

## 11.2: Simplifying Square Roots

## TERMS

**Radical expression**- any expression that contains a radical, such as a square root,  $\sqrt{25}$ , a cube root,  $\sqrt[3]{25}$ , or other root.

**Radicand**- the expression under the radical symbol, like 25 in  $\sqrt{25}$

**Simplify a square root**- rewriting a square root so that no perfect factors are left in the radicand (except for 1).

## Simplifying Square Roots

**Method 1 - Perfect Squares:** Find Perfect Square Factors to simplify out. If a number is already outside the radical, multiply anything taken out by this number.

1. $\frac{\sqrt{24}}{\sqrt{4 \cdot 6}}$ $2\sqrt{6}$	2. $\frac{\sqrt{108}}{\sqrt{36 \cdot 3}}$ $6\sqrt{3}$	3. $\frac{3\sqrt{54}}{3\sqrt{9 \cdot 6}}$ $3 \cdot 3\sqrt{6}$ $9\sqrt{6}$	4. $\frac{\pm 2\sqrt{72}}{\pm 2\sqrt{36 \cdot 2}}$ $\pm 2 \cdot 6\sqrt{2}$ $\pm 12\sqrt{2}$
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**Method 2 - Factor Tree:** Break the radicand down to the PRIME factors. Any pair of the same factor represents a perfect square. Take this number outside the radical to represent the pair. Anything not in a pair stays in the radicand.

5. $\sqrt{24}$  $2\sqrt{6}$	6. $\sqrt{108}$  $2 \cdot 3\sqrt{3} = 6\sqrt{3}$	7. $\frac{3\sqrt{54}}{3\sqrt{9 \cdot 6}}$  $3 \cdot 3\sqrt{6} = 9\sqrt{6}$	8. $\frac{\pm 2\sqrt{72}}{\pm 2\sqrt{36 \cdot 2}}$  $\pm 2 \cdot 6\sqrt{2}$ $\pm 12\sqrt{2}$
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Look for perfect squares when simplifying square roots with variables, too!

9. $\sqrt{x^6}$ $\sqrt{x^2 \cdot x^2 \cdot x^2}$ $x \cdot x \cdot x = x^3$	10. $\sqrt{27x^3}$ $\sqrt{9 \cdot 3 \cdot x^2 \cdot x}$ $3x\sqrt{3x}$	11. $-4\sqrt{162x^5}$ $-4\sqrt{81 \cdot 2 \cdot x^2 \cdot x^2 \cdot x}$ $-4 \cdot 9 \cdot x \cdot x \sqrt{2x}$ $-36x^2\sqrt{2x}$
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12.  $5\sqrt{28x^2y^3}$

$$5\sqrt{4 \cdot 7 \cdot x^2 \cdot y^2 \cdot y}$$

$$5 \cdot 2 \cdot x \cdot y \sqrt{7y}$$

$$10xy\sqrt{7y}$$

13.  $3\sqrt{64s^4t^7}$

$$3\sqrt{64 \cdot s^4 \cdot t^6 \cdot t}$$

$$3 \cdot 8 \cdot s \cdot s \cdot t \cdot t \cdot t \sqrt{t}$$

$$24s^2t^3\sqrt{t}$$

Homework...Simplify each of the following by using the method of your choice!