



Simplifying Radical Expressions

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Learning Objectives

- Identify perfect squares and use radical notation correctly
- Simplify square roots of non-perfect (irregular) numbers using factor trees
- Simplify radical expressions containing variables
- Apply factoring skills to fully simplify radical expressions

Simplify each radical expression completely, showing all work and leaving answers in simplest radical form.

1. Evaluate the perfect square root.

$$\sqrt{81}$$

Answer: _____

2. Evaluate the perfect square root.

$$\sqrt{144}$$

Answer: _____

3. Simplify the irregular square root using a factor tree.

$$\sqrt{72}$$

Answer: _____

4. Simplify the irregular square root using a factor tree.

$$\sqrt{50}$$

Answer: _____

5. Simplify the irregular square root.

$$\sqrt{200}$$

Answer: _____

6. Simplify the radical expression with a variable.

$$\sqrt{x^6}$$

Answer: _____



7. Simplify the radical expression with variables.

$$\sqrt{49x^4y^2}$$

Answer: _____

8. Simplify the radical expression with variables.

$$\sqrt{18x^3}$$

Answer: _____

9. Simplify the radical expression with variables.

$$\sqrt{75a^5b^2}$$

Answer: _____

10. Simplify the radical expression completely.

$$\sqrt{128x^7y^4}$$

Answer: _____





Covers warm-up review, introduction to radicals and radical notation, perfect squares, irregular square roots, simplifying radical expressions, radicals with variables, factor-tree method, and applying factoring skills to fully simplify radical expressions.

Solutions

1. Evaluate the perfect square root.

$$\sqrt{81}$$

- Recognize 81 as a perfect square.
- Since 9 times 9 equals 81, the square root of 81 is 9.

Answer: 9

2. Evaluate the perfect square root.

$$\sqrt{144}$$

- Recognize 144 as a perfect square.
- Since 12 times 12 equals 144, the square root of 144 is 12.

Answer: 12

3. Simplify the irregular square root using a factor tree.

$$\sqrt{72}$$

- Factor 72 into prime factors: 2, 2, 2, 3, 3.
- Pair the like factors: a pair of 2s and a pair of 3s, with one 2 left over.
- Each pair leaves the radical as a single factor, giving 2 times 3 equals 6 outside the radical.
- The leftover 2 stays inside the radical, giving six root two.

Answer: $6\sqrt{2}$

4. Simplify the irregular square root using a factor tree.

$$\sqrt{50}$$

- Factor 50 as 25 times 2.
- Since 25 is a perfect square, take its square root, which is 5.
- Bring 5 outside the radical and keep 2 inside, giving five root two.

Answer: $5\sqrt{2}$

5. Simplify the irregular square root.

$$\sqrt{200}$$

- Factor 200 as 100 times 2.
- Since 100 is a perfect square, take its square root, which is 10.
- Place 10 outside the radical and keep 2 inside, giving ten root two.

Answer: $10\sqrt{2}$



6. Simplify the radical expression with a variable.

$$\sqrt{x^6}$$

→ Apply the rule that the square root of x to an even power equals x raised to half that power.

→ Divide the exponent 6 by 2 to get 3.

→ The simplified expression is x cubed.

Answer: x^3

7. Simplify the radical expression with variables.

$$\sqrt{49x^4y^2}$$

→ Take the square root of 49 to get 7.

→ Take the square root of x to the fourth, which is x squared.

→ Take the square root of y squared, which is y .

→ Multiply the results to get seven x squared y .

Answer: $7x^2y$

8. Simplify the radical expression with variables.

$$\sqrt{18x^3}$$

→ Factor 18 as 9 times 2 and rewrite x cubed as x squared times x .

→ Take the square root of 9, which is 3, and the square root of x squared, which is x .

→ Place 3 and x outside the radical, leaving 2 and x inside.

→ The simplified expression is three x times the square root of two x .

Answer: $3x\sqrt{2x}$

9. Simplify the radical expression with variables.

$$\sqrt{75a^5b^2}$$

→ Factor 75 as 25 times 3.

→ Rewrite a to the fifth as a to the fourth times a .

→ Take the square root of 25 to get 5, the square root of a to the fourth to get a squared, and the square root of b squared to get b .

→ Leave 3 and the single a inside the radical, giving five a squared b times the square root of three a .

Answer: $5a^2b\sqrt{3a}$

10. Simplify the radical expression completely.

$$\sqrt{128x^7y^4}$$

→ Factor 128 as 64 times 2.

→ Rewrite x to the seventh as x to the sixth times x .

→ Take the square root of 64 to get 8, the square root of x to the sixth to get x cubed, and the square root of y to the fourth to get y squared.

→ Leave 2 and the single x inside the radical, giving eight x cubed y squared times the square root of two x .

Answer: $8x^3y^2\sqrt{2x}$

