Name _____ Date _____

LESSON 6.1

Study Guide

For use with pages 356–363

GOAL **Solve problems by writing and solving proportions.**

Vocabulary

If a and b are two numbers or quantities and $b \neq 0$, then the

ratio of *a* to *b* is $\frac{a}{b}$.

An equation that states that two ratios are equal, such as $\frac{a}{b} = \frac{c}{d}$, is called a **proportion.** The numbers b and c are the **means,** and the numbers a and d are the **extremes.**

The **geometric mean** of two positive numbers a and b is the positive number x that satisfies $\frac{a}{x} = \frac{x}{b}$. So, $x^2 = ab$ and $x = \sqrt{ab}$.

A Property of Proportions

1. Cross Products Property:

If $\frac{a}{b} = \frac{c}{d}$ where $b \neq 0$ and $d \neq 0$, then $ad = bc$.

EXAMPLE 1 Simplify ratios

Simplify the ratio.

a. 81 cm : 3 cm **b.** $\frac{9 \text{ ft}}{15 \text{ yd}}$

Solution

a. Write 81 cm : 3 cm as $\frac{81 \text{ cm}}{3 \text{ cm}}$.
Then divide out the units and simplify.

$$\frac{81 \cancel{\text{ cm}}}{3 \cancel{\text{ cm}}} = \frac{27}{1} = 27 : 1$$

b. To simplify a ratio with unlike units, multiply by a conversion factor.

$$\frac{9 \text{ ft}}{15 \text{ yd}} = \frac{9 \cancel{\text{ ft}}}{15 \cancel{\text{ yd}}} \cdot \frac{1 \cancel{\text{ yd}}}{3 \cancel{\text{ ft}}} = \frac{9}{45} = \frac{1}{5}$$

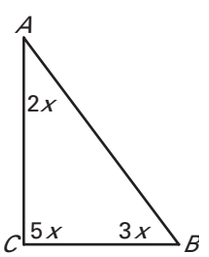
EXAMPLE 2 Use extended ratios

The measures of the angles in $\triangle ABC$ are in the extended ratio of 2 : 3 : 5. Find the measures of the angles.

Solution

Sketch the triangle and use the extended ratio of $2 : 3 : 5$ to label the angle measures as $2x°$, $3x°$, and $5x°$. By the Triangle Sum Theorem, $2x° + 3x° + 5x° = 180°$. So, $x = 18$.

The angle measures of the triangle are $2(18°) = 36°$, $3(18°) = 54°$, and $5(18°) = 90°$.



Name _____ Date _____

LESSON 6.1

Study Guide *continued*

For use with pages 356–363

Exercises for Examples 1 and 2

Simplify the ratio.

1. $\frac{60 \text{ mi}}{51 \text{ mi}}$

2. 7 cm : 14 mm

3. A triangle's angle measures are in the extended ratio of 5 : 9 : 16. Find the measures of the angles.

EXAMPLE 3 **Solve a proportion**

Solve the proportion $\frac{x}{8} = \frac{5}{4}$.

Solution

$\frac{x}{8} = \frac{5}{4}$	Write original proportion.
$4 \cdot x = 8 \cdot 5$	Cross Products Property
$4x = 40$	Multiply.
$x = 10$	Divide each side by 4.

EXAMPLE 4 **Find a geometric mean**

Find the geometric mean of 45 and 5.

Solution

$x = \sqrt{ab}$	Definition of geometric mean
$= \sqrt{45 \cdot 5}$	Substitute 45 for a and 5 and b.
$= \sqrt{225}$	Multiply.
$= 15$	Simplify.

The geometric mean of 45 and 5 is 15.

Exercises for Examples 3 and 4

Solve the proportion.

4. $\frac{a}{12} = \frac{5}{3}$

5. $\frac{6}{7} = \frac{30}{x}$

6. $\frac{9}{y} = \frac{3}{7}$

Find the geometric mean of the two numbers.

7. 3 and 27

8. 40 and 5

9. 6 and 15