$ax^2 + bx + c = 0$

You've learn two methods to solve quadratic equations:

sq

Square Roots

But,
it ony works some of the time.

ONLY when $b = 0$

Factoring

But,
this method only works some of the time too.
Not everything is factorable.

What if a Quadratic Equation can't be solved with either Square Roots or Factoring?

Use the Quadratic Formula!!

Sec 10-7: The Quadratic Formula

Equation must be in Standard Form:
$ax^2 + bx + c = 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

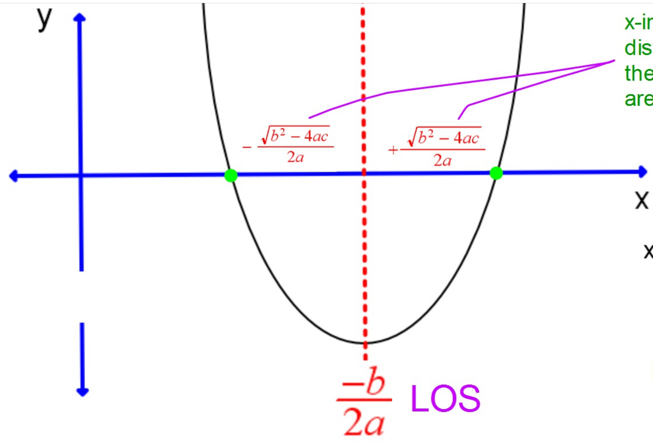
This can solve ANY Quadratic Equation!

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Sometimes written this way:

$$x = \frac{-b}{2a} \pm \frac{\sqrt{b^2 - 4ac}}{2a}$$

Remember, solving a quadratic equation is the same as finding the x-intercepts of the graph.



x-intercepts are the same distance on both sides of the LOS because they are reflections of each other.

x-intercepts:

$$x = \frac{-b}{2a} \pm \frac{\sqrt{b^2-4ac}}{2a}$$

LOS

distance from LOS to each x-intercept

Steps to follow when using the Quadratic Formula

1. Make sure the equation is written in Standard Form, $ax^2 + bx + c = 0$
2. Find the values of
   - $-b$
   - $b^2 - 4ac$
   - $2a$
3. Substitute these values into the formula
4. Calculate this formula first with either the $+$ or $-$
5. Then calculate a second time using the other sign.

$$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$$

$4x^2 + 5x = 13$

Solve this quadratic equation using the Quadratic Formula. Round to the nearest tenth if necessary.

First write eq in Standard Form: $4x^2 + 5x - 13 = 0$

$b^2 - 4ac = 25 - 4(4)(-13) = 233$

$-b = -5$

$2a = 8$

$$x = \frac{-5 \pm \sqrt{233}}{8}$$

$$= \boxed{1.3, -2.5}$$

Solve using the Quadratic Formula. Round to a tenth if needed.

$2x^2 - 7x - 5 = 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

b^2 - 4ac = 49 - 4(2)(-5) = 89

-b = 7

2a = 4

$$x = \frac{7 \pm \sqrt{89}}{4}$$

$$= \boxed{4.1, -0.6}$$

Solve using the Quadratic Formula. Round to a tenth if needed.

$2x^2 + 5x - 42 = 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

b^2 - 4ac = 25 - 4(2)(-42) = 361

-b = -5

2a = 4

$$x = \frac{-5 \pm \sqrt{361}}{4}$$

$$= \boxed{3.5, -6}$$

Solve using the Quadratic Formula. Round to a tenth if needed.

$4x^2 - 20x + 25 = 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

b^2 - 4ac = $(-20)^2$ - 4(4)(25) = 0

-b = 20

2a = 8

$$x = \frac{20 \pm \sqrt{0}}{8} = \frac{20}{8}$$

$$= \boxed{2.5}$$

There is only one unique solution to this quadratic equation.
This means the graph will have only one x-intercept.

Solve using the Quadratic Formula. Round to a tenth if needed.

$x^2 - 5x + 12 = 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

b^2 - 4ac = 25 - 4(1)(12) = -23

-b =

2a =

Once you know that b^2 - 4ac is NEGATIVE there is NO REAL SOLUTION

Find the EXACT solutions to this Quadratic Equation.

$4x^2 + 6x - 3 = 0$

$b^2 - 4ac = 36 - 4(4)(-3) = 84$

$-b = -6$

$2a = 8$

$x = \frac{-6 \pm \sqrt{84}}{8} \leftarrow \sqrt{4 \cdot 21}$

$= \frac{-6 \pm 2\sqrt{21}}{8}$ reduce all parts of this fraction by a factor of 2.

$= \frac{-3 \pm \sqrt{21}}{4}$

Find the EXACT solutions to this Quadratic Equation.

$x^2 - 10x + 19 = 0$

$b^2 - 4ac = 100 - 4(1)(19) = 24$

$-b = 10$

$2a = 2$

$x = \frac{10 \pm \sqrt{24}}{2} \leftarrow \sqrt{4 \cdot 6}$

$x = \frac{10 \pm 2\sqrt{6}}{2}$ divide both terms in the numerator by 2

$= 5 \pm \sqrt{6}$

A ball is shot into the air. The following equation models the height of the ball as a function of time:

$h(t) = -16t^2 + 184t + 35$

This tells me to find the coordinates of the vertex!

(t, h)

$\frac{-b}{2a} = \frac{-184}{-32} = 5.75$ sec

1. Find the maximum height of the ball.

564 feet

2. Find the time it takes to reach this maximum height.

5.75 sec

replace t with 5.75
h(5.75)=564 ft

$h(t) = -16t^2 + 184t + 35$

How long does it take this ball to come back down to the ground?

When the ball reaches the ground it has a height of zero. Therefore, replace h(t) with zero and solve for time using the Quadratic Equation.