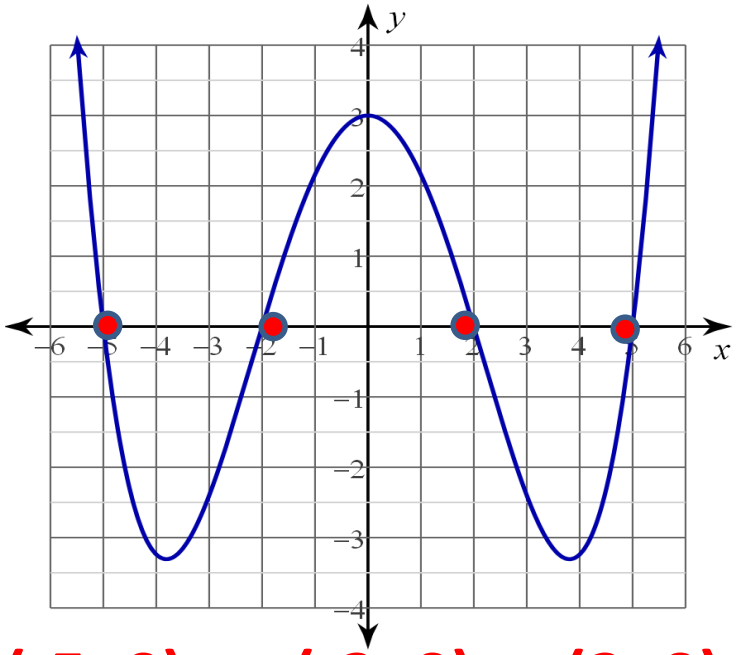
Math-3

Lesson 2-1

Factoring Common Factors, Simple Trinomials

What more are we trying to learn?



We will learn some tools that will help us to find <u>where graphs cross the x-axis</u>.

(-5, 0) **(-2, 0)** **(2, 0)** **(5, 0)**

What is the y-value of an x-intercept?

(x, f(x)=0)

Factor (noun) a number or expression that is being multiplied.

$2x$ Factors: 2, x.

$2(x+3)$ Factors: 2, (x + 3).

Why is (x + 3) a factor? (it looks like a sum)

Identify the factors in the following expressions.

$x^2(x-2)(x+3)$ $x^2, (x-2), (x+3)$

$5x(3x+1)(2x-5)$ $5, x, (3x+1), (2x-5)$

$$2(x+3)$$

Using the distributive property: 2(x + 3) = 2x + 6

Common Factor (noun) a number that is a factor of more than one term in a polynomial.

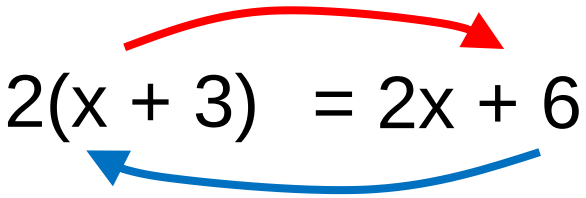
‘2’ is a common factor to both terms in the expression: 2x + 6

Binomial an expression made up of two “unlike” terms that are being added (or subtracted).

$$2x+6$$

To Factor (verb) to break apart a number or an expression into its factors.

distributive property: multiply a term times a sum.



To factor out the common factor: the "reverse" of the distributive property.

Factor out the common factor from each binomial.

$$35x - 28 = 7(5x - 4)$$

$$15x - 20 = 5(3x - 4)$$

$$11x + 33 = 11(x + 3)$$

Factor out the common factor from each binomial.

$$x^3 - x^2 = x^2(x-1)$$

$$x^5 + x^3 = x^3(x^2+1)$$

$$x^7 - x^2 = x^2(x^5-1)$$

$$-5x^4 - 15x^2 = -5x^2(x^2+3)$$

$$24x^6 - 20x^3 = 4x^3(6x^3-5)$$

$$-12x + 36x^3 = 12x(-1+3x^2) = 12x(3x^2-1)$$

Multiplying Binomials

The "Box Method"

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

	x	4
x	x^2	4x
-3	-3x	-12

$x^2 + x - 12$

Standard Form
Quadratic Expression

$(x-1)(x+5)$

	x	5
x	x^2	5x
-1	-x	-5

$x^2 + 4x - 5$

$(x+2)(x+6)$

	x	6
x	x^2	6x
2	2x	12

$x^2 + 8x + 12$

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

	x	4
x	x^2	4x
-4	-4x	-16

$x^2 + 0x - 16$

$x^2 - 16$

$(x+2)(x+3)$ multiply

x^2 "left times left is the left term"

$(x+2)(x+3)$ "right times right is the right term"

$x^2 \quad +6$

$(x+2)(x+3)$ "inner"

$x^2 \quad +2x \quad +6$

$(x+2)(x+3)$ "outer"

$x^2+2x+3x+6 = x^2+(2+3)x+(2*3)$

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

$$= x^2 + (2+3)x + (2*3)$$

$$= x^2 + 5x + 6$$

Left times left is left

Right plus right is middle

Right times right is right

$$(x+4)(x+5)$$

$$= x^2 + (4+5)x + (4*5)$$

Left times left is left

Right plus right is middle

Right times right is right

$$= x^2 + 9x + 20$$

$x^2 + 5x + 6$

Left times left is left

$(\_\_ + \_\_)(\_\_ + \_\_)$

$(x + \_\_)(x + \_\_)$ Right times right is right

$(x + \_\_)(x + \_\_)$ Right plus right is middle

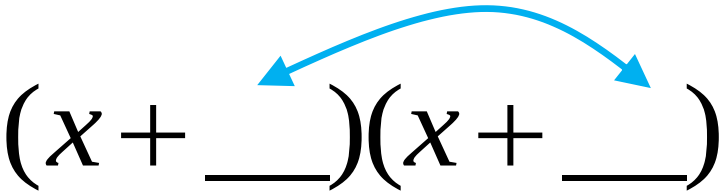
$(x+2)(x+3)$

What are the factors of 6 that add up to 5?

Try the following:

$$x^2 - 3x - 4 \quad = (x-4)(x+1)$$

$$(x+\_\_)(x+\_\_)$$ Right times right is right



$$(x+\_\_)(x+\_\_)$$ Right plus right is middle

$$(-4)(1) = -4$$

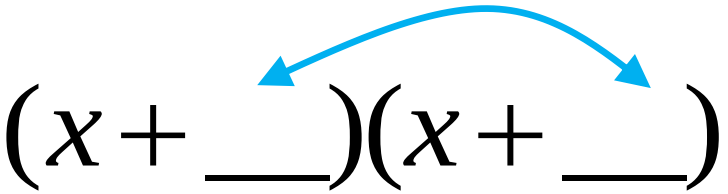
$$(-4)+(1) = -3$$

What are the factors of -4 that add up to -3?

Try the following:

$$x^2+8x+15 = (x+3)(x+5)$$

$(x+\_\_)(x+\_\_)$ Right times right is right



Right plus right is middle

$$(3)(5) = 15$$

$$3+5=8$$

What are the factors of 15 that add up to 8?

Try the following:

$$x^2 + 10x + 21 = (x+3)(x+7)$$

$$x^2 - 6x - 16 = (x-8)(x+2)$$

$$x^2 - 9x + 18 = (x-6)(x-3)$$

$2x^2 + 4x + 2$

Always factor out the common factor first.

$2(x^2 + 2x + 1)$

Now factor the trinomial.

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

Your turn:

$6x^2 + 24x + 18$

Always factor out the common factor 1st.

$6(x^2 + 4x + 3)$

Now factor the trinomial.

$6(x+1)(x+3)$

$$x^2 - 1$$

"the difference of two squares"

$$x^2 + 0x - 1$$

Two numbers multiplied = (-1)
and added = 0

$$(-1)(+1)$$

$$(x-1)(x+1)$$

Conjugate pair (of binomials) two binomials whose terms are exactly the same except +/- for one pair of terms

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

Use the "box method" to multiply the conjugate pairs.

$(x-5)(x+5)$

	x	5
x	x^2	5x
-5	-5x	-25

x^2-25

"the difference of two squares"

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

	3x	2
3x	$9x^2$	6x
-2	-6x	-4

$9x^2-4$

"the difference of two squares"

$(x^2+4)(x^2-4)$

	x^2	4
x^2	x^4	$4x^2$
-4	$-4x^2$	-16

x^4-16

"the difference of two squares"