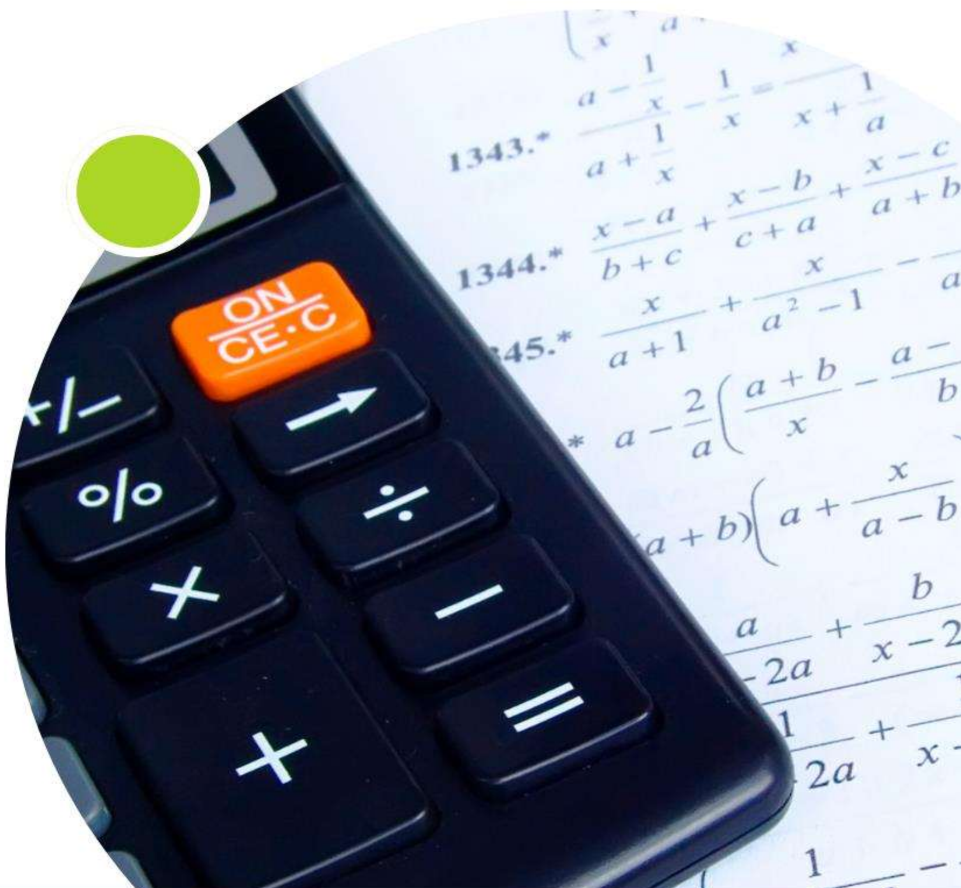
MALMS8

TAILORED LEARNING, PERSONALIZED PROGRESS

# LEARNING MODULE 5

## Multiply and Divide Simple Monomials, Leading to the Derivation of the Laws of Exponent



# 1 MULTIPLYING AND DIVIDING SIMPLE MONOMIALS, LEADING TO THE DERIVATION OF THE LAWS OF EXPONENT

## WElCOME LEARNERS!

*Welcome aboard our thrilling expedition into the world of multiplying and dividing simple monomials, setting the stage for unraveling the mysteries of exponent laws! Together, we'll delve deep into the realm of algebraic operations, sharpening our skills and broadening our understanding along the way. Get ready to dive in, explore, and conquer the captivating domain of exponents!*

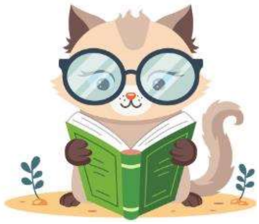
**Learning Objectives**

At the end of this module, students will be able to:

Recall what is a monomial;

Describe the process of multiplying and dividing simple monomials; and

Recognize the significance of understanding the process of multiplying and dividing monomials in the derivation of exponential laws.



A **monomial** is an algebraic expression that consists of only one term. It can have multiple variables and a higher degree. The term "monomial" typically refers to expressions that can be written in the form $cx^n$.

**Where:**

- *c* is a coefficient
- *x* is a variable
- *n* is a non-negative integer exponent.

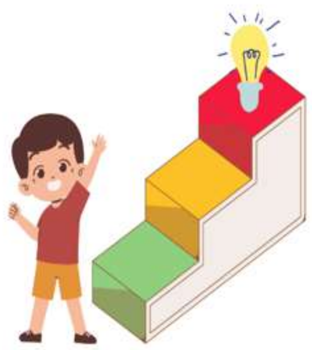
**Distinct features of a monomial include:**

- It must have a single non-zero term.
- The exponents of the variables must be non-negative integers.
- There should not be any variable in the denominator.

| **Examples of Monomials** | |
|---|---|
| p | One variable and degree is one. |
| $\boldsymbol{5p^2}$ | With 5 as coefficient, p as variable with degree of two. |
| $\boldsymbol{p^3q}$ | With two variables (p and q) and degree as 4. The degree is 4 because in monomial expression, the sum of exponents on each variable is the degree of monomial expression, in this case 1+3 =4. |
| -6ty | t and y are two variables with coefficient -6. |

**Multiplying monomials** involves multiplying the coefficients and adding the exponents of like variables.

**To multiply these monomials, we follow these steps:**



1. **Multiply the coefficients.** Multiply the numerical coefficients a and b. This gives us ab.
2. **Add the exponents of like variables.** Since both monomials contain the variable x, we add the exponents m and n of x to obtain m+n. This results in $x^{m+n}$.

So, the **general form** of multiplying monomials can be expressed as: $(\boldsymbol{ax^m})\,(\boldsymbol{bx^n}) = \boldsymbol{abx^{m+n}}$

### Example 1

Given: $3x^2(4x^3)$

a. **Multiply the coefficients:**

   3 (4) = 12

b. **Add the exponents of like variables:**

   The like variables in the given is x being raised to the power of 2 and 3, hence;

   2+3=6

   $x^6$

c. **Simplify:**

   $= 12x^6$

### Example 2

Given: $11xy^2(2x^2)$

a. **Multiply the coefficients:**

   11 (2) =22

b. **Add the exponents of like variables:**

   The like variables in the given is x being raised to the power of 1 and 2, hence;

   1+2=3

   $x^3$

   When dealing with a variable that doesn't have a counterpart in the other expression, simply copy and paste it. In this case, the $y^2$

c. **Simplify:**

   $= 22x^3y^2$

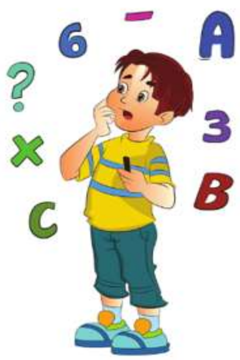
**Dividing monomials** involves dividing the coefficients and subtracting the exponents of like variables.

**To divide these monomials, we follow these steps:**

1. **Divide the coefficients:** Divide the numerical coefficient of the dividend (a) by the numerical coefficient of the divisor (b). This gives us a/b.
2. **Subtract the exponents of like variables:** Since both monomials contain the variable *x*, we subtract the exponent of *x* in the divisor (*n*) from the exponent of *x* in the dividend (*m*). This results in *m*−*n*.

So, the general form of dividing monomials can be expressed as:

$$\frac{ax^m}{bx^n} = \frac{a}{b}x^{m-n}$$




### Example 1

Given: $12x^4 \div 3x^2$

**a. Divide the coefficients:**

12/3= 4

**b. Subtract the components of like variables:**

The like variables in the given is x, hence;

=4-2

=2

=$x^2$

**c. Simplify:**

$4x^2$

**Example 2**

Given: $20a^2b \div 4b$

a. **Divide the coefficient**

   20/4 =5

b. **Subtract the components of like variables:**

   The like variables in the given is b, hence;

   =1-1

   =0

   =$b^0$

   = 1 (any number raised to 0 is equal to 1)

   In the case of $a^2$ , since there are no variable a in the denominator, it will just be just as is:

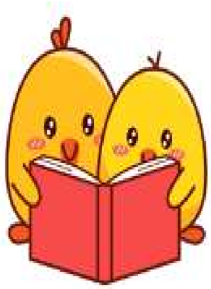
   =2-0

   =2

   =$a^2$

c. **Simplify:**

   $5a^2$



**Summary:**
Multiplying and dividing monomials involves combining or splitting terms with the same base. This process naturally leads to observing patterns, which form the foundation for the laws of exponents. These laws simplify the manipulation of exponential expressions by governing how exponents interact during multiplication and division.