MALMS8

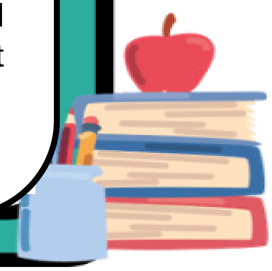
TAILORED LEARNING, PERSONALIZED PROGRESS

SUPPLEMENTARY MODULE 5

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

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

This supplementary material is here to lend you a helping hand. We understand that grasping these concepts might take some time, and that's completely okay. So, whether you're still wrapping your head around multiplying and dividing monomials or struggling to crack the code of exponents, know that you're not alone. Together, we'll navigate through any hurdles. You've got this!



Learning Objectives:

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

1. evaluate real-world problems involving multiplication and division of monomials;
2. construct and solve their own word problems involving monomials; and
3. highlight concrete examples wherein the knowledge of multiplying and dividing monomials simplifies complex mathematical problems.

Real-world scenarios involving multiplication and division of monomials

Understanding how to multiply and divide monomials has numerous practical applications in real-life scenarios. For instance, when calculating the total cost of items bought in bulk or determining the growth of populations over time, multiplying and dividing monomials helps in simplifying complex calculations. In fields like engineering and finance, where precise measurements and calculations are crucial, these fundamental operations play a vital role in streamlining processes and ensuring accuracy.

Scenario 1: Painting a Mural

You're an artist commissioned to paint a mural on a rectangular wall measuring 3x by 4x feet. However, there's a window in the middle of the wall, taking up an area of x^2square feet. You estimate that you need 2 gallons of paint to cover every x^2 square feet, and each gallon costs $10.

Given:

- The dimensions of the rectangular wall: 3x by 4x feet.
- The area of the window in the wall: x^2 square feet.
- The amount of paint required to cover every x^2 square feet: 2 gallons.
- The cost of each gallon of paint: $10.

Question: How many gallons of paint are needed to cover the entire wall, and what is the total cost of the paint required?

1. **Calculate the total area of the wall:**

   Total area = Length × Width = (3x) × (4x) = 12x^2 square feet.

2. **Determine the area to be painted by subtracting the area of the window from the total area:**

   Paintable area = Total area - Area of window = 12x^2 - x^2 = 11x^2 square feet.

3. **Calculate the total amount of paint needed:**

   Total paint needed = (Area to be painted) ÷ (Area covered by 1 gallon of paint) = (11x^2) ÷ (x^2) = 11 gallons.

4. **Finally, find the total cost of paint:**

   Total cost = Total gallons needed × Cost per gallon = 11 gallons × $10 = $110.

Conclusion:

Therefore, you'll need 11 gallons of paint, costing $110, to complete the mural.

Scenario 2: Gardening Project

You have a rectangular garden with dimensions of $(5a^3)^2$ meters by $3b^2$meters. You want to plant flowers in the garden, each requiring an area of *ab* square meters. The cost of each flower is $2.How many flowers do you need to cover the entire garden, and what will be the total cost?

Given:

- The dimensions of the rectangular garden: $(5a^3)^2$ meters by $3b^2$ meters.
- The area required for each flower: *ab* square meters.
- The cost of each flower: $2.

Question: How many flowers do you need to cover the entire garden, and what will be the total cost?

1. **Calculate the total area of the garden:**
   The area of a rectangle is given by length x width. So, the area of the garden is:
   Area= length x width = $(5a^3)^2 \ (3b^2)$
   Area = $25a^5 \ (3b^2)$
   Area= $75a^5b^2$
2. **Calculate the area of one flower:**
   Given that each flower requires an area of ab square meters.
3. **Determine the number of flowers needed:**
   To find the number of flowers needed to cover the entire garden, divide the total area of the garden by the area on one flower:

   Number of flowers= $\frac{Total\ area\ of\ garden}{Area\ of\ one\ flower}$
   Number of flowers: $\frac{75a^5b^2}{ab}$
   Number of flowers: $75a^4b$
4. **Calculate the total cost:**
   Multiply the number of flowers by the cost of each flower:

   Total cost = Number of flowers x Cost of each flower

   Total cost = $(75a^4b)\ (2)$

   Total cost = $150a^4b$

   Conclusion:

   The number of flowers needed to cover the entire garden is $75a^4b$, and the total cost will be $\$150a^4b$.

Importance of learning how to multiply and divide monomials

Understanding how to multiply and divide monomials is crucial for simplifying complex word or mathematical problems. Firstly, it allows for the efficient manipulation of algebraic expressions, enabling the reduction of complicated terms into simpler forms. Secondly, mastery of these operations enhances problem-solving skills by facilitating the organization and manipulation of variables and constants.

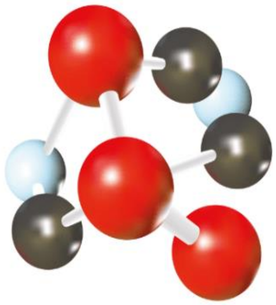
Engineering Calculations

Understanding how to multiply and divide monomials is crucial for simplifying equations representing physical phenomena. For instance, when calculating forces in structural engineering, monomial operations help simplify complex expressions involving variables like mass, acceleration, and distance, leading to more manageable equations for analysis and design.

Financial Analysis

Multiplying and dividing monomials play a significant role in analyzing investment returns, interest rates, and financial projections. For example, when determining compound interest over time, monomial operations are used to simplify expressions involving principal amounts, interest rates, and time periods, allowing for accurate calculations and informed decision-making regarding investments.

Biological Modeling



Monomial operations are essential for modeling population growth, gene expression, and biochemical reactions. For instance, when studying population dynamics, multiplying and dividing monomials help simplify equations representing birth rates, death rates, and immigration rates, enabling biologists to make predictions about population trends and ecological interactions with greater accuracy.