


LESSON
4.5**Study Guide**

For use with pages 219–223

 **CA Standards**
NS 2.4**GOAL****Simplify square root expressions.****VOCABULARY****Product Property of Square Roots**

$$\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}, \text{ where } a \geq 0 \text{ and } b \geq 0.$$

A radical expression is in **simplest form** when:

- The expression under the radical sign has no perfect square factors other than 1.
- There are no fractions under the radical sign, and no radicals appear in the denominator of a fraction.

Quotient Property of Square Roots

$$\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}, \text{ where } a \geq 0 \text{ and } b > 0.$$

EXAMPLE 1**Simplifying Radical Expressions**

$$\begin{aligned} \text{a. } \sqrt{112} &= \sqrt{16 \cdot 7} \\ &= \sqrt{16} \cdot \sqrt{7} \\ &= 4\sqrt{7} \end{aligned}$$

Factor out greatest perfect square factor.

Product property of square roots

Simplify.

$$\begin{aligned} \text{b. } \sqrt{405} &= \sqrt{81 \cdot 5} \\ &= \sqrt{81} \cdot \sqrt{5} \\ &= 9\sqrt{5} \end{aligned}$$

Factor out greatest perfect square factor.

Product property of square roots

Simplify.

Exercises for Example 1**Simplify the expression.**

1. $\sqrt{20}$

2. $\sqrt{72}$

3. $\sqrt{147}$

4. $\sqrt{200}$

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EXAMPLE 2 **Simplifying a Product of Two Radicals**Simplify the radical expression $\sqrt{3} \cdot \sqrt{15}$.

Solution

$$\begin{aligned} \sqrt{3} \cdot \sqrt{15} &= \sqrt{45} && \text{Product property of square roots} \\ &= \sqrt{9 \cdot 5} && \text{Factor out greatest perfect square factor.} \\ &= \sqrt{9} \cdot \sqrt{5} && \text{Product property of square roots} \\ &= 3\sqrt{5} && \text{Simplify.} \end{aligned}$$

Exercises for Example 2

Simplify the expression.

5. $\sqrt{2} \cdot \sqrt{14}$

6. $\sqrt{6} \cdot \sqrt{8}$

7. $\sqrt{10} \cdot \sqrt{5}$

8. $\sqrt{7} \cdot \sqrt{12}$

EXAMPLE 3 **Simplifying a Radical Expression**Simplify the radical expression $\sqrt{\frac{6}{25}}$.

Solution

$$\begin{aligned} \sqrt{\frac{6}{25}} &= \frac{\sqrt{6}}{\sqrt{25}} && \text{Quotient property of square roots} \\ &= \frac{\sqrt{6}}{5} && \text{Simplify.} \end{aligned}$$

Exercises for Example 3

Simplify the expression.

9. $\sqrt{\frac{1}{16}}$

10. $\sqrt{\frac{81}{100}}$

11. $\sqrt{\frac{21}{64}}$

12. $\sqrt{\frac{47}{324}}$