Unit 1.3: Solving a Quadratic Equation using the Quadratic Formula

What happens when you can't factor a quadratic? Another algebraic method we can use to solve quadratic equations is using the quadratic formula. When the quadratic is in standard form, (Meaning: $ax^2 + bx + c$), you locate a, b, c and plug the values into the following formula:

YOU NEED TO MEMORIZE THIS!!	$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$ * sung to tune of "Pop Goes the Weasel"

Let's Practice! Use this formula to solve the following equation: $x^2 + 4x - 9 = 0$

Step 1: Identify the following: a= 1 b= 4 c= -9

Step 2: Plug these values into the Quadratic Formula

Step 3: Simplify the radical (solve for x).

Not every problem needs to be solved by the quadratic formula. Use it if the glasses step of factoring doesn't work, otherwise you can:

- solve by factoring
- solve by getting x by itself (if only one term has x)

ERROR ALERT! Simplifying the radical is the place where most mistakes are made. Be Careful!

Example 1: Solve each equation using the quadratic formula

* Be sure equation is set = to 0

a) $x^2 + x - 11 = 0$

b) $x^2 + 11x + 18 = 3$
$-3 \quad -3$
$x^2 + 11x + 15$
$a=1 \quad b=11 \quad c=15$
$-15x^2$ Doesn't work, use quad formula
$\frac{-11 \pm \sqrt{(11)^2-4(1)(15)}}{2(1)} = \frac{-11 \pm \sqrt{61}}{2}$

c) $4x^2 + 10x + 6 = 0$ Can factor
$6x^2$ $2((2x^2+5x+3)) = 0$
$2x \cdot 3x$ $2(2x^2+2x+3x+3) = 0$
$2(2x(x+1)+3(x+1)) = 0$
$2(2x+3)(x+1) = 0$
$x = -\frac{3}{2}$ $x = -1$

d) $3x^2 - 8 = 0$ Get x by itself
$3x^2 = 8$
$x^2 = \frac{8}{3}$
$x = \sqrt{\frac{8}{3}} = \frac{\sqrt{8}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$
$= \frac{\sqrt{24}}{3} = \pm \frac{2\sqrt{6}}{3}$
$\sqrt{24}$ $6 \cdot 4$ $2 \cdot 3$ $2 \cdot 2$

e) $x^2 - 4x + 10 = 0$

f) $2x^2 - 6x + 5 = 0$

$a=2 \quad b=-6 \quad c=5$

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

Reduce all three numbers

$$= \frac{6 \pm \sqrt{-4}}{4} = \frac{6 \pm 2i}{4} = \boxed{\frac{3 \pm i}{2}}$$

g) $2x^2 = -10$

$x^2 = -5$

$x = \pm\sqrt{-5}$

$\boxed{x = \pm i\sqrt{5}}$

Imaginary answers happen with a negative under the square root

h) $5x^2 = 8 - 5n$

Example 2:

a. Is it possible for a quadratic graph to have 1 real solution? If yes, sketch an example of that graph:

NOTE

b. Is it possible for a quadratic graph to have 0 real solutions? If yes, sketch an example of that graph:

NOTE