Math-3

Lesson 2-1

Factoring Out Common Factors

And

Multiplying Simple Trinomials

"Expression" (a math "phrase") A name or a symbol for a number

4 $x + 3$ $3x + 4y - 2$

Do you see an equal sign in an expression?

"Statement" (a math sentence)

A meaningful assertion that is either true or false.

The most common "statement" is an equation.

$$x + 3 = 5$$

Another "statement" could be an inequality.

$$x + 3 \leq 5$$

Equivalence?

Consult with your neighbor to define "equivalence" as it applies to mathematics.

Fill in the blank: $7-4=$ 5 - 2

Are there any other possible "equivalences"?

$$"3" = \{3, \frac{6}{2}, \frac{3x}{x}, (5-2), \ldots\}$$

Solution: the number (or numbers) that when substituted in for the "letter" (x, y, m, etc.) make the statement true.

Equivalent Equations — Equations that look different by have the same solutions.

$x = 2$ and $2x = 4$ are equivalent equations.

Can an expression have a solution?

Are expressions math statements (that are either true or false)?

"Variable" vs. "Unknown Value"

variable: A letter or symbol can have many values as the solution.

$x + 3 = 5$

'x' is an unknown value

$3x + 4y = 12$

'x' and 'y' are the variables

What is it?

a. Statement
b. Equation
c. expression

1. $3 + 4 - 1 = 6$
2. $x + 2y$
3. $ax + by > c$

Terms The individual numbers in an expression or an expression or equation that are separated by either a "+" or "-" symbol.

$4x$

1 term

"Monomial"

$x + 3$

2 terms

"Binomial"

$2x^2 + 3x - 4$

3 terms

"Trinomial"

$x^3 - 5x^2 + x - 1$

More than 3 terms?

"Polynomial"

Coefficient The number in front of a variable in an expression or an equation.

$$3x + 4y - 2$$

3 is the coefficient of ‘x’

4 is the coefficient of ‘y’

Constant A term in an expression or an equation that does not contain a variable

$3x + 4y - 2$ ← -2 is a constant (it’s “constantly” -2 regardless of the values of ‘x’ or ‘y’)

$2x + 3 = 5$ Both 3 and 5 are constants

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

$2x$ Factors: 2, x.

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

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

Because it is an expression that is being multiplied by '2'.

$$2 * (x + 3)$$

To Factor (verb) to break a number or an expression into two (or more) parts (factors) that are multiplied together.

$10 \rightarrow 2*5$

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

The expression $2x + 6$ has the common factor '2' in both terms

We can see this if we factor each term individually:

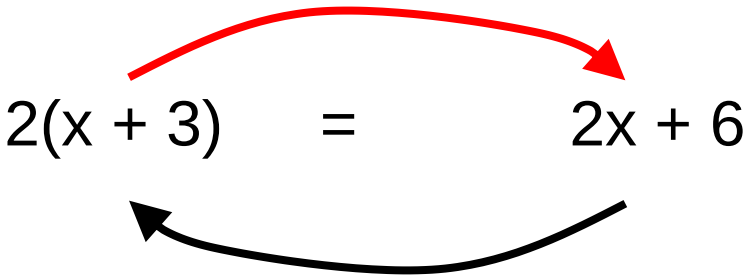
$2x + 6 \rightarrow (2*x) + (2*3)$

"Factoring out" a common Factor from an expression means to rewrite the expression as the *common factor multiplied by* the expression.

$2x + 6 \rightarrow 2(x + 3)$

"Factoring out the common factor" is actually the reverse of the distributive property!

distributive property: an expression of terms being added that is multiplied by another number or expression.



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

Identify the factors in each expression.

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

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

Factors can be an expression made up of terms being added.

Sometimes the common factor is an integer

$3x - 12$

$(3 * x) - (3 * 4)$

$3(x - 4)$

$-4x^2 + 8x + 12$

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

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

Sometimes the common factor is a variable

$x^2 + x$

$(x * x) + (1 * x)$

$x^3 + x^2 + x$

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

"x" is a common factor both terms

$x(x + 1)$

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

Sometimes the common factors
are both an **integer** and a **variable**.

$$4x^2 - 16x$$

$$(4 * x * x) - (4 * 4 * x)$$

$$4x(x - 4)$$

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

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

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

Factor the following expressions

$-50b + 90$

$-10 + 20n^3$

$-60x^5 - 100x^4 - 30x^2$

$-81r - 63r^3 - 63r^4$

$-24x^4 + 40x^3 - 80x^2 + 16x$

$-40x^6 + 20x^2 + 4x + 8$

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

$x^2 + 0x - 16$

$x^2 - 16$