

6-3 Factoring (GCF and Grouping)

Objectives:

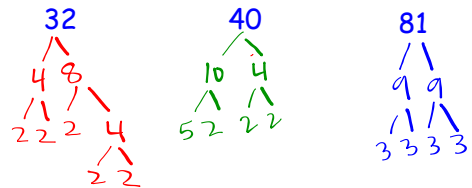
- I can factor the greatest common factor out of an expression.
- I can factor an expression by grouping.

Introduction to factoring

What does it mean to factor a number?

Prime Factorization

Give the prime factorization for:



What does it mean for a number to be PRIME?

Give the prime factorization for:

3

17

127

Factoring is the opposite of distributing:

$$2(x+7) = 2x+14 = 2(x+7)$$

Instead of multiplying through

We are divide out

Find the greatest common factor (GCF) of the terms

$$\underbrace{4x, 12}_{4}$$

$$\underbrace{6x^3, 12x^2, 15x}_{3x}$$

$$\underbrace{4x^3y^4, 8x^2y^3, 12xy^2}_{4xy^2}$$

You Try

Find the greatest common factor (GCF) of the terms

$$3x^3y^5, 9x^2y^3, 12xy^4$$

$$3 \times y^3$$

When factoring out a GCF you:

1 - Decide what the GCF of ALL the terms is

2 - Divide out the GCF from Each term

Factor out the GCF

$$\begin{aligned} &4a^2b^2 - 10ab^3 + 18a^3b^4 \\ &\underbrace{2ab^2}_{\text{GCF}}(2a - 5b + 9a^2b^2) \end{aligned}$$

You Try

Factor out the GCF

$$6y^3 - 14y^2 + 10y$$

$$\underset{\text{GCF}}{2y} (3y^2 - 7y + 5)$$

Factor out the GCF

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

$$\underset{\text{GCF}}{2x} (2x^2 + 3x + 1)$$

Factor out the GCF

$$-2b^3 + 10b^2 + 8b$$

$$2b(-b^2 + 5b + 4) \quad -2b(b^2 - 5b - 4)$$

You Try

Factor out the GCF

$$-5y^2 + 10y$$

$$5y(-y + 2)$$

$$5c^5d^3 - 10c^4d^2 - 25c^3d$$

$$5c^3d(c^2d^3 - 2cd^2 - 5)$$

Factor out the Greatest Common Binomial Factor $(x-3)=z$

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

$$4xz+5z$$

$$z(4x+5)$$

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

$$4yx+3y^2x$$

You Try

Factor out the Greatest Common Binomial Factor

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

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

GCF

$$2x(y+7)+d(y+7)$$

$$(y+7)(2x+d)$$

$$-5m(2r+8)+7(2r+8)$$

$$(2r+8)(-5m+7)$$

Sometimes every term does NOT have a common factor, but groups of terms do so we:

1- Split our expression into groups

2- Factor out the common factor from each group

Factor by grouping

$$4x-4y+ax-ay$$

$$\rightarrow 4(x-y)+a(x-y)$$

$$(x-y)(4+a)$$

Factor by grouping

$$\begin{aligned} & \underline{6x^2 + 9x} - \underline{10x - 15} \\ & 3x(\underline{2x+3}) - 5(\underline{2x+3}) \\ & (2x+3)(3x-5) \end{aligned}$$

Factor COMPLETELY by grouping

$$6x^2 + 8x + 18x + 24$$

You Try
Factor by grouping

$$\begin{aligned} & \underline{6z^2 + 2z} + \underline{9z + 3} \\ & 2z(\underline{3z+1}) + 3(\underline{3z+1}) \\ & 3z+1(\underline{2z+3}) \end{aligned}$$

You Try
Factor by grouping

$$\begin{aligned} & \underline{2x^2 + 2x} + \underline{x + 1} \\ & 2x(\underline{x+1}) + 1(\underline{x+1}) \\ & (x+1)(2x+1) \end{aligned}$$

$$\begin{aligned} \frac{3}{3} &= 1 & \frac{2x}{2x} &= 1 \\ \frac{(x+1)}{(x+1)} &= 1 \end{aligned}$$

$$2b^2 + b + 4b + 2$$

$$b(2b+1) + 2(2b+1)$$

$$(2b+1)(b+2)$$

$$3n^2 - 6n - 2n + 4$$

$$-2n(n-2)$$

$$(n-2)(3n-2)$$