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The Quadratic Formula.

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



What Does The Formula Do ?

The Quadratic formula allows you to find the roots of a quadratic equation (if they exist) even if the quadratic equation does not factorise.

The formula states that for a quadratic equation of the form :

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

The roots of the quadratic equation are given by :

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



James Madison High School Example 1

Use the quadratic formula to solve the equation :

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

Solution:

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

$$a = 1 \quad b = 5 \quad c = 6$$

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

$$x = \frac{-5 \pm \sqrt{5^2 - (4 \times 1 \times 6)}}{2 \times 1}$$

$$x = \frac{-5 \pm \sqrt{25 - (24)}}{2}$$

$$x = \frac{-5 \pm \sqrt{1}}{2}$$

$$x = \frac{-5 + 1}{2} \quad \text{or} \quad x = \frac{-5 - 1}{2}$$

$$x = -2 \quad \text{or} \quad x = -3$$

These are the roots of the equation.



James Madison High School Example 2

Use the quadratic formula to solve the equation :

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

Solution:

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

$$a = 8 \quad b = 2 \quad c = -3$$

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

$$x = \frac{-2 \pm \sqrt{2^2 - (4 \times 8 \times -3)}}{2 \times 8}$$

$$x = \frac{-2 \pm \sqrt{4 - (-96)}}{16}$$

$$x = \frac{-2 \pm \sqrt{100}}{16}$$

$$x = \frac{-2 + 10}{16} \quad \text{or} \quad x = \frac{-2 - 10}{16}$$

$$x = \frac{1}{2} \quad \text{or} \quad x = -\frac{3}{4}$$

These are the roots of the equation.



James Madison High School Example 3

Use the quadratic formula to solve the equation :

$$8x^2 - 22x + 15 = 0$$

Solution:

$$8x^2 - 22x + 15 = 0$$

$$a = 8 \quad b = -22 \quad c = 15$$

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

$$x = \frac{-(-22) \pm \sqrt{(-22)^2 - (4 \times 8 \times 15)}}{2 \times 8}$$

$$x = \frac{22 \pm \sqrt{(484 - (480))}}{16}$$

$$x = \frac{22 \pm \sqrt{4}}{16}$$

$$x = \frac{22+2}{16} \quad \text{or} \quad x = \frac{22-2}{16}$$

$$x = 3/2 \quad \text{or} \quad x = 5/4$$

These are the roots of the equation.



James Madison High School Example 4

Use the quadratic formula to solve for x to 2 d.p :

$$2x^2 + 3x - 7 = 0$$

Solution:

$$2x^2 + 3x - 7 = 0$$

$$a = 2 \quad b = 3 \quad c = -7$$

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

$$x = \frac{-3 \pm \sqrt{3^2 - (4 \times 2 \times -7)}}{2 \times 2}$$

$$x = \frac{-3 \pm \sqrt{9 - (-56)}}{4}$$

$$x = \frac{-3 \pm \sqrt{65}}{4}$$

$$x = \frac{-3 + 8.0622}{4} \quad \text{or} \quad x = \frac{-3 - 8.0622}{4}$$

$$x = 1.27 \quad \text{or} \quad x = -2.77$$

These are the roots of the equation.