Simplifying Radical Expressions

Algebra Worksheet · Grade 8–10

Name: _____ Date: _____

Learning Objectives

- Simplify square roots by factoring out perfect squares
- Simplify cube roots by factoring out perfect cubes, including negative radicands
- Add, subtract, and multiply radical expressions by combining like radicals

Problems

1. Simplify the square root below:

$\sqrt{36}$

2. Simplify the square root below:

$\sqrt{50}$

3. Simplify the square root below:

$\sqrt{72}$

4. Simplify the cube root below:

$\sqrt[3]{-54}$

5. Simplify the cube root below:

$\sqrt[3]{128}$

6. Add the radical expressions below:

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$-5\sqrt{3} - 3\sqrt{3}$

7. Simplify and then add the radical expressions below:

$\sqrt{45} + \sqrt{20}$

8. Multiply the radical expressions below and simplify:

$\sqrt{6} \times \sqrt{2}$

9. Simplify the cube root expression below:

$\sqrt[3]{27m^3n^5}$

10. Simplify and then subtract the radical expressions below:

$3\sqrt{98} - 2\sqrt{50} + \sqrt{8}$

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Simplifying Radical Expressions — Answer Key

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Answer Key

1. Answer: 6
- 36 is a perfect square because 6 × 6 = 36
- So √36 = 6

2. Answer: 5√2
- Factor 50 into a perfect square factor: 50 = 25 × 2
- √50 = √25 × √2 = 5√2

3. Answer: 6√2
- Factor 72 into a perfect square factor: 72 = 36 × 2
- √72 = √36 × √2 = 6√2

4. Answer: -3■2
- Factor 54 into a perfect cube factor: 54 = 27 × 2
- ■(–54) = ■(–27) × ■2 = –3■2

5. Answer: 4■2
- Factor 128 into a perfect cube factor: 128 = 64 × 2
- ■128 = ■64 × ■2 = 4■2

6. Answer: -8√3
- Both terms have the same radical √3, so combine the coefficients
- –5 – 3 = –8, giving –8√3

7. Answer: 5√5
- Simplify √45 = √(9×5) = 3√5
- Simplify √20 = √(4×5) = 2√5
- Add like radicals: 3√5 + 2√5 = 5√5

8. Answer: 2√3
- Multiply inside the radical: √6 × √2 = √12
- Factor √12 = √(4×3) = √4 × √3 = 2√3

9. Answer: 3m■(n²)
- Factor: ■27 = 3 (perfect cube), ■(m³) = m (perfect cube)
- For n■, write n■ = n³ × n², so ■(n³ × n²) = n■(n²)
- Combine: 3 × m × n × ■(n²) = 3mn■(n²)

10. Answer: 13√2
- Simplify 3√98 = 3√(49×2) = 3×7√2 = 21√2

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- Simplify $2\sqrt{50} = 2\sqrt{(25\times2)} = 2\times5\sqrt{2} = 10\sqrt{2}$
- Simplify $\sqrt{8} = \sqrt{(4\times2)} = 2\sqrt{2}$
- Combine: $21\sqrt{2} - 10\sqrt{2} + 2\sqrt{2} = 13\sqrt{2}$

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