Indicator 41 Class Notes by Mrs. Joshi

Writing and Solving Proportions

Honors Math-Red Book

3.4 Lesson

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One way to write a proportion is to use a table.

	Last Month	This Month
Purchase	2 ringtones	3 ringtones
Total Cost	6 dollars	x dollars

Use the columns or the rows to write a proportion.

Use columns:

$$\frac{2 \text{ ringtones}}{6 \text{ dollars}} = \frac{3 \text{ ringtones}}{x \text{ dollars}}$$

Numerators have the same units.

Denominators have the same units.

Use rows:

$$\frac{2 \text{ ringtones}}{3 \text{ ringtones}} = \frac{6 \text{ dollars}}{x \text{ dollars}}$$

The units are the same on each side of the proportion.

EXAMPLE 1 Writing a Proportion

Black Bean Soup
1.5 cups black beans
0.5 cup salsa
2 cups water
1 tomato
2 teaspoons seasoning

A chef increases the amounts of ingredients in a recipe to make a proportional recipe. The new recipe has 6 cups of black beans. Write a proportion that gives the number x of tomatoes in the new recipe.

Organize the information in a table.

	Original Recipe	New Recipe
Black Beans	1.5 cups	6 cups
Tomatoes	1 tomato	x tomatoes

∴ One proportion is $\frac{1.5 \text{ cups beans}}{1 \text{ tomato}} = \frac{6 \text{ cups beans}}{x \text{ tomatoes}}$.

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EXAMPLE 2 Solving Proportions Using Mental Math

Solve $\frac{3}{2} = \frac{x}{8}$.

Step 1: Think: The product of 2 and what number is 8?

$$\frac{3}{2} = \frac{x}{8}$$
$$2 \times ? = 8$$

Step 2: Because the product of 2 and 4 is 8, multiply the numerator by 4 to find x.

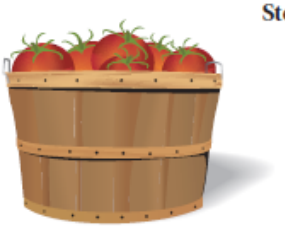
$$3 \times 4 = 12$$
$$\frac{3}{2} = \frac{x}{8}$$
$$2 \times 4 = 8$$

∴ The solution is $x = 12$.

EXAMPLE 3 Solving Proportions Using Mental Math

In Example 1, how many tomatoes are in the new recipe?

Solve the proportion $\frac{1.5}{1} = \frac{6}{x}$. ← cups black beans ← tomatoes



Step 1: Think: The product of 1.5 and what number is 6?

$$1.5 \times ? = 6$$
$$\frac{1.5}{1} = \frac{6}{x}$$

Step 2: Because the product of 1.5 and 4 is 6, multiply the denominator by 4 to find x.

$$1.5 \times 4 = 6$$
$$\frac{1.5}{1} = \frac{6}{x}$$
$$1 \times 4 = 4$$

∴ So, there are 4 tomatoes in the new recipe.

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3.5 Lesson

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Key Idea

Solving Proportions

Method 1 Use mental math. *(Section 3.4)*

Method 2 Use the Multiplication Property of Equality. *(Section 3.5)*

Method 3 Use the Cross Products Property. *(Section 3.5)*

EXAMPLE 1 Solving Proportions Using Multiplication

Solve $\frac{5}{7} = \frac{x}{21}$.

$\frac{5}{7} = \frac{x}{21}$ Write the proportion.

$21 \cdot \frac{5}{7} = 21 \cdot \frac{x}{21}$ Multiply each side by 21.

$15 = x$ Simplify.

∴ The solution is 15.

EXAMPLE 2 Solving Proportions Using the Cross Products Property

Solve each proportion.

a. $\frac{x}{8} = \frac{7}{10}$

$x \cdot 10 = 8 \cdot 7$ Use the Cross Products Property.

$10x = 56$ Multiply.

$x = 5.6$ Divide.

∴ The solution is 5.6.

b. $\frac{9}{y} = \frac{3}{17}$

$9 \cdot 17 = y \cdot 3$

$153 = 3y$

$51 = y$

∴ The solution is 51.

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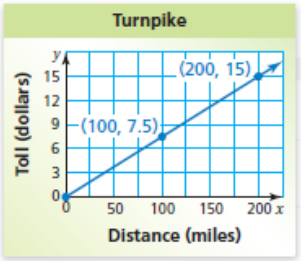
EXAMPLE 3 **Real-Life Application**

The toll due on a turnpike is proportional to the number of miles driven. How much does it cost to drive 150 miles?



Method 1: Interpret the slope as a unit rate.

$$\text{slope} = \frac{\text{change in } y}{\text{change in } x}$$

$$= \frac{7.5}{100} \quad \text{Substitute.}$$

$$= 0.075 \quad \text{Divide.}$$

The unit rate is \$0.075 per mile. Multiply to find the total cost.

$$150 \text{ mi} \cdot \frac{\$0.075}{1 \text{ mi}} = \$11.25$$

∴ It costs \$11.25 to drive 150 miles on the turnpike.

Method 2: Write and solve a proportion.

$$\frac{7.5}{100} = \frac{y}{150} \quad \begin{matrix} \leftarrow \text{dollars} \\ \leftarrow \text{miles} \end{matrix} \qquad \text{Use (100, 7.5) to write a proportion.}$$

$$150 \cdot \frac{7.5}{100} = 150 \cdot \frac{y}{150} \qquad \text{Multiply each side by 150.}$$

$$11.25 = y \qquad \text{Simplify.}$$

∴ It costs \$11.25 to drive 150 miles on the turnpike.