1 What is an Arithmetic Progression (AP)?

An **Arithmetic Progression (AP)** is a sequence of numbers in which the difference between any two consecutive terms is constant. This constant difference is called the **common difference (d)**.

Example: The sequence:

$$2, 5, 8, 11, 14, \ldots$$

has a common difference of $d = 3$.

2 General Form of Arithmetic Progression

The general form of an arithmetic progression is:

$$a, \quad a + d, \quad a + 2d, \quad a + 3d, \quad \ldots$$

where:

- a is the first term,

- d is the common difference.

3 General Term (nth Term) of an AP

The formula for the general (nth) term of an arithmetic progression is:

$$a_n = a + (n - 1)d$$

Example: Find the 10th term of the AP: $3, 7, 11, \ldots$

$$a = 3, \quad d = 4, \quad n = 10$$

$$a_{10} = 3 + (10 - 1) \cdot 4 = 3 + 36 = 39$$

Thus, the 10th term is 39.

4 nth Term from the End

The formula for the nth term from the end of an arithmetic progression with last term l is:

$$a_n = l - (n - 1)d$$

Example: Find the 3rd term from the end of the AP: $2, 4, 6, \ldots, 20$

$$l = 20, \quad d = 2, \quad n = 3$$

$$a_3 = 20 - (3 - 1) \cdot 2 = 20 - 4 = 16$$

Thus, the 3rd term from the end is 16.

5   Sum of n Terms of an AP

The sum of the first n terms of an arithmetic progression is given by the formula:

$$S_n = \frac{n}{2} \left(2a + (n-1)d\right)$$

Example: Find the sum of the first 8 terms of the AP: $5, 10, 15, \ldots$

$$a = 5, \quad d = 5, \quad n = 8$$

$$S_8 = \frac{8}{2} \left(2(5) + (8-1)5\right)$$

$$= 4\left(10 + 35\right) = 4 \times 45 = 180$$

Thus, the sum of the first 8 terms is 180.

6   General Form of the Sum of n Terms of an AP

The sum of n terms can also be expressed as:

$$S_n = \frac{n}{2}(a + l)$$

where:

- n = number of terms,

- a = first term,

- l = last term.

Example: Find the sum of the AP with first term 2, last term 20, and 10 terms.

$$S_{10} = \frac{10}{2}(2 + 20) = 5 \times 22 = 110$$

Thus, the sum is 110.