Arithmetic Progression (AP) – Complete Theory Notes (Class 10 Level)

1. Introduction

- An Arithmetic Progression (AP) is a sequence of numbers in which the difference between consecutive terms remains constant. This constant difference is called the common difference.

2. General Form of AP

- General form: a, a + d, a + 2d, a + 3d, ... where 'a' is the first term and 'd' is the common difference.

3. First Term

- The first number of the sequence is called the first term and is denoted by 'a'.

4. Common Difference

- The difference between any term and its previous term is constant. Formula: d = a2 – a1 or d = an – a(n–1).

5. Types of AP

- Increasing AP: when d > 0
- Decreasing AP: when d < 0
- Constant AP: when d = 0

6. nth Term of AP

- The nth term represents the term at position n in the sequence.
- Formula: an = a + (n – 1)d

7. Finding Number of Terms

- If first term, last term and common difference are known, number of terms can be calculated as:
- n = (l – a) / d + 1

8. Sum of First n Terms

- The sum of first n terms of an AP is given by:
- Sn = n/2 [2a + (n – 1)d]

9. Alternative Formula for Sum

- If the last term is known:
- $S_n = n/2 (a + l)$

10. Special Properties

- If a, b, c are in AP then: $2b = a + c$.
- This property helps to find missing numbers in an AP.

11. Applications of AP

- Arithmetic Progressions are used in many real-life situations such as calculating salaries, savings plans, arranging seats in rows, and solving financial calculations.

12. Important Series

- Sum of first n natural numbers = $n(n+1)/2$
- Sum of first n even numbers = $n(n+1)$
- Sum of first n odd numbers = n^2