

Greatest Common Factors: Factoring by Grouping

Factoring is the process of writing a polynomial as the product of 2 or more simpler polynomials using the distributive property. Factoring undoes multiplying.

GCF is the greatest common factor. It is the largest term that is a factor of all the terms of the polynomial.

Example 1: Factor out the greatest common factor.

a) $5z + 5$

b) $100m^4 - 50m^3 + 25m^2$

c) $5m^5x^3 + 15m^5x^5 - 20m^4x^6$

In example 1, the GCF in each problem was a monomial. The GCF can also be binomial.

Example 2: Factor out the greatest common factor.

a) $(y-1)(y+3) - (y-1)(y+4)$

b) $k^2(a+5b) + m^2(a+5b)^2$

c) $(a-4)(a+9) - (a-4)(3a-5)$

When the coefficient of the leading term is negative, it is sometimes better to factor out the -1 with the GCF.

Example 3: Factor

a) $-6r^2 + 5r$

b) $-15a^2 - 70a + 120$

Factoring by grouping: To know when a polynomial can be factored by grouping, the polynomial often has 4 terms.

Factor: $4a - 4b - a^2 + ab$

Grouping terms:

Factor out the common factor in each grouping:

Now there are 2 terms; factor out the common binomial:

Example 4: Factor:

a) $3a^2 - 15a - a + 5$

b) $kn - kp + mn - mp$

c) $10p^2 + 15p - 12p - 18$

d) $8x^2y - 4x^2 + 6y - 3$

Sometimes when factoring by grouping, sometimes the terms need to be rearranged before factoring.

Example 5: Factor: $10x^2y^2 - 18 + 15y^2 - 12x^2$