Section 5.8 Simplifying Square Roots

1. Multiplication Property for Square Roots: If a and b are positive numbers, then

$$\sqrt{a \bullet b} = \sqrt{a} \bullet \sqrt{b}$$

In words, the square root of a product is the product of the square roots.

Example 1: Simplify.

a. $\sqrt{49x} = \sqrt{49} \bullet \sqrt{x} = 7\sqrt{x}$

b. $\sqrt{9x}$

2. Repeated Factor Property for Square Roots: If a is a positive number, then

$$\sqrt{a \bullet a} = a \text{ OR } \sqrt{a^2} = a$$

Example 2: Simplify. Assume all variables represent positive numbers.

a. $\sqrt{6 \bullet 6}$

b. $\sqrt{x \bullet x}$

c. $\sqrt{y^2}$

d. $\sqrt{9a^2}$

3. Simplifying Square Roots: When the expression under the square root has been completely factored, any factor that occurs twice can be taken out from under the square root symbol. Note: The factor occurs **twice** under the square root but **once** when brought outside the square root.

Note: Portions of this document are excerpted from the textbook *Prealgebra,* 7th ed. by Charles McKeague

Example 3: Simplify.

a. $\sqrt{12}$

b. $\sqrt{50}$

c. $\sqrt{75x^2}$

d. $\sqrt{180x^3}$

Practice Problems

Simplify each of the following without using a calculator.

a. $\sqrt{81x}$

b. $\sqrt{a \bullet a}$

c. $\sqrt{25z^2}$

d. $\sqrt{32x}$

e. $\sqrt{8y^3}$

Answers to Practice Problems:

a. $9\sqrt{x}$; b. a; c. $5z$; d. $4\sqrt{2x}$; e. $2y\sqrt{2y}$

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