MindSpark

📘 **Mathematics Notes**

Contents

Chapter 1: Introduction to Algebra

Algebra is a fundamental branch of mathematics that deals with symbols and the rules for manipulating them. Instead of using only numbers, algebra uses **letters (variables)** to represent unknown values. This allows us to form general rules and solve problems systematically.

- Constants: Fixed values such as 5, 10, -3.
- Variables: Letters like x, y, z that represent unknowns.
- Expressions: Combinations of constants, variables, and operators (e.g., 3x + 7).

Example: If a student has x books and buys 4 more, the total = x + 4.

Chapter 2: Laws of Algebra

1. Commutative Law: a + b = b + a, ab = ba
2. Associative Law: (a + b) + c = a + (b + c), (ab)c = a(bc)
3. Distributive Law: a(b + c) = ab + ac

These laws are the foundation of algebraic simplifications.

Chapter 3: Linear Equations

A linear equation is an equation of the first degree, represented as:
$ax + b = 0$, where $a \neq 0$

Example: Solve $2x + 5 = 15$

- $2x = 15 – 5$
- $2x = 10$
- $x = 5$

A linear equation always represents a straight line when graphed.

Chapter 4: Quadratic Equations

Quadratic equations have the standard form:
$ax^2 + bx + c = 0$, $a \neq 0$

Methods of Solving:

1. Factorization:
   Example: $x^2 + 5x + 6 = 0 \rightarrow (x+2)(x+3) = 0 \rightarrow x = -2, -3$
2. Quadratic Formula:
   $x = (-b \pm \sqrt{(b^2 - 4ac)}) / 2a$
3. Completing the Square: Rewriting the equation in square form to solve.

Chapter 5: Word Problems

Algebra helps solve real-life problems.

Example:
The sum of two numbers is 20, and their difference is 4. Find the numbers.

- $x + y = 20$
- $x – y = 4$
- Adding both → $2x = 24 \rightarrow x = 12$
- Substituting → $y = 8$

✅ Numbers are 12 and 8.

Key Takeaways

- Algebra generalizes arithmetic and is used in higher studies of Math and Science.
- Always check solutions by substitution.
- Practice makes concepts stronger.
