

Warm-up:

Solve each quadratic equation by factoring.

1)  $x^2 - 12x - 28 = 0$

$(x - 14)(x + 2) = 0$

$x - 14 = 0$      $x + 2 = 0$

$x = 14$      $x = -2$

2)  $x^2 - 2x = 48$

$x^2 - 2x - 48 = 0$

$(x - 8)(x + 6) = 0$

$x - 8 = 0$      $x + 6 = 0$

$x = 8$      $x = -6$

3)  $5x^2 - 20x = 0$

$5x(x - 4) = 0$

$5x = 0$      $x - 4 = 0$

$x = 0$      $x = 4$

4)  $2x^2 = -8x$

$2x^2 + 8x = 0$

$2x(x + 4) = 0$

$2x = 0$      $x + 4 = 0$

$x = 0$      $x = -4$

Agenda:

- 1) Warm-up
- 2) Homework questions
- 3) New Lesson---3.1 Solving quadratic equations (day 3)
- 4) Homework/in-class activity

## Algebra 2: 3.1 Solving Quadratic Equations (day 3):

### Learning Targets for Today:

- 1) Solve quadratic equations by factoring!

### (A) Solving Quadratic Equations by factoring

A quadratic equation is an equation that can be written in the form  $f(x) = ax^2 + bx + c$ , where "a" cannot be 0. A root of an equation is a solution of the equation.

- When the left side of  $ax^2 + bx + c = 0$  is factorable, you can solve the equation using the *Zero Product Property!*
- last time we factored "easy" trinomials because they all started with  $1x^2$ ...today there is a number in front

#### Factoring trinomials (by grouping):

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

**Step 1:** Set the equation equal to zero ( $= 0$ )

**Step 2:** Multiply a & c together

**Step 3:** Find all factors of ac.

- Pick the set of factors that add/subtract to the middle number (b)
- Re-write the trinomial as a four term polynomial (using the factors you just found. (watch for +/-)
- Hint...the 2<sup>nd</sup> sign in the trinomial tells us if we need to add (+) or subtract (-) to get to the middle number

**Step 4:** Factor the 4-term polynomial by grouping.

\*Can always check by foil!!!!

Example:  
 $3x^2 - 17x + 10 = 0$

30 · 1  
 15 · 2  
 10 · 3  
 6 · 5

$$\left( \frac{3x^2 - 15x}{3x} \right) \left( \frac{-2x + 10}{-2} \right) = 0$$

$$3x(x-5) - 2(x-5) = 0$$

$$(x-5)(3x-2) = 0$$

$$x-5 = 0 \quad 3x-2 = 0$$

$$\underline{x=5}$$

$$3x = 2$$

$$\underline{x = \frac{2}{3}}$$

Try/Together:

$$4x^2 - 4x - 3 = 0$$

12 · 1  
 6 · 2  
 4 · 3

$$\left( \frac{4x^2 - 6x}{2x} \right) \left( \frac{2x - 3}{1} \right) = 0$$

$$2x(2x-3) + 1(2x-3) = 0$$

$$(2x-3)(2x+1) = 0$$

$$2x-3 = 0 \quad 2x+1 = 0$$

$$2x = 3$$

$$2x = -1$$

$$\underline{x = \frac{3}{2}}$$

$$\underline{x = -\frac{1}{2}}$$

Try:

$$1) 2x^2 + 7x + 3 = 0$$

6 · 1  
 3 · 2

$$\left( \frac{2x^2 + 6x}{2x} \right) \left( \frac{1x + 3}{1} \right) = 0$$

$$2x(x+3) + 1(x+3) = 0$$

$$(x+3)(2x+1) = 0$$

$$x+3 = 0 \quad 2x+1 = 0$$

$$\underline{x = -3}$$

$$2x = -1$$

$$\underline{x = -\frac{1}{2}}$$

$$2) 3x^2 + 32x - 11 = 0$$

33 · 1  
 11 · 3

$$\left( \frac{3x^2 + 33x}{3x} \right) \left( \frac{-1x - 11}{-1} \right) = 0$$

$$3x(x+11) - 1(x+11) = 0$$

$$(x+11)(3x-1) = 0$$

$$x+11 = 0 \quad 3x-1 = 0$$

$$\underline{x = -11}$$

$$3x = 1$$

$$\underline{x = \frac{1}{3}}$$

$$3) 11x^2 + 14x - 16 = 0$$

$$\begin{array}{r} 176 \cdot 1 \\ 88 \cdot 2 \\ 44 \cdot 4 \\ \underline{22 \cdot 8} \end{array}$$

$$\left( \frac{11x^2 + 22x}{11x} \right) \left( \frac{-8x - 16}{-8} \right) = 0$$

$$11x(x+2) - 8(x+2) = 0$$

$$(x+2)(11x-8) = 0$$

$$x+2=0 \quad 11x-8=0$$

$$x = -2 \quad 11x = 8$$

$$x = \frac{8}{11}$$

$$4) 12x^2 - 25x = 7$$

$$12x^2 - 25x - 7 = 0$$

$$84 \cdot 1$$

$$42 \cdot 2$$

$$\underline{28 \cdot 3}$$

$$\left( \frac{12x^2 - 28x}{4x} \right) \left( \frac{+3x - 7}{1} \right) = 0$$

$$4x(3x-7) + 1(3x-7) = 0$$

$$(3x-7)(4x+1) = 0$$

$$3x-7=0$$

$$3x=7$$

$$x = \frac{7}{3}$$

$$4x+1=0$$

$$4x = -1$$

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

Example:

$$2x^2 - 17x + 45 = 3x - 5$$

$$\underline{-3x + 5} \quad \underline{-3x + 5}$$

$$2x^2 - 20x + 50 = 0$$

$$\begin{array}{r} 25 \cdot 1 \\ 5 \cdot 5 \end{array}$$

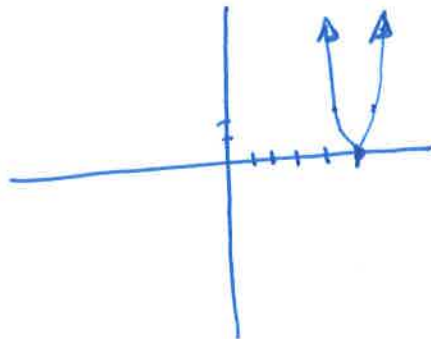
$$2(x^2 - 10x + 25) = 0$$

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

$$2=0 \quad x-5=0 \quad x-5=0$$

$$\underline{\underline{x=5}}$$

Picture



Try:

18 · 1  
9 · 2  
6 · 3

1)  $x^2 + 3x - 18 = 0$

$(x + 6)(x - 3) = 0$

$x + 6 = 0$     $x - 3 = 0$

$x = -6$     $x = 3$

2)  $9x^2 - 12x = -4$

$9x^2 - 12x + 4 = 0$

$(\begin{array}{r} 9x^2 - 6x \\ 3x \end{array}) (\begin{array}{r} -6x + 4 \\ -2 \end{array}) = 0$

36 · 1  
18 · 2  
12 · 3  
9 · 4  
6 · 6

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

$3x - 2 = 0$     $3x - 2 = 0$

$x = 2/3$     $x = 2/3$

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

3)  $3x - 6 = x^2 - 10$

$-3x + 6 = x^2 - 10$

$x^2 - 3x - 4 = 0$

4 · 1  
2 · 2

$(x - 4)(x + 1) = 0$

$x - 4 = 0$     $x + 1 = 0$

$x = 4$     $x = -1$

(B) Solving quadratic equations by factoring---binomials

Factoring (binomials):

$$(a)^2 - (b)^2$$

- only works on binomials
- Must be a minus sign

\*Pattern  $(a)^2 - (b)^2$

Step 1:  $(a - b)(a + b)$

Example:

1)  $x^2 - 9 = 0$

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

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

$$x-3=0 \quad x+3=0$$

$$x=3 \quad x=-3$$

2)  $4x^2 - 25 = 0$

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

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

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

$$2x=5 \quad 2x=-5$$

$$x=5/2 \quad x=-5/2$$

Try:

1)  $x^2 - 64 = 0$

$$(x)^2 - (8)^2 = 0$$

$$(x-8)(x+8) = 0$$

$$x-8=0 \quad x+8=0$$

$$x=8 \quad ; \quad -8$$

2)  $64x^2 - 9 = 0$

$$(8x)^2 - (3)^2 = 0$$

$$(8x-3)(8x+3) = 0$$

$$8x-3=0 \quad 8x+3=0$$

$$x=3/8 \quad ; \quad -3/8$$

Homework: wks solving quadratic equations by factoring #3