WORKING WITH SQUARE ROOTS (RADICALS)

The square root sign $\sqrt{\ }$ (also called the radical sign) over a number is asking you to find the number that taken times itself will equal the number under the radical sign:

Examples: $\sqrt{64} = 8$ because $8 \cdot 8 = 64$
$\sqrt{9} = 3$ because $3 \cdot 3 = 9$
Numbers that have whole number square roots are called **Perfect Squares:**

1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225 . . . .

Numbers that are not perfect squares can be expressed in decimal form or in "simplified radical form". To be in simplified radical form there can be no perfect square factor left under the radical sign.

Ex. $\sqrt{8} = 2\sqrt{2} \approx 2.82$

When you put a number into simplest radical form, you use the fact that $\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}$

Suppose that you want to simplify 75. You first ask yourself "what is the biggest perfect square that goes evenly into 75?" The answer is 25. So you rewrite the problem as follows:

$\sqrt{75} = \sqrt{25 \cdot 3}$ Using the formula given above, you get:
$\sqrt{25 \cdot 3} = \sqrt{25} \cdot \sqrt{3} = 5\sqrt{3}$

Other examples:
$\sqrt{27} = \sqrt{9 \cdot 3} = \sqrt{9} \cdot \sqrt{3} = 3\sqrt{3}$
$\sqrt{45} = \sqrt{9 \cdot 5} = \sqrt{9} \cdot \sqrt{5} = 3\sqrt{5}$
$\sqrt{50} = \sqrt{25 \cdot 2} = \sqrt{25} \cdot \sqrt{2} = 5\sqrt{2}$

If you are working with variables, you need to understand that any even power is a perfect square. To take the square root you just divide the variable by 2. See the examples below.
$\sqrt{x^2} = x \quad \sqrt{x^4} = x^2 \quad \sqrt{x^6} = x^3 \quad \sqrt{x^8} = x^4 \ldots$
$\sqrt{100x^2y^6} = \sqrt{100} \cdot \sqrt{x^2} \cdot \sqrt{y^6} = 10xy^3$

To take the square root of an odd power, use the procedure below:
$\sqrt{x^5} = \sqrt{x^4 \cdot x} = \sqrt{x^4} \cdot \sqrt{x} = x^2\sqrt{x}$
$\sqrt{x^7} = \sqrt{x^6 \cdot x} = \sqrt{x^6} \cdot \sqrt{x} = x^3\sqrt{x}$
$\sqrt{x^3} = \sqrt{x^2 \cdot x} = \sqrt{x^2} \cdot \sqrt{x} = x\sqrt{x}$