

10-2 Study Guide and Intervention

Operations with Radical Expressions

Add and 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 $10\sqrt{6} - 5\sqrt{3} + 6\sqrt{3} - 4\sqrt{6}$.

$$\begin{aligned} 10\sqrt{6} - 5\sqrt{3} + 6\sqrt{3} - 4\sqrt{6} &= (10 - 4)\sqrt{6} + (-5 + 6)\sqrt{3} && \text{Associative and Distributive Properties} \\ &= 6\sqrt{6} + \sqrt{3} && \text{Simplify.} \end{aligned}$$

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

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

Exercises Simplify.

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

10-2 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 Find each product.

1. $2(\sqrt{3} + 4\sqrt{5})$
2. $\sqrt{6}(\sqrt{3} - 2\sqrt{6})$
3. $\sqrt{5}(\sqrt{5} - \sqrt{2})$
4. $\sqrt{2}(3\sqrt{7} + 2\sqrt{5})$
5. $(2 - 4\sqrt{2})(2 + 4\sqrt{2})$
6. $(3 + \sqrt{6})^2$
7. $(2 - 2\sqrt{5})^2$
8. $3\sqrt{2}(\sqrt{8} + \sqrt{24})$
9. $\sqrt{8}(\sqrt{2} + 5\sqrt{8})$
10. $(\sqrt{5} - 3\sqrt{2})(\sqrt{5} + 3\sqrt{2})$
11. $(\sqrt{3} + \sqrt{6})^2$
12. $(\sqrt{2} - 2\sqrt{3})^2$
13. $(\sqrt{5} - \sqrt{2})(\sqrt{2} + \sqrt{6})$
14. $(\sqrt{8} - \sqrt{2})(\sqrt{3} + \sqrt{6})$
15. $(\sqrt{5} - \sqrt{18})(7\sqrt{5} + \sqrt{3})$
16. $(2\sqrt{3} - \sqrt{45})(\sqrt{12} + 2\sqrt{6})$
17. $(2\sqrt{5} - 2\sqrt{3})(\sqrt{10} + \sqrt{6})$
18. $(\sqrt{2} + 3\sqrt{3})(\sqrt{12} - 4\sqrt{8})$