Factoring using a Greatest Common Factor (aka "grouping")

The factors of a number are the numbers that, when multiplied, yield the original number.

For example, what are the factors of 15?

$(\quad)(\quad) = 15$
$(\quad)(\quad) = 15$

The factors of 24?

$(\quad)(\quad) = 24$
$(\quad)(\quad) = 24$
$(\quad)(\quad) = 24$
$(\quad)(\quad) = 24$

Earlier in the unit, we look at the distributive property for 'expanding' polynomials. For instance, **$3(x + 2) = 3x + 6$**

Factoring a polynomial is the opposite operation of expansion.

**The factors of a polynomial are the polynomials that,
when multiplied, yield the original polynomial.**

The factors of $3x + 6$ are _____ and _____

When factoring any polynomial, no matter how complicated it may seem, the first step is to always factor out the greatest common factor (GCF). This is the monomial that can be divided evenly into all terms. You will repeatedly here me call this **the fundamental rule of factoring**.

Example 1:
Given the following groups of monomials, determine the prime factors. Use the prime factors to determine the GCF.

$6a^3 \quad =$ GCF =
$18a^2b \quad =$

$27c^3 \quad =$ GCF =
$9c \quad =$

$25m^4 \quad =$ GCF =
$5m \quad =$

Example 2:
Begin to internalize the process in Example 1. Factor the following polynomials by finding the GCF.

$3x^2 + 6x + 9 =$ $10y^3 + 10y^2 + 10y + 5 =$

$xyz + xy + y =$ $w^5 + w^3 - w^2 =$

$4x^3 - 12x^2 - 8 =$ $a^2b^3 + 8a^2b + 16a^2b^2 =$