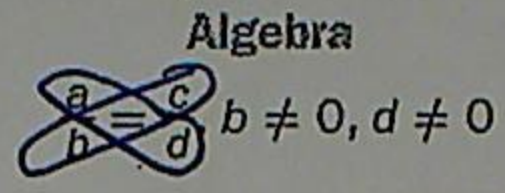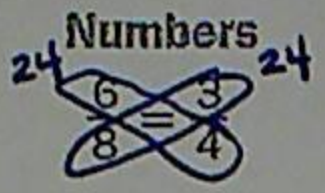Chapter 4 Lesson 3 Solve Proportional Relationships
Student Objective: Students will be able to use proportions to solve problems.
What makes two quantities proportional?

*A __proportion__ is an equation stating that two ratios or rates are ___equivalent___.

Numbers

$$\frac{6}{8} = \frac{3}{4}$$

Algebra

$$\frac{a}{b} = \frac{c}{d} \quad b \neq 0, d \neq 0$$

The products **ad** and **bc** are called the ___cross products___ of this proportion. The cross products of any ___proportion___ are equal.

Solving Proportions Using Cross Products

Examples:

a. $\dfrac{x}{4} = \dfrac{9}{10}$ $x = 3.6$

$$4 \cdot 9 = 10x$$
$$\frac{36}{10} = \frac{10x}{10}$$

b. $\dfrac{2}{34} = \dfrac{5}{x}$

$$2y = 34 \cdot 5$$
$$\frac{2y}{2} = \frac{170}{2} \quad y = 85$$

c. $\dfrac{7}{3} = \dfrac{n}{21}$

$$7 \cdot 21 = 3n$$
$$\frac{147}{3} = \frac{3n}{3}$$
$$n = 49$$

d. The ratio of 7th grade students to 8th grade students in a soccer league is 17:23. If there are 200 students in all, how many are in the 7th grade?

7th $\dfrac{17}{23}$ 8th $17 + 23 = 40$

$$\frac{17}{40} = \frac{x}{200} \quad \text{total}$$

$$17 \cdot 200 = 40x$$
$$\frac{3400}{40} = \frac{40x}{40}$$
$$x = 85$$

There are 85 7th graders

You try:

1. A recipe serves 8 people and calls for 3 cups of flour. If you want to make the recipe for 14 people, about how many cups of flour should you use?

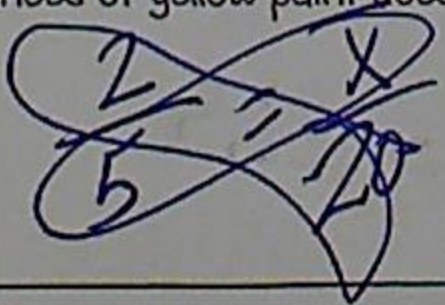$$\frac{people}{flour} \qquad \frac{8}{3} = \frac{14}{x}$$
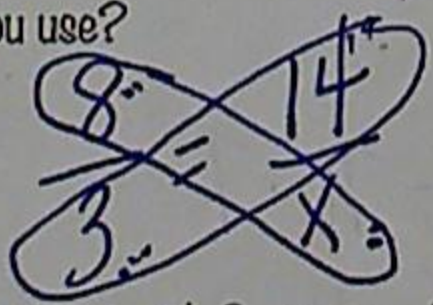
$$8x = 14 \cdot 3$$
$$\frac{8x}{8} = \frac{42}{8}$$
$$x = 5.25$$

You need 5.25 cups of flour

2. Sheila mixed 3 ounces of blue paint with 2 ounces of yellow paint. She decided to create 20 ounces of the same mixture. How many ounces of yellow paint does Sheila need for the new mixture?

$$\frac{yellow}{total} \qquad \frac{2}{5} = \frac{x}{20}$$

$$2 \cdot 20 = 5x$$
$$\frac{40}{5} = \frac{5x}{5} \quad x = 8$$

8 oz of yellow

Example:

The wait time to ride a roller coaster is 20 minutes when 160 people are in line. At this rate, how long is the wait time when 220 people are in line?

$$\frac{\text{minutes}}{\text{\# of people}} \quad \frac{M \quad 20}{220 \quad 160}$$

$$\frac{220}{m} = \frac{160}{20}$$

$$160m = 220 \cdot 20$$
$$160m = 4400$$
$$\frac{160m}{160} = \frac{4400}{160}$$
$$m = 27.5$$

$$\frac{20}{160} = \frac{m}{220}$$

$$\boxed{27.5 \text{ minutes}}$$

Example:

Mrs. Hidalgo paid $30 for 4 students to visit an art museum. Find the cost for 20 students.

$$\frac{4}{30} = \frac{20}{X}$$

$$\frac{4x}{4} = \frac{600}{4}$$
$$X = 150$$

$$\$150$$

$$\frac{30}{4} = \frac{X}{20}$$

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5-19 odds

Example:

A serving of 4 crackers contains 70 Calories. How many Calories are in 7 crackers?

$$\frac{4}{70} = \frac{7}{X}$$

$$4x = 70 \cdot 7$$
$$\frac{4x}{4} = \frac{490}{4}$$
$$x = 122.5$$

122.5 calories