



New York State Testing Program

**2016 Common Core
Mathematics Test**

Grade 6

Scoring Leader Materials

Training Set

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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

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

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).

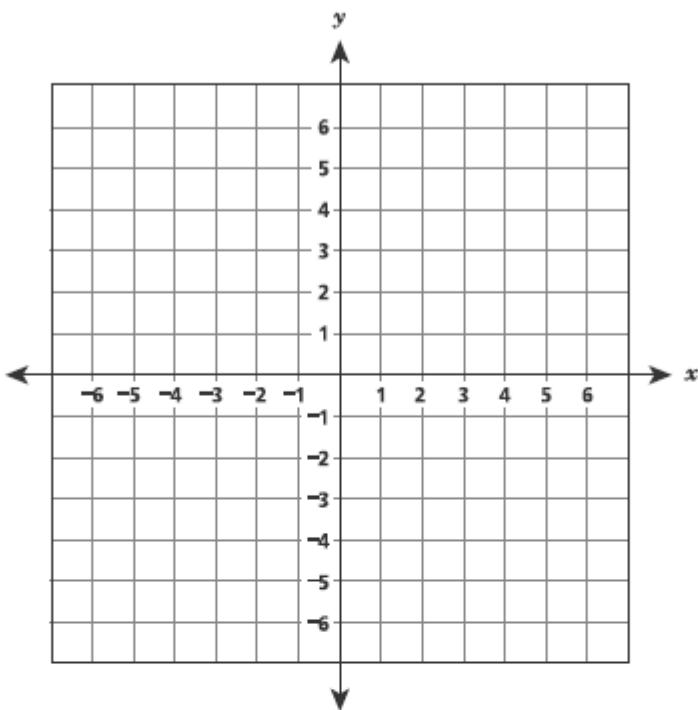
2016 2-and 3-Point Mathematics Scoring Policies

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.

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.



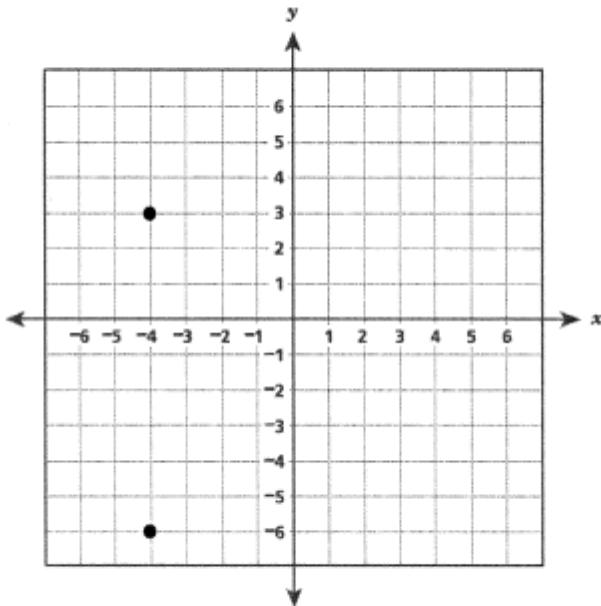
Each unit on the grid represents 1 mile. If Curtis can ride his bike at a constant rate of 12 miles per hour, how many minutes would it take Curtis to ride from his house to Jean's house?

Answer _____ minutes

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?

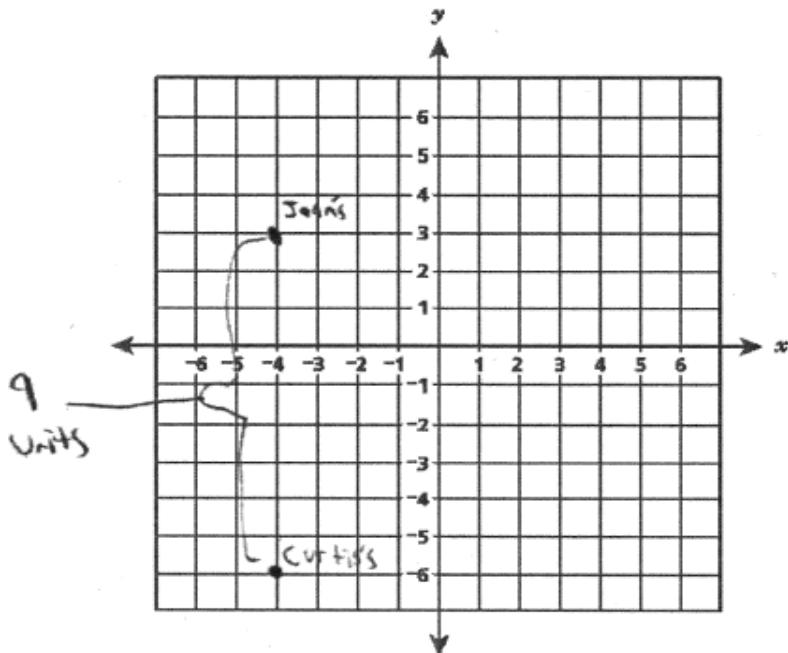
Answer 45 minutes

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

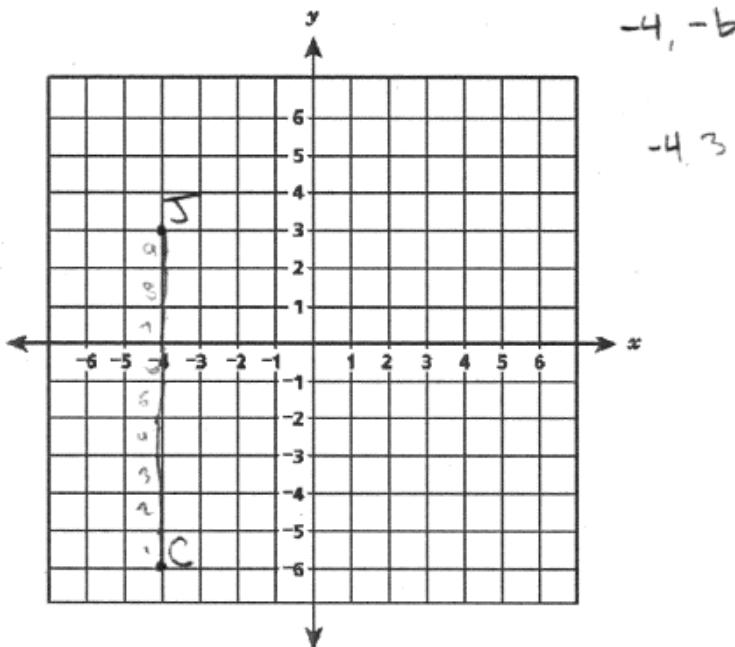
Score Point 2 (out of 2 points)

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

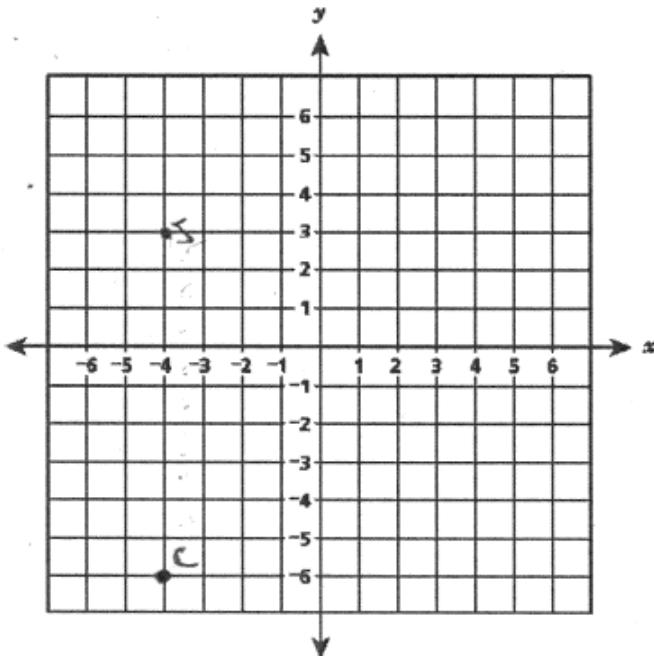
Score Point 2 (out of 2 points)

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

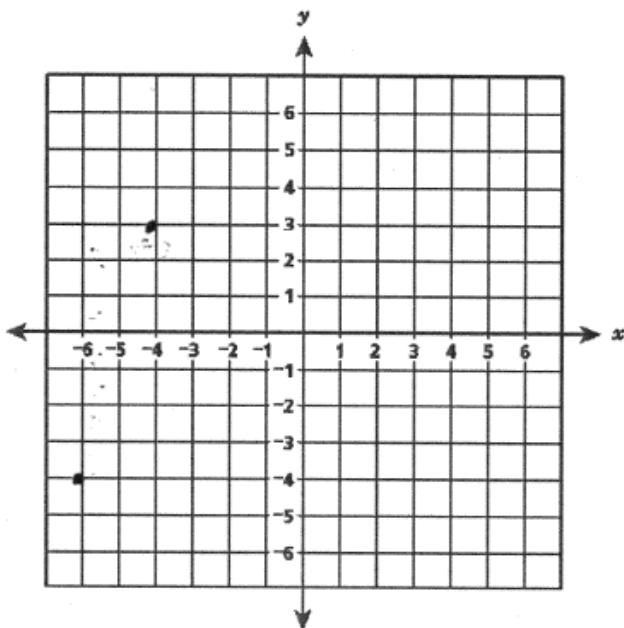
Score Point 2 (out of 2 points)

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

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

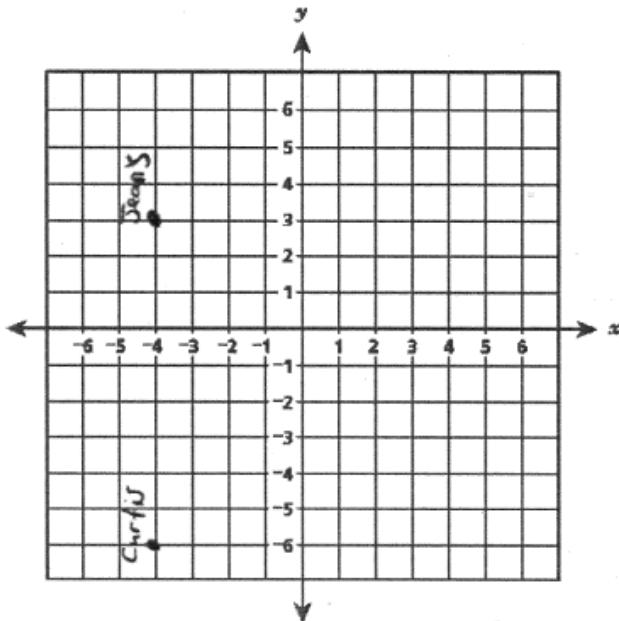
Score Point 1 (out of 2 points)

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

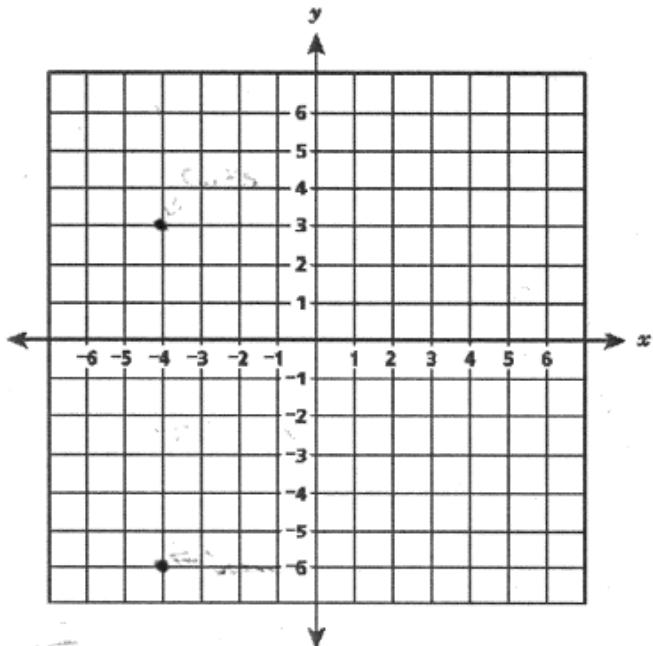
Score Point 1 (out of 2 points)

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

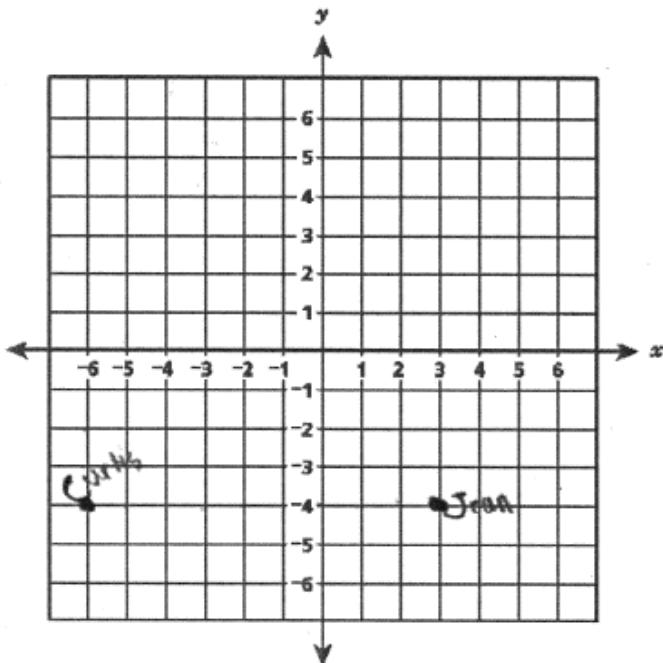
Score Point 1 (out of 2 points)

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)

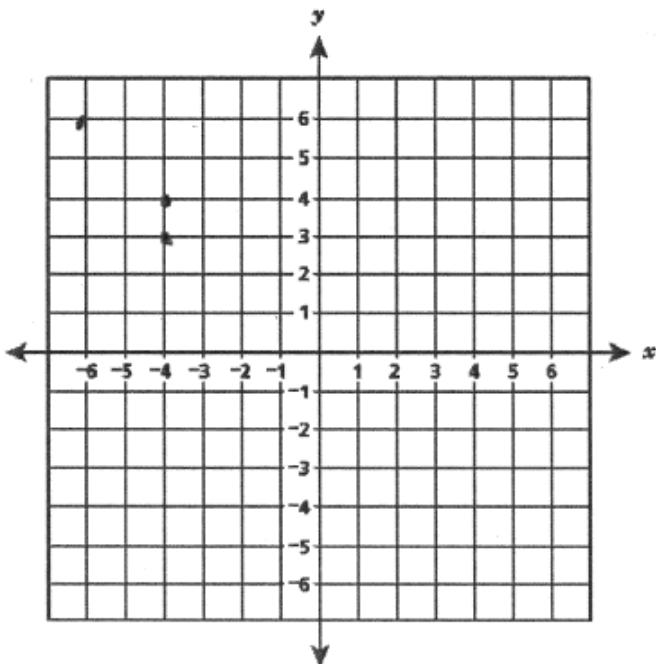
This response is not sufficient to demonstrate even a limited understanding of the mathematical concepts in the task. Both points are incorrectly plotted using transposed x - and y -coordinates and the solution of 22 minutes is incorrect.

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.

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

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)

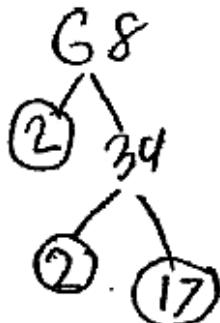
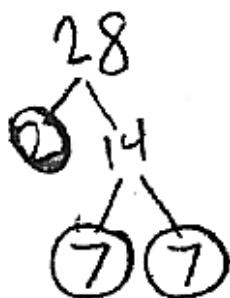
This response demonstrates only a partial understanding of the mathematical concepts in the task. 28 and 68 are both correctly divided by the greatest common factor of 4 resulting in prime numbers as quotients; however, the value of 17 is chosen as the solution rather than 4.

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.

$$\begin{array}{r} \overline{28bs} : 14 \\ \hline 68bs \end{array}$$

$\begin{array}{r} 14 \\ 2 \overline{)28} \\ \underline{-2} \quad 8 \\ \hline 08 \\ \underline{-8} \quad 0 \end{array}$

$$\begin{array}{r} 34 \\ 2 \overline{)68} \\ \underline{-6} \quad 8 \\ \hline 8 \\ \underline{-8} \quad 0 \end{array}$$

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.

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 _____

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.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$\frac{8 \cdot 16 + 16}{128 + 16}$$

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

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

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

C

$$\begin{array}{r} 15^2 - 3^4 \\ \hline 225 - 81 \\ \hline 144 \end{array}$$

$$\begin{array}{r} 15 \\ \times 15 \\ \hline 15 \\ 150 \\ \hline 225 \end{array}$$

$$\begin{array}{r} 81 \\ \times 81 \\ \hline 81 \\ 648 \\ \hline 6561 \end{array}$$

Answer: B + C

$$\begin{array}{r} 144 \\ \cancel{144} \\ \hline 00 \end{array}$$

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.

$$20^2 - 18^2$$

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

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

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

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

$$15^2 - 3^4$$

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

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

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

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.

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

$$\begin{array}{r}
 C \quad \begin{array}{r} 15^2 - 3^4 \\ 225 - 81 \\ \hline 144 \end{array} \quad \begin{array}{r} 3 \times 3 = 9 \\ 9 \times 3 = 27 \\ 27 \times 3 = 81 \\ + 150 \\ \hline 325 \end{array} \quad \begin{array}{r} 2^2 15 \\ 2 \times 15 = 30 \\ 30 + 15 = 45 \\ 45 + 75 = 120 \\ 120 + 81 = 201 \\ - 144 \\ \hline 56 \end{array} \quad \begin{array}{r} 1225 \\ - 81 \\ \hline 144 \end{array}
 \end{array}$$

$$12^2 = 144$$

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.

$$\frac{A}{20^3 - 18^3}$$

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

15² - 3⁴

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

Show your work.

A) $\frac{20^2 - 18^2}{400-36^2} \Big| \begin{array}{r} 76 \\ 32 \\ 32 \\ \hline 144 \\ 144 \\ \hline 0 \end{array}$

B) $8(4^2) + 24 \Big| \begin{array}{r} 128 \\ 8 \cdot 16 + 24 \\ 128 + 16 \\ \hline 144 \end{array}$

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

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.

$$A \quad 20^2 - 18^2 \quad B \quad 8(4^2) + 2^4 \quad C \quad 15^2 - 3^4$$

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

Show your work.

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

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

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

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

$$\begin{array}{r} 125 \\ - 50 \\ \hline 75 \end{array}$$

$$\begin{array}{r} 31 \\ \times 3 \\ \hline 93 \\ 225 \\ \hline 15 \end{array}$$

Answer:

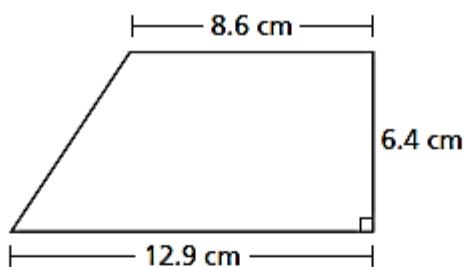
d

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.

55

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



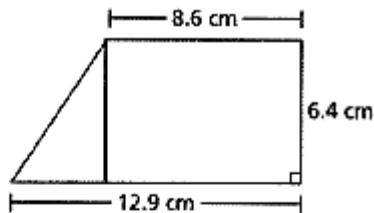
Show your work.

Answer _____ square centimeters

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

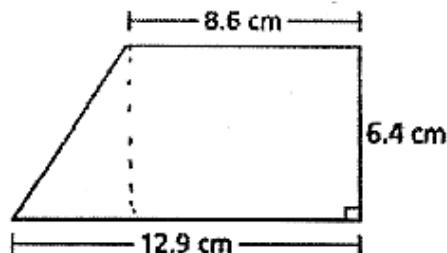
Answer 68.8 square centimeters

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

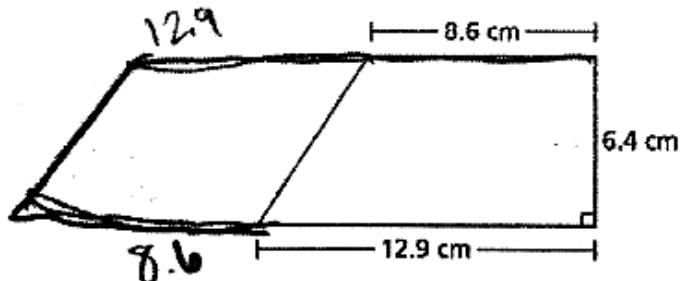
Score Point 2 (out of 2 points)

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

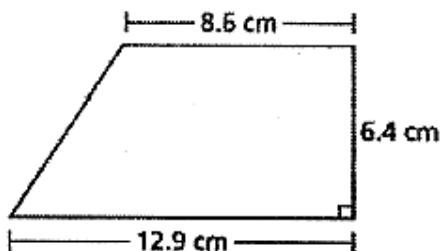
Score Point 2 (out of 2 points)

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

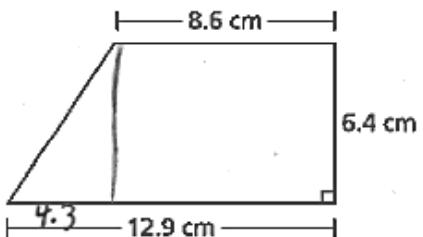
Score Point 2 (out of 2 points)

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)

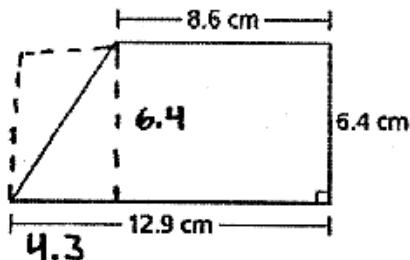
This response demonstrates only a partial understanding of the mathematical concepts in the task. The area of the trapezoid is appropriately found by splitting the problem into the combined area of a triangle and a rectangle; however, a calculation error occurs when adding the subareas ($55.04 + 13.76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

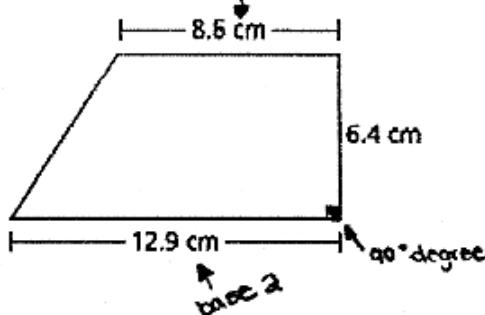
Score Point 1 (out of 2 points)

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

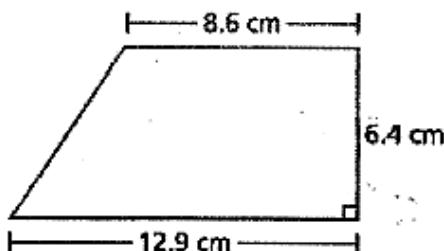
Score Point 1 (out of 2 points)

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)

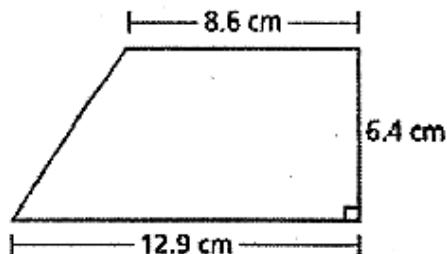
This response is not sufficient to demonstrate even a limited understanding of the mathematical concepts in the task. The length of the longer base is inappropriately used in the formula for a rectangle rather than the formula for a trapezoid.

GUIDE PAPER 8

Additional

55

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



Show your work.

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

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.

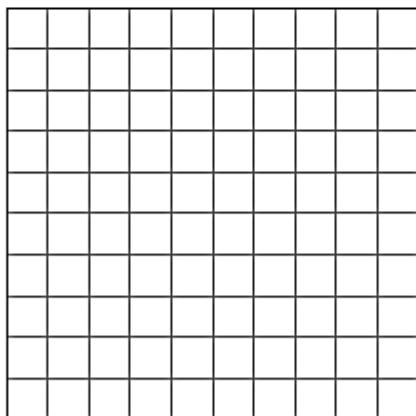
56

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 _____ yards

EXEMPLARY RESPONSE

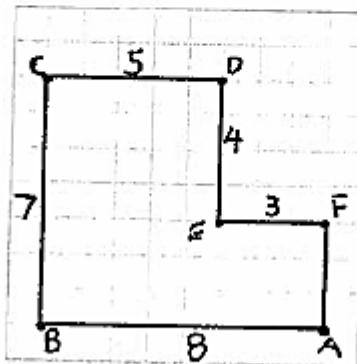
56

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

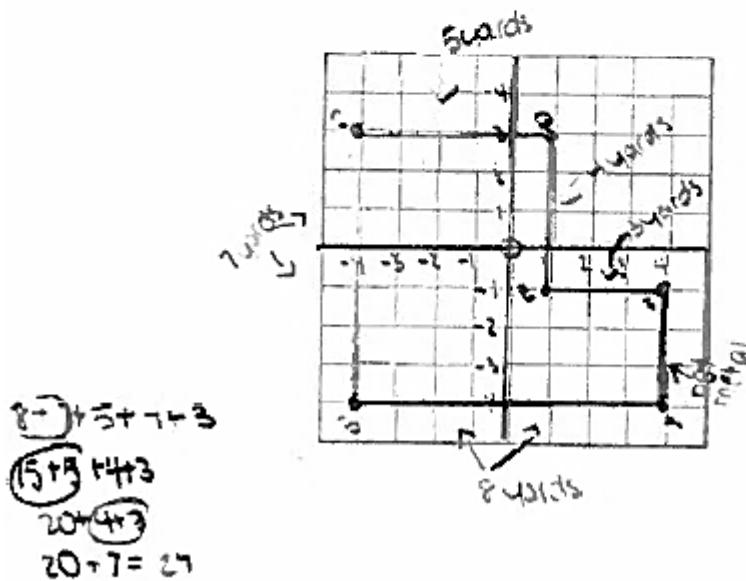
56

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

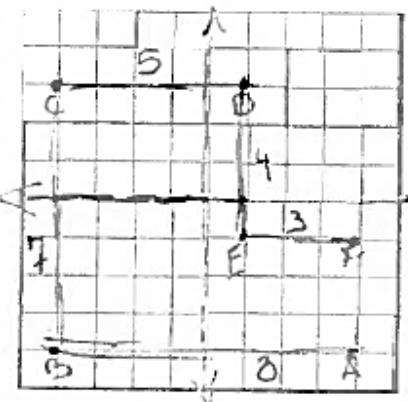
56

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

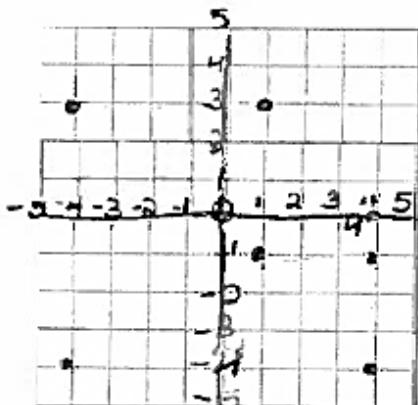
56

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

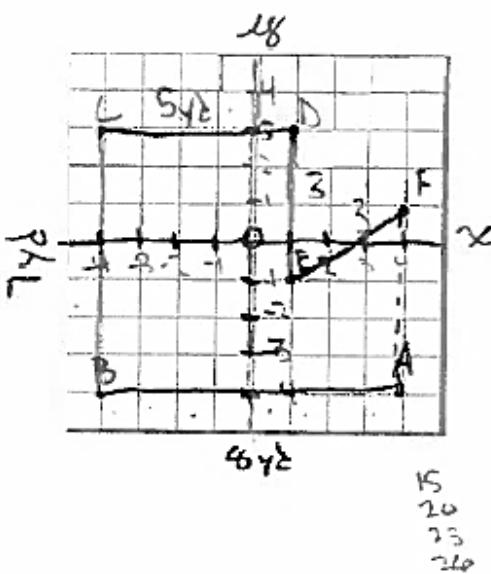
A park planner is designing a dog park. He wants to use a metal fence to enclose a kennel at the dog park. The vertices of the fence are shown below. The units on the coordinate plane are yards.

- 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

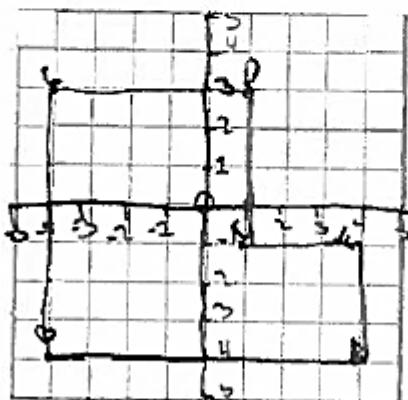
56

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

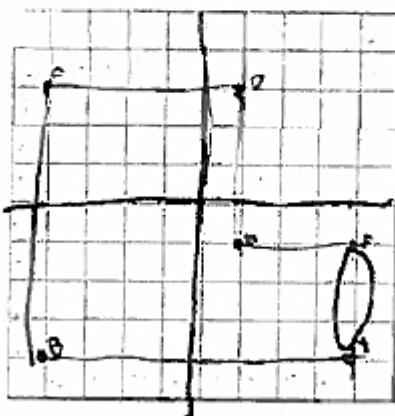
56

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

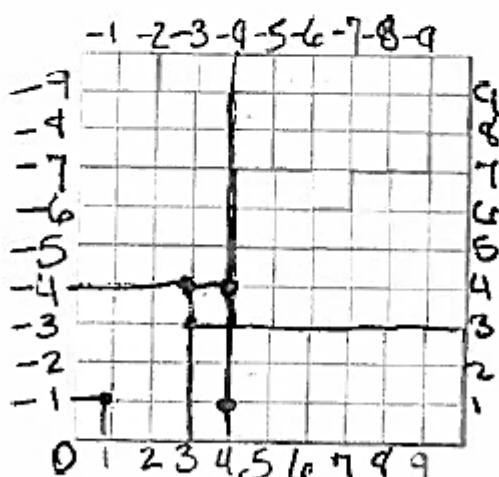
56

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

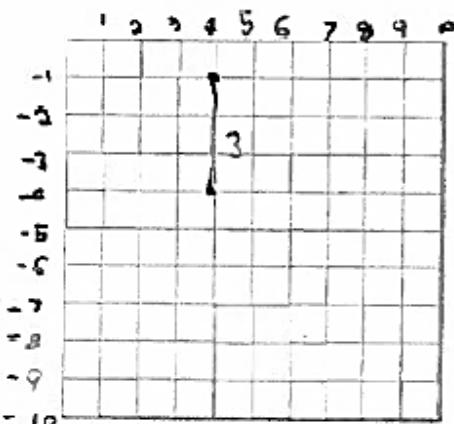
56

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

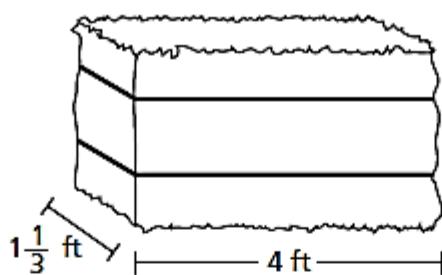
yards

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.

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?

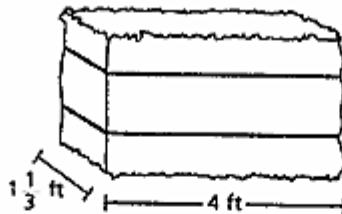
Show your work.

Answer _____ feet

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

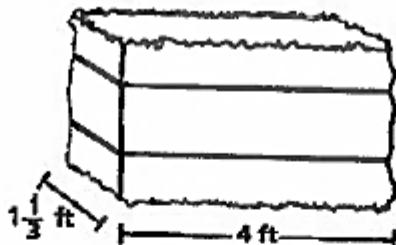
Answer 16 feet

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

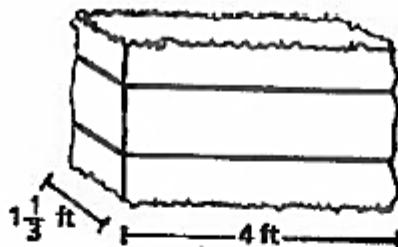
Score Point 2 (out of 2 points)

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

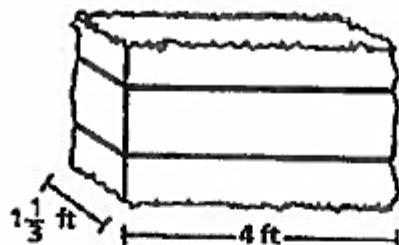
Score Point 2 (out of 2 points)

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

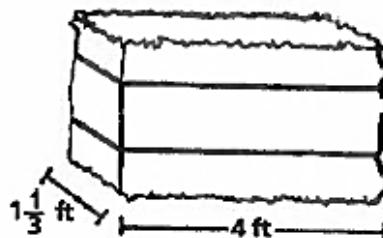
Score Point 2 (out of 2 points)

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?

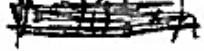
Show your work.

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

$$\frac{5}{3} \times \frac{4}{1} = \frac{20}{3} \text{ (6}\frac{2}{3}\text{)}$$

$$V = lwh$$

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



$$\begin{array}{r} V = \cancel{4} \frac{2}{3} \times h = 10 \frac{2}{3} \\ \hline \cancel{6} \frac{2}{3} \end{array}$$

1 hay bale

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

$$\frac{32}{3} \times \frac{32}{3} = \frac{1024}{9} = 7\frac{1}{9}$$

$$h =$$

$$\begin{array}{r} 1024 \\ \times 32 \\ \hline 640 \\ 300 \\ \hline 1024 \\ \hline 32 \\ \hline 1 \end{array}$$

Answer

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

feet

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.

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

Answer

16

feet

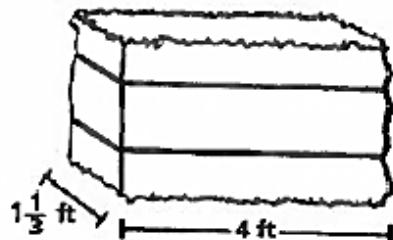
Score Point 1 (out of 2 points)

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)

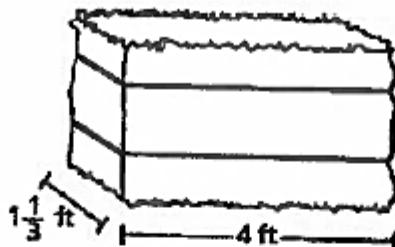
Although the height of a single bale is correctly identified as 2 feet and this is then appropriately multiplied by 8 to arrive at the correct solution of 16 feet, no additional work is shown to provide support for how these values were obtained. Holistically, the response is not sufficient to demonstrate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

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

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

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

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.

$$\begin{array}{l} 18x + 48 + 32 + 12x \\ 30x + 80 \\ 12x + 80 + 18x \end{array}$$

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

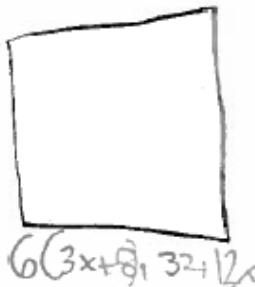
A square with one side length represented by an expression is shown below.



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

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.

$$18x + 48 + 32 + 12x$$
$$66x + 32 + 12x$$
$$98x + 12x$$

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. $110x$

Next to the first two expressions, there are circled numbers 1, 2, and 3 above them, likely indicating the order of the responses. To the right, the student has written the expression $6(3x + 8) + 32 + 12x$ with arrows pointing from the circled numbers 1, 2, and 3 to the terms $42 + 15x$, $18x + 48 + 32 + 12x$, and $110x$ respectively. Below these, the student has written the expression $18x + 48 + 32 + 12x$.

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.

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

$$3x(2x + 6) \quad 8 + 32$$

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

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.

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

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.

$$\begin{aligned} W &= [456 - (A+B+C)] \div 2 && | 132 \\ &= [456 - (132 + 94 + 108)] \div 2 && | 94 \\ &= [456 - (236 + 108)] \div 2 && | 456 \\ &= [456 - 344] \div 2 && | 344 \\ &= 122 \div 2 && | 122 \\ &= 61 && | 61 \end{aligned}$$

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 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 $w =$ 66 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.

$$A+b+c+w = 465$$

11
of
and
etc.

Answer: $w = 122$ 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.

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

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.

$$\begin{array}{r} \overbrace{\quad\quad\quad\quad\quad}^{+340} \\ \begin{array}{r} \$32 \\ \times 8 \\ \hline 32 \end{array} \\ \begin{array}{r} \$32 \\ \overbrace{340}^m \\ \hline \end{array} \quad \begin{array}{r} ? 40.09 \\ \hline 1 \\ \hline \end{array} \\ \begin{array}{r} \overbrace{\quad\quad\quad\quad\quad}^{+340} \\ \begin{array}{r} 7 \\ \times 4 \\ \hline 28 \end{array} \\ \begin{array}{r} 7 \\ \overbrace{350}^m \\ \hline \end{array} \quad \begin{array}{r} ? 0.08 \\ \hline 1 \\ \hline \end{array} \\ \begin{array}{r} \overbrace{\quad\quad\quad\quad\quad}^{+350} \\ \begin{array}{r} \$28 \\ \times 7 \\ \hline 196 \end{array} \\ \begin{array}{r} \$28 \\ \overbrace{350}^m \\ \hline \end{array} \quad \begin{array}{r} ? 0.08 \\ \hline 1 \\ \hline \end{array} \\ \begin{array}{r} 0.09 \\ -0.08 \\ \hline 0.01 \end{array} \end{array} \end{array} \end{array}$$

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.

$$\begin{array}{r} \underline{8} \\ 340 \end{array} - \frac{1 \text{ gallon}}{8} \quad \begin{array}{r} \underline{7} \\ 350 \end{array} = \frac{1 \text{ gallon}}{50}$$

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

$$\begin{array}{r} 4.00 \\ 42.5 \\ \hline 11 \\ 0.09 \end{array} \quad \begin{array}{r} 4.00 \\ 50 \\ \hline 0.08 \end{array}$$

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

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.

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

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

$$\frac{8}{340} \times \frac{40}{1} = \frac{320}{340} = \frac{160}{17} = 9\frac{7}{17} = 9\frac{1}{2}\text{c}$$
$$\begin{array}{r} 8 \\ \hline 17 \\ 14 \\ \hline 3 \\ 3 \\ \hline 0 \end{array}$$
$$\begin{array}{r} 7 \\ \hline 350 \end{array}$$
$$\begin{array}{r} 7 \\ \hline 17 \\ 14 \\ \hline 3 \\ 3 \\ \hline 0 \end{array}$$
$$\frac{7}{350} \times \frac{40}{1} = \frac{280}{350} = \frac{56}{7} = 8\frac{4}{7} = 8\frac{1}{2}\text{c}$$

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~~

~~12.5~~

~~10.625~~

~~1.875~~

$$\begin{array}{r} .32 \\ \times 5 \\ \hline 160 \\ \end{array}$$

$$\begin{array}{r} .32 \\ \times 6 \\ \hline 192 \\ \end{array}$$

$$\begin{array}{r} .32 \\ \times 7 \\ \hline 224 \\ \end{array}$$

$$\begin{array}{r} .32 \\ \times 3 \\ \hline 96 \\ \end{array}$$

$$\begin{array}{r} 228 \\ \times 3 \\ \hline 84 \\ \end{array}$$

$$\begin{array}{r} 12.500 \\ -10.625 \\ \hline 1.875 \\ \end{array}$$

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.

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

$$\begin{array}{r} 340 \\ 8 \\ \hline 1 \\ 350 \\ 7 \\ \hline 50 \\ 1 \\ \hline \end{array} \quad \begin{array}{r} 42.5 \\ 8 \\ \hline 340.0 \\ -32 \\ \hline 20 \\ -16 \\ \hline 40 \end{array}$$

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

$$\begin{array}{r} 50 \\ 7 \\ \hline 350 \\ -35 \\ \hline 000 \end{array}$$

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

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.

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 _____ %

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.

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

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

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

kjhy 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 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.

$$\begin{array}{r} \text{85\% of } 1,600 = \underline{\underline{1360}} \\ 0.85 \times 1,600 = \underline{\underline{1360}} \\ \begin{array}{r} 1600 \\ \times 0.85 \\ \hline 136000 \end{array} \end{array}$$

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.

$$\begin{array}{r} \text{816\% of } 850 = \underline{\underline{816}} \\ \frac{816}{850} = \frac{408}{425} = 0.96 \\ \begin{array}{r} 425 \overline{)408.00} \\ -3925 \\ \hline 1550 \\ -1550 \\ \hline 0 \end{array} \end{array}$$

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.

$$\begin{array}{r} \cancel{85} \\ \times 100 \\ \hline \cancel{1,600} \\ 136,000 \\ \hline 100 \\ n = 1,360 \end{array}$$

$$\begin{array}{r} 1,600 \\ \times 85 \\ \hline 8000 \\ + 12800 \\ \hline 136000 \end{array}$$

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.

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

$$\begin{array}{r} \cancel{816} \\ \times 100 \\ \hline \cancel{816} \\ 81600 \end{array}$$

$$\begin{array}{r} 816 \\ \overline{)81600} \\ 764 \\ \hline 520 \\ 510 \\ \hline 10 \end{array} ?$$

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!

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

~~$$\begin{array}{r} 357 \\ \times 100 \\ \hline 35700 \end{array}$$~~

$$\begin{array}{r} 325 \\ \times 6 \\ \hline 510 \\ 180 \\ \hline 1980 \end{array}$$

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.

$$\begin{array}{r} 850 \\ \times .816 \\ \hline 650 \\ 680 \\ \hline 68900 \\ 68900 \\ \hline 70200 \\ 70200 \\ \hline 56300 \\ 56300 \\ \hline 450600 \\ 450600 \\ \hline 351700 \\ 351700 \\ \hline 2501700 \\ 2501700 \\ \hline 1700 \\ 1700 \\ \hline 0 \end{array}$$

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

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.

$$\begin{array}{r}
 425 \\
 \times 85 \\
 \hline
 2125 \\
 -340 \\
 \hline
 05 \\
 -40 \\
 \hline
 10 \\
 -10 \\
 \hline
 0
 \end{array}$$

Answer: 97

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

$$\begin{array}{r}
 816 \\
 -425 \\
 \hline
 391 \\
 -364 \\
 \hline
 27 \\
 -25 \\
 \hline
 2
 \end{array}$$

$$\begin{array}{r}
 7405 \\
 -351 \\
 \hline
 56 \\
 -48 \\
 \hline
 8 \\
 87405 \\
 -425 \\
 \hline
 450 \\
 -364 \\
 \hline
 86 \\
 -81 \\
 \hline
 5
 \end{array}$$

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

$$\rho = 85 \text{ to } 1,600$$

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

$$\begin{array}{r}
 4 \\
 \times 1,150 \\
 \hline
 4,600
 \end{array}$$

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.

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

$$r = \frac{116}{350}$$

$$\begin{array}{r}
 & 1 & 0 & 4 \\
 & \boxed{8} & 9 & 0 \\
 \hline
 & 3 & 4 & 0 \\
 - & 2 & 6 & 4 \\
 \hline
 & 1 & 3 & 6
 \end{array}$$

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.

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

$$\begin{aligned} d &= 1.34 \\ F &= 1 \frac{34}{816} \\ P &= 134\% \end{aligned}$$

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.

