Standard Form of a Quadratic Function

$$y = ax^2 + bx + c$$

Standard Form of a Quadratic Equation

$$ax^2 + bx + c = 0$$

Ways to solve Quadratic Equations:

- Factoring
- Square Roots
- Quadratic Formula
- Graphing

Solving Quadratic Equations by Factoring:

1st: Make sure one side = 0
2nd: Factor completely
3rd: Solutions are zeros of each factor (x-intercepts)

Solve by factoring.

$12x^2 + 8x = 0$

Take out the GCF and find the zeros of the factors.

$4x(3x + 2) = 0$

$x = 0, -2/3$

Solve by factoring.

$6x^2 + 5x = 4$

$6x^2 + 5x - 4 = 0$

$(3x + 4)(2x - 1) = 0$

$x = -4/3, 1/2$

	$3x$	$+4$
$2x$	$6x^2$	$+8x$
-1	$-3x$	-4

-24, $+8$, -3, $+5$

Solve by factoring.

$x = -3, 6$

$5x^2 - 90 = 15x$

$-15x \quad -15x$

$5x^2 - 15x - 90 = 0$

$5(1x^2 - 3x - 18) = 0$

$5(x + 3)(x - 6) = 0$

-18, $+3$, -6, -3

Since the coefficient a=1 the numbers +3 and -6 can be turned directly into the factors.

Solve by factoring.

$4x^2 - 25 = 0$

$(2x \pm 5)$

$2x + 5 = 0 \qquad 2x - 5 = 0$

$x = \pm \frac{5}{2}$

What are the square roots of 100? ±10

Every Positive Number has two square roots ±

Solve using square roots.

Solve: $x^2 = 25$

$x = \pm 5$

Solve: $4x^2 - 25 = 0$

$+25 \quad +25$

$\frac{4x^2}{4} = \frac{25}{4}$

$\sqrt{x^2} = \sqrt{\frac{25}{4}}$

$x = \pm \frac{5}{2}$

What are the solutions to this equation?

$x^2 + 81 = 0$

$-81 \quad -81$

$\sqrt{x^2} = \sqrt{-81}$ → No Real Solutions

Why can't you solve the following equation using square roots?

$x^2 - 16x + 49 = 0$

Because of the -16x. There can't be a linear term and solve with square roots.

You can only solve a quadratic equation using square roots if the equation is:

1. In Standard Form $(ax^2 + bx + c = 0)$ and there is no linear term.
   $ax^2 + c = 0$
2. In Vertex Form.

Steps to solving with square roots.

1. Arrange the equation so whatever is being squared is alone on one side.
2. Find the square roots of both sides
3. Complete solving for x

Find the exact solutions to each using square roots.

1. $6x^2 - 24 = 0$

$+24 \quad +24$

$\frac{6x^2}{6} = \frac{24}{6}$

$\sqrt{x^2} = \sqrt{4}$

$x = \pm 2$

2. $27 - 2x^2 = 5$

$-27 \quad -27$

$\frac{-2x^2}{-2} = \frac{-22}{-2}$

$x^2 = 11$

$x = \pm\sqrt{11}$

Find the exact solutions to each using square roots.

3. $2(x - 10)^2 - 32 = 0$

$+32 \quad +32$

$\frac{2(x-10)^2}{2} = \frac{32}{2}$

$\sqrt{(x-10)^2} = \sqrt{16}$

$x - 10 = \pm 4$

$+10 \quad +10$

$+4+10 = 14$

$-4+10 = 6$

$x = 6, 14$

4. $3(x + 5)^2 - 21 = 0$
$+21 \quad +21$

$\frac{3(x+5)^2}{3} = \frac{21}{3}$

$\sqrt{(x+5)^2} = \pm\sqrt{7}$

$x + 5 = \pm\sqrt{7}$
$-5 \quad -5$

$\longrightarrow$ $x = -5 \pm \sqrt{7}$