

10-3 Study Guide and Intervention

Operations with Radical Expressions

Add or Subtract Radical Expressions When adding or subtracting radical expressions, use the Associative and Distributive Properties to simplify the expressions. If radical expressions are not in simplest form, simplify them.

Example 1: Simplify $10\sqrt{6} - 5\sqrt{3} + 6\sqrt{3} - 4\sqrt{6}$.

$$\begin{aligned} 10\sqrt{6} - 5\sqrt{3} + 6\sqrt{3} - 4\sqrt{6} &= (10 - 4)\sqrt{6} + (-5 + 6)\sqrt{3} \\ &= 6\sqrt{6} + \sqrt{3} \end{aligned}$$

Associative and Distributive Properties
Simplify.

Example 2: Simplify $3\sqrt{12} + 5\sqrt{75}$.

$$\begin{aligned} 3\sqrt{12} + 5\sqrt{75} &= 3\sqrt{2^2 \cdot 3} + 5\sqrt{5^2 \cdot 3} \\ &= 3 \cdot 2\sqrt{3} + 5 \cdot 5\sqrt{3} \\ &= 6\sqrt{3} + 25\sqrt{3} \\ &= 31\sqrt{3} \end{aligned}$$

Factor 12 and 75.
Simplify.
Multiply.
Distributive Property

Exercises

Simplify each expression.

1. $2\sqrt{5} + 4\sqrt{5}$

2. $\sqrt{6} - 4\sqrt{6}$

3. $\sqrt{8} - \sqrt{2}$

4. $3\sqrt{75} + 2\sqrt{5}$

5. $\sqrt{20} + 2\sqrt{5} - 3\sqrt{5}$

6. $2\sqrt{3} + \sqrt{6} - 5\sqrt{3}$

7. $\sqrt{12} + 2\sqrt{3} - 5\sqrt{3}$

8. $3\sqrt{6} + 3\sqrt{2} - \sqrt{50} + \sqrt{24}$

9. $\sqrt{8a} - \sqrt{2a} + 5\sqrt{2a}$

10. $\sqrt{54} + \sqrt{24}$

11. $\sqrt{3} + \sqrt{\frac{1}{3}}$

12. $\sqrt{12} + \sqrt{\frac{1}{3}}$

13. $\sqrt{54} - \sqrt{\frac{1}{6}}$

14. $\sqrt{80} - \sqrt{20} + \sqrt{180}$

15. $\sqrt{50} + \sqrt{18} - \sqrt{75} + \sqrt{27}$

16. $2\sqrt{3} - 4\sqrt{45} + 2\sqrt{\frac{1}{3}}$

17. $\sqrt{125} - 2\sqrt{\frac{1}{5}} + \sqrt{\frac{1}{3}}$

18. $\sqrt{\frac{2}{3}} + 3\sqrt{3} - 4\sqrt{\frac{1}{12}}$

10-3 Study Guide and Intervention *(continued)*

Operations with Radical Expressions

Multiply Radical Expressions Multiplying two radical expressions with different radicands is similar to multiplying binomials.

Example: Multiply $(3\sqrt{2} - 2\sqrt{5})(4\sqrt{20} + \sqrt{8})$.

Use the FOIL method.

$$\begin{aligned}
 (3\sqrt{2} - 2\sqrt{5})(4\sqrt{20} + \sqrt{8}) &= (3\sqrt{2})(4\sqrt{20}) + (3\sqrt{2})(\sqrt{8}) + (-2\sqrt{5})(4\sqrt{20}) + (-2\sqrt{5})(\sqrt{8}) \\
 &= 12\sqrt{40} + 3\sqrt{16} - 8\sqrt{100} - 2\sqrt{40} && \text{Multiply.} \\
 &= 12\sqrt{2^2 \cdot 10} + 3 \cdot 4 - 8 \cdot 10 - 2\sqrt{2^2 \cdot 10} && \text{Simplify.} \\
 &= 24\sqrt{10} + 12 - 80 - 4\sqrt{10} && \text{Simplify.} \\
 &= 20\sqrt{10} - 68 && \text{Combine like terms.}
 \end{aligned}$$

Exercises

Simplify each expression.

- $2(\sqrt{3} + 4\sqrt{5})$
- $\sqrt{6}(\sqrt{3} - 2\sqrt{6})$
- $\sqrt{5}(\sqrt{5} - \sqrt{2})$
- $\sqrt{2}(3\sqrt{7} + 2\sqrt{5})$
- $(2 - 4\sqrt{2})(2 + 4\sqrt{2})$
- $(3 + \sqrt{6})^2$
- $(2 - 2\sqrt{5})^2$
- $3\sqrt{2}(\sqrt{8} + \sqrt{24})$
- $\sqrt{8}(\sqrt{2} + 5\sqrt{8})$
- $(\sqrt{5} - 3\sqrt{2})(\sqrt{5} + 3\sqrt{2})$
- $(\sqrt{3} + \sqrt{6})^2$
- $(\sqrt{2} - 2\sqrt{3})^2$
- $(\sqrt{5} - \sqrt{2})(\sqrt{2} + \sqrt{6})$
- $(\sqrt{8} - \sqrt{2})(\sqrt{3} + \sqrt{6})$
- $(\sqrt{5} - \sqrt{18})(7\sqrt{5} + \sqrt{3})$
- $(2\sqrt{3} - \sqrt{45})(\sqrt{12} + 2\sqrt{6})$
- $(2\sqrt{5} - 2\sqrt{3})(\sqrt{10} + \sqrt{6})$
- $(\sqrt{2} + 3\sqrt{3})(\sqrt{12} - 4\sqrt{8})$