Multiplication of a Monomial by a Polynomial

Understanding of Multiplication of a Monomial by a Polynomial

- A monomial is a single term expression.
- A polynomial is an expression with two or more terms.
- Multiplying a monomial by a polynomial means multiplying the monomial with each term of the polynomial separately using the distributive property.

Important Points

- Multiply the monomial with each term of the polynomial one by one.
- Multiply coefficients (numbers) and add exponents of like variables.
- Be careful with signs while multiplying.
- Write the final expression in standard form by arranging terms in descending order of degree if needed.

Examples with Solutions

Example: Simple Multiplication

Multiply: 3x × (x + 5)

Solution: $3x \times x = 3x^2$

3x × 5 = 15x

Final answer: $3x^2 + 15x$

Example: Multiplying with Two Variables

Multiply: 2a × (3a – 4b)
 Solution: 2a × 3a = 6a²
 2a × (-4b) = -8ab
 Final answer: 6a² – 8ab

Example: Multiplying Negative Monomial

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> Multiply: (-5m) × (m<sup>2</sup> + 2m - 3)

Solution: (-5m) × m<sup>2</sup> = -5m<sup>3</sup>

(-5m) × 2m = -10m<sup>2</sup>

(-5m) × (-3) = 15m

Final answer: -5m^3 - 10m^2 + 15m
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Example: Multiplying Monomial with Three Terms Polynomial

> Multiply:
$$4p^2 \times (2p^2 + 3p + 1)$$

Solution: $4p^2 \times 2p^2 = 8p^4$
 $4p^2 \times 3p = 12p^3$
 $4p^2 \times 1 = 4p^2$
Final answer: $8p^4 + 12p^3 + 4p^2$

Example: Multiplication Involving Fractions

> Multiply:
$$\left(\frac{1}{2}\right)\mathbf{x} \times (6\mathbf{x}^2 - 4\mathbf{x} + \mathbf{8})$$

Solution: $\left(\frac{1}{2}\right)\mathbf{x} \times 6\mathbf{x}^2 = 3\mathbf{x}^3$
 $\left(\frac{1}{2}\right)\mathbf{x} \times (-4\mathbf{x}) = -2\mathbf{x}^2$
 $\left(\frac{1}{2}\right)\mathbf{x} \times \mathbf{8} = 4\mathbf{x}$

Final answer: $3x^3 - 2x^2 + 4x$

Summary Points

- Always multiply the monomial with each term of the polynomial individually.
- Multiply coefficients and add exponents of like variables.
- Distribute carefully to avoid sign mistakes.
- Arrange the final answer properly by degree if required.
- Multiplication involving fractions should be done carefully step-by-step.