Proportional Ratios

Name: _____	Date: _____	Score: _____ / 18

Quick Review and Helpful Hints

Two ratios are *proportional* when they are equal, like $\frac{a}{b} = \frac{c}{d}$. The fastest way to work with a proportion is *cross-multiplication*: multiply each numerator by the other denominator. To find a missing value, cross-multiply and then divide to isolate the variable.

▷ **Example:** Solve the proportion $\frac{3}{4} = \frac{x}{20}$. **Work:** Cross-multiply: $4 \cdot x = 3 \cdot 20$, which gives $4x = 60$. Divide both sides by 4: $x = \frac{60}{4} = 15$.

★ **Answer:** $x = 15$

Practice Problems

Solve each proportion for the variable.

1. $\frac{2}{3} = \frac{x}{9}$ _____
2. $\frac{5}{6} = \frac{x}{12}$ _____
3. $\frac{x}{4} = \frac{9}{12}$ _____
4. $\frac{7}{x} = \frac{14}{10}$ _____
5. $\frac{3}{5} = \frac{12}{x}$ _____
6. $\frac{4}{9} = \frac{x}{27}$ _____
7. $\frac{x}{8} = \frac{15}{24}$ _____
8. $\frac{6}{7} = \frac{18}{x}$ _____
9. $\frac{10}{x} = \frac{5}{4}$ _____
10. $\frac{x}{15} = \frac{4}{5}$ _____
11. $\frac{8}{12} = \frac{x}{15}$ _____
12. $\frac{9}{x} = \frac{3}{2}$ _____
13. $\frac{x}{6} = \frac{14}{21}$ _____
14. $\frac{5}{8} = \frac{x}{40}$ _____

Word Problems

15. A car travels 150 miles on 5 gallons of gas. At the same rate, how far can it travel on 8 gallons? _____
16. A photo 4 inches wide and 6 inches tall is enlarged so its width becomes 10 inches. Keeping the same proportions, what is the new height? _____
17. If 3 notebooks cost $\$7.50$, how much do 7 notebooks cost at the same price? _____
18. On a map, 2 inches represents 30 miles. How many miles do 5 inches represent? _____

Answer Keys

1. $x = 6$	**7.** $x = 5$	**13.** $x = 4$
2. $x = 10$	**8.** $x = 21$	**14.** $x = 25$
3. $x = 3$	**9.** $x = 8$	**15.** 240 miles
4. $x = 5$	**10.** $x = 12$	**16.** 15 inches
5. $x = 20$	**11.** $x = 10$	**17.** $\$17.50$
6. $x = 12$	**12.** $x = 6$	**18.** 75 miles

Step-by-Step Explanations

1. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Multiply diagonally – equal fractions always have equal cross-products: $3x = 2 \cdot 9 = 18$, so $x = 6$. So the final answer is $x = 6$.

2. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Set the cross-products equal: $6x = 5 \cdot 12 = 60$, then divide by 6 to find $x = 10$. So the final answer is $x = 10$.

3. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Even with x on top, the rule is the same: $12x = 4 \cdot 9 = 36$, so $x = 3$. So the final answer is $x = 3$.

4. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is When x sits in a denominator, cross-multiply anyway: $14x = 7 \cdot 10 = 70$, giving $x = 5$. So the final answer is $x = 5$.

5. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Cross-multiply and solve: $3x = 5 \cdot 12 = 60$, so $x = 20$. So the final answer is $x = 20$.

6. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is The diagonal products are equal: $9x = 4 \cdot 27 = 108$, then $x = 12$. So the final answer is $x = 12$.

7. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Multiply across the equals sign: $24x = 8 \cdot 15 = 120$, so $x = 5$. So the final answer is $x = 5$.

8. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Cross-multiply: $6x = 7 \cdot 18 = 126$, giving $x = 21$. So the final answer is $x = 21$.

9. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Set the cross-products equal: $5x = 10 \cdot 4 = 40$, so $x = 8$. So the final answer is $x = 8$.

10. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Cross-multiply: $5x = 15 \cdot 4 = 60$, then $x = 12$. So the final answer is $x = 12$.

11. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Multiply diagonally: $12x = 8 \cdot 15 = 120$, so $x = 10$. So the final answer is $x = 10$.

12. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is The cross-products match: $3x = 9 \cdot 2 = 18$, giving $x = 6$. So the final answer is $x = 6$.

13. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Cross-multiply: $21x = 6 \cdot 14 = 84$, so $x = 4$. So the final answer is $x = 4$.

14. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Set the cross-products equal: $8x = 5 \cdot 40 = 200$, then $x = 25$. So the final answer is $x = 25$.

15. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Write miles over gallons and keep the units lined up: $\frac{150}{5} = \frac{x}{8}$. Cross-multiply: $5x = 1200$, so $x = 240$ miles. So the final answer is 240 miles.

16. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Keep width over height the same: $\frac{4}{6} = \frac{10}{x}$. Cross-multiply: $4x = 60$, so the new height is 15 inches. So the final answer is 15 inches.

17. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Set notebooks over cost equal: $\frac{3}{7.50} = \frac{7}{x}$. Cross-multiply: $3x = 52.5$, so $x = \$17.50$. So the final answer is $\$17.50$.

18. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Use inches over miles: $\frac{2}{30} = \frac{5}{x}$. Cross-multiply: $2x = 150$, so $x = 75$ miles. So the final answer is 75 miles.

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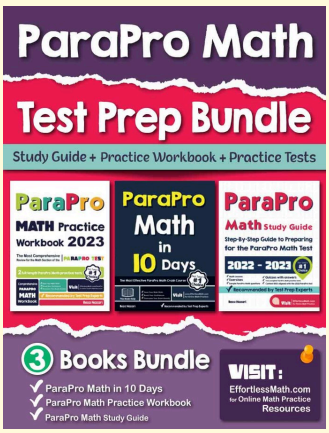

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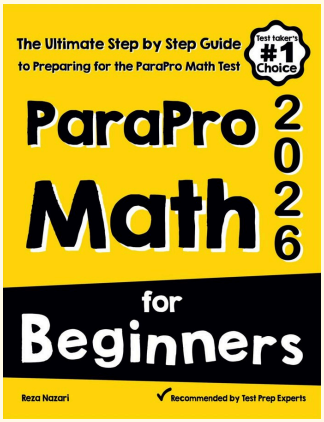

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