Class 8 Mathematics

Chapter 2: Linear Equations in One Variable

From Notes Book

What Is a Linear Equation?

A **linear equation in one variable** is an equation that can be written in the form:

ax + b = c where:

- x is the variable (unknown).
- a, b, and c are constants (numbers).
- a ≠ 0 (the coefficient of x cannot be zero).

Examples:

1. 3x + 5 = 14
2. 4x - 7 = 1
3. x + 6 = 12

Solving a Linear Equation

The goal is to find the value of x (the unknown variable) that makes the equation true.

Steps to Solve a Linear Equation:

1. **Simplify both sides**: Remove parentheses and combine like terms.
2. **Bring all terms with x** to one side and constants to the other side.
3. **Isolate x**: Divide or multiply to make the coefficient of x equal to 1.

Example: Solve 3x + 5 = 14

1. Subtract 5 from both sides: 3x + 5 - 5 = 14 - 5 → 3x = 9
2. Divide both sides by 3: 3x / 3 = 9 / 3 → x = 3

Applications of Linear Equations

Linear equations can be used to solve real-life problems, such as:

1. Finding numbers or unknown quantities.
2. Solving word problems (age problems, money problems, etc.).
3. Geometry-related problems (perimeter, area, etc.).

Example:

Problem: The sum of two numbers is 20. One number is twice the other. Find the numbers.

Solution:

1. Let the smaller number be x.
2. The larger number is 2x.
3. According to the question: x + 2x = 20
4. Solve: 3x = 20 → x = 20 / 3 So, the numbers are 20 / 3 and 40 / 3.

Special Cases in Linear Equations

1. **Equations with variables on both sides:**
    - Example: 2x + 5 = x + 9
    - Steps: 2x - x = 9 - 5 → x = 4
2. **Equations with brackets:**
    - Example: 3(x + 2) = 12
    - Steps: 3x + 6 = 12 → 3x = 6 → x = 2
3. **Equations with fractions:**
    - Example: x / 3 + 4 = 6
    - Steps: x / 3 = 6 - 4 → x / 3 = 2 → x = 2 × 3 → x = 6

Practice Questions

1. Solve the following equations:

   a) $5x + 3 = 18$

   b) $7x - 4 = 24$

   c) $x / 5 - 3 = 7$

   d) $2(x - 3) = 8$

2. Word Problems:

   a) A number is increased by 7, and the result is 15. Find the number.

   b) The perimeter of a rectangle is 40 cm. Its length is twice its width. Find the dimensions of the rectangle.

   c) A father's age is three times his son's age. In 10 years, their total age will be 80. Find their present ages.

3. Equations with variables on both sides:

   a) $2x + 3 = x + 9$

   b) $4x - 7 = 3x + 2$

   c) $5(x - 2) = 2(x + 4)$

Key Points to Remember

1. To solve linear equations, always keep x on one side and constants on the other.
2. Simplify the equation step by step to avoid mistakes.
3. Fractions can be cleared by multiplying throughout by the LCM of denominators.
4. Check your solution by substituting the value of x back into the original equation.
