

11-1 Study Guide and Intervention***Simplifying Radical Expressions***

Product Property of Square Roots The **Product Property of Square Roots** and prime factorization can be used to simplify expressions involving irrational square roots. When you simplify radical expressions with variables, use absolute value to ensure nonnegative results.

Product Property of Square RootsFor any numbers a and b , where $a \geq 0$ and $b \geq 0$, $\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}$.**Example 1****Simplify $\sqrt{180}$.**

$$\begin{aligned}\sqrt{180} &= \sqrt{2 \cdot 2 \cdot 3 \cdot 3 \cdot 5} && \text{Prime factorization of 180} \\ &= \sqrt{2^2 \cdot 3^2 \cdot 5} && \text{Product Property of Square Roots} \\ &= 2 \cdot 3 \cdot \sqrt{5} && \text{Simplify.} \\ &= 6\sqrt{5} && \text{Simplify.}\end{aligned}$$

Example 2**Simplify $\sqrt{120a^2 \cdot b^5 \cdot c^4}$.**

$$\begin{aligned}\sqrt{120a^2 \cdot b^5 \cdot c^4} &= \sqrt{2^3 \cdot 3 \cdot 5 \cdot a^2 \cdot b^5 \cdot c^4} \\ &= \sqrt{2^2} \cdot \sqrt{2} \cdot \sqrt{3} \cdot \sqrt{5} \cdot \sqrt{a^2} \cdot \sqrt{b^4 \cdot b} \cdot \sqrt{c^4} \\ &= 2 \cdot \sqrt{2} \cdot \sqrt{3} \cdot \sqrt{5} \cdot |a| \cdot b^2 \cdot \sqrt{b} \cdot c^2 \\ &= 2|a|b^2c^2\sqrt{30b}\end{aligned}$$

Exercises**Simplify.**

1. $\sqrt{28}$

2. $\sqrt{68}$

3. $\sqrt{60}$

4. $\sqrt{75}$

5. $\sqrt{162}$

6. $\sqrt{3} \cdot \sqrt{6}$

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

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

9. $\sqrt{4a^2}$

10. $\sqrt{9x^4}$

11. $\sqrt{300a^4}$

12. $\sqrt{128c^6}$

13. $4\sqrt{10} \cdot 3\sqrt{6}$

14. $\sqrt{3x^2} \cdot 3\sqrt{3x^4}$

15. $\sqrt{20a^2b^4}$

16. $\sqrt{100x^3y}$

17. $\sqrt{24a^4b^2}$

18. $\sqrt{81x^4y^2}$

19. $\sqrt{150a^2b^2c}$

20. $\sqrt{72a^6b^3c^2}$

21. $\sqrt{45x^2y^5z^8}$

22. $\sqrt{98x^4y^6z^2}$