Essential Question: How do we solve quadratic equations?

Do Now: Compare and contrast the equations below.

a) $x^2 + 1 = 10$

$x^2 = 9$

$\sqrt{x^2} = \pm\sqrt{9}$

$x = \pm 3$

b) $x + 1 = 9$

$x = 8$

(a) has two solutions

Think about this to help you...

- Are the equations equivalent? No
- Would you solve the equations in the same way? No
- Do the equations have the same number of solutions? No

Quadratic Equation: An equation of the form $ax^2 + bx + c = 0$ where a, b, and c are real numbers and $a \neq 0$

Let's look at another quadratic equation. How would you solve $x^2 - 6x + 8 = 0$?

[to solve, set equation = to zero]

- Factor
- set each factor equal to zero
- solve for x

$(x-4)(x-2) = 0$

$x - 4 = 0$ | $x - 2 = 0$

$x = 4$ $x = 2$

Examples:

1) $x^2 - 8x = -16$

$x^2 - 8x + 16 = 0$

$(x-4)(x-4) = 0$

$x - 4 = 0$ | $x - 4 = 0$

$x = 4$ | $x = 4$

$\{4\}$

2) $x^2 + 5x = 36$

$x^2 + 5x - 36 = 0$

$(x+9)(x-4) = 0$

$x + 9 = 0$ | $x - 4 = 0$

$x = -9$ | $x = 4$

$\{-9, 4\}$

3) $x^2 - 16 = 0$

$(x-4)(x+4) = 0$

$x - 4 = 0$ | $x + 4 = 0$

$x = 4$ | $x = -4$

$\{-4, 4\}$

4) $4x^2 - x = 0$

$x(4x-1) = 0$

$x = 0$ | $4x - 1 = 0$

$4x = 1$

$x = \frac{1}{4}$

$\{0, \frac{1}{4}\}$

5) $3x^2 - 6x - 45 = 0$

$3(x^2 - 2x - 15) = 0$

$3(x-5)(x+3) = 0$

$x - 5 = 0$ | $x + 3 = 0$

$x = 5$ | $x = -3$

$\{-3, 5\}$

6) $5x^2 - 125 = 0$

$5(x^2 - 25) = 0$

$5(x+5)(x-5) = 0$

$x + 5 = 0$ | $x - 5 = 0$

$x = -5$ | $x = 5$

$\{-5, 5\}$

Solving Quadratic Equations by Factoring

1) **Rewrite the equation in the form of $ax^2 + bx + c = 0$**
2) **Factor**
3) **Set each factor equal to zero and solve (*zero product property*)**
4) **Check solution set with the original equation**

7) $x(x-2)=35$

$x^2 - 2x = 35$

$x^2 - 2x - 35 = 0$

$(x-7)(x+5)=0$

$x-7=0$	$x+5=0$
$x=7$	$x=-5$

$\{-5,7\}$

8) $x^2+5x-12=8x-2$

$-8x \quad -8x$

$x^2-3x-12=-2$

$+2 \quad +2$

$x^2-3x-10=0$

$(x-5)(x+2)=0$

$x-5=0$	$x+2=0$
$x=5$	$x=-2$

$\{-2,5\}$

Quadratic Equations can be solved by factoring and using the zero product property. If the product of two quantities equals zero, at least one of the quantities must equal zero.

One more question...

The solution set of the equation $x^2-4x-12=0$ is

(1) {-6,2} (3) {-2,6}

(2) {-4,3} (4) {-3,4}

other strategies:

substitute each number into the equation to see which set of numbers will make the equation equal to zero

or put $y = x^2-4x-12$ in calculator look at table of values when $y=0$

$x=-2$ and $x=6$

Answer the question without looking at the choices!

$x^2-4x-12=0$

$(x-6)(x+2)=0$

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

$\{-2,6\}$

choice (3)