

9.1 Simplifying Radical Expressions Operations DAY FOUR Worksheet

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

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

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

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.

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. $(\sqrt{2} + 3\sqrt{3})(\sqrt{12} - 4\sqrt{8})$