

The background of the slide is a dark, textured surface with a grid of glowing, light blue numbers and mathematical symbols. The numbers are scattered across the frame, some appearing larger and brighter than others, creating a sense of depth and movement. The overall aesthetic is futuristic and data-oriented.

ALGEBRIC EQUATIONS

UNIT 01 LESSON 02

OBJECTIVES

Students will be able to:

- Apply the Algebraic expressions to simplify algebraic expressions.
- Produce an equivalent form of an expression.
- Interpret a word problem into an algebraic expression.

Key Vocabulary:

- Algebraic Expression.
- Real Numbers Properties

An **algebraic expression** is an **expression** built up from integer constants, variables, and the **algebraic** operations (addition, subtraction, multiplication, division and exponentiation by an exponent that is a rational number).

When we simplify an expression we operate in the following order:

- 1 Simplify the expressions inside parentheses, brackets, braces and fractions bars.
- 2 Evaluate all powers.
- 3 Do all multiplications and division from left to right.
- 4 Do all addition and subtractions from left to right.

Remember the properties of real numbers we learnt about in the previous lesson:

- 1 Commutative and associative properties of addition.
- 2 Commutative and associative properties of addition.
- 3 The distributive property.
- 4 The additive and multiplicative inverse property.
- 5 The multiplicative property of zero.

EXPONENTS RULES

Rule Name	Rule	Example
Product Rules	$a^n \cdot a^m = a^{n+m}$	$2^3 \cdot 2^4 = 2^{3+4} = 128$
	$a^n \cdot b^n = (a \cdot b)^n$	$3^2 \cdot 4^2 = (3 \cdot 4)^2 = 144$
Quotient Rules	$a^n / a^m = a^{n-m}$	$2^5 / 2^3 = 2^{5-3} = 4$
	$a^n / b^n = (a/b)^n$	$4^3 / 2^3 = (4/2)^3 = 8$
Power Rules	$(b^n)^m = b^{n \cdot m}$	$(2^3)^2 = 2^{3 \cdot 2} = 64$
	$b^{n^m} = b^{(n^m)}$	$2^{3^2} = 2^{(3^2)} = 512$
	$\sqrt[m]{(b^n)} = b^{n/m}$	$\sqrt{(2^6)} = 2^{6/2} = 8$
	$b^{1/n} = \sqrt[n]{b}$	$8^{1/3} = \sqrt[3]{8} = 2$

EXPONENTS RULES

Negative Exponents	$b^{-n} = 1/ b^n$	$2^{-3} = 1/ 2^3 = 0.125$
Zero Rules	$b^0 = 1$	$5^0 = 1$
	$0^n = 0, \text{ for } n > 0$	$0^5 = 0$
One Rules	$b^1 = b$	$5^1 = 5$
	$1^n = 1$	$1^5 = 1$

PROBLEM 1

Simplify $\frac{(2^2 - 2)}{\sqrt{2}}$

First we evaluate the expression inside the parentheses by evaluating the powers and do the subtraction.

$$= \frac{(4 - 2)}{\sqrt{2}}$$

$$= \frac{2}{\sqrt{2}}$$

PROBLEM 1

We then remove the parentheses and multiply both the denominator and the numerator by $\sqrt{2}$.

$$= \frac{2\sqrt{2}}{\sqrt{2}\sqrt{2}}$$

As a last step we do all multiplications and division from left to right.

$$= \frac{2\sqrt{2}}{2}$$

$$= \sqrt{2}$$

PROBLEM 2

Simplify $x^3(x^4 + 5x^2)$

We apply the distributive law.

We multiply x^3 by x^4 , and multiply x^3 by $5x^2$.

$$x^3 \times x^4 + x^3 \times 5x^2$$

Then we apply the power rule of the exponents

$$x^{3+4} + 5x^{3+2}$$

$$x^7 + 5x^5$$

PROBLEM 3

Simplify $2x \frac{(6x - 4x)}{2}$

First, we evaluate the expression inside the parentheses by doing the subtraction then doing the division.

$$2x \frac{(2x)}{2}$$

PROBLEM 3

$$2x(x)$$

Then we apply the commutative rule

$$2(x \cdot x)$$

Then we do the multiplication using the power rule from the exponents rules.

$$2(x^{1+1})$$

$$2(x^2)$$

PROBLEM 4

Translate "the ratio of 9 more than x to x " into an algebraic expression.

"9 more than x " translates into $x + 9$

So "the ratio of 9 more than x to x " translates into $\frac{x + 9}{x}$