Class 10-Mathematics

Instructions for students: The notes provided must be copied to the Maths copy and then do the homework in the same copy.

Chapter 9

Arithmetic Progression(A.P)

Arithmetic Progression (A.P)

- A list of numbers in which each term is obtained by adding a fixed number to its preceding term, except the first term, is called an arithmetic progression.
- A list of numbers is called an arithmetic progression if and only if the difference of any term from its preceding term is a constant.
- This constant is called common difference and is usually denoted by d.
- It may be positive, negative or zero.
- The first term of an A.P is usually denoted by **'a'**.
- The first, second, third, …. Terms are denoted by a_1, a_2, a_3……. Or t_1, t_2, t_3…….
- $d = a_{n+1} - a_n$

  Examples of Arithmetic progression

  1, 4, 7, 10… a=1, d=3

  4, 1, -2, -5, -8… A=4, d= -3
- An Arithmetic Progression which contains finite number of terms is called a **finite A.P**.

  Example: 1, 4, 7, 10, 13…….40
- An Arithmetic Progression which contains infinite number of terms is called an **infinite A.P**.

  Example: -5, 0, 5, 10, 15, 20, …….

<u>General Term of an Arithmetic Progression</u>

$\mathbf{a_n = a+(n-1)d}$, where n is a natural number, a is the first term & d is the common difference.

<u>Difference of any two terms of an A.P</u>

$\mathbf{a_n - a_m = (n - m)d}$, where m and n are natural numbers & d is the common difference

The n^{th} term from the end of a finite A.P

The n^{th} term from the end of a finite A.P consisting of m terms = a+(m – n)d, where a is the first term & d is the common difference.

Or

The n^{th} term from last term = l –(n-1)d, where l is the last term.

Middle term(s) of a finite A.P with n terms

- If n is odd, then the A.P has only one middle term and that term is $\frac{n}{2}\ th$ term.
- If n is even, then the A.P has 2 middle terms and they are $\frac{n}{2}\ th$ term and $\left(\frac{n}{2}+1\right)\ th$ term.

Exercise 9.2

3. Solution:

a = 5, d = -3

n^{th} term = a+(n-1)d

= 5+(n-1). -3

= 5-3n+3 = 8 – 3n

12^{th} term = 8 - 3×12

= -28.

5. i) If the common difference of an A.P is -3 and the 18^{th} term is -5, then find its first term.

Solution:

a_n = a+(n-1)d;

$\Rightarrow a_{18}$ = a+(18-1)d; a_{18} = -5, d = -3

$\Rightarrow$-5 = a+17×-3

$\Rightarrow$a = -5 + 51 = 46

8. i) Solution:

a = 3 , d = 5 l =253

n^{th} term = l - (n-1)d

20^{th} term = 253 – (20-1).5

= 253 – 95 = 158

15. Solution:

a+6d = $\frac{1}{9}$ …….(i)

a+8d = $\frac{1}{7}$ ……(ii)

Subtracting (i) from (ii) we get

2d = $\frac{1}{7} - \frac{1}{9} = \frac{2}{63}$

d = $\frac{1}{63}$

a+ $\frac{8}{63}$ = $\frac{1}{7}$

a = $\frac{1}{63}$

a_{63} = a+62d

= $\frac{1}{63} + \frac{62}{63}$

a_{63} = $\frac{63}{63}$ = 1

18. Which term of the A.P 3, 10, 17, …..will be 84 more than its 13th term?

Solution:

a=3, d=7

Let the required term be the nth term.

A/Q, a_n = a_{13} + 84

$\Rightarrow$ a+(n-1)d = a+12d + 84

$\Rightarrow$ 3+(n – 1).7 = 3+12.7 + 84

$\Rightarrow$ 3+7n – 7 = 3 +84+84

$\Rightarrow$ n = $\frac{175}{7}$ = 25

25th term is the required term.

Home Work: Solve Exercise **9.1 and 9.2** in the Maths copy.