The Quadratic Formula

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

When To Use The Quadratic Formula

When solving an equation that shows a quadratic equal to zero. If you see, or can make, $ax^2 + bx + c = 0$, use it.

What The Quadratic Formula Finds

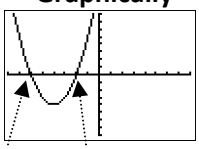
The quadratic formula finds all solutions for $ax^2 + bx + c = 0$. These can also be called roots, x-intercepts, or zeros.

Example #1: Solve $x^2 + 8x + 12 = 0$

a = 1, b = 8, c = 12

$\frac{-8 \pm \sqrt{8^2 - 4(1)(12)}}{2(1)} = \frac{-8 \pm \sqrt{16}}{2} = \frac{-8 \pm 4}{2} = -2 \text{ or } -6$

What does the solution mean …

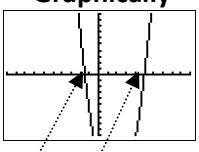
Graphically	Equation	Factoring
 x=-6 x=-2	Only -2 & -6 work in the equation $x^2 + 8x + 12 = 0$	(x + 2)(x + 6)=0

Example #2: Solve $2x^2 - 7x - 15 = 0$

a = 2, b = -7, c = -15

$\frac{7 \pm \sqrt{7^2 - 4(2)(-15)}}{2(2)} = \frac{7 \pm \sqrt{169}}{4} = \frac{7 \pm 13}{4} = 5 \text{ or } \frac{-3}{2}$

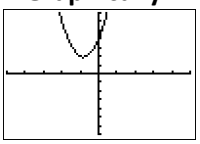
What does the solution mean …

Graphically	Equation	Factoring
 x=-1.5 x=5	Only 5 & -1.5 work in the equation $2x^2 - 7x - 15 = 0$	(x + 1.5)(x – 5)=0

Example #3: Solve $3x^2 + 5x + 4 = 0$

$\frac{-5 \pm \sqrt{5^2 - 4(3)(4)}}{2(3)} = \frac{-5 \pm \sqrt{-23}}{6}$ ← WHAT?

The number under the square root is called the discriminant. If negative, the solution is imaginary – meaning no real solution.

Graphically	Equation	Factoring
	NO REAL SOLUTION	CAN'T FACTOR

DISCRIMINANT

IF …

$b^2 - 4ac < 0$, then no real solutions
$b^2 - 4ac = 0$, then there is only 1 solution
$b^2 - 4ac > 0$, then there are 2 solutions

Try these (if a square root does not simplify nicely, you don't need to simplify) …

1. $x^2 + 3x - 28 = -10$
2. $12x^2 - 17x - 5 = 0$
3. $4x^2 - 3x + 5 = 0$
4. $2x^2 + 8x + 3 = 6$
5. $-5x^2 - 2 = 4x$
6. $3x^2 - 4x - 1 = 0$

The Quadratic Formula

ANSWER KEY

1. x = - 6 and x = 3

2. x = $\frac{5}{3}$ and x = $-\frac{1}{4}$

3. No real solution

4. x = $\frac{-8 \pm \sqrt{88}}{4}$ or $\frac{-4 \pm \sqrt{22}}{2}$

5. No real solution

6. x = $\frac{4 \pm \sqrt{28}}{6}$ or $\frac{-2 \pm \sqrt{7}}{3}$