Math-2

Lesson 5-3

Factoring Quadratics with Lead Coefficient Not = 1,

Irrational and Complex Conjugates

Factor the quadratic equations.

$$y = 3x^2 + 15x - 42$$

$$y = 3(x + 7)(x - 2)$$

$$y = 5x^2 - 15x - 20$$

$$y = 5(x - 4)(x + 1)$$

What if there is no common factor AND the lead coefficient is NOT equal to 1? $y = ax^2 + bx + c$

(These come from multiplying binomials that also do not have lead coefficients of 1.)

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

Use the "box method" to multiply the binomials

$$y = 2x^2 + 7x + 3$$

	x	3
2x	$2x^2$	6x
1	x	3

Notice a nice pattern when you multiply these binomials

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

$$y = 2x^2 + 7x + 3$$

Left times left is left

Right times right is right

"right plus right" *does not* add up to 7, but notice something.

$$6x$$

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

$$x$$

$$6x + x = 7x$$

$$2x^2 + 7x + 3$$

$$2 * 3 = 6$$

$$1 + 6 = 7$$

$$6 = 1 * 6$$

Are there any other factors of 6 that add up to 7?

Multiply 1st times Last $2 * 15 = 30$

$$2x^2 + 13x + 15$$

$$10 + 3 = 13$$

$$30 = 10 * 3$$

Are there any *other* factors of 30 that add up to 13?

This tells us to break <u>13x</u> into <u>10x + 3x</u>

$$2x^2 + 13x + 15$$

$$2x^2 + 10x + 3x + 15$$

	x	5
2x	$2x^2$	10x
3	3x	15

These are all of the terms in “the box”

Multiply 1st times Last

$$4x^2 + 13x + 10 \quad 4 * 10 = 40$$

$$8 + 5 = 13$$

Other factors of 40 that add up to 13?

$$40 = 8 * 5$$

This tells us to break 13x into 8x + 5x

$$4x^2 + 13x + 10$$

$$4x^2 + 8x + 5x + 10$$

These are all of the terms in “the box”

	4x	5
x	$4x^2$	5x
2	8x	10

$$4x^2 + 13x + 10$$

Factored form:

$$\rightarrow (x + 2)(4x + 5)$$

Multiply 1st times Last

These are all of the terms in "the box"

$$3x^2 + 14x + 8$$

$$3 * 8 = 24$$

	x	4
3x	$3x^2$	12x
2	2x	8

$$2 + 12 = 14$$

Other factors of 24 that add up to 14?

$$24 = 2 * 12$$

$$3x^2 + 14x + 8$$

This tells us to break 14x into 2x + 12x

Factored form:

$$3x^2 + 14x + 8$$

$$\rightarrow (3x + 2)(x + 4)$$

$$3x^2 + 2x + 12x + 8$$

Factor

9*10 = ____

$$9x^2 - 13x - 10$$

____*____= ____

____+____= -13

12*5 = ____

$$12x^2 - 16x + 5$$

____*____= ____

____+____= -16

Factor

____ * ____ = ____

$$6x^2 - 5x - 6$$

____ * ____ = ____

____ + ____ = ____

____ * ____ = ____

$$8x^2 - 2x - 3$$

____ * ____ = ____

____ + ____ = ____

Factor

____ * ____ = ____

$$7x^2 - 12x - 4$$

____ * ____ = ____

____ + ____ = ______

____ * ____ = ____

$$6x^2 - 29x + 9$$

____ * ____ = ____

____ + ____ = ____

Standard form

$$y = 2x^2 + 7x + 3$$ y-intercept? $(0, 3)$

Intercept form

$$y = (2x + 1)(x + 3)$$ x-intercepts?

According to the zero product property, if: $x + 3 = 0$

$$-3 \quad -3$$

$$x = -3$$

then: $y = 0$

then one x-intercept is: $(-3, 0)$

And if: $2x + 1 = 0$ then: $y = 0$

$$-1 \quad -1$$

$$2x = -1$$

$$\div 2 \quad \div 2$$

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

The other x-intercept is: $(-\frac{1}{2}, 0)$

Standard form

$$y = 6x^2 - 5x - 6$$

y-intercept? $(0, -6)$

Intercept form

$$y = (3x + 2)(2x - 3)$$

x-intercepts?

$(-\frac{2}{3}, 0)$ $(\frac{3}{2}, 0)$

$$y = 8x^2 - 2x - 3$$

y-intercept? $(0, -3)$

Intercept form

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

x-intercepts?

$(\frac{-1}{2}, 0)$ $(\frac{3}{4}, 0)$

Standard form

$$y = 7x^2 - 12x - 4$$

y-intercept? $(0, -4)$

Intercept form

$$y = (7x + 2)(x - 2)$$

x-intercepts?

$(-\frac{2}{7}, 0)$ $(2, 0)$

$$y = 6x^2 - 29x + 9$$

y-intercept? $(0, 9)$

Intercept form

$$y = (2x - 9)(3x - 1)$$

x-intercepts?

$(\frac{9}{2}, 0)$ $(\frac{1}{3}, 0)$