Math-2

Lesson 5-3
Factoring Quadratics with Lead
Coefficient Not = 1,
Irrational and Complex Conjugates

Factor the quadratic equations.

$$y = 3x^2 + 15x - 42$$
 $y = 5x^2 - 15x - 20$
 $y = 3(x + 7)(x - 2)$ $y = 5(x - 4)(x + 1)$

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.)

Use the "box method" to multiply the binomials

	Х	3
2x	2x ²	6x
1	X	3

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

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

Notice a nice pattern when you multiply these binomials

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

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

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

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

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

$$6x$$

$$6x + x = 7x$$

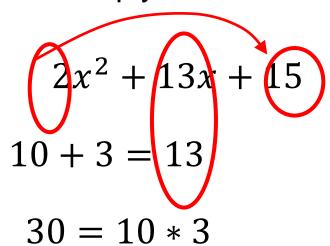
$$2 * 3 = 6$$

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

Notice a nice pattern when you multiply the
$$y=(2x+1)(x+3)$$
 "right plus right" up to 7, but notice $y=2x^2+7x+3$ "right plus right" up to

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

$$2 * 15 = 30$$



$$30 = 10 * 3$$

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

This tells us to break 13x into 10x + 3x

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

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

	Х	5
2x	2x ²	10x
3	3x	(15)

These are all of the terms in "the box"

Multiply 1st times Last

$$4x^{2} + 13x + 10 4 * 10 = 40$$

$$8 + 5 = 13 Other factors of 40$$
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

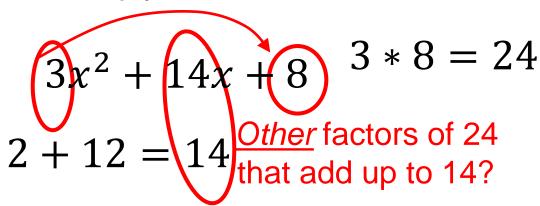
$$4x^2 + 13x + 10$$

Factored form:

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

Multiply 1st times Last

These are all of the terms in "the box"



$$24 = 2 * 12$$

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

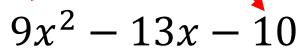
$$3x^2 + 14x + 8$$

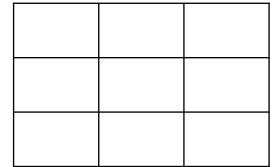
$$3x^2 + 14x + 8$$

Factored form:

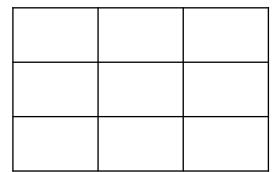
$$\rightarrow (3x+2)(x+4)$$

Factor





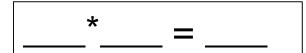
 $12x^2 - 16x + 5$

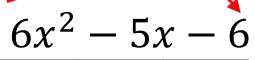


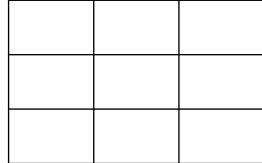
____*___= ____

____+__= -16

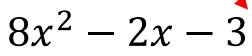
Factor

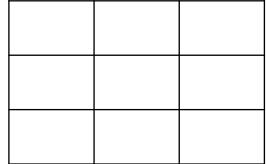




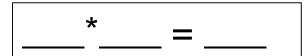


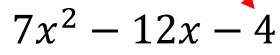


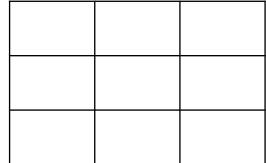




Factor

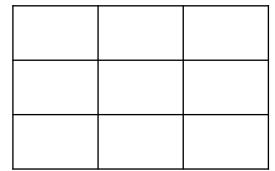












Standard form

$$y = 2x^2 + 7x + 3 \quad \text{y-intercept?} \quad (0,3)$$

Intercept form

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

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

then: $y = 0$
then one x intercept is: $(-2,0)$

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

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

$$-1 - 1$$

$$2x = -1$$

$$\div 2 \div 2$$

$$x = -\frac{1}{2}$$
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?
 $(\frac{9}{2}, 0)$ $(\frac{1}{3}, 0)$