

# 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.  $\frac{2}{3} = \frac{x}{9}$

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2.  $\frac{5}{6} = \frac{x}{12}$

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3.  $\frac{x}{4} = \frac{9}{12}$

\_\_\_\_\_

4.  $\frac{7}{x} = \frac{14}{10}$

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5.  $\frac{3}{5} = \frac{12}{x}$

\_\_\_\_\_

6.  $\frac{4}{9} = \frac{x}{27}$

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7.  $\frac{x}{8} = \frac{15}{24}$

\_\_\_\_\_

8.  $\frac{6}{7} = \frac{18}{x}$

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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?

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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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