

## 4-1

NAME \_\_\_\_\_ DATE \_\_\_\_\_

**Ratios and Proportions** (Pages 195–200)

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.

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?

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

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.

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

$$3x = 4x + 8 \quad \text{Distribute.}$$

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

$$-1x = 8$$

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

$$x = -8$$

The solution is  $-8$ .

**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