

SOLVING QUADRATIC EQUATIONS BY THE QUADRATIC FORMULA

THE QUADRATIC FORMULA

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

2. This is the quadratic formula!
3. Just identify a, b, and c then substitute into the formula.

WHY USE THE QUADRATIC FORMULA?

The quadratic formula allows you to solve ANY quadratic equation, even if you cannot factor it.

An important piece of the quadratic formula is what's under the radical:



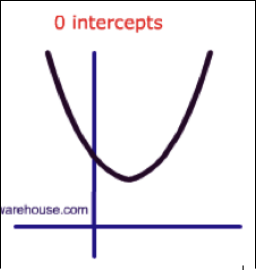
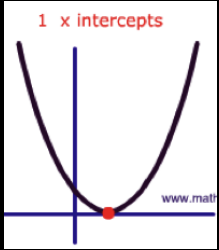
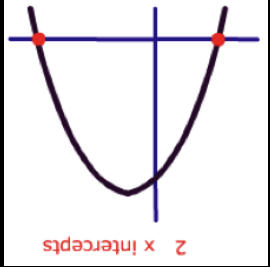
$$b^2 - 4ac$$

This piece is called the **discriminant**.

WHY IS THE DISCRIMINANT IMPORTANT?

The **discriminant** tells you the **number** and **types of answers (roots)** you will get. The **discriminant** can be $+$, $-$, or 0 which actually tells you a lot! Since the **discriminant** is under a radical, think about what it means if you have a positive or negative number or 0 under the radical.

WHAT THE DISCRIMINANT TELLS YOU!

Value of the Discriminant	Nature of the Solutions	Picture
Negative	No solution No roots Never touches x-axis	 <p>A coordinate plane showing a parabola opening upwards. The vertex is above the x-axis, and the entire curve is above the x-axis, not touching it. The text '0 intercepts' is written in red above the graph. A small watermark 'warehouse.com' is visible at the bottom left of the graph area.</p>
Zero	One Solution One root Touches x-axis once	 <p>A coordinate plane showing a parabola opening upwards. The vertex of the parabola is exactly on the x-axis, touching it at one point. A red dot marks the point of contact. The text '1 x intercepts' is written in red above the graph. A small watermark 'www.math' is visible at the bottom right of the graph area.</p>
Positive	2 Solutions Two roots Touches x-axis twice	 <p>A coordinate plane showing a parabola opening upwards. The parabola intersects the x-axis at two distinct points, marked with red dots. The text '2 x intercepts' is written in red below the graph.</p>

TO SUMMARIZE...

What do the solutions represent?

In the quadratic formula, the expression inside the $\sqrt{\text{Radical}}$ is called the discriminant.

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ So $b^2 - 4ac$ is used to find the number of solutions.

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REMEMBER! The number of solutions is equal to the number of x-intercepts of that equation.

★ ★ ★ SOLUTIONS = ROOTS = ANSWERS = X-INTERCEPTS