MALMS8

TAILORED LEARNING, PERSONALIZED PROGRESS

LEARNING MODULE 5

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

2 MULTIPLY AND DIVIDE SIMPLE MONOMIALS, LEADING TO THE DERIVATION OF THE LAWS OF EXPONENTS

Welcome, Grade 8 learners!

In this main course, we're diving into the exciting world of multiplying and dividing simple monomials, which will eventually lead us to uncovering the mysteries of exponents. Get ready to flex those brain muscles as we explore the fundamentals of these operations. Throughout our journey, we'll tackle various examples, practice problems, and engaging activities to help solidify your understanding. So, buckle up and let's embark on this mathematical journey together!

LEARNING OBJECTIVES

- Apply the laws of exponents to multiply and divide monomials.
- Multiply and divide monomials
- Demonstrate accuracy in dividing and multiplying monomials.

Here are the laws of exponents derived in the process of multiplying and dividing monomials:

1. **Multiplying Powers with the Same Base:** When multiplying monomials with the same base (variable), we add the exponents.

$$x^a \cdot x^b = x^{a+b}$$

Example: $3x^2 \cdot 2x^3 = 6x^5$

2. **Dividing Powers with the Same Base:** When dividing monomials with the same base (variable), we subtract the exponent of the divisor from the exponent of the dividend.

$$\frac{x^a}{x^b} = x^{a-b}$$

Example: $\frac{4a^5}{2a^3} = 2a^2$

3. **Power of a Power:** To raise a power to another power, we multiply the exponents.

$$(x^a)^b = x^{ab}$$

Example: $(2m^3)^2 = 4m^6$

4. **Power of a Product:** When a product is raised to an exponent, each factor in the product is raised to that exponent.

$$(xy)^a = x^a y^a$$

Example: $(ef)^3 = e^3 f^3$

5.**Power of a Quotient:** When a quotient is raised to an exponent, both the numerator and the denominator are raised to that exponent.

$$\left(\frac{x}{y}\right)^a = \frac{x^a}{y^a}$$

Example: $\left(\frac{j}{k}\right)^4 = \frac{j^4}{k^4}$

TO MULTIPLY MONOMIALS, WE FOLLOW THESE STEPS

Given: $-2xy^3$ **(xy)**

a)Multiply the coefficients.
= -2 (1)
= -2

b) Add the exponents of like variables
In terms of x: 1+1 =2
In terms of y: 3+1 = 4

c. Simplify: $-2x^2y^4$

More Examples:

1. **Given :** $\mathbf{13ab\ (3b)}$
   Multiply the coefficients
   = 13 (3)
   = 39

   Add the exponents of like variables
   - In terms of a: 1+0 (since there are no variable a in the second expression) = 1
   - In terms of b: 1+1 = 2

   Simplify
   $= \mathbf{39ab^2}$

2. **Given:** $(\mathbf{-2x^4})^{\mathbf{3}}$
   Notice that the given is an example of power of power. However, let's try to apply the apply the rules for multiplying monomials one by one.

   $(-2x^4)^3$ can be written as $(-2x^4)\,(-2x^4)\,(-2x^4)$

Multiply the coefficients
= (-2) (-2) (-2)
= -8

Add the exponents of like variables
- In terms of x: 4+4+4 = 12

Simplify
$= -8x^{12}$

Applying the rule of power of power, we will get the same answer in which is:

$$(-2x^4)^3 = -8x^{12}$$

3. Given: $(3mn)^2$

Notice that the given is an example of power of a product. However, let's try to apply the apply the rules for multiplying monomials one by one.

$(3mn)^2$ can be written as $(3mn)(3mn)$

Multiply the coefficients
= (3) (3)
= 9

Add the exponents of like variables
- In terms of m: 1+1= 2
- In terms of n: 1+1 =2

Simplify
$= 9m^2n^2$

Applying the rule of power of product, we will get the same answer in which is:

$$(3mn)^2 = 9m^2n^2$$

TO DIVIDE MONOMIALS, WE FOLLOW THESE STEPS:

Given: $\frac{8xy^7}{2y^2}$

a) **Divide the coefficients**

=8/2

=4

b) Subtract the exponents of like variables

In terms of x: 1- 0 (since there are no variable x in the denominator) = 1

In terms of y: 7-2 = 5

c) Simplify

= $4xy^5$

More Example:

1. **Given :** $\left(\frac{6ab^5}{3ab}\right)^2$

   Notice that the given is in the power of a quotient form. However, let's try to apply the apply the rules for dividing monomials one by one.

   - $\left(\frac{6ab^5}{3ab}\right)^2$ can be written as $\frac{(6ab^5)^2}{(3ab)^2}$
   - Simplifying first the expression using the exponent rules we will have: $\frac{36a^2b^7}{9a^2b^2}$

   Divide the coefficients

   =36/9 =4

   Subtract the exponents of like variables

   In terms of a: 2- 2 = 0

   In terms of b= 7-2 = 5

   Simplify: $4b^5$