DAY 4

Applications of General Term of AP

In last section, we have discussed about general term and missing terms of AP. In this section, we shall discuss its applications in practical life which are as follows:

1. **How many two digit numbers are divisible by 3?** **[Example 7]**

Sol:- Two digit numbers start from 10,11,12,.....99

Given condition: Two digit numbers divisible by 3 are 12,15,.....,99

Here $a = 12, d = 15 - 12 = 3$ and last term $(l) = 99$

Since last term$(l)$is considered as n^{th}term

So $l = a_n = 99$

$\Rightarrow a + (n-1)d = 99$ $\Rightarrow 12 + (n-1)3 = 99$

$\Rightarrow 12 + 3n - 3 = 99$ $\Rightarrow 3n + 9 = 99$

$\Rightarrow 3n = 99 - 9 = 90$ $\Rightarrow n = \frac{90}{3} = 30$

Hence **there are 30 two digit numbers are divisible by 3.**

2. **How many three digit numbers are divisible by 7?** **[Ex 5.2, Q13]**

Sol:- Three digit numbers start from 100,101,102,.....,999

Given condition: Three digit numbers divisible by 7 are 105, 112,.....,994

Here $a = 105, d = 112 - 105 = 7$ and last term $(l) = 994$

Since last term$(l)$is considered as n^{th}term

So $l = a_n = 994$

$\Rightarrow a + (n-1)d = 994$ $\Rightarrow 105 + (n-1)7 = 994$

$\Rightarrow 105 + 7n - 7 = 994$ $\Rightarrow 7n + 98 = 994$

$\Rightarrow 7n = 994 - 98 = 896$ $\Rightarrow n = \frac{896}{7} = 128$

Hence **there are 128 three digit numbers are divisible by 7.**

3. **For what value of n, are the nth terms of two APs: 63,65,67,..... and 3,10,17,.....equal?** **[Ex 5.2, Q15]**

Sol:- First AP 63,65,67, … … ..

here first term$(a) = 63$ and $d = 65 - 63 = 2$

Second AP 3,10,17, … … ..

here first term (A) $= 3$ and $D = 10 - 3 = 7$

Given condition: nth of first AP = nth of second AP

$\Rightarrow a + (n-1)d = A + (n-1)D$

$\Rightarrow 63 + (n-1)2 = 3 + (n-1)7$

$\Rightarrow 63 + 2n - 2 = 3 + 7n - 7 \qquad \Rightarrow 2n + 61 = 7n - 4$

$\Rightarrow 7n - 2n = 61 + 4 = 65 \qquad \Rightarrow 5n = 65$

$\Rightarrow n = \frac{65}{5} = 13$

Hence 13th term of both APs are equal.

4. **In a flower bed, there are 23 rose plants in the first row, 21 in the second, 19 in the third, and so on. There are 5 rose plants in the last row. How many rows are there in the flower bed? [Example 10]**

Sol:- In the flower red, In 1st, 2nd, 3rd.... rows, there are 23,21,19, ...,5 roses respectively.

Here difference in each term is same, so this is an AP.

AP is 23,21,19, … … … … … … … … … .,5

$a = 23, d = 21 - 23 = -2,$ last term$(l) = 5$

$\boldsymbol{l}$ is considered as n^{th} term, so $a_n = 5$

$\Rightarrow \quad a + (n-1)d = 5$

$\Rightarrow \quad 23 + (n-1)(-2) = 5 \qquad \Rightarrow (n-1)(-2) = 5 - 23 = -18$

$\Rightarrow \quad n - 1 = \frac{-18}{-2} = 9 \qquad \Rightarrow \quad n = 9 + 1 = 10$

$\therefore$ **There are 10 rows of roses in the flower bed.**

5. **Two APs have the same common difference. The difference between their 100th terms is 100, what is the difference between their 1000th terms?**

Sol:- Given: **Two APs have the same common difference suppose $\boldsymbol{d}$.**

In 1st AP, suppose first term is a and difference is d

then 100th term$= a + 99d$ and 1000th term $= a + 999d$

In 2nd AP, suppose first term is A and difference is d

then 100th term$= A + 99d$ and 1000th term $= A + 999d$

Given condition: Difference between 100th terms of both AP = 100

$\Rightarrow \quad (a + 99d) - (A + 99d) = 100$

$\Rightarrow \quad a + 99d - A - 99d = 100 \qquad \Rightarrow a - A = 100 \ldots\ldots\ldots \text{i})$

Now Difference between 1000th terms of both AP $= (a + 999d) - (A + 999d)$

$= a + 999d - A - 999d = a - A = 100$ [by i)]

$\therefore$ **The difference between their 1000th terms is 100.**

EXERCISE

1. **Ex. 5.2, Q14,19,20**
2. **Example 9**