

Proportions and Cross Multiplication

Name: _____ Date: _____ Score: _____ / 24

Quick Review

A **proportion** is an equation that says two ratios are equal, like $\frac{2}{3} = \frac{8}{12}$. When one number is missing, you can solve the proportion with **cross multiplication**: multiply each numerator by the *opposite* denominator and set the products equal. For $\frac{x}{4} = \frac{6}{8}$ this gives $8x = 4 \times 6$. Then **divide** to find the unknown. Cross multiplication works because equal ratios always have equal “cross products.” Always check by plugging your answer back in.

◇ **Example:** Solve the proportion $\frac{x}{4} = \frac{6}{8}$.

⇒ We have two equal ratios with one missing piece. Cross multiply: multiply x by 8 and multiply 4 by 6, then set them equal. That gives $8x = 24$. Now undo the multiplication by dividing both sides by 8: $x = 24 \div 8 = 3$. Check it: $\frac{3}{4} = \frac{6}{8}$ because both simplify to the same ratio. Perfect.

Answer: $x = 3$

PRACTICE

Solve each proportion for the unknown.

- | | | | |
|----------------------------------|-------|------------------------------------|-------|
| 1. $\frac{x}{4} = \frac{6}{8}$ | _____ | 11. $\frac{7}{2} = \frac{21}{x}$ | _____ |
| 2. $\frac{x}{15} = \frac{5}{3}$ | _____ | 12. $\frac{x}{6} = \frac{10}{12}$ | _____ |
| 3. $\frac{x}{12} = \frac{3}{4}$ | _____ | 13. $\frac{9}{12} = \frac{x}{16}$ | _____ |
| 4. $\frac{2}{5} = \frac{x}{20}$ | _____ | 14. $\frac{x}{14} = \frac{2}{7}$ | _____ |
| 5. $\frac{3}{7} = \frac{x}{28}$ | _____ | 15. $\frac{8}{x} = \frac{2}{3}$ | _____ |
| 6. $\frac{x}{9} = \frac{4}{6}$ | _____ | 16. $\frac{5}{6} = \frac{15}{x}$ | _____ |
| 7. $\frac{5}{8} = \frac{x}{24}$ | _____ | 17. $\frac{x}{21} = \frac{4}{3}$ | _____ |
| 8. $\frac{x}{10} = \frac{9}{15}$ | _____ | 18. $\frac{10}{25} = \frac{x}{30}$ | _____ |
| 9. $\frac{4}{x} = \frac{8}{14}$ | _____ | 19. $\frac{7}{x} = \frac{14}{18}$ | _____ |
| 10. $\frac{6}{x} = \frac{3}{5}$ | _____ | 20. $\frac{x}{16} = \frac{15}{20}$ | _____ |

Word Problems

21. A recipe uses 3 eggs for every 2 cakes. How many eggs are needed for 8 cakes? Set up and solve a proportion. _____
22. A map scale shows 1 inch represents 25 miles. How many miles do 4 inches represent? _____
23. If 5 notebooks cost \$8, how much do 15 notebooks cost at the same rate? _____
24. A car uses 4 gallons of gas to travel 96 miles. How many gallons are needed to travel 144 miles? _____



Answer Keys

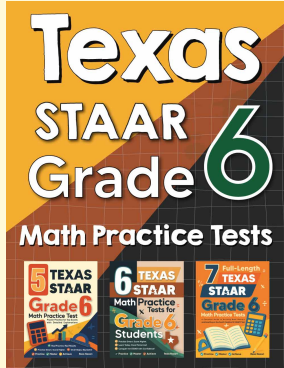
- | | |
|--------------|---------------|
| 1. $x = 3$ | 13. $x = 12$ |
| 2. $x = 25$ | 14. $x = 4$ |
| 3. $x = 9$ | 15. $x = 12$ |
| 4. $x = 8$ | 16. $x = 18$ |
| 5. $x = 12$ | 17. $x = 28$ |
| 6. $x = 6$ | 18. $x = 12$ |
| 7. $x = 15$ | 19. $x = 9$ |
| 8. $x = 6$ | 20. $x = 12$ |
| 9. $x = 7$ | 21. 12 eggs |
| 10. $x = 10$ | 22. 100 miles |
| 11. $x = 6$ | 23. \$24 |
| 12. $x = 5$ | 24. 6 gallons |

Step-by-Step Explanations

- | | |
|--|--|
| 1. Cross multiply: $8x = 24$, so $x = 24 \div 8 = 3$. | 13. Cross multiply: $12x = 144$, so $x = 144 \div 12 = 12$. |
| 2. Cross multiply: $3x = 75$, so $x = 75 \div 3 = 25$. | 14. Cross multiply: $7x = 28$, so $x = 28 \div 7 = 4$. |
| 3. Cross multiply: $4x = 36$, so $x = 36 \div 4 = 9$. | 15. Cross multiply: $2x = 24$, so $x = 24 \div 2 = 12$. |
| 4. Cross multiply: $5x = 40$, so $x = 40 \div 5 = 8$. | 16. Cross multiply: $5x = 90$, so $x = 90 \div 5 = 18$. |
| 5. Cross multiply: $7x = 84$, so $x = 84 \div 7 = 12$. | 17. Cross multiply: $3x = 84$, so $x = 84 \div 3 = 28$. |
| 6. Cross multiply: $6x = 36$, so $x = 36 \div 6 = 6$. | 18. Cross multiply: $25x = 300$, so $x = 300 \div 25 = 12$. |
| 7. Cross multiply: $8x = 120$, so $x = 120 \div 8 = 15$. | 19. Cross multiply: $14x = 126$, so $x = 126 \div 14 = 9$. |
| 8. Cross multiply: $15x = 90$, so $x = 90 \div 15 = 6$. | 20. Cross multiply: $20x = 240$, so $x = 240 \div 20 = 12$. |
| 9. Cross multiply: $8x = 56$, so $x = 56 \div 8 = 7$. | 21. Write $\frac{3}{2} = \frac{x}{8}$. Cross multiply: $2x = 24$, so $x = 12$ eggs. |
| 10. Cross multiply: $3x = 30$, so $x = 30 \div 3 = 10$. | 22. Write $\frac{1}{25} = \frac{4}{x}$. Cross multiply: $x = 25 \times 4 = 100$ miles. |
| 11. Cross multiply: $7x = 42$, so $x = 42 \div 7 = 6$. | 23. Write $\frac{5}{8} = \frac{15}{x}$. Cross multiply: $5x = 120$, so $x = \$24$. |
| 12. Cross multiply: $12x = 60$, so $x = 60 \div 12 = 5$. | 24. Write $\frac{4}{96} = \frac{x}{144}$. Cross multiply: $96x = 576$, so $x = 6$ gallons. |



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