Math-2A

Lesson 2-13
Factoring Quadratics with Lead
Coefficient Not = 1

When factoring a quadratic expression, what if there is no common factor AND the lead coefficient is NOT equal to 1?

$$ax^2 + bx + c$$

(These come from multiplying binomials that also do not have lead coefficients of 1.) (2x + 1)(x + 3)

Use the "box method" to multiply the binomials

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

	Х	3
2x	2x ²	6x
1	X	3

Notice a nice pattern when you multiply this out ("simplify")

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

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

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

6x

(2x+1)(x+3)

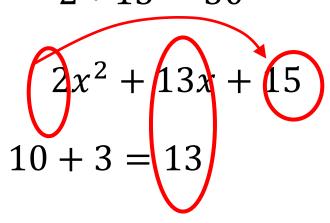
Right times tight is tight left times left is left

$$6x + x = 7x$$

$$2 * 3 = 6$$

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

$$2 * 15 = 30$$



$$30 = 10 * 3$$

Are there any <u>other</u> factors of 30 that add up to 13?

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

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

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

These are all of the terms in "the box"

	X	5
2x	2x ²	10x
3	3x	(15)

What is the bottom-left term in the box?

$$x^*(_3) = 3x$$

What is the top-right term in the box?

$$2x^*(_5) = 10x$$

Final check: 3*5 = 15?

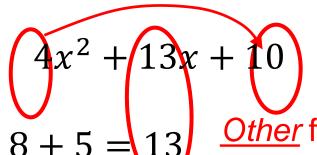
Factored form:

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

$$\rightarrow (2x+3)(x+5)$$

$$4 * 10 = 40$$

These are all of the terms in "the box"



Other factors of 40 that add up to 13?

$$40 = 8 * 5$$

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

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

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

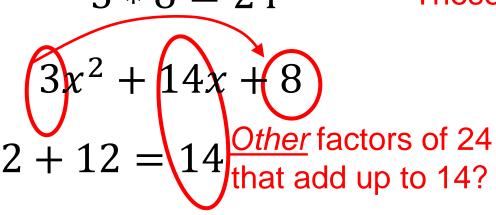
$$4x^2 + 13x + 10$$

Factored form:

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

$$3 * 8 = 24$$

These are all of the terms in "the box"



	X	4
3x	3x ²	12x
2	2x	(8)

$$24 = 2 * 12$$

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

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

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

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

Factored form:

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

Factor

$$5x^2 + 12x + 4$$

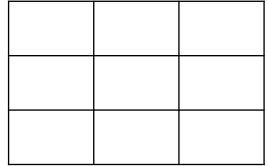
	X	2
5x	5x ²	10x
2	2x	4

$$(5x + 2)(x + 2)$$

$$11x^2 + 2x - 9$$

Factor

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



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