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

What part of the Quadratic Formula determines if there are Real solutions or not?

b^2 - 4ac ⟶ This is called the DISCRIMINANT

Depending on the value of the DISCRIMINANT you can determine how many and what kind of solutions there will be.

Discriminate: recognize a distinction; differentiate

What are the only three values the DISCRIMINANT can be?

Negative   Zero   Positive

Discriminant	# and kind of solutions
b^2 - 4ac > 0	2 Real Solutions
b^2 - 4ac = 0	1 Real Solution
b^2 - 4ac < 0	0 Real Solutions or 2 Imaginary Solutions

Tell the number of solutions each quadratic equation has and if they are real or imaginary.

1. $x^2 + 8x - 3 = 0$

$b^2 - 4ac = 76$

2 Real

2. $2x^2 - 7x + 8 = 0$

$b^2 - 4ac = -15$

No Real

3. $-3x^2 - 4x + 5 = 0$

$b^2 - 4ac = 76$

2 Real

4. $2x^2 - 20x + 50 = 0$

$b^2 - 4ac = 0$

1 Real

5. $-4x^2 + 7x - 2 = 0$

$b^2 - 4ac = 17$ 2 Real

For some of these equations you can tell that there will be 2 Real solutions without doing anything. Which ones?

A Quadratic Equation always has two real solutions if: $b^2 - 4ac$ is POSITIVE

$b^2 - 4ac$ will ALWAYS be Posiitve if:

Either a OR c is negative.

How many x-intercepts does each Quadratic Function have?

1. $y = 9x^2 - 12x + 36$

$b^2 - 4ac = -1152$

NO X-INT

2. $y = 7x^2 + 3x - 43$

$b^2 - 4ac = 1213$

2 Y-INT

3. $y = 6x^2 - 30x + 37.5$

$b^2 - 4ac = 0$

1 X-INT

An object is shot into the air from the top of a 80 foot tall building. The following equation models the height (ft) of the object as a function of time (sec).

$$h(t) = -16t^2 + 172t + 80$$

(t, h)

a) Find the max height and the time to reach it.

LOS $t = \dfrac{-172}{-32} = 5.375$ sec

y-coord → $h(5.375) = 542.25$ ft

b) Find the time to reach the ground

$0 = -16t^2 + 172t + 80$

$b^2 - 4ac = 34704$ $\dfrac{-172 \pm \sqrt{34704}}{-32}$

Neg time is not possible here

$t = -.48$ 11.20 sec

An object is shot into the air from the top of a 35 foot tall building.
The following equation models the height (ft) of the object as a function
of time (sec). $h(t) = -16t^2 + 102t + 35$

a) Find the time to reach a height of 300 ft.

$h = 300$

$300 = -16t^2 + 102t + 35$
-300 -300

$0 = -16t^2 + 102t - 265$

$b^2 - 4ac = -6556$

THIS OBJECT
DOESN'T Reach
a height of
          300 ft

b) Find the time to reach a height of 50 feet.

$h = 50$

$50 = -16t^2 + 102t + 35$
-50 -50

$0 = -16t^2 + 102t + 15$

$b^2 - 4ac = 9444$

$t = \dfrac{-102 \pm \sqrt{9444}}{-32}$

$t = 0.15 \ \& \ 6.22 \ sec$

These both make
Sense.