

COMMON FACTORING - GCF

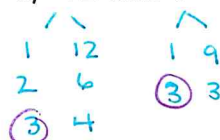
GCF: Greatest common factor is the largest factor you can divide **ALL** terms in a polynomial by.

The factor can be:

- numbers, or
- variables, or
- numbers & variables

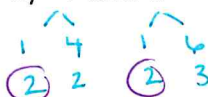
Examples: Find the GCF of:

a) 12 and 9



$$\text{GCF} = 3$$

b) 4 and 6



$$\text{GCF} = 2$$

c) x^2 and x^3



$$\text{GCF} = x$$

Factor each of the following by indicating the GCF

Example 1: $3x^2 + 6x - 36$

Step 1: Find the GCF

$$\text{GCF} = 3$$

Step 2: Divide the trinomial by the GCF

$$= 3 \left(\frac{3x^2}{3} + \frac{6x}{3} - \frac{36}{3} \right)$$

$$= 3(x^2 + 2x - 12)$$

Step 3: Check the solution (expand)

$$3(x^2 + 2x - 12)$$

$$= 3x^2 + 6x - 36$$

Example 2: $5x^5 + 15x^3 - 35x^4$

Step 1: Find the GCF

$$\text{GCF} = 5x^3$$

Step 2: Divide the trinomial by the GCF

$$= 5x^3 \left(\frac{5x^5}{5x^3} + \frac{15x^3}{5x^3} - \frac{35x^4}{5x^3} \right)$$

$$= 5x^3(x^2 + 3 - 7x)$$

Step 3: Check the solution (expand)

$$5x^3(x^2 + 3 - 7x)$$

$$= 5x^5 + 15x^3 - 35x^4$$

Example 3: Factor each of the following by a common factor.

$$\begin{aligned} \text{a) } 3x^2 + 21x + 30 & \quad \text{GCF} = 3 \\ &= 3 \left(\frac{3x^2}{3} + \frac{21x}{3} + \frac{30}{3} \right) \\ &= 3(x^2 + 7x + 10) \end{aligned}$$

$$\begin{aligned} \text{b) } 4x^2 - 12x - 72 & \quad \text{GCF} = 4 \\ &= 4 \left(\frac{4x^2}{4} - \frac{12x}{4} - \frac{72}{4} \right) \\ &= 4(x^2 - 3x - 18) \end{aligned}$$

$$\begin{aligned} \text{c) } -x^2 + 4x - 3 & \quad \text{GCF} = -1 \\ &= -1 \left(\frac{-x^2}{-1} + \frac{4x}{-1} - \frac{3}{-1} \right) \\ &= -1(x^2 - 4x + 3) \end{aligned}$$

$$\begin{aligned} \text{d) } 2x^2 + 4x + 2 & \quad \text{GCF} = 2 \\ &= 2 \left(\frac{2x^2}{2} + \frac{4x}{2} + \frac{2}{2} \right) \\ &= 2(x^2 + 2x + 1) \end{aligned}$$

$$\begin{aligned} \text{e) } 3x^2 + 21x + 30 & \quad \text{GCF} = 3 \\ &= 3 \left(\frac{3x^2}{3} + \frac{21x}{3} + \frac{30}{3} \right) \\ &= 3(x^2 + 7x + 10) \end{aligned}$$

$$\begin{aligned} \text{f) } 4x^2 - 12x - 72 & \quad \text{GCF} = 4 \\ &= 4 \left(\frac{4x^2}{4} - \frac{12x}{4} - \frac{72}{4} \right) \\ &= 4(x^2 - 3x - 18) \end{aligned}$$

Note: You can also have a binomial as a GCF.

$$\begin{aligned} \text{Factor a) } 2a(2+a) - 3(2+a) & \quad \text{GCF} = (2+a) \\ &= (2+a) \left[\frac{2a(2+a)}{(2+a)} - \frac{3(2+a)}{(2+a)} \right] \\ &= (2+a)(2a-3) \end{aligned}$$

$$\begin{aligned} \text{b) } 2(x-2) + 3x(x-2) & \quad \text{GCF} = (x-2) \\ &= (x-2) \left[\frac{2(x-2)}{(x-2)} + \frac{3x(x-2)}{(x-2)} \right] \\ &= (x-2)(2+3x) \end{aligned}$$