



CLASS – X
MATHEMATICS
CHAPTER – 6
ARITHMETIC PROGRESSION (AP)

NOTES

➤ **Sequence**

A succession of numbers formed according to a specific rule is called a sequence.

➤ **Arithmetic Progression**

A sequence $a_1, a_2, a_3, a_4, \dots, a_n, \dots$ is called an Arithmetic Progression (AP) if $a_{n+1} - a_n = \text{constant}$ for all $n \in \mathbb{N}$.

Or

An arithmetic progression is a sequence in which each term other than the first is obtained by adding a fixed number to the preceding term.

➤ **Common Difference**

In an AP, $a_1, a_2, a_3, \dots, a_n, \dots$ the value of $a_{n+1} - a_n$ is called common difference of the AP.

➤ **The n^{th} term (or the general term) of an AP**

Let a be the first term and d be the common difference of an AP.

Then the AP is $a, a + d, a + 2d, a + 3d, \dots$

$$\text{Here, } a_1 = a = a + (1 - 1)d$$

$$a_2 = a + d = a + (2 - 1)d$$

$$a_3 = a + 2d = a + (3 - 1)d$$

$$a_4 = a + 3d = a + (4 - 1)d$$

$$\dots\dots\dots$$

$$\dots\dots\dots$$

Looking the above pattern, we can write

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

Thus, for an AP whose first term is a and the common difference is d ,

$$\text{the } n^{\text{th}} \text{ term (or the general term) } a_n = a + (n - 1)d$$



➤ **Sum of the first n terms of an AP**

Let a and d be the first term and the common difference of an AP.

Then the AP is

$$a, a + d, a + 2d, \dots \dots a + (n - 2)d, a + (n - 1)d, \dots$$

Let S_n denotes the sum of the first n terms of the AP.

$$\text{Then } S_n = a + (a + d) + (a + 2d) + \dots + \{a + (n - 2)d\} + \{a + (n - 1)d\}$$

$$\text{And } S_n = \{a + (n - 1)d\} + \{a + (n - 2)d\} + \dots + (a + 2d) + (a + d) + a$$

Adding the above relations, we have

$$2.S_n = \{2a + (n - 1)d\} + \{2a + (n - 1)d\} + \dots + \text{to } n \text{ terms}$$

$$\Rightarrow 2.S_n = n\{2a + (n - 1)d\}$$

$$\Rightarrow S_n = \frac{n}{2}\{2a + (n - 1)d\} \text{ ----- (i)}$$

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

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

$$= \frac{n}{2}(a + l) \text{ ----- (ii)}$$

Thus, for an AP whose first term is a and the common difference is d ,

$$\text{the sum of the first } n \text{ terms, } S_n = \frac{n}{2}(a + a_n)$$

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

