

Algebra 1A

Lesson 3.5

Write Ratios and Proportions

Warm-Up

Solve.

(a) $7(y-4) = 2y + 17$

$$\begin{array}{r} 7y - 28 = 2y + 17 \\ -2y \quad -2y \\ \hline 5y - 28 = 17 \\ +28 \quad +28 \\ \hline 5y = 45 \\ \frac{5y}{5} = \frac{45}{5} \end{array} \quad y = 9$$

(b) $\frac{2}{3}(6x+3) = 14$

$$\begin{array}{r} 4x + 2 = 14 \\ -2 \quad -2 \\ \hline 4x = 12 \\ \frac{4x}{4} = \frac{12}{4} \\ x = 3 \end{array}$$

(c) $\frac{8}{5} - 7 = 12$

$$\begin{array}{r} +7 \quad +7 \\ \hline 5 \cdot \frac{9}{5} = 19 - 5 \\ g = 95 \end{array}$$

(d) $\frac{65}{8}x = 25 \cdot \frac{6}{8}$

$$x = 30$$

Ratios

A ratio uses *division* to compare two quantities. There are three ways to write the ratio of the numbers a and b:

a to b

a : b

 $\frac{a}{b}$

*All ratios should be written in **LOWEST TERMS!***

Example 1. Write a Ratio

In a math class at the high school there are 18 ninth graders and 14 tenth graders.

(a) Find the ratio of ninth graders to tenth graders.

$$\begin{array}{l} 18 \text{ to } 14 \\ 18:14 \\ \frac{18}{14} \end{array}$$

$$\begin{array}{l} 9 \text{ to } 7 \\ 9:7 \\ \frac{9}{7} \end{array}$$

(b) Find the ratio of ninth graders to all students in class.

$$\frac{18}{32} \quad \frac{9}{16}$$

Example 2. Writing More Ratios

The table to the right shows the number of pizzas sold one night at Hungry Howie's. Use the information to find the ratios.

Size	Small	Medium	Large
# of Pizzas	24	36	60

(a) Small pizzas to large pizzas.

$$\frac{24 \text{ Small}}{60 \text{ Large}} \rightarrow \frac{2}{5}$$

(b) Medium pizzas to large pizzas.

$$\frac{36 \text{ Medium}}{60 \text{ Large}} \rightarrow \frac{3}{5}$$

(c) Large pizzas to all pizzas sold.

$$\frac{60 \text{ Large}}{120 \text{ Total}} \rightarrow \frac{1}{2}$$

$$\text{Total} = 120$$

Example 3. Solve a Proportion

Solve the proportions.

(a) $\frac{x}{35} = \frac{4}{7} \cdot \frac{5}{5}$
 $\frac{x}{35} = \frac{20}{35}$
 $x = 20$

(b) $\frac{3}{3} \cdot \frac{2}{5} = \frac{x}{3} \cdot \frac{5}{5}$
 $\frac{6}{15} = \frac{5x}{15}$
 $6 = 5x$
 $x = \frac{6}{5}$

Example 4. Writing Sentences as Proportions

Write each sentence as a proportion and then solve.

(a) 3 is to 8 as x is to 32.

$\frac{4}{4} \cdot \frac{3}{8} = \frac{x}{32}$
 $\frac{12}{32} = \frac{x}{32}$
 $x = 12$

(b) 4 is to 12 as n is to 3.

~~$\frac{4}{12} = \frac{n}{3}$~~
 $\frac{12n}{12} = \frac{12}{12}$
 $n = 1$

Example 5. Solve a Multi-Step Problem

A cross-country runner travels 3.1 miles in 20 minutes. If she could continue to run at the same rate, how far would she travel in 35 minutes? Write and solve a proportion to answer the question.

$\frac{3.1 \text{ miles}}{20 \text{ minutes}} = \frac{x \text{ miles}}{35 \text{ minutes}}$

$\frac{20x}{20} = \frac{108.5}{20}$

$x = 5.425$

She can run
5.425 miles
in 35
minutes

Try It!

Solve the proportions.

(a) $\frac{c}{8} = \frac{11}{4} \cdot \frac{2}{2}$
 $\frac{c}{8} = \frac{22}{8}$
 $c = 22$

(b) $\frac{3}{3} \cdot \frac{16}{7} = \frac{m}{21}$

$\frac{48}{21} = \frac{m}{21}$
 $m = 48$

(c) x is to 4 as 8 is to 16.

$\frac{4}{4} \cdot \frac{x}{4} = \frac{8}{16}$

$\frac{4x}{16} = \frac{8}{16}$

$\frac{4x}{4} = \frac{8}{4}$

$x = 2$

Assignment: Pages 165 - 166 (4 - 42) even**Review:**

1. $18 + \frac{x}{3} = 9$

2. $8 = -\frac{2}{3}(2x - 6)$

3. $4(2 - n) = 1$

4. $-3y + 14 = -5y$

5. $-4a - 3 = 6a + 2$

6. $5x - (6 - x) = 2(x - 7)$