Class 10th 3. Arithmetic Progression Algebra

Let's Study:

- Introduction of Sequence [3·1]
- Arithmetic Progression [3·1]
  [Definition, first term, common difference, general terms of an A.P]
- n^{th} term of an A.P. [3·2]
- Sum of first n terms of an A.P. [3·3]
- Application of A.P. [3·4]

Practice set and Problem set 3

3·1, 3·2, 3·3, 3·4

GALAXY OF MATHS

Arithmetic Progression

Definition:

→ An arithmetic progression (A.P) is a sequence in which difference between two consecutive terms is constant.

→ The terms of an A.P are denoted by $t_1, t_2, t_3, t_4, \ldots$

For Example: In a sequence,

$2, 4, 6, 8, \ldots$

$t_1 = 2,\ t_2 = 4,\ t_3 = 6,\ t_4 = 8$ and so on

Difference Between two consecutive terms

$$\left\{\begin{aligned} t_2 - t_1 &= 4 - 2 = \underline{\underline{2}} \\ t_3 - t_2 &= 6 - 4 = \underline{\underline{2}} \\ t_4 - t_3 &= 8 - 6 = \underline{\underline{2}} \end{aligned}\right\} \text{constant / same}$$

$\therefore$ The Sequence $2, 4, 6, 8, \ldots$ is an A.P.

→ Common difference: And that difference is known as common difference of an A.P

In the above Example, common difference $= \underline{\underline{2}}$

→ Common difference is denoted by 'd'.

→ Common difference can be positive, negative or zero. (MCQ)

→ First term: The First term is also denoted by 'a'

General term:

If for an A.P a = first term, d = common difference

$$\boxed{\therefore \text{A.P is } a,\ a+d,\ a+2d,\ a+3d,\ \ldots}$$

$$\begin{array}{ccccc} a & a+d & a+2d & a+3d & \\ \downarrow & \downarrow & \downarrow & \downarrow & \\ t_1 & t_2 & t_3 & t_4 & \ldots \end{array}$$

Terms of an A.P

n^{th} term of an A.P [t_n]

→ The n^{th} term of an A.P is given by,

$$\boxed{t_n = a + (n-1)d}$$

Here, a → first term

d → common difference

t_n → n^{th} term

n → position of the term.

Sum of first 'n' terms of an A.P [Sum = Total] [S_n]

When first term and Common difference are given:

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

Here,

a → first term

d → common difference

n → total terms

When first and last terms are given.

$$\boxed{S_n = \frac{n}{2}[t_1 + t_n]}$$

Here,

$t_1 = a$ → first term

n → total terms

t_n → n^{th} term [last term]

Note: Three Consecutive terms which are in A.P

$a-d,\ a,\ a+d.$

Four Consecutive terms which are in A.P

$a-d,\ a,\ a+d,\ a+2d.$