Math 2 Unit 2.3 Solving Quadratics by Factoring Name: _____

- **quadratic equation (to solve by factoring)** → equation can be in two different forms:

1.) $ax^2+bx=0$ – will factor out a GCF.

2.) $ax^2+bx+c=0$ – will choose a method to FACTOR.

EQUATIONS MUST BE SET EQUAL TO ZERO!

NOTE: Quadratics may have 2 solutions, 1 solution, or NO REAL solution!
FOR FACTORING, YOU WILL HAVE REAL RATIONAL SOLUTIONS!

Zero-Product Property → A property used when solving quadratic equations (by factoring):

If have $a \cdot b = 0$

then $a=0$ or $b=0$

Ex: $(x+3)(x-2)=0$

→ $x+3=0$ $x=-3$ $x-2=0$ $x=2$

Example 1: Use the Zero-Product Property to solve each quadratic equation.

DO NOT DISTRIBUTE OR BOX/FOIL YOUR FACTORS!!

a.) $(x+5)(2x-6)=0$	b.) $3x(12x+4)=0$	c.) $(2x-3)^2=0$	d.) $5(x-4)(2x-1)=0$
$x+5=0$ $2x-6=0$ $x=-5$ $2x=6$ $x=3$ $\{-5,3\}$	$3x=0$ $12x+4=0$ $x=0$ $12x=-4$ $x=-4/12$ $\{-1/3,0\}$	$(2x-3)(2x-3)=0$ $2x-3=0$ $2x=3$ $x=3/2$ $\{3/2\}$ (HAS a multiplicity of 2)	~~$5=0$~~ $x-4=0$ $2x-1=0$ $x=4$ $2x=1$ $x=1/2$ $\{1/2,4\}$

xample 2: Solve each quadratic equation by factoring and using the Zero-Product Property.

a.) $x^2-6x=0$	b.) $x^2+3x-28=0$	c.) $x^2+8x=-15$
$\{0,6\}$	$\{-7,4\}$	$\{-5,-3\}$
d.) $8x^2+22x=2x$	e.) $18x^2=15x+12$	f.) $-15x^2-22x-18=-10$
$\{-5/2,0\}$	$\{-1/2,4/3\}$	$\{-4/5,-2/3\}$

Solutions to equations should be written in {SET NOTATION}!

ie: $x-4=0 \rightarrow x=4$ $\{4\}$

Set Notation

Example 2

a) $x^2 - 6x = 0$ ✓ set equal to zero!

$x(x-6) = 0$ Factor out a GCF!

DO NOT STOP AFTER FACTORING!

USE ZPP to get solutions!

$x = 0 \quad x - 6 = 0$

$x = 6$

$\{0, 6\}$

b) $x^2 + 3x - 28 = 0$ Choose a factoring method!

bx	a·c
3x	-28
	-1·28
	-2·14
-4x+7x	-4·7

$(x^2 - 4x)(7x - 28) = 0$

$x(x-4) + 7(x-4)$

$(x+7)(x-4) = 0$ DON'T STOP HERE!

USE ZPP!

$x + 7 = 0 \quad x - 4 = 0$

$x = -7 \quad x = 4$

$\{-7, 4\}$

c) $x^2 + 8x = -15$ NOT SET EQUAL TO ZERO!

$+15 \quad +15$

$x^2 + 8x + 15 = 0$

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

$x + 5 = 0 \quad x + 3 = 0$

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

$\{-5, -3\}$

d) $8x^2+22x = 2x$ SET EQUAL TO ZERO!

$-2x \quad -2x$

$8x^2+20x = 0$ In the form $ax^2+bx=0$, so take out a GCF!

$4x(2x+5)=0$

$\frac{4x}{4}=\frac{0}{4} \quad 2x+5=0$

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

$x=-5/2$

$\{-5/2, 0\}$

c) $18x^2 = 15x+12$

$-15x \quad -15x \quad -12$

$\frac{18x^2}{3}-\frac{15x}{3}-\frac{12}{3}=\frac{0}{3}$

$6x^2-5x-4=0$

$(6x^2+3x)(-8x-4)=0$

$3x(2x+1)-4(2x+1)$

$(3x-4)(2x+1)=0$

bx	a·c
-5x	-24
	1·-24
	2·-12
3x-8x	3·-8

$3x \neq 0$

$3x-4=0 \quad 2x+1=0$

$x=4/3 \quad x=-1/2$

$\{-1/2, 4/3\}$

f) $-15x^2-22x-18=-10$ SET EQUAL TO ZERO!

$+10 \quad +10$

$\frac{-15x^2}{-1}-\frac{22x}{-1}-\frac{8}{-1}=\frac{0}{-1}$ Divide by -1 to get rid of $-ax^2$!

$15x^2+22x+8=0$

$(15x^2+10x)(12x+8)=0$

$5x(3x+2)+4(3x+2)$

$(5x+4)(3x+2)=0$

bx	a·c
22x	120
	1·120
	2·60
	3·40
	4·30
	5·24
	6·20
	8·15
10x+12x	10·12

$5x+4=0 \quad 3x+2=0$

$5x=-4 \quad 3x=-2$

$x=-4/5 \quad x=-2/3$

$\{-4/5, -2/3\}$