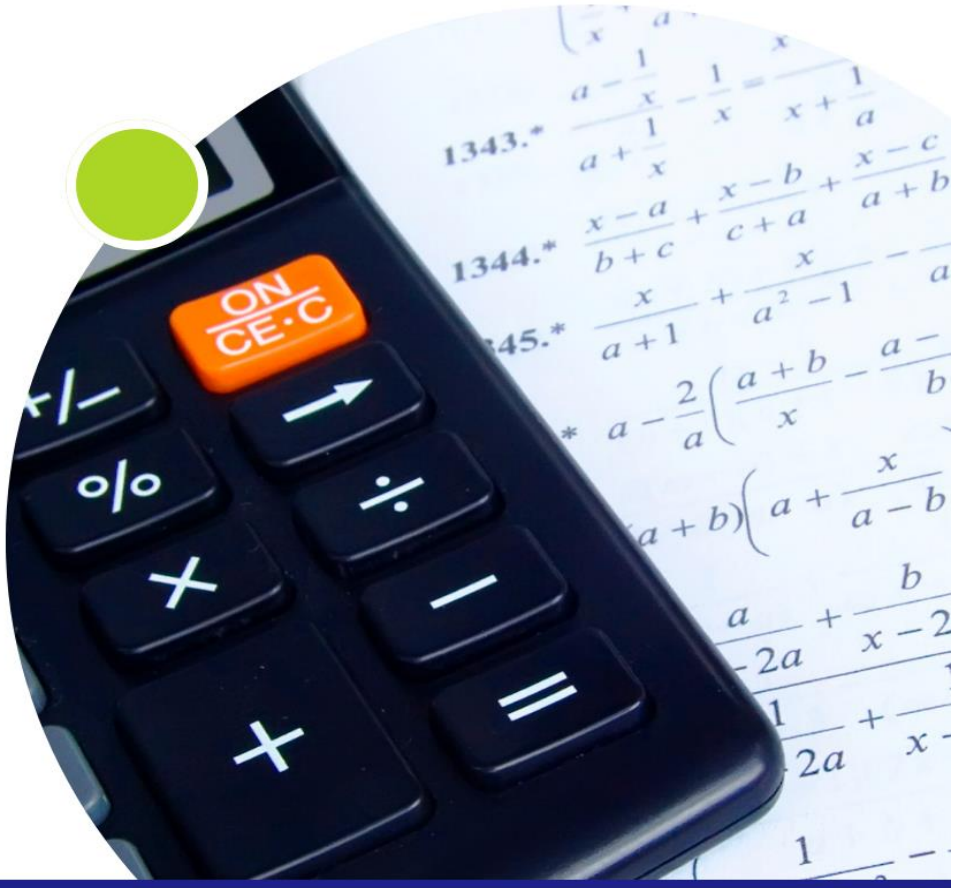
ALMS8

TAILORED LEARNING, PERSONALIZED PROGRESS

SUPPLEMENTARY MODULE 5

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



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

Hello, awesome learners! If you're struggling with understanding how to multiply and divide monomials and rules of exponents, don't worry! This extra help is here for you. We know learning these things can be tricky, but that's totally fine. We've got more examples and easier explanations to help you out. We're here to cheer you on as you keep learning. Let's tackle this together and celebrate every bit of progress. You're doing great!

Learning Objectives:

At the end of this lesson students will be able:

1. reinforce their knowledge about the laws of exponents by identifying the commonly committed mistakes/errors;
2. demonstrate mastery in multiplying and dividing monomials; and
3. evaluate solutions of multiplication and division involving monomials.

Laws of Exponents that must understand first to master multiplying and dividing monomials:

Multiplying Powers with the Same Base ● When multiplying monomials with the same base (variable), we add the exponents.	$(x^2)\,(x^3) = x^{2+3} = x^5$
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.	$\frac{a^7}{a^5} = a^{7-5} = a^2$
Power of a Power ● To raise a power to another power, we multiply the exponents.	$(m^2)^3 = m^{2(3)} = m^6$
Power of a Product ● When a product is raised to an exponent, each factor in the product is raised to that exponent	$(qr)^2 = q^2r^2$
Power of a Quotient ● When a quotient is raised to an exponent, both the numerator and the denominator are raised to that exponent.	$\left(\frac{x}{y}\right)^3 = \frac{x^3}{y^3}$

Some common mistakes or errors make when applying the laws of exponents:

a) Forgetting to add the exponent when multiplying with the same base

Incorrect: $2x^3(3x^2) = 6x^6$

(Instead of adding the exponents, it was multiplied.)

Correct: $2x^3(3x^2) = 6x^5$

b) Incorrectly applying the exponent rule when raising a power to another power.

Incorrect: $(2x^2)^4 = 8x^6$
(Instead of raising the coefficient to a power of 4, it was rather multiplied. Then the coefficient of x which is 2 was increased by 4 instead of multiplying it)

Correct: $(2x^2)^4 = 16x^8$

c) Misunderstanding the negative exponents

A negative exponent means that the base is on the wrong side of the fraction line, so you need to flip the base to the other side.

Incorrect: $x^{-2} = -2x$

Correct: $x^{-2} = \frac{1}{x^2}$

d) Forgetting to simplify terms with coefficients and exponents separately:

Incorrect: $2x^3(3x) = 6x^3$ (Mistakenly multiplying only the coefficients)
Correct: $2x^3(3x) = 6x^4$

Multiplying and Dividing Monomials

To multiply monomials, we follow these steps:

a)Multiply the coefficients.

b)Add the exponents of like variables.

Examples

1. $Given: (-2xy^2)\,(35x^3)$

Multiply the coefficients:

= -2 (35) = -70

Add the exponents of like variables:

$$x^{1+4} = x^4$$

Since there is no y in the second expression, just copy it or it could be explained as:

$$y^{1+0} = y$$

Hence, $\boldsymbol{\left(-2xy^2\right)\left(35x^3\right) = -70x^4y}$

2. **Given** $(3x)^2(13x^4)$

Simplify first the multiplicand using the laws of exponent:

$$(3x)^2 = 9x^2$$

Multiply the coefficients:

=9(13) = 117

Add the exponents of like variables:

$$x^{2+4} = x^6$$

Hence, $\boldsymbol{(3x)^2\left(13x^4\right) = 117x^6}$

3. Given $(4xy)^2\ (-3xy^{-2})$

There are some instances where the variable is raised to negative exponent, just like in the multiplicand. Please remember that nothings changed in the process. Just applied the same steps.

Simplify first the multiplicand by applying the power of a product law of exponent:

$$(4xy)^2 = 16x^2y^2$$

Multiply the coefficients:

=16 (-3) = -48

Add the exponents of like variables:

$$x^{2+1} = x^3$$

$$y^{2+(-2)} = y^0 = 1$$

Hence, $\boldsymbol{(4xy)^2\ (-3xy^{-2}) = -48x^3}$

To divide these monomials, we follow these steps:

a) Divide the coefficients

b) Subtract the exponents of like variables

1. Given: $\frac{-2ab^4}{6ab^3}$

Divide the coefficients:

= -2/6

= -1/3

Subtract the exponents of like variables;

$$a^{1-1} = a^0 = 1$$

$$b^{4-3} = b$$

Hence, $\frac{-2ab^4}{6ab^3} = -\frac{1}{3}b$

2. Given: $\left(\frac{-6x^2}{3x}\right)^3$

Simplify first the numerator and denominator by applying the power of a quotient law of exponent:

$$(-6x^2)^3 = -216x^6$$

$$(3x)^3 = 27x^3$$

Divide the coefficients:

= (-216)/27 = -8

Subtract the exponents of like variables:

$$x^{6-3} = x^3$$

Hence, $\left(\frac{-6x^2}{3x}\right)^3 = -8x^3$