

LESSON

8.4

Writing and Solving Proportions

BEFORE

You learned how to write ratios.

Now

You'll solve proportions using equivalent ratios and algebra.

WHY?

So you can find the width of a Viking ship, as in Ex. 24.

Word Watch

proportion, p. 387

In the Real World

Sports A person burned about 150 calories while skateboarding for 30 minutes. About how many calories would the person burn while skateboarding for 60 minutes? In Example 1, you will use a *proportion* to answer this question.



Proportions

Words A **proportion** is an equation that states that two ratios are equivalent.

Numbers $\frac{3}{5} = \frac{6}{10}$

The proportion is read
"3 is to 5 as 6 is to 10."

Algebra $\frac{a}{b} = \frac{c}{d}$, where b and d are nonzero numbers.

Using Equivalent Ratios When one of the numbers in a proportion is unknown, you can find the number by *solving the proportion*. One way to solve a proportion is to use mental math to find an equivalent ratio.

EXAMPLE 1 Using Equivalent Ratios

To find the number C of calories the person would burn while skateboarding for 60 minutes, solve the proportion $\frac{150}{30} = \frac{C}{60}$.

① Ask yourself: What number can you multiply 30 by to get 60?

$$\frac{150}{30} = \frac{C}{60}$$

↘ × ?

② Because $30 \times 2 = 60$, multiply the numerator by 2 to find C .

$$\frac{150}{30} = \frac{C}{60}$$

↗ × 2

ANSWER Because $150 \times 2 = 300$, $C = 300$. So, the person would burn about 300 Calories while skateboarding for 60 minutes.



Using Algebra The same method you used to solve division equations in Lesson 7.4 can also be used to solve proportions that have the variable in the numerator.

HELP with Notetaking

As you learn different methods for solving a proportion, remember to write an example of each method in your notebook.

EXAMPLE 2 Solving Proportions Using Algebra

xy Solve the proportion $\frac{6}{10} = \frac{x}{25}$.

$$\frac{6}{10} = \frac{x}{25}$$

Write original proportion.

$$25 \cdot \frac{6}{10} = 25 \cdot \frac{x}{25}$$

Multiply each side by 25.

$$\frac{150}{10} = x$$

Simplify.

$$15 = x$$

Simplify fraction.

ANSWER The solution is 15.

Your turn now Use equivalent ratios to solve the proportion.

1. $\frac{1}{5} = \frac{z}{20}$

2. $\frac{8}{3} = \frac{k}{18}$

3. $\frac{27}{c} = \frac{9}{12}$

4. $\frac{9}{n} = \frac{99}{22}$

Use algebra to solve the proportion.

5. $\frac{4}{14} = \frac{m}{49}$

6. $\frac{25}{30} = \frac{x}{12}$

7. $\frac{h}{33} = \frac{2}{6}$

8. $\frac{b}{8} = \frac{7}{28}$

Setting Up a Proportion There are different ways to set up a proportion. Consider the following problem.

**Yesterday you bought 8 bagels for \$4.
Today you want only 5 bagels. How much
will 5 bagels cost?**

The information is arranged in the two tables below, in which x represents the cost of 5 bagels. The proportions that follow from the tables appear below the tables.

| | Yesterday | Today |
|--------|-----------|-------|
| Cost | 4 | x |
| Bagels | 8 | 5 |

Proportion: $\frac{4}{8} = \frac{x}{5}$

| | Bagels | Cost |
|-----------|--------|------|
| Today | 5 | x |
| Yesterday | 8 | 4 |

Proportion: $\frac{5}{8} = \frac{x}{4}$



Watch Out!



You cannot write a proportion that compares bagels to dollars and dollars to bagels.

$$\frac{\text{bagels}}{\text{dollars}} \neq \frac{\text{dollars}}{\text{bagels}}$$