacked eight hay bales on top of one another. What is the height, in feet, of the stacked hay bales?

Show your work.

$$1\frac{1}{3} + 10\frac{2}{3} + 4$$

$$\frac{4}{3} + \frac{32}{3} + 4$$

$$\frac{4}{3} + \frac{32}{3} = \frac{36}{3} + 4 = 16$$

Answer

16

feet

Score Point 0 (out of 2 points)

This response is not sufficient to demonstrate even a limited understanding of the mathematical concepts in the task. Although the correct solution of 16 feet is given, it is obtained using an obviously incorrect procedure. All values given in the prompt are inappropriately added together.

EXEMPLARY RESPONSE

58

A square with one side length represented by an expression is shown below.



$$6(3x + 8) + 32 + 12x$$

Use the properties of operations to write three different equivalent expressions to represent the lengths of the other three sides of the square. One of your expressions should contain only two terms.

Show your work.

$$18x + 48 + 32 + 12x$$

$$30x + 48 + 32$$

$$30x + 80$$

$$18x + 48 + 32 + 12x$$

$$18x + 80 + 12x$$

$$30x + 80$$

Answer

$$18x + 48 + 32 + 12x \quad 30x + 48 + 32 \quad 18x + 80 + 12x \quad 30x + 80$$

GUIDE PAPER 1

Additional

58

A square with one side length represented by an expression is shown below.



$$6(3x + 8) + 32 + 12x$$

Use the properties of operations to write three different equivalent expressions to represent the lengths of the other three sides of the square. One of your expressions should contain only two terms.

Show your work.

$$\begin{aligned} &6(3x + 8) + 32 + 12x \\ &\quad \swarrow \\ &18x + 48 + 32 + 12x \\ &\quad \swarrow \\ &18x + 80 + 12x \\ &\quad \swarrow \\ &30x + 80 \end{aligned}$$

Answer

$$\begin{array}{c} 18x + 48 + 32 + 12x; \quad 18x + 80 + 12x; \\ \hline 30x + 80 \end{array}$$

Score Point 3 (out of 3 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The distributive property is correctly applied to the expression and like terms combined to construct equivalent expressions, with one expression containing only two terms.

GUIDE PAPER 2

58

A square with one side length represented by an expression is shown below.



$$6(3x + 8) + 32 + 12x$$

Use the properties of operations to write three different equivalent expressions to represent the lengths of the other three sides of the square. One of your expressions should contain only two terms.

79
15
CG

Show your work.

$$6(3x + 8) + 32 + 12x$$

$$(18x + 48) + 32 + 12x$$

$$30x + 80$$

Answer

① $30x + 80$ ② $(18x + 48) + 32 + 12x$

③ $(30x + 48) + 32$

Score Point 3 (out of 3 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The distributive property is correctly applied to the expression and like terms combined to construct equivalent expressions, with one expression containing only two terms. Although the continued inclusion of parentheses after distributing is atypical, it is still mathematically valid and does not detract from the response.

GUIDE PAPER 3

58

A square with one side length represented by an expression is shown below.



$$6(3x + 8) + 32 + 12x$$

Use the properties of operations to write three different equivalent expressions to represent the lengths of the other three sides of the square. One of your expressions should contain only two terms.

Show your work.

Three handwritten responses enclosed in rounded rectangular boxes:

- $18x + 48 + 32 + 12x$
- $30x + 80$
- $12x + 80 + 18x$

Answer

Score Point 3 (out of 3 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The distributive property is correctly applied to the expression and like terms combined to construct equivalent expressions, with one expression containing only two terms. Although there may appear to be no work shown, each step of the work is also part of the solution; therefore, the expressions on their own constitute a complete response. As per Scoring Policy #2, the response should still receive full credit even though the solution is not written in the answer blank.

GUIDE PAPER 4

58

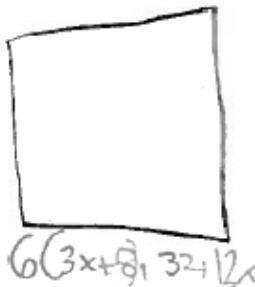
A square with one side length represented by an expression is shown below.



$$6(3x + 8) + 32 + 12x$$

Use the properties of operations to write three different equivalent expressions to represent the lengths of the other three sides of the square. One of your expressions should contain only two terms.

Show your work.



$$6(3x + 8), 32 + 12x$$

$$16x + 112 \\ 6(3x + 8) + 32 + 12x$$

$$18x + 32 + 12x$$

$$\begin{array}{r} 18 \\ + 12 \\ \hline 30 \end{array}$$

$$\begin{array}{r} 48 \\ + 32 \\ \hline 80 \end{array}$$

Answer

$$\begin{array}{r} 18x + 32 + 12x, 30x + 32 + 48, \\ \hline 80 + 30x \end{array}$$

Score Point 2 (out of 3 points)

This response demonstrates a partial understanding of the mathematical concepts in the task. The distributive property is correctly applied to the expression and like terms combined to construct equivalent expressions, with one expression containing only two terms; however, the term 48 is missing both from portions of the work and in one of the final expressions ($18x + 32 + 12x$). The response appropriately addresses most, but not all aspects of the task.

GUIDE PAPER 5

58

A square with one side length represented by an expression is shown below.



$$6(3x + 8) + 32 + 12x$$

Use the properties of operations to write three different equivalent expressions to represent the lengths of the other three sides of the square. One of your expressions should contain only two terms.

$$x = 2$$

Show your work.

. $18x + 48 + 32 + 12x$

40
32
—
80

. $30x + 80$

. $6(15x + 40)$

Answer

$18x + 48 + 32 + 12x$ $30x + 80$ $6(15x + 40)$

$6(15x + 40)$

Score Point 2 (out of 3 points)

This response demonstrates a partial understanding of the mathematical concepts in the task. The distributive property is correctly applied to the expression and like terms combined to construct two equivalent expressions; however, the third expression provided [$6(15x + 40)$] is incorrect. The response appropriately addresses most, but not all aspects of the task.

GUIDE PAPER 6

58

A square with one side length represented by an expression is shown below.



$$6(3x + 8) + 32 + 12x$$

Use the properties of operations to write three different equivalent expressions to represent the lengths of the other three sides of the square. One of your expressions should contain only two terms.

Show your work

$$\begin{aligned} & (3x+8) + 32 + 12x \\ & \underline{18x+48} + \underline{32} + \underline{12x} \end{aligned}$$

$$30x + 80$$

Answer

The answer is $30x + 80$

Score Point 2 (out of 3 points)

This response demonstrates a partial understanding of the mathematical concepts in the task. The distributive property is correctly applied to the expression and like terms combined to construct two equivalent expressions; however, a third expression is not provided. The response appropriately addresses most, but not all aspects of the task.

GUIDE PAPER 7

58

A square with one side length represented by an expression is shown below.



$$6(3x + 8) + 32 + 12x$$

Use the properties of operations to write three different equivalent expressions to represent the lengths of the other three sides of the square. One of your expressions should contain only two terms.

Show your work.

$$\begin{aligned} & 18x + 48 + 32 + 12x \\ & 66x + 32 + 12x \\ & 98x + 12x \end{aligned}$$

Answer

Score Point 1 (out of 3 points)

This response demonstrates only a limited understanding of the mathematical concepts in the task. The distributive property is correctly applied to the expression to construct one equivalent expression; however, the remaining two expressions ($66x + 32 + 12x$ and $98x + 12x$) are incorrect. In each step, the two left-most terms are inappropriately combined. The response reflects a lack of essential understanding of like terms.

GUIDE PAPER 8

Additional

58

A square with one side length represented by an expression is shown below.



$$6(3x + 8) + 32 + 12x$$

Use the properties of operations to write three different equivalent expressions to represent the lengths of the other three sides of the square. One of your expressions should contain only two terms.

Show your work.

The student has written three expressions for the side length of the square:

1. $42 + 15x$
2. $18x + 48 + 32 + 12x$
3. $110x$

To the right, the student has shown the simplification of the second expression:

$$6(3x + 8) + 32 + 12x$$
$$18x + 48 + 32 + 12x$$
$$110x$$

Answer

$$1 = 42 + 15x, 2 = 18x + 48 + 32 + 12x, 3 = 110x$$

Score Point 1 (out of 3 points)

This response demonstrates only a limited understanding of the mathematical concepts in the task. The distributive property is correctly applied to the expression to construct one equivalent expression; however, the remaining two expressions ($42 + 15x$ and $110x$) are incorrect. The response addresses only some elements of the task correctly.

GUIDE PAPER 9

58

A square with one side length represented by an expression is shown below.



$$6(3x + 8) + 32 + 12x$$

Use the properties of operations to write three different equivalent expressions to represent the lengths of the other three sides of the square. One of your expressions should contain only two terms.

Show your work.

$$\begin{aligned} &6(3x + 8) + 32 + 12x \\ &18x + 8 + 32 + 12x \\ &18x + 40 + 12x \\ &30x + 40 \end{aligned}$$

Answer

Score Point 1 (out of 3 points)

This response demonstrates only a limited understanding of the mathematical concepts in the task. The value 6 is only distributed to $3x$ rather than to both terms within the parentheses. As a result, none of the expressions provided are equivalent to the original expression; however, like terms are correctly combined after this error and the three expressions given are equivalent to each other. The response addresses some elements of the task correctly. As per Scoring Policy #2, the response should still receive credit even though the solution is not written in the answer blank.

GUIDE PAPER 10

58

A square with one side length represented by an expression is shown below.



$$6(3x + 8) + 32 + 12x$$

Use the properties of operations to write three different equivalent expressions to represent the lengths of the other three sides of the square. One of your expressions should contain only two terms.

Show your work.

$$\begin{aligned} & 6(12x + 3x) \quad 32 + 8 \\ & 3x(2x + 6) \quad 8 + 32 \\ & 8(6 + 3x) \quad 3x + 12 \end{aligned}$$

Answer

110, the square length
is 110

Score Point 0 (out of 3 points)

This response is not sufficient to demonstrate even a limited understanding of the mathematical concepts in the task. None of the solutions are equivalent to the original expression: terms are merely transposed in three different permutations. Although the expression does evaluate to a value of 110 for the case $x = 1$, such understanding is not supported or demonstrated by the work and does not address the task.

GUIDE PAPER 11

Additional

58

A square with one side length represented by an expression is shown below.



$$6(3x + 8) + 32 + 12x$$

Use the properties of operations to write three different equivalent expressions to represent the lengths of the other three sides of the square. One of your expressions should contain only two terms.

Show your work.

$$\begin{array}{r} 6(3x + 8) + 32 + 12x \\ 6(11x) + 32 + 12x \\ \hline 66x \\ + 32 \\ \hline 98x \\ + 12x \\ \hline 110x \end{array}$$

Answer

<p>first equivalent expression</p> $(8 + 3x)6 + 12x + 32$	<p>2 equivalent expressions</p> $100x + 10x$
<hr/> <p>3rd equivalent expression</p> $90x + 20x$ <hr/>	

Score Point 0 (out of 3 points)

This response is not sufficient to demonstrate even a limited understanding of the mathematical concepts in the task. The first expression provided is identical to the expression in the prompt and is improperly simplified to $110x$ by combining unlike terms. Although the remaining two expressions ($100x + 10x$ and $90x + 20x$) are equivalent to the incorrect $110x$, holistically the comparison demonstrates no understanding of the task.

EXEMPLARY RESPONSE

59

A carpenter built three bookcases, A, B, and C, to stand next to each other along a wall. The total length of the wall is 456 centimeters. The carpenter will build two more bookcases, D and E, along the same wall. These two bookcases will have equal widths. The widths of bookcases A, B, and C are shown in the table below.

WIDTHS OF BOOKCASES

Bookcase	Width (centimeters)
A	132
B	94
C	108
D	w
E	w

Write and solve an equation to determine w , the greatest possible width for bookcases D and E.

Show your work.

$$132 + 94 + 108 + 2w = 456$$

$$334 + 2w = 456$$

$$2w = 122$$

$$w = 61$$

Answer $w = \underline{\hspace{2cm}}^{\hspace{2mm}61}$ centimeters

GUIDE PAPER 1

Additional

59

A carpenter built three bookcases, A, B, and C, to stand next to each other along a wall. The total length of the wall is 456 centimeters. The carpenter will build two more bookcases, D and E, along the same wall. These two bookcases will have equal widths. The widths of bookcases A, B, and C are shown in the table below.

WIDTHS OF BOOKCASES

Bookcase	Width (centimeters)
A	132
B	94
C	108
D	w
E	w

Write and solve an equation to determine w, the greatest possible width for bookcases D and E.

Show your work.

$$\begin{aligned} W &= \frac{456 - (A+B+C)}{2} \\ &= \frac{456 - (132 + 94 + 108)}{2} \\ &= \frac{456 - (234 + 108)}{2} \\ &= \frac{456 - 342}{2} \\ &= \frac{114}{2} \\ &= 57 \end{aligned}$$

Answer $w =$ 61 centimeters

Score Point 3 (out of 3 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. An appropriate equation already rearranged to solve for the variable w is given and all following mathematical procedures are performed correctly.

GUIDE PAPER 2

59

A carpenter built three bookcases, A, B, and C, to stand next to each other along a wall. The total length of the wall is 456 centimeters. The carpenter will build two more bookcases, D and E, along the same wall. These two bookcases will have equal widths. The widths of bookcases A, B, and C are shown in the table below.

WIDTHS OF BOOKCASES

Bookcase	Width (centimeters)
A	132
B	94
C	108
D	w
E	w

Write and solve an equation to determine w, the greatest possible width for bookcases D and E.

w = 132 times 2, so divide by 2

Show your work.

$$\begin{aligned} 456 - (132 + 94 + 108) &= 2w \\ 456 - 334 &= 122 \\ 122 \div 2 &= 61 \end{aligned}$$

Answer $w =$ 61 centimeters

Score Point 3 (out of 3 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. An appropriate equation is given and solved through correct mathematical operations. Although each line of the work does not follow a formal simplification of the equation, the procedure is clear and mathematically sound.

GUIDE PAPER 3

59

A carpenter built three bookcases, A, B, and C, to stand next to each other along a wall. The total length of the wall is 456 centimeters. The carpenter will build two more bookcases, D and E, along the same wall. These two bookcases will have equal widths. The widths of bookcases A, B, and C are shown in the table below.

WIDTHS OF BOOKCASES

Bookcase	Width (centimeters)
A	132
B	94
C	108
D	w
E	w

Write and solve an equation to determine w, the greatest possible width for bookcases D and E.

Show your work.

$$\begin{aligned}456 &= 132 + 94 + 108 + 2w \\456 &- 334 = 2w \\122 &= 2w \\w &= 61\end{aligned}$$

Answer $w = \underline{\hspace{2cm}} 61 \underline{\hspace{2cm}}$ centimeters

Score Point 3 (out of 3 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. An appropriate equation is given and solved correctly using mathematically sound procedures.

GUIDE PAPER 4

59

A carpenter built three bookcases, A, B, and C, to stand next to each other along a wall. The total length of the wall is 456 centimeters. The carpenter will build two more bookcases, D and E, along the same wall. These two bookcases will have equal widths. The widths of bookcases A, B, and C are shown in the table below.

WIDTHS OF BOOKCASES

Bookcase	Width (centimeters)
A	132
B	94
C	108
D	w
E	w

Write and solve an equation to determine w, the greatest possible width for bookcases D and E.

$$132 + 94 + 108 = 334 \quad \begin{array}{r} 456 \\ - 334 \\ \hline 122 \end{array}$$

Show your work.

$$122 \div 2 = 61$$

$$456 - (132 + 94 + 108) \div 2$$

$$\checkmark 456 - 334 = 122$$

$$\checkmark 122 \div 2$$

$$\checkmark \boxed{61}$$

Answer $w = \underline{\hspace{2cm}} 61 \underline{\hspace{2cm}}$ centimeters

Score Point 2 (out of 3 points)

This response demonstrates a partial understanding of the mathematical concepts in the task. A correct solution is found by appropriately subtracting the width of the already existing bookcases from the length of the wall; however, the work does not contain an equation that includes the variable w . The response addresses most, but not all aspects of the task.

GUIDE PAPER 5

59

A carpenter built three bookcases, A, B, and C, to stand next to each other along a wall. The total length of the wall is 456 centimeters. The carpenter will build two more bookcases, D and E, along the same wall. These two bookcases will have equal widths. The widths of bookcases A, B, and C are shown in the table below.

WIDTHS OF BOOKCASES

Bookcase	Width (centimeters)
A	132
B	94
C	108
D	w
E	w

Write and solve an equation to determine w, the greatest possible width for bookcases D and E.

Show your work.

$$132 + 94 + 108 + w + w = 456$$
$$\begin{array}{r} 132 \\ + 94 \\ + 108 \\ \hline 334 \end{array}$$
$$\begin{array}{r} 456 \\ - 334 \\ \hline 122 \end{array}$$
$$\begin{array}{r} 132 \\ + 94 \\ \hline 226 \end{array}$$

Answer $w = \underline{\hspace{2cm}} 66 \underline{\hspace{2cm}}$ centimeters

Score Point 2 (out of 3 points)

This response demonstrates a partial understanding of the mathematical concepts in the task. An appropriate equation is given and solved through correct mathematical procedures; however, a calculation error when subtracting ($456 - 334 = 132$) results in an incorrect final solution. While the response contains an incorrect solution, a mathematically appropriate process is applied.

GUIDE PAPER 6

59

A carpenter built three bookcases, A, B, and C, to stand next to each other along a wall. The total length of the wall is 456 centimeters. The carpenter will build two more bookcases, D and E, along the same wall. These two bookcases will have equal widths. The widths of bookcases A, B, and C are shown in the table below.

WIDTHS OF BOOKCASES

Bookcase	Width (centimeters)
A	132
B	94
C	108
D	w
E	w

Write and solve an equation to determine w, the greatest possible width for bookcases D and E.

Show your work.

$$A + B + C + W = 465$$

or
of
book
D and
E.

$$\begin{array}{r} \boxed{A} \quad 1 \\ \boxed{B} \quad | \\ \boxed{C} \quad 108 \\ + \\ \hline 334 \\ \boxed{D} \quad \boxed{W} \quad | \\ \boxed{E} \quad \boxed{W} \quad + \\ \hline 456 \end{array}$$

Answer $w = \underline{\hspace{2cm}} 122 \underline{\hspace{2cm}}$ centimeters

Score Point 2 (out of 3 points)

This response demonstrates a partial understanding of the mathematical concepts in the task. The equation written is correctly solved for the variable w ; however, the equation and work shown do not accurately recognize that the width w applies to bookcases D and E individually and not the combined width, resulting in an incorrect final solution. While the response contains an incorrect solution and a minor misunderstanding of the underlying mathematical concept, an appropriate process is applied.

GUIDE PAPER 7

59

A carpenter built three bookcases, A, B, and C, to stand next to each other along a wall. The total length of the wall is 456 centimeters. The carpenter will build two more bookcases, D and E, along the same wall. These two bookcases will have equal widths. The widths of bookcases A, B, and C are shown in the table below.

WIDTHS OF BOOKCASES

Bookcase	Width (centimeters)
A	132
B	94
C	108
D	w
E	w

456

Write and solve an equation to determine w, the greatest possible width for bookcases D and E.

Show your work.

$$\begin{array}{r} 334 \\ + 122 \\ \hline 456 \end{array} \quad \begin{array}{r} 456 \\ - 334 \\ \hline 122 \end{array} \quad \begin{array}{r} 132 \\ + 94 \\ \hline 226 \end{array}$$

$\frac{108}{+ w?}$

Answer $w =$ 122 centimeters

Score Point 1 (out of 3 points)

This response demonstrates only a limited understanding of the mathematical concepts in the task. The combined width of bookcases D and E are correctly identified by subtracting the existing bookcases from the length of the wall; however, similar to Guide Paper 6 the work shown does not recognize that w only represents half of that combined width. Additionally, no equation is written to represent the situation; no understanding of how to construct an algebraic equation from a word problem is demonstrated. The response addresses some elements of the task correctly but reaches an inadequate solution based on incomplete reasoning.

GUIDE PAPER 8

Additional

59

A carpenter built three bookcases, A, B, and C, to stand next to each other along a wall. The total length of the wall is 456 centimeters. The carpenter will build two more bookcases, D and E, along the same wall. These two bookcases will have equal widths. The widths of bookcases A, B, and C are shown in the table below.

WIDTHS OF BOOKCASES

Bookcase	Width (centimeters)
A	132
B	94
C	108
D	w
E	w

Write and solve an equation to determine w, the greatest possible width for bookcases D and E.

Show your work.

$$\begin{aligned}(A + B + C) - 456 \\ (132 + 94 + 108) - 456 \\ (226 + 108) - 456 \\ 334 - 456 \\ \cancel{1}12\end{aligned}$$

ANSWER $w = \underline{\hspace{2cm}} 112$ centimeters

Score Point 1 (out of 3 points)

This response demonstrates only a limited understanding of the mathematical concepts in the task. The width of the existing bookcases is correctly identified. While an attempt is made to subtract it from the total length of the wall, a calculation error ($334 - 456 = 112$) results in an incorrect value. Additionally, the work shown does not recognize that w only represents half of the leftover width, nor does it represent the information as an algebraic equation, and the order of subtraction is reversed. The response addresses some elements of the task correctly but reaches an inadequate solution based on incomplete reasoning.

GUIDE PAPER 9

59

A carpenter built three bookcases, A, B, and C, to stand next to each other along a wall. The total length of the wall is 456 centimeters. The carpenter will build two more bookcases, D and E, along the same wall. These two bookcases will have equal widths. The widths of bookcases A, B, and C are shown in the table below.

WIDTHS OF BOOKCASES

Bookcase	Width (centimeters)
A	132
B	94
C	108
D	w
E	w

Write and solve an equation to determine w, the greatest possible width for bookcases D and E.

Show your work.

$$\begin{aligned}(A+B+C) &\div 2 \\ (132+94+108) &\div 2 \\ 334 &\div 2 \\ 167\end{aligned}$$

Answer $w = \underline{\hspace{2cm}} 167 \underline{\hspace{2cm}}$ centimeters

Score Point 1 (out of 3 points)

This response demonstrates only a limited understanding of the mathematical concepts in the task. The width of the existing bookcases is correctly added, but no attempt is made to subtract this value from the length of the wall or to represent the situation as an algebraic equation. While the work does recognize that a value needs to be halved to find w , the division is inappropriately performed on the wrong value because the difference from the total width was not found. The response exhibits multiple flaws related to misunderstanding of important aspects of the task.

GUIDE PAPER 10

59

A carpenter built three bookcases, A, B, and C, to stand next to each other along a wall. The total length of the wall is 456 centimeters. The carpenter will build two more bookcases, D and E, along the same wall. These two bookcases will have equal widths. The widths of bookcases A, B, and C are shown in the table below.

WIDTHS OF BOOKCASES

Bookcase	Width (centimeters)
A	132
B	94
C	108
D	w
E	w

Write and solve an equation to determine w , the greatest possible width for bookcases D and E.

Show your work.

$$\begin{array}{r} 0 \\ 132 \\ 108 \\ + \quad 94 \\ \hline 334 \end{array}$$

Answer $w = \underline{\hspace{2cm}} 334 \underline{\hspace{2cm}}$ centimeters

Score Point 0 (out of 3 points)

Although this response contains some correct mathematical procedures, holistically, it is not sufficient to demonstrate even a limited understanding of the mathematical concepts in the task. The widths of the existing bookcases are correctly added; however, this procedure alone is not sufficient to assess the ability to solve multistep word problems.

GUIDE PAPER 11

Additional

59

A carpenter built three bookcases, A, B, and C, to stand next to each other along a wall. The total length of the wall is 456 centimeters. The carpenter will build two more bookcases, D and E, along the same wall. These two bookcases will have equal widths. The widths of bookcases A, B, and C are shown in the table below.

WIDTHS OF BOOKCASES

Bookcase	Width (centimeters)
A	132
B	94
C	108
D	w
E	w

Write and solve an equation to determine w, the greatest possible width for bookcases D and E.

Show your work.

$$\begin{array}{r} 132 \\ \times 04 \\ \hline 528 \\ + 11880 \\ \hline 12408 \end{array} \quad \begin{array}{r} 12408 \\ - 108 \\ \hline 12300 \end{array}$$

Answer $w =$ 12300 centimeters

Score Point 0 (out of 3 points)

This response is irrelevant and not sufficient to demonstrate even a limited understanding of the mathematical concepts in the task. The given values are inappropriately multiplied with no relation to the correct procedure of the problem.

EXEMPLARY RESPONSE

60

Darnell's car used 8 gallons of gasoline to travel 340 miles. After a mechanic worked on the car, it used 7 gallons of gasoline to travel 350 miles. If the price of gasoline was approximately \$4.00 per gallon, how much less, to the nearest cent per mile, did it cost to run the car after the mechanic worked on it?

Show your work.

$$\text{Before} - 8 \times 4 = 32$$

$$\frac{\$32}{340 \text{ miles}} = \frac{x}{1 \text{ mile}}$$

$$32 = 340x$$
$$x = .094 \text{ or } \$0.09/\text{mile}$$

$$\text{After} - 7 \times 4 = 28$$

$$\frac{\$28}{350 \text{ miles}} = \frac{x}{1 \text{ mile}}$$

$$28 = 350x$$
$$x = .08 \text{ or } \$0.08/\text{mile}$$

$$\$0.09 - \$0.08 = \$0.01$$

OR other valid process

NOTE: All forms of the monetary value are acceptable as long as they are correct (e.g. 0.01 is acceptable for dollars, rather than cents)

Answer 1 cent(s) per mile

GUIDE PAPER 1

Additional

60

Damell's car used 8 gallons of gasoline to travel 340 miles. After a mechanic worked on the car, it used 7 gallons of gasoline to travel 350 miles. If the price of gasoline was approximately \$4.00 per gallon, how much less, to the nearest cent per mile, did it cost to run the car after the mechanic worked on it?

Show your work.

before

$$\frac{8 \text{ gal}}{340 \text{ miles}} = \frac{\$32}{\text{8 gal}}$$

$$\frac{\$32}{340 \text{ miles}} \text{ let } x \text{ be the \$ per one mile} \\ \frac{\$32}{340 \text{ miles}} = \frac{x}{1 \text{ mile}}$$

$$32 = 340x$$

$$\frac{32}{340} = \frac{340x}{340}$$

$$0.09 \approx x$$

$$\begin{array}{r} \text{4.00} \\ \times 340 \\ \hline 320 \\ -320 \\ \hline 3200 \end{array}$$

$$\frac{0.09}{1 \text{ mile}}$$

after

$$\frac{7 \text{ gal}}{350 \text{ miles}} = \frac{\$28}{7 \text{ gal}}$$

$$\text{let } x \text{ be the \$ per one mile}$$

$$\frac{\$28}{350 \text{ miles}} = \frac{x}{1 \text{ mile}}$$

$$\frac{28}{350} = \frac{350x}{350}$$

$$0.08 = x$$

$$\begin{array}{r} 0.09 \\ -0.08 \\ \hline 0.01 \end{array}$$

Answer

\$0.01

cent(s) per mile $\frac{\$0.01}{1 \text{ mile}}$

Score Point 3 (out of 3 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The cost per mile is correctly calculated for both before and after the mechanic worked on the car and the difference correctly determined.

GUIDE PAPER 2

60

Darnell's car used 8 gallons of gasoline to travel 340 miles. After a mechanic worked on the car, it used 7 gallons of gasoline to travel 350 miles. If the price of gasoline was approximately \$4.00 per gallon, how much less, to the nearest cent per mile, did it cost to run the car after the mechanic worked on it?

Show your work.

$$\begin{array}{r} \overbrace{\quad\quad\quad\quad\quad}^{+340} \\ \begin{array}{r} \$32 \\ \times 8 \\ \hline 32 \end{array} \\ \begin{array}{r} \overbrace{\quad\quad\quad\quad\quad}^{+340} \\ 340 \text{ m} \end{array} \\ \begin{array}{r} \overbrace{\quad\quad\quad\quad\quad}^{\div 340} \\ \begin{array}{r} ? 40.09 \\ \hline 1 \end{array} \\ \begin{array}{r} \overbrace{\quad\quad\quad\quad\quad}^{+350} \\ \$28 \end{array} \\ \begin{array}{r} \overbrace{\quad\quad\quad\quad\quad}^{+350} \\ 350 \text{ m} \end{array} \\ \begin{array}{r} \overbrace{\quad\quad\quad\quad\quad}^{\div 350} \\ \begin{array}{r} ? 0.08 \\ \hline 1 \end{array} \\ \begin{array}{r} \overbrace{\quad\quad\quad\quad\quad}^{+0.09} \\ -0.08 \\ \hline 0.01 \end{array} \end{array} \end{array} \end{array}$$

Answer

1

cent(s) per mile

Score Point 3 (out of 3 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The cost per mile is correctly calculated for both before and after the mechanic worked on the car and the difference correctly determined.

GUIDE PAPER 3

60

Darnell's car used 8 gallons of gasoline to travel 340 miles. After a mechanic worked on the car, it used 7 gallons of gasoline to travel 350 miles. If the price of gasoline was approximately \$4.00 per gallon, how much less, to the nearest cent per mile, did it cost to run the car after the mechanic worked on it?

Show your work.

$$\begin{array}{r} 8 \\ \hline 340 \end{array} \begin{array}{l} \text{- } \\ \hline 8 \end{array} \begin{array}{l} \text{1 gallon} \\ \hline 42.5 \end{array} \quad \begin{array}{r} 7 \\ \hline 350 \end{array} \begin{array}{l} \text{- } \\ \hline 50 \end{array}$$

$$\begin{array}{r} 1 \text{ gallon} \\ \hline 42.5 \end{array} \quad \begin{array}{r} 1 \text{ gallon} \\ \hline 50 \end{array}$$

$$\begin{array}{r} 4.00 \\ \hline 42.5 \end{array} \quad \begin{array}{r} 4.00 \\ \hline 50 \end{array}$$

11
0.09 0.08

$$\begin{array}{r} 0.09 \\ - 0.08 \\ \hline 1 \end{array}$$

Answer

0.01

cent(s) per mile

Score Point 3 (out of 3 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The cost per mile is correctly calculated for both before and after the mechanic worked on the car and the difference correctly determined.

GUIDE PAPER 4

60

Damell's car used 8 gallons of gasoline to travel 340 miles. After a mechanic worked on the car, it used 7 gallons of gasoline to travel 350 miles. If the price of gasoline was approximately \$4.00 per gallon, how much less, to the nearest cent per mile, did it cost to run the car after the mechanic worked on it?

Show your work.

$$\begin{array}{r} 8 \\ \hline 340 \end{array}$$
$$\begin{array}{r} 7 \\ \hline 350 \end{array}$$

$\$4.00 = 400\text{c}$

$$\frac{8}{340} \times \frac{40}{1} = \frac{320}{340} = \frac{160}{17} = 9\frac{7}{17} = 9\frac{1}{2}\text{c}$$
$$\begin{array}{r} 8 \\ \hline 17 \\ 14 \\ \hline 3 \\ 3 \\ \hline 0 \end{array}$$
$$\begin{array}{r} 7 \\ \hline 350 \end{array}$$
$$\begin{array}{r} 7 \\ \hline 17 \\ 14 \\ \hline 3 \\ 3 \\ \hline 0 \end{array}$$
$$\frac{7}{350} \times \frac{400}{1} = \frac{2800}{350} = \frac{56}{7} = 8\frac{4}{7} = 8\frac{1}{2}\text{c}$$

Answer

8 cent(s) per mile

Score Point 2 (out of 3 points)

This response demonstrates a partial understanding of the mathematical concepts in the task. The cost per mile is correctly calculated for both before and after the mechanic worked on the car; however, the difference between them is not calculated and the cost per mile after the mechanical work is incorrectly taken as the final solution. The response addresses most, but not all aspects of the task.

GUIDE PAPER 5

60

Darnell's car used 8 gallons of gasoline to travel 340 miles. After a mechanic worked on the car, it used 7 gallons of gasoline to travel 350 miles. If the price of gasoline was approximately \$4.00 per gallon, how much less, to the nearest cent per mile, did it cost to run the car after the mechanic worked on it?

Show your work.

$$\begin{aligned}8 \text{ gallons of gas} &= 340 \text{ miles} \\1 \text{ gallon of gas} &= 42.5 \text{ miles}\end{aligned}$$

$$\begin{aligned}7 \text{ gallons of gas} &= 350 \text{ miles} \\1 \text{ gallon of gas} &= 50 \text{ mi}\end{aligned}$$

$$\begin{aligned}\text{Originally } 8 \text{ gallons} &= 8 \times 4 = 32 \\\$32 &= 340 \text{ miles} \quad 9\text{¢} = 1 \text{ mile}\end{aligned}$$

$$\begin{aligned}\text{New } 7 \text{ gallons} &= 7 \times 4 = 28 \\\$28 &= 350 \text{ miles} \\8\text{¢} &= 1 \text{ mile}\end{aligned}$$

Answer

cent(s) per mile

Score Point 2 (out of 3 points)

This response demonstrates a partial understanding of the mathematical concepts in the task. The cost per mile is correctly calculated for both before and after the mechanic worked on the car; however, although the correct solution of 1 cent per mile is recorded on the answer blank, it is not clear if it was obtained via finding the difference or simply copied with incorrect units from either 1 gallon or 1 mile, as the subtraction is not shown explicitly. The response appropriately addresses most, but not all aspects of the task.

GUIDE PAPER 6

60

Damell's car used 8 gallons of gasoline to travel 340 miles. After a mechanic worked on the car, it used 7 gallons of gasoline to travel 350 miles. If the price of gasoline was approximately \$4.00 per gallon, how much less, to the nearest cent per mile, did it cost to run the car after the mechanic worked on it?

Show your work.

The handwritten work shows two rows of calculations. The top row starts with '\$32' followed by a division symbol and '8 gal'. An arrow points from '340 miles' to '1 mile', indicating the calculation of miles per gallon. The bottom row starts with '\$24' followed by a division symbol and '7 gal'. Another arrow points from '350 miles' to '1 mile', indicating the calculation of miles per gallon.

Answer

\$0.08 cent(s) per mile

Score Point 2 (out of 3 points)

This response demonstrates a partial understanding of the mathematical concepts in the task. The cost per mile is correctly calculated for both before and after the mechanic worked on the car; however, the difference between them is not calculated and the cost per mile after the mechanical work is incorrectly taken as the final solution. The response addresses most, but not all aspects of the task.

GUIDE PAPER 7

60

Damell's car used 8 gallons of gasoline to travel 340 miles. After a mechanic worked on the car, it used 7 gallons of gasoline to travel 350 miles. If the price of gasoline was approximately \$4.00 per gallon, how much less, to the nearest cent per mile, did it cost to run the car after the mechanic worked on it?

Show your work.

AFTER

50 miles per gallon
80¢ every mile

before 42.5 miles per gallon

$$\begin{array}{r} 42.5 \\ \times 8 \\ \hline 340.0 \\ -340 \\ \hline 0 \end{array}$$

94¢ per mile

$$\begin{array}{r} 94 \\ -80 \\ \hline 14 \end{array}$$

Answer

14

cent(s) per mile

Score Point 1 (out of 3 points)

This response demonstrates only a limited understanding of the mathematical concepts in the task. The cost per mile is calculated for both before and after the mechanic worked on the car and the difference correctly determined; however, a calculation error when finding the costs per mile results in incorrectly placed decimal points (94¢ and 80¢ instead of 9.4¢ and 8¢), and the step involving this calculation is not actually shown in the work. The response addresses some elements of the task correctly but reaches an inadequate solution based on faulty and incomplete reasoning.

GUIDE PAPER 8

Additional

60

Darnell's car used 8 gallons of gasoline to travel 340 miles. After a mechanic worked on the car, it used 7 gallons of gasoline to travel 350 miles. If the price of gasoline was approximately \$4.00 per gallon, how much less, to the nearest cent per mile, did it cost to run the car after the mechanic worked on it?

Show your work.

$$340 \text{ mi} = 8 \cdot 4 = 32 = 10.625$$

$$350 \text{ mi} = 7 \cdot 4 = 28 = 12.500$$

$$\begin{array}{r} 10.625 \\ 32 \overline{)340.000} \\ -32 \\ \hline 20 \\ -00 \\ \hline 1800 \\ -160 \\ \hline 200 \\ -160 \\ \hline 40 \\ -40 \\ \hline 0 \\ \end{array}$$

~~340.000~~
~~-32~~
~~10.625~~
~~12.500~~
~~350~~
~~-28~~
~~12.500~~
~~-160~~
~~160~~
~~0~~

$$350 \div 28 = 12.5$$

$$\begin{array}{r} .32 \\ \times 5 \\ \hline 160 \\ \end{array}$$
$$\begin{array}{r} .32 \\ \times 6 \\ \hline 192 \\ \end{array}$$
$$\begin{array}{r} .32 \\ \times 7 \\ \hline 224 \\ \end{array}$$
$$\begin{array}{r} .32 \\ \times 3 \\ \hline 96 \\ \end{array}$$

$$\begin{array}{r} 228 \\ \times 3 \\ \hline 84 \\ \end{array}$$
$$\begin{array}{r} 228 \\ \times 2 \\ \hline 56 \\ \end{array}$$
$$\begin{array}{r} 10.625 \\ -12.500 \\ \hline -1.875 \\ \end{array}$$

Answer 1.875 cent(s) per mile

Score Point 1 (out of 3 points)

This response demonstrates only a limited understanding of the mathematical concepts in the task. The difference between the two costs per mile is correctly understood; however, the division to calculate the costs per mile is performed in the incorrect order ($340 \div 32$ instead of $32 \div 340$), resulting in an incorrect final solution. Additionally, the solution is not rounded to the nearest whole cent, as required by the prompt. The response exhibits multiple flaws related to misuse of mathematical procedures.

GUIDE PAPER 9

60

Darnell's car used 8 gallons of gasoline to travel 340 miles. After a mechanic worked on the car, it used 7 gallons of gasoline to travel 350 miles. If the price of gasoline was approximately \$4.00 per gallon, how much less, to the nearest cent per mile, did it cost to run the car after the mechanic worked on it?

Show your work.

$$\begin{array}{r} 4.00 \\ \times 8 \\ \hline 32.00 \end{array}$$

$$\begin{array}{r} 340 \\ 8 \\ \hline 350 \end{array}$$

$$\begin{array}{r} 42.5 \\ 1 \\ \hline 50 \end{array} \quad \begin{array}{r} 8 \\ -32 \\ \hline 20 \end{array} \quad \begin{array}{r} 340.0 \\ -32 \\ \hline 20 \end{array}$$

$$\begin{array}{r} 450.00 \\ 42.50 \\ \hline 7.50 \end{array}$$

$$\begin{array}{r} 50 \\ 7 \\ \hline 35 \\ -35 \\ \hline 00 \end{array}$$

$$\begin{array}{r} 7.5 = 8.0 \\ \uparrow \end{array}$$

Answer

8

cent(s) per mile

Score Point 1 (out of 3 points)

This response demonstrates only a limited understanding of the mathematical concepts in the task. The miles per gallon are correctly calculated both before and after the mechanic worked on the car and the difference correctly understood; however, miles per gallon is not the quantity specified in the prompt (cost per mile). The response addresses some elements of the task correctly but reaches an inadequate solution based on faulty reasoning, and reflects a lack of essential understanding of the underlying concepts.

GUIDE PAPER 10

60

Darnell's car used 8 gallons of gasoline to travel 340 miles. After a mechanic worked on the car, it used 7 gallons of gasoline to travel 350 miles. If the price of gasoline was approximately \$4.00 per gallon, how much less, to the nearest cent per mile, did it cost to run the car after the mechanic worked on it?

Show your work.

$$\begin{array}{r} 8 \text{ Gal} = 340 \text{ Miles} \\ 7 \text{ Gal} = 350 \text{ Miles} \\ \hline - & 350 \\ & 340 \\ \hline & 10 \end{array}$$

$$\begin{array}{r} 4.00 \\ \times 10 \\ \hline + 40.00 \\ \hline 40.00 \end{array}$$

Answer

10

cent(s) per mile

Score Point 0 (out of 3 points)

This response is not sufficient to demonstrate even a limited understanding of the mathematical concepts in the task. The miles driven before and after the mechanical work are inappropriately subtracted directly with no use of the amount or cost of the gasoline.

GUIDE PAPER 11

Additional

60

Darnell's car used 8 gallons of gasoline to travel 340 miles. After a mechanic worked on the car, it used 7 gallons of gasoline to travel 350 miles. If the price of gasoline was approximately \$4.00 per gallon, how much less, to the nearest cent per mile, did it cost to run the car after the mechanic worked on it?

Show your work.

$$\begin{array}{r} 8 \\ \times 4 \\ \hline \$32.00 \end{array}$$
$$\begin{array}{r} 7 \\ \times 4 \\ \hline \$28.00 \end{array}$$
$$\begin{array}{r} \$32 \\ -\$28 \\ \hline \$4 \end{array}$$

Answer

400

cent(s) per mile

Score Point 0 (out of 3 points)

Although the total cost of gasoline used both before and after the mechanical work is correctly calculated, the difference between the two total costs is incorrectly taken as the final solution. No attempt is made to use the values for the number of miles driven. Holistically, the response is not sufficient to demonstrate even a limited understanding of the mathematical concepts in the task.

EXEMPLARY RESPONSE

61

The circus had one performance at the Dewey Civic Center and one at the Atlantic Auditorium. The Dewey Civic Center has 1,600 seats. Tickets for 85% of the total number of seats were sold. How many tickets were sold?

Show your work.

$$\begin{array}{r} 1600.00 \\ \times \quad 0.85 \\ \hline 30.00 \\ 50.00 \\ 480.00 \\ \hline 800.00 \\ \hline 1360.00 \end{array}$$

Or other equivalent process

Answer 1,360 tickets

Atlantic Auditorium has 850 seats. Tickets were sold for 816 of the seats. For what percent of the seats were tickets sold?

Show your work.

$$\begin{array}{r} 0.96 \\ 850) 816.0 \\ \underline{765\,0} \\ 51\,0 \\ \underline{51\,0} \\ 0 \end{array}$$

$$0.96 \times 100 = 96$$

Or other equivalent process

Answer 96 %

GUIDE PAPER 1

Additional

61

The circus had one performance at the Dewey Civic Center and one at the Atlantic Auditorium. The Dewey Civic Center has 1,600 seats. Tickets for 85% of the total number of seats were sold. How many tickets were sold?

Show your work.

Answer: 1,360 tickets

Atlantic Auditorium has 850 seats. Tickets were sold for 816 of the seats. For what percent of the seats were tickets sold?

Show your work.

$$\frac{816}{850} = \frac{x}{100}$$

$$816 \times 100 = 850 \times x$$

$$\frac{81600}{850} = \frac{850x}{850}$$

kjhy

Score Point 3 (out of 3 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The number of tickets sold at the Dewey Civic Center and the percent of tickets sold at the Atlantic Auditorium are both correctly calculated.

GUIDE PAPER 2

61

The circus had one performance at the Dewey Civic Center and one at the Atlantic Auditorium. The Dewey Civic Center has 1,600 seats. Tickets for 85% of the total number of seats were sold. How many tickets were sold?

Show your work.

$$\begin{aligned}85\% \text{ of } 1,600 &= \underline{1360} \\0.85 \times 1,600 &= 1360\end{aligned}$$

$$\begin{array}{r} 1600 \\ \times 0.85 \\ \hline 136000 \end{array}$$

Answer, 1360 tickets

Atlantic Auditorium has 850 seats. Tickets were sold for 816 of the seats. For what percent of the seats were tickets sold?

Show your work.

$$816 \text{ % of } 850 = 96$$

$$\begin{array}{r} 416 \\ \overline{\div 450} \\ 40 \\ -45 \\ \hline 10 \\ -9 \\ \hline 10 \\ -9 \\ \hline 1 \end{array} \quad \begin{array}{r} 232 \\ \overline{\times 6} \\ 132 \\ -232 \\ \hline 0 \end{array} \quad \begin{array}{r} 473 \\ \overline{\times 9} \\ 373 \\ -473 \\ \hline 0 \end{array}$$

Answer, 96 %

Score Point 3 (out of 3 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The number of tickets sold at the Dewey Civic Center and the percent of tickets sold at the Atlantic Auditorium are both correctly calculated.

GUIDE PAPER 3

61

The circus had one performance at the Dewey Civic Center and one at the Atlantic Auditorium. The Dewey Civic Center has 1,500 seats. Tickets for 85% of the total number of seats were sold. How many tickets were sold?

Show your work.

$$\begin{array}{r} 53 \\ 85 \\ \times 16 \\ \hline 1510 \\ 850 \\ \hline 1360 \end{array}$$

Answer: 1360 tickets

Atlantic Auditorium has 850 seats. Tickets were sold for 816 of the seats. For what percent of the seats were tickets sold?

Show your work.

$$\begin{aligned}\frac{x}{100} &= \frac{816}{850} \\ 850x &= 816 \cdot 100 \\ 850x &= \cancel{816}00 \\ \underline{850} &= \underline{850} \\ x &= \end{aligned}$$

$$\begin{array}{r} 96 \\ 858160 \\ -765 \\ \hline 510 \\ \times 9 \\ \hline 455 \\ 85 \\ \times 5 \\ \hline 425 \\ 510 \end{array}$$

Check
~~96 = 816~~
~~100 = 850~~

Answer: 96 %

Score Point 3 (out of 3 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The number of tickets sold at the Dewey Civic Center and the percent of tickets sold at the Atlantic Auditorium are both correctly calculated.

GUIDE PAPER 4

61

The circus had one performance at the Dewey Civic Center and one at the Atlantic Auditorium. The Dewey Civic Center has 1,500 seats. Tickets for 85% of the total number of seats were sold. How many tickets were sold?

Show your work.

$$\begin{array}{r}
 \cancel{85} \\
 \times \cancel{100} \\
 \hline
 \cancel{1,600} \\
 \cancel{1,36,000} \\
 \hline
 \cancel{100} \quad \cancel{100} \\
 \hline
 \cancel{n} = \cancel{1,360}
 \end{array}$$

$$\begin{array}{r}
 1,600 \\
 \times 85 \\
 \hline
 + 8,000 \\
 12,800 \\
 \hline
 136,000
 \end{array}$$

Answer: 1,360 tickets

Atlantic Auditorium has 850 seats. Tickets were sold for 816 of the seats. For what percent of the seats were tickets sold?

Show your work.

$$\begin{array}{r}
 \cancel{n} = \cancel{816} \\
 \cancel{100} \quad \cancel{850} \\
 \hline
 \cancel{850} \quad \cancel{81600} \\
 \hline
 \cancel{850} \quad \cancel{81600} \\
 \hline
 n = ??
 \end{array}$$

$$\begin{array}{r}
 \cancel{816} \\
 \times \cancel{85} \\
 \hline
 \cancel{692} \\
 \cancel{692} \\
 \hline
 \cancel{916}
 \end{array}$$

$$\begin{array}{r}
 85 \overline{) 916} \\
 764 \\
 \hline
 520 \\
 510 \\
 \hline
 10
 \end{array}
 ??$$

Answer: 97 %

Score Point 2 (out of 3 points)

This response demonstrates a partial understanding of the mathematical concepts in the task. The number of tickets sold at the Dewey Civic Center is correctly calculated and an appropriate procedure is used to calculate the percent of tickets sold at the Atlantic Auditorium; however, a calculation error within the long division ($9 \times 85 = 764$) leaves a remainder of 10 and a transcription error occurs when writing the quotient in the answer blank. Although the solution is incorrect, appropriate procedures were applied.

GUIDE PAPER 5

61

The circus had one performance at the Dewey Civic Center and one at the Atlantic Auditorium. The Dewey Civic Center has 1,600 seats. Tickets for 85% of the total number of seats were sold. How many tickets were sold?

Show your work!

$$\begin{array}{r} 1600 \\ \times .85 \\ \hline 8000 \\ 12800 \\ \hline 13600.00 \end{array}$$

~~$$\begin{array}{r} 325 \\ \times 6 \\ \hline 1950 \end{array}$$~~

$$\begin{array}{r} 325 \\ \times 6 \\ \hline 1950 \end{array}$$

Answer. 1360 tickets

Atlantic Auditorium has 850 seats. Tickets were sold for 816 of the seats. For what percent of the seats were tickets sold?

Show your work.

$$\begin{array}{r} 850 \\ \times 816 \\ \hline 1600 \\ 7200 \\ 6800 \\ \hline 693000 \end{array}$$

$$\begin{array}{r} 850 \\ \times 816 \\ \hline 693000 \end{array}$$

$$\begin{array}{r} .951 \\ \times 100 \\ \hline 95.1\% \end{array}$$

Answer. 95.1%

Score Point 2 (out of 3 points)

This response demonstrates a partial understanding of the mathematical concepts in the task. The number of tickets sold at the Dewey Civic Center is correctly calculated and an appropriate procedure is used to calculate the percent of tickets sold at the Atlantic Auditorium; however, a calculation error occurs when solving for the percentage ($816 \div 850 = .951$). The response correctly addresses most, but not all aspects of the task.

GUIDE PAPER 6

61

The circus had one performance at the Dewey Civic Center and one at the Atlantic Auditorium. The Dewey Civic Center has 1,600 seats. Tickets for 85% of the total number of seats were sold. How many tickets were sold?

Show your work.

$$100 \left| \begin{array}{r} 128 \\ 1,288,000 \\ 100 \downarrow \\ 28 \\ 20 \downarrow \\ 80 \\ 80 \downarrow \\ 00 \end{array} \right. \quad \frac{x}{1600} = \frac{85}{100}$$

$$\begin{aligned} & \begin{array}{r} 1600 \\ \times 85 \\ \hline 8000 \\ 12800 \\ \hline 1288000 \end{array} \\ & 100x = 1,600 \times 85 \\ & 100 \end{aligned}$$

Answer: 1,288 tickets

Atlantic Auditorium has 850 seats. Tickets were sold for 816 of the seats. For what percent of the seats were tickets sold?

Show your work.

Answer: 96 %

Score Point 2 (out of 3 points)

This response demonstrates a partial understanding of the mathematical concepts in the task. The percent of tickets sold at the Atlantic Auditorium is correctly calculated and an appropriate procedure is used to calculate the number of tickets sold at the Dewey Civic Center; however, a calculation error occurs when solving for the tickets sold ($1600 \times 85 = 1288000$), resulting in an incorrect solution. The response correctly addresses most, but not all aspects of the task.

GUIDE PAPER 7

61

The circus had one performance at the Dewey Civic Center and one at the Atlantic Auditorium. The Dewey Civic Center has 1,600 seats. Tickets for 85% of the total number of seats were sold. How many tickets were sold?

Show your work.

$$\begin{array}{r}
 42 \\
 \times .85 \\
 \hline
 1800 \\
 +12800 \\
 \hline
 13600
 \end{array}$$

Answer: 1,360 tickets

Atlantic Auditorium has 850 seats. Tickets were sold for 816 of the seats. For what percent of the seats were tickets sold?

Show your work.

$$\begin{array}{r}
 425 \\
 \times 8 \\
 \hline
 340 \\
 -320 \\
 \hline
 10 \\
 -10 \\
 \hline
 0
 \end{array}$$

Answer: 97

$$\begin{array}{r}
 816 \\
 -425 \\
 \hline
 391
 \end{array}$$

$$\begin{array}{r}
 816 \\
 -425 \\
 \hline
 391 \\
 -364 \\
 \hline
 27
 \end{array}$$

$$\begin{array}{r}
 7405 \\
 -351 \\
 \hline
 58 \\
 -48 \\
 \hline
 10 \\
 -9 \\
 \hline
 1
 \end{array}$$

$$\begin{array}{r}
 87405 \\
 -425 \\
 \hline
 83150
 \end{array}$$

$$\begin{array}{r}
 816 \\
 -816 \\
 \hline
 0
 \end{array}$$

Score Point 1 (out of 3 points)

This response demonstrates only a limited understanding of the mathematical concepts in the task. The number of tickets sold at the Dewey Civic Center is correctly calculated; however, the work provided for the tickets sold at the Atlantic Auditorium uses incorrect procedures and does not support the incorrect solution of 97%. The response correctly addresses only some elements of the task.

GUIDE PAPER 8

Additional

61

The circus had one performance at the Dewey Civic Center and one at the Atlantic Auditorium. The Dewey Civic Center has 1,600 seats. Tickets for 85% of the total number of seats were sold. How many tickets were sold?

Show your work.

Percentage = Rate % Base

$$\rho = 85 \approx 1,600$$

$$P = \boxed{1} 360 - \text{answer}$$

$$\begin{array}{r} 4 \\ \times 1,100 \\ \hline 4,400 \end{array}$$

Answer: 1350 tickets

box *departs*
Atlantic Auditorium has 850 seats. Tickets were sold for $\frac{8}{16}$ of the seats. For what percent of the seats were tickets sold?

Show your work.

$$\text{Rate} = \frac{\text{percentage}}{\text{Year}}$$

$$t = \frac{316}{350}$$

$$\begin{array}{r}
 & 104 \\
 & \times 32 \\
 \hline
 & 32 \\
 & 3400 \\
 - & 3244 \\
 \hline
 & 136
 \end{array}$$

91.04%

Answer. 104 %

Score Point 1 (out of 3 points)

This response demonstrates only a limited understanding of the mathematical concepts in the task. The number of tickets sold at the Dewey Civic Center is correctly calculated; however, although a correct statement of $R = \frac{816}{850}$ is given, the work then divides the values in the incorrect order, resulting in an incorrect solution. Additionally, the decimal point is moved in the incorrect direction when converting the ratio into a percentage. The response correctly addresses only some elements of the task.

GUIDE PAPER 9

61

The circus had one performance at the Dewey Civic Center and one at the Atlantic Auditorium. The Dewey Civic Center has 1,600 seats. Tickets for 85% of the total number of seats were sold. How many tickets were sold?

Show your work.

$$\begin{array}{r} 1,600 \\ \times 85 \\ \hline 136,000 \end{array}$$

Answer: 136,000 tickets

Atlantic Auditorium has 850 seats. Tickets were sold for 816 of the seats. For what percent of the seats were tickets sold?

Show your work.

$$\begin{array}{r} 816 \\ \times 85 \\ \hline 4080 \\ 6520 \\ \hline 69,360 \end{array}$$

Answer: 69,360 %

Score Point 1 (out of 3 points)

This response demonstrates only a limited understanding of the mathematical concepts in the task. An appropriate procedure is used to calculate the number of tickets sold at the Dewey Civic Center; however, the last two zeroes are not removed from the product to account for 85 being a percentage. Additionally, the same procedure is used inappropriately to address the tickets sold at the Atlantic Auditorium. The response reflects a lack of essential understanding of the underlying concepts in the task.

GUIDE PAPER 10

61

The circus had one performance at the Dewey Civic Center and one at the Atlantic Auditorium. The Dewey Civic Center has 1,600 seats. Tickets for 85% of the total number of seats were sold. How many tickets were sold?

Show your work.

Next page

$$1600 \overline{) 85.00} \begin{matrix} 5 \\ 80 \\ \hline 5.00 \end{matrix}$$

Answer: 800 tickets

Atlantic Auditorium has 850 seats. Tickets were sold for 816 of the seats. For what percent of the seats were tickets sold?

Show your work.

$$\frac{850}{1} \times \frac{1}{816} = \boxed{\frac{850}{816} = 1\frac{34}{816}}$$

$$d = 1.34$$

$$F = 1 \frac{34}{816}$$

$$P = 134\%$$

Answer: 134

Score Point 0 (out of 3 points)

This response is not sufficient to demonstrate even a limited understanding of the mathematical concepts in the task. The value 85 is inappropriately divided by 1600 to calculate the tickets sold at the Dewey Civic Center. When addressing the tickets sold at the Atlantic Auditorium, the values 850 and 816 are divided in the incorrect order, the result of which ($1\frac{34}{816}$) is additionally converted into decimal and percentage formats incorrectly.

GUIDE PAPER 11

Additional

61

The circus had one performance at the Dewey Civic Center and one at the Atlantic Auditorium. The Dewey Civic Center has 1,600 seats. Tickets for 85% of the total number of seats were sold. How many tickets were sold?

Show your work.

$$\begin{array}{r} 150\% \\ - 85 \\ \hline 1,525 \end{array}$$

Answer. 1,525 tickets

Atlantic Auditorium has 850 seats. Tickets were sold for 816 of the seats. For what percent of the seats were tickets sold?

Show your work.

$$\begin{array}{r} 850\% \\ - 816 \\ \hline 34 \end{array}$$

Answer. 34 %

Score Point 0 (out of 3 points)

This response is not sufficient to demonstrate even a limited understanding of the mathematical concepts in the task. For both performances, the values given in the prompt are inappropriately subtracted.