

3-6 Ratios and Proportions (Pages 155–159)

A **ratio** is a comparison of two numbers by division. The ratio of x to y can be expressed as x to y , $x:y$, or $\frac{x}{y}$. An equation stating that two ratios are equal is called a **proportion**. In $\frac{a}{b} = \frac{c}{d}$, the numbers a and d are the **extremes** and the numbers b and c are the **means**.

Means-Extremes Property of Proportions	In a proportion, the product of the extremes is equal to the product of the means. If $\frac{a}{b} = \frac{c}{d}$, then $ad = bc$. The cross products, ad and bc , in a proportion are equal.
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You can write proportions that involve a variable and then use cross products to solve the proportion.

Examples

a. Do the ratios $\frac{3}{4}$ and $\frac{4}{3}$ form a proportion?

$$\begin{array}{c} \frac{3}{4} \quad ? \quad \frac{4}{3} \\ \hline 3 \cdot 3 \stackrel{?}{=} 4 \cdot 4 \\ 9 = 16 \end{array}$$

Check cross products.

False

Since $9 \neq 16$, $\frac{3}{4}$ and $\frac{4}{3}$ do not form a proportion.

b. Solve the proportion $\frac{3}{4} = \frac{x+2}{x}$.

Set the cross products equal to each other.

$$3(x) = 4(x + 2)$$

$$3x = 4x + 8$$

$$3x - 4x = 4x + 8 - 4x$$

$$-1x = 8$$

$$\frac{-1x}{-1} = \frac{8}{-1}$$

$$x = -8$$

The solution is -8 .

Distribute.

Subtract $4x$ from each side.

Simplify.

Divide each side by -1 .

Simplify.

Practice

Use cross products to determine whether each pair of ratios forms a proportion.

1. $\frac{7}{8}, \frac{28}{34}$

2. $\frac{15}{20}, \frac{5}{7}$

3. $\frac{100}{240}, \frac{5}{12}$

4. $\frac{7.5}{10}, \frac{21}{28}$

Solve each proportion.

5. $\frac{8}{5} = \frac{x}{35}$

6. $\frac{a}{12} = \frac{6}{18}$

7. $\frac{2.2}{6} = \frac{11}{y}$

8. $\frac{5}{p} = \frac{7}{8.4}$

9. $\frac{20}{35} = \frac{2x}{7}$

10. $\frac{1}{2} = \frac{22}{c-5}$

11. $\frac{12}{v+3} = \frac{1}{4}$

12. $\frac{8}{9} = \frac{d-1}{18}$

13. **Medicine** Your doctor has prescribed two teaspoons of medicine to be taken every six hours. How much medicine will you have taken in 4 days? (*Hint:* Convert 4 days into hours.)

14. **Standardized Test Practice** Two out of every seven people at a particular high school play in the band. If the school has 742 students, how many of them are in the band?

A 106 students

B 212 students

C 371 students

D 1484 students

Answers: 1. no 2. no 3. yes 4. yes 5. 56 6. 4 7. 30 8. 6 9. 2 10. 49 11. 45 12. 17 13. 32 teaspoons 14. B