Chapter II
Polynomials

Factoring of polynomials

Factoring P.40

Greatest Common Factor

The first step in the factorization of any polynomial is to use the distributive property to factor out the **greatest common factor (GCF)** of the terms of the polynomial. Given two or more exponential expressions with the same prime number base or the same variable base, the GCF is the exponential expression with the smallest exponent. For example,

2^3 is the GCF of 2^3, 2^5, and 2^8 and a is the GCF of a^4 and a

- Another examples:

$5^8, 5^5, and\ 5^7$ ___GCF___ 5^5

u^4 , and u ___GCF ___ u

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The GCF of two or more monomials is the product of the GCFs of all the *common* bases. For example, to find the GCF of $27a^3b^4$ and $18b^3c$, factor the coefficients into prime factors and then write each common base with its smallest exponent.

$$27a^3b^4 = 3^3 \cdot a^3 \cdot b^4 \qquad 18b^3c = 2 \cdot 3^2 \cdot b^3 \cdot c$$

The only common bases are 3 and b. The product of these common bases with their smallest exponents is 3^2b^3. The GCF of $27a^3b^4$ and $18b^3c$ is $9b^3$.

The expressions $3x(2x + 5)$ and $4(2x + 5)$ have a common *binomial* factor, which is $2x + 5$. Thus the GCF of $3x(2x + 5)$ and $4(2x + 5)$ is $2x + 5$.

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- ***Keep in mind :***

When you are doing GCF you are looking to the common base with its smallest exponent.

Exercises :

Factor out the Greatest Common Factor (GCF) to the following :

1. 8, 2

2. $6xy^3,\ 12y^2$

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EXAMPLE 1 Factor Out the Greatest Common Factor

Factor out the GCF.

a. $12x^3y^4 - 24x^2y^5 + 18xy^6$ **b.** $(6x - 5)(4x + 3) - (4x + 3)(3x - 7)$

Solution

a. $12x^3y^4 - 24x^2y^5 + 18xy^6$

$= (6xy^4)2x^2 - (6xy^4)4xy + (6xy^4)3y^2$ • The GCF is $6xy^4$.

$= 6xy^4(2x^2 - 4xy + 3y^2)$ • Factor out the GCF.

b. $(6x - 5)(4x + 3) - (4x + 3)(3x - 7)$

$= (4x + 3)[(6x - 5) - (3x - 7)]$ • The common binomial factor is $4x + 3$.

$= (4x + 3)(3x + 2)$

■ **Try Exercise 6, page 48**

Exercises P.48

In Exercises 1 to 8, factor out the GCF from each polynomial.

1. $5x + 20$

2. $8x^2 + 12x - 40$

3. $-15x^2 - 12x$

4. $-6y^2 - 54y$

5. $10x^2y + 6xy - 14xy^2$

■ **6.** $6a^3b^2 - 12a^2b + 72ab^3$

7. $(x - 3)(a + b) + (x - 3)(a + 2b)$

8. $(x - 4)(2a - b) + (x + 4)(2a - b)$

Questions