Factoring Using the Distributive Property

Vocabulary

- **Factor** – all numbers and variables in a mathematical expression
- **GCF (Greatest Common Factor)** – The largest factor that divides two or more numbers
- **Distributive Property** – multiplying an outside factor with all factors inside of grouping symbols
- **Factoring** – the process of separating an equation into its component parts

- **Monomial** – an algebraic expression with only one term
- **Binomial** – an algebraic expression with two terms
- **Trinomial** – an algebraic expression with three terms
- **Polynomial** – an algebraic expression with two or more terms

Introduction

- We just reviewed how to use the distributive property. You can also reverse the process and express a polynomial in factored form by using the distributive property.

Yeah, so what does that mean?

- Multiplying Polynomials:

- $3(a + b) =$ $3a + 3b$
- $x(y - z) =$ $xy - xz$
- $3y(4x + 2) =$ $3y(4x) + 3y(2)$

  $12xy + 6y$

So you need to "Reverse" it??

- Factoring Polynomials:

$3a + 3b =$ $3(a + b)$

$xy - xz =$ $x(y - z)$

$12xy + 6y =$

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

Reversing the Process

- Factoring polynomials:

3a + 3b
**find the common factor(s) and remove it from the problem*
**write the factor outside of parentheses and rewrite the rest as it was in the original*
3(a + b)

Ex. 1: Use the distributive property to factor $10y^2 + 15y$

- First, find the greatest common factor for $10y^2$ and 15y

$$10y^2 = 2 \bullet 5 \bullet y \bullet y$$
$$15y = 3 \bullet 5 \bullet y$$

The GCF is 5y.

- Then, express each term as the product of the GCF and its remaining factors.

$10y^2 + 15y = 5y(2y + 3)$

Example 2

- xy – xz
- xy – xz   x is what they have in common
- x(y – z)

Example 3

- 12xy + 6y   break down numbers
- 2· 6 x y + **1**· 6 y   both have a 6 y
- 6y(x + **1**)   ***one is a factor of all values**

Ex. 4: DIFFICULT ☺

$21ab^2 - 33a^2bc$

1st: Break each term down into numbers and variables

$21 \cdot ab^2 \qquad -33 \cdot a^2bc$

2nd: Break down numbers into their factors

$3 \cdot 7 \cdot ab^2 \qquad -1 \cdot 3 \cdot 11 \cdot a^2bc$

3rd: Break up variables with powers to how many

$\boxed{3} \cdot 7 \cdot \boxed{a} \cdot \boxed{b} \cdot b \qquad \boxed{-1} \cdot \boxed{3} \cdot \boxed{11} \cdot \boxed{a} \cdot \boxed{a} \cdot \boxed{b} \cdot \boxed{c}$

Now find common factors

and form group of leftovers in each term

$\boxed{3 \cdot a \cdot b}(7 \cdot b \qquad \boxed{-1 \cdot 11 \cdot a \cdot c})$

$3ab(7b - 11ac)$