Solve Quadratics using Quadratic Formula

The Quadratic Formula

Solve

$$x^2 + 13 = 6x$$
$$ -6x -6x$$
$$x^2 - 6x + 13 = 0$$

$a = 1 \quad b = -6 \quad c = 13$

$$x = \frac{6 \pm \sqrt{(-6)^2 - 4 \cdot 1 \cdot 13}}{2 \cdot 1}$$

$$x = \frac{6 \pm \sqrt{-16}}{2}$$

$$x = \frac{6 \pm 4i}{2}$$

*if you can divide all 3 "outside" #s by a GCF, then you can simplify more

$$\frac{\frac{6}{2} \pm \frac{4i}{2}}{2/2}$$

$$x = 3 \pm 2i$$

The Quadratic Formula:

If $ax^2 + bx + c = 0$, and $a \neq 0$, then

opposite sign of b

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

← discriminant
tells you # +
type of solutions

+: 2 real sol.
0: 1 real sol.
−: 2 imag. sol
2 imag. so

ONE Real solution

$b^2 - 4ac = 0$

—OR—

Two ~~Imaginary~~ **NO**
~~solutions~~
$b^2 - 4ac$ is negative

TWO Real solutions

$b^2 - 4ac$ is positive

The Quadratic Formula:

If $ax^2 + bx + c = 0$, and $a \neq 0$, then

opposite sign of b ↓

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

← discriminant
tells you # + type of solutions

$+$: 2 real sol.
0: 1 real sol.
$-$: 2 imag. sol.

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1 Solve $x^2 - 2x - 8 = 0$.

$a=1 \quad b=-2 \quad c=-8$

① Plug in a, b, c to formula

$x = \dfrac{2 \pm \sqrt{(-2)^2 - 4(1)(-8)}}{2(1)}$

② Simplify under radical

$x = \dfrac{2 \pm \sqrt{36}}{2}$

③ Simplify radical

$x = \dfrac{2 \pm 6}{2}$

★ Since there isn't a radical or i you can separate + add/subtract

$x = \dfrac{2+6}{2} = 4 \qquad x = \dfrac{2-6}{2} = -2$

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3 Solve $x^2 + 6x + 9 = 0$.

$a=1 \quad b=6 \quad c=9$

$x = \dfrac{-6 \pm \sqrt{(6)^2 - 4 \cdot 1 \cdot 9}}{2(1)}$

discr. $= 0$
1 real sol.

$x = \dfrac{-6 \pm \sqrt{0}}{2}$

$x = \dfrac{-6 \pm 0}{2} = \dfrac{-6}{2}$

$x = -3$

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

$a=3 \quad b=5 \quad c=-4$

$x = \dfrac{-5 \pm \sqrt{(5)^2 - 4 \cdot 3 \cdot -4}}{2(3)}$

$x = \dfrac{-5 \pm \sqrt{73}}{6}$

discriminant $= 73$ meaning you will have 2 real sol.

★ Since you can't simplify the $\sqrt{73}$, you are done.

2 solutions:

$\dfrac{-5 + \sqrt{73}}{6}$ and $\dfrac{-5 - \sqrt{73}}{6}$

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

$a=2 \quad b=-3 \quad c=5$

$x = \dfrac{3 \pm \sqrt{(-3)^2 - 4(2)(5)}}{2(2)}$

discr. $= -31$
2 imag. sol.

$x = \dfrac{3 \pm \sqrt{-31}}{4}$

$x = \dfrac{3 \pm i\sqrt{31}}{4}$