Inverse Variation

Name: _____	Date: _____	Score: _____ / 26

Quick Review

In **inverse variation**, the product of two quantities stays constant: $xy = k$, or $y = \frac{k}{x}$. The constant k is found by multiplying one input-output pair: $k = xy$. Inverse variation does not pass through the origin because $x = 0$ is not allowed. When one quantity increases, the other decreases in a way that keeps the product the same.

PRACTICE

Find the inverse-variation constant or write the model.

1. $y = \frac{12}{x}$; k _____
2. $y = \frac{-20}{x}$; k _____
3. $(x, y) = (3, 8)$; k _____
4. $(x, y) = (-4, 5)$; k _____
5. $k = 30$; model _____
6. $y = \frac{18}{x}$; y when $x = 6$ _____
7. $y = \frac{40}{x}$; x when $y = 5$ _____
8. If y varies inversely with x, $y = 9$ when $x = 4$; k _____
9. A lighting setup follows the inverse-variation model from the previous item, $xy = 36$. What is y when $x = 12$? _____
10. Table $(2, 12), (3, 8), (4, 6)$; inverse? _____
11. Table $(1, 5), (2, 7), (3, 9)$; inverse? _____
12. $xy = 48$; y when $x = 6$ _____
13. $xy = -15$; x when $y = 3$ _____
14. For $y = \frac{10}{x}$, what values of x are allowed? _____
15. $y = \frac{10}{x}$; does it pass through $(0, 0)$? _____
16. If x doubles in $xy = 60$, y does what? _____
17. Point $(5, 7)$; inverse model _____
18. $y = \frac{24}{x}$; y when $x = -3$ _____
19. Product $xy = 100$; $y = 20$; x _____
20. Inverse variation with $k = 1$ _____

VISUAL PRACTICE

Use the graph, table, chart, or diagram to answer the question.

21. The table shows inverse variation. What is the constant k?

x	2	3	4	6
y	12	8	6	4

Answer: _____

22. If $xy = 36$, what is y when $x = 9$?

x	y	xy
9		36

Answer: _____

Word Problems

23. A 120-mile trip has travel time t that varies inversely with speed r. Write the model and find the time at 40 mph. _____

24. Six workers can finish a job in 10 hours. Assuming the work rate stays the same, how long would 15 workers take? _____

25. The pressure of a gas varies inversely with its volume. If pressure is 30 psi at 8 L, find the pressure at 12 L. _____

26. A rectangular garden has fixed area 96 square feet. Write the width w as a function of length ℓ, and find w when _____

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Answer Keys

1. $\boxed{12}$
2. $\boxed{-20}$
3. $\boxed{24}$
4. $\boxed{-20}$
5. $\boxed{y = \frac{30}{x}}$
6. $\boxed{3}$
7. $\boxed{8}$
8. $\boxed{36}$
9. $\boxed{3}$
10. $\boxed{\text{yes}}$
11. $\boxed{\text{no}}$
12. $\boxed{8}$
13. $\boxed{-5}$
14. $\boxed{x \neq 0}$
15. $\boxed{\text{no}}$
16. $\boxed{\text{halves}}$
17. $\boxed{y = \frac{35}{x}}$
18. $\boxed{-8}$
19. $\boxed{5}$
20. $\boxed{y = \frac{1}{x}}$
21. $\boxed{24}$
22. $\boxed{4}$
23. $\boxed{t = \frac{120}{r};\ 3 \text{ hours}}$
24. $\boxed{4 \text{ hours}}$
25. $\boxed{20 \text{ psi}}$
26. $\boxed{w = \frac{96}{\ell};\ 6 \text{ ft}}$

Step-by-Step Tutor Notes

1. Focus on the main idea of the problem, then simplify carefully. The numerator is the constant of variation. So the answer is 12.
2. Use the clue in the question first, then let the arithmetic finish the job. The product xy stays at -20. So the answer is -20.
3. This is a good place to slow down, check the notation, and simplify cleanly. $k = xy = 3 \cdot 8 = 24$. So the answer is 24.
4. Take it one clear step at a time and keep the original question in mind. $k = (-4)(5) = -20$. So the answer is -20.
5. Take it one clear step at a time and keep the original question in mind. Inverse variation has form $y = k/x$. So the answer is $y = \frac{30}{x}$.
6. Use the clue in the question first, then let the arithmetic finish the job. $18/6 = 3$. So the answer is 3.
7. Start with the definition the problem is testing, then apply it directly. Solve $5 = \frac{40}{x}$, so $x = 8$. So the answer is 8.
8. Focus on the main idea of the problem, then simplify carefully. $k = xy = 4 \cdot 9 = 36$. So the answer is 36.
9. Focus on the main idea of the problem, then simplify carefully. Use the constant product $xy = 36$. With $x = 12$, solve $12y = 36$, so $y = 3$. So the answer is 3.
10. Start with the definition the problem is testing, then apply it directly. Each product is 24. So the answer is yes.
11. Start with the definition the problem is testing, then apply it directly. The products are $5, 14, 27$, not constant. So the answer is no.
12. Use the clue in the question first, then let the arithmetic finish the job. $6y = 48$, so $y = 8$. So the answer is 8.
13. Take it one clear step at a time and keep the original question in mind. $3x = -15$, so $x = -5$. So the answer is -5.
14. First identify the feature of the graph or equation that matches the wording of the question. Division by zero is not allowed, so every real x works except 0. That leads to $x \neq 0$.
15. This is a good place to slow down, check the notation, and simplify cleanly. The graph never has $x = 0$. So the answer is no.
16. This is a good place to slow down, check the notation, and simplify cleanly. The product must stay 60. So the answer is halves.
17. This is a good place to slow down, check the notation, and simplify cleanly. $k = 5 \cdot 7 = 35$. So the answer is $y = \frac{35}{x}$.
18. Use the clue in the question first, then let the arithmetic finish the job. $24/(-3) = -8$. So the answer is -8.
19. Take it one clear step at a time and keep the original question in mind. $20x = 100$. So the answer is 5.
20. This is a good place to slow down, check the notation, and simplify cleanly. This is the parent inverse-variation graph. So the answer is $y = \frac{1}{x}$.
21. Work one inverse operation at a time and keep both sides balanced. For inverse variation, multiply x and y. Each pair gives 24. After simplifying, the answer is 24.
22. Focus on the main idea of the problem, then simplify carefully. Keep the product at 36: $9y = 36$, so $y = 4$. So the answer is 4.
23. Use the given numbers to build the model, then finish the calculation. Distance is fixed, so $rt = 120$. Thus $t = 120/r$, and $120/40 = 3$ hours.
24. Name the quantities first so the model is easy to read. Workers times hours is constant: $6 \cdot 10 = 60$. Then $15h = 60$, so $h = 4$.
25. Name the quantities first so the model is easy to read. The constant is $30 \cdot 8 = 240$. At 12 L, $p = 240/12 = 20$ psi.
26. The safest move is to replace the variable, keep the arithmetic organized, and simplify one step at a time. Area is fixed, so $\ell w = 96$. Divide by ℓ and substitute $\ell = 16$ to get $w = 6$. That confirms the final answer is $w = \frac{96}{\ell};\ 6$ ft.

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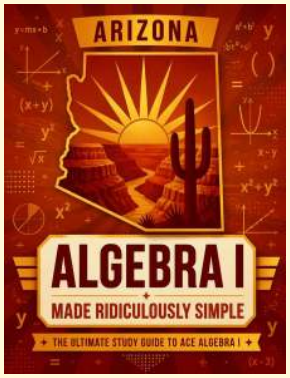

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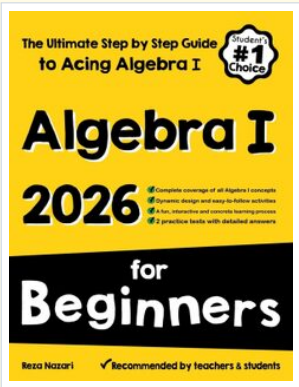

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