

Memorize these Perfect Squares

$$\begin{array}{ll} 1^2 = 1 & 9^2 = 81 \\ 2^2 = 4 & 10^2 = 100 \\ 3^2 = 9 & 11^2 = 121 \\ 4^2 = 16 & 12^2 = 144 \\ 5^2 = 25 & 13^2 = 169 \\ 6^2 = 36 & 14^2 = 196 \\ 7^2 = 49 & 15^2 = 225 \\ 8^2 = 64 & \end{array}$$

Square Root of a Number

*** Finding the **square root of a number** is the inverse operation of squaring that **number**.

Examples:

$$\begin{array}{l} \sqrt{4} = 2 \text{ because } 2^2 = 4 \\ \sqrt{16} = 4 \text{ because } 4^2 = 16 \end{array}$$

Steps to Simplifying Radicals in simplest radical form:

1.) **Factor** the radicand so that one factor is the largest perfect square possible.

2.) Take the **square root** of the perfect square factor, that will become the coefficient of the remaining radical.

(16 is a perfect square)

3.) Check with the calculator.

Simplify

$$\begin{array}{l} 3\sqrt{32} \\ 3\sqrt{16 \cdot 2} \\ 3 \cdot 4\sqrt{2} \\ 12\sqrt{2} \end{array}$$

*Even exponent is a perfect square.

k^8 is a perfect square so to take the square root of it, divide the

exponent in half. Example: $\sqrt{k^8} = k^4$

Simplify Radicals:

1.) $-2\sqrt{108}$
 $-2\sqrt{36 \cdot 3}$
 $-2 \cdot 6\sqrt{3}$
 $-12\sqrt{3}$

2.) $\frac{2}{3}\sqrt{45}$
 $\frac{2}{3} \cdot \sqrt{9 \cdot 5}$
 $\frac{2}{3} \cdot 3\sqrt{5}$
 $2\sqrt{5}$

Simplify Radicals:

3.) $\sqrt{48w^6}$
 $w^3\sqrt{16 \cdot 3}$
 $w^3 \cdot 4\sqrt{3}$
 $4w^3\sqrt{3}$

4.) $\frac{1}{5}\sqrt{75y^9}$
 $\frac{1}{5}\sqrt{25 \cdot 3 \cdot y^8 \cdot y^1}$
 $\frac{1}{5} \cdot 5 \cdot y^4 \sqrt{3y}$
 $y^4\sqrt{3y}$

*Odd exponent is a non-perfect square.

k^5 is a non-perfect square so ... the square root of k^5 is "broken down". See example below. Example: $\sqrt{k^5} = \sqrt{k^4 \cdot k^1} = k^2\sqrt{k}$

Directions: Simplify each expression.

5.) $\frac{1}{2}\sqrt{80} - 6\sqrt{125}$
 $\frac{1}{2}\sqrt{16 \cdot 5} - 6\sqrt{25 \cdot 5}$
 $\frac{1}{2} \cdot 4\sqrt{5} - 6 \cdot 5\sqrt{5}$
 $2\sqrt{5} - 30\sqrt{5}$
 $-28\sqrt{5}$

6.) $\frac{2}{3}\sqrt{27} - 7\sqrt{32} + 5\sqrt{147}$
 $\frac{2}{3}\sqrt{9 \cdot 3} - 7\sqrt{16 \cdot 2} + 5\sqrt{49 \cdot 3}$
 $\frac{2}{3} \cdot 3\sqrt{3} - 7 \cdot 4\sqrt{2} + 5 \cdot 7\sqrt{3}$
 $2\sqrt{3} - 28\sqrt{2} + 35\sqrt{3}$
 $37\sqrt{3} - 28\sqrt{2}$