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. $\frac{x}{4} = \frac{6}{8}$ _____
2. $\frac{x}{15} = \frac{5}{3}$ _____
3. $\frac{x}{12} = \frac{3}{4}$ _____
4. $\frac{2}{5} = \frac{x}{20}$ _____
5. $\frac{3}{7} = \frac{x}{28}$ _____
6. $\frac{x}{9} = \frac{4}{6}$ _____
7. $\frac{5}{8} = \frac{x}{24}$ _____
8. $\frac{x}{10} = \frac{9}{15}$ _____
9. $\frac{4}{x} = \frac{8}{14}$ _____
10. $\frac{6}{x} = \frac{3}{5}$ _____
11. $\frac{7}{2} = \frac{21}{x}$ _____
12. $\frac{x}{6} = \frac{10}{12}$ _____
13. $\frac{9}{12} = \frac{x}{16}$ _____
14. $\frac{x}{14} = \frac{2}{7}$ _____
15. $\frac{8}{x} = \frac{2}{3}$ _____
16. $\frac{5}{6} = \frac{15}{x}$ _____
17. $\frac{x}{21} = \frac{4}{3}$ _____
18. $\frac{10}{25} = \frac{x}{30}$ _____
19. $\frac{7}{x} = \frac{14}{18}$ _____
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. $\boxed{x = 3}$
2. $\boxed{x = 25}$
3. $\boxed{x = 9}$
4. $\boxed{x = 8}$
5. $\boxed{x = 12}$
6. $\boxed{x = 6}$
7. $\boxed{x = 15}$
8. $\boxed{x = 6}$
9. $\boxed{x = 7}$
10. $\boxed{x = 10}$
11. $\boxed{x = 6}$
12. $\boxed{x = 5}$
13. $\boxed{x = 12}$
14. $\boxed{x = 4}$
15. $\boxed{x = 12}$
16. $\boxed{x = 18}$
17. $\boxed{x = 28}$
18. $\boxed{x = 12}$
19. $\boxed{x = 9}$
20. $\boxed{x = 12}$
21. $\boxed{12 \text{ eggs}}$
22. $\boxed{100 \text{ miles}}$
23. $\boxed{\$24}$
24. $\boxed{6 \text{ gallons}}$

Step-by-Step Explanations

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

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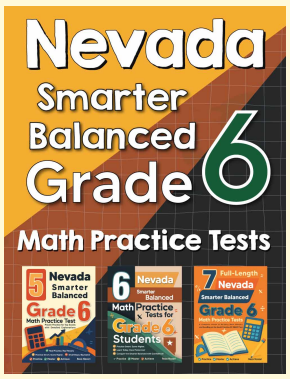

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