

2.4 Common Factors

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2.4 Common Factors of a Polynomial

A **factor** is any number that will divide into another number.

factors of 21 $3 \times 7 = 21$ factors of 21
 $1 \times 21 = 21$ 1, 3, 7, 21

A **common factor** is any number that divides into each number in a set. In algebra, we say that an expression that divides into each term of a polynomial is also a common factor.

eg 9, 15 and 21 $9x^1, 15x^3, 21x^2$
 $9 = 1, 3, 9$ $21 = 1, 3, 7, 21$ common factors
 $15 = 1, 3, 5, 15$ common factors 1 and 3 $1x$ and $3x$

The greatest factor that divides into each term is known as the **greatest common factor (GCF)**.

GCF 8 and 12 $8 = 2 \cdot 2 \cdot 2$ GCF = $2 \cdot 2$
 $12 = 2 \cdot 2 \cdot 3$ GCF = 4

When we write a polynomial into an expression of the product of factors, we are said to **factor** the polynomial.

Example 1: Factor the polynomial.

<p>① Find the GCF of the coefficients GCF of 4 and 12 $4 = 2 \cdot 2$ $12 = 2 \cdot 2 \cdot 3$ GCF = $2 \cdot 2 = 4$</p>	<p>② Find the GCF of the variables $m^2 = m \cdot m$ $m = m$ GCF = m</p>
<p>③ Divide each term by the combined GCF GCF = $4m$</p> <p>Mrs. Shaw</p> $\frac{4m^2 + 12m}{4m} = \frac{4m^2}{4m} + \frac{12m}{4m}$ <p>$m + 3$ other</p>	<p>④ Write the polynomial as a product GCF (other factor) $4m(m + 3)$</p> <p>F. & P.-C. 10</p>

$\frac{4m}{m+3}$ other factor

$6 = 2 \cdot 3$ $15 = 3 \cdot 5$

Example 2: Factor each polynomial.

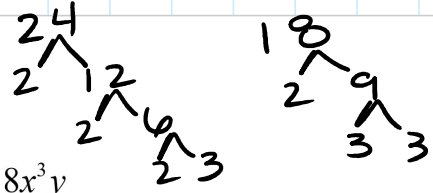
$x^2 = x \cdot x$ $x^3 = x \cdot x \cdot x$
 a) $6x^2 - 15x^3$ * $GCF = 3x^2$

* $\frac{6x^2}{3x^2} - \frac{15x^3}{3x^2}$
 * $(2 - 5x)$ other factor
 * $3x^2(2 - 5x)$

c) $4x^2 - 6x + 12$

$4 = 2 \cdot 2$
 $6 = 2 \cdot 3$
 $12 = 2 \cdot 2 \cdot 3$
 GCF = 2

$\frac{4x^2}{2} - \frac{6x}{2} + \frac{12}{2}$
 $(2x^2 - 3x + 6)$ other factor
 $2(2x^2 - 3x + 6)$



b) $24x^2y^3 - 18x^3y$

$24 = 2 \cdot 2 \cdot 2 \cdot 3$
 $18 = 2 \cdot 3 \cdot 3$
 GCF = $2 \cdot 3 \cdot x \cdot x \cdot y$
 GCF = $6x^2y$

$x^2y^3 = x \cdot x \cdot y \cdot y \cdot y$
 $x^3y = x \cdot x \cdot x \cdot y$

$\frac{24x^2y^3}{6x^2y} - \frac{18x^3y}{6x^2y}$
 other factor $(4y^2 - 3x)$ $6x^2y(4y^2 - 3x)$

d) $-3x^3 - 9x^2 + 12x$

$3 = 3$
 $9 = 3 \cdot 3$
 $12 = 2 \cdot 2 \cdot 3$
 $x^3 = x \cdot x \cdot x$
 $x^2 = x \cdot x$
 $x = x$

GCF = $3x$

$\frac{-3x^3}{3x} - \frac{9x^2}{3x} + \frac{12x}{3x}$
 $(-x^2 - 3x + 4)$ other factor
 $3x(-x^2 - 3x + 4)$

or if GCF = $-3x$

$-3x(x^2 + 3x - 4)$