

## **ARITHMETIC PROGRESSION**

### **(Key Points)**

- Arithmetic progression (A.P.) :- An A.P. is a list of numbers in which each term is obtained by adding a fixed number to the preceding term except the first term.
- This fixed number is called the common difference of the A.P.
- If  $a$  is first term and  $d$  is common difference of an A.P. , then the A.P is  $a, a+d, a+2d, 2+3d \dots$
- The  $n^{th}$  term of an A.P is denoted by  $a_n$  and  $a_n = a + (n-1)d$  , where  $a$  = first term and  $d$  = common difference.
- $n^{th}$  term from the end =  $l - (n-1)d$  , where  $l$  = last term.
- Three terms  $a-d, a, a+d$  are in A.P with common difference  $d$ .
- Four terms  $a-3d, a-d, a+d, a+3d$  are in A.P with common diff.  $2d$  .
- The sum of first  $n$  natural numbers is  $\frac{n(n+1)}{2}$
- The sum of  $n$  terms of an A.P with first term  $a$  and common difference  $d$  is denoted by  $s_n = \frac{n}{2} \{ 2a + (n-1)d \}$  also ,  $s_n = \frac{n}{2}(a+l)$  where ,  $l$  = last term.
- $a_n = s_n - s_{n-1}$ . Where  $a_n = n^{th}$  term of an A.P
- $D = a_n - a_{n-1}$ . Where  $d$  = common difference of an A.P.

### **[LEVEL - 1]**

1. Find  $n^{th}$  term of  $-15, -18, -21, \dots$

Ans .-3 (n+4)

2. Find the common diff. of A.P  $1, -2, -5, -8, \dots$

Ans . -3

3. Find the A.P whose first term is 4 and common difference is  $-3$

Ans . a.p =  $4, 1-2, -5, -8, \dots$

4. Find  $5^{th}$  term from end of the AP :  $17, 14, 11, \dots, -40$ .

Ans . -28

5. If  $2p, p+10, 3p+2$  are in AP then find  $p$ .

Ans .  $p=6$

6. If arithmetic mean between  $3a$  and  $2a-7$  is  $a+4$  , then find  $a$ .

Ans .  $a=5$

7. Find sum of all odd numbers between 0 & 50.

Ans . 625

8. If  $a = 5, d = 3$  and  $a_n = 50$  , then find  $n$ .

Ans .  $n=16$

9. For what value of  $n$  are the  $n^{th}$  term of two AP ,  $63, 65, 67, \dots$  and  $3, 10, 17, \dots$  equal?

Ans .  $n=13$ .

10. If sum of  $n$  terms of an AP is  $2n^2+5n$  , then find its  $n^{th}$  term.

Ans.  $4n+3$ .

### **[LEVEL - 2]**

1. Find  $n^{th}$  term of an AP is  $7-4n$ . find its common difference.

Ans. -4.

2. Which term of an AP  $5, 2, -1, \dots$  will be -22 ?

Ans .  $10^{th}$  term .

3. Write the next term of an AP  $\sqrt{8}, \sqrt{18}, \sqrt{32}, \dots$

Ans.  $5\sqrt{2}$ .

4. Determine  $27^{th}$  term of an AP whose  $9^{th}$  term is -10 and common difference is  $1\frac{1}{4}$

Ans.  $927 = \frac{25}{2}$ .

5. Find the sum of series  $103+101+99+\dots+49$ .

Ans. 2128.

6. Which term of the AP  $3, 15, 27, 39, \dots$  will be 132 more than its  $54^{th}$  term ?

Ans.  $65^{th}$  term .

7. How many three digit numbers are divisible by 7 ?

Ans. 128.

8. Given  $a = 2$ ,  $d = 8$ ,  $s_n = 90$ , find n and  $a_n$ .

Ans.  $N = 5$  &  $a_n = 34$

### (LEVEL- 3)

1. Which term of the sequence  $-1, 3, 7, 11, \dots$  Is 95?

Ans.  $25^{th}$  term

2. How many terms are there in the sequence  $3, 6, 9, 12, \dots, 111$ ?

Ans. 37 terms

3. The first term of an AP is -7 and the common difference 5, find its  $18^{th}$  term and the general term.

Ans.  $a_{18} = 78n$  &  $a_n = 5n - 12$

4. How many numbers of two digits are divisible by 3?

Ans. 30

5. If the  $n^{th}$  term of an AP is  $(2n+1)$ , find the sum of first n terms of the AP

Ans.  $S_n = n(n+2)$

6. Find the sum of all natural numbers between 250 and 1000 which are exactly divisible by 3.

Ans. 156375.

### Problems for self evaluation.

1. Show that the sequence defined by  $t_n = 4n + 7$  is an AP.

2. Find the number of terms for given AP :  $7, 13, 19, 25, \dots, 205$ .

3. The  $7^{th}$  term of an AP is 32 and its  $13^{th}$  term is 62. Find AP.

4. Find the sum of all two digit odd positive nos.

5. Find the value of 'x' for AP.  $1+6+11+16+\dots+x=148$ .

6. Find the  $10^{th}$  term from the end of the AP  $8, 10, 12, \dots, 126$ .

7. The sum of three numbers of AP is 3 and their product is -35. Find the numbers.

8. A man repays a loan of Rs3250 by paying Rs20 in the first month and then increase the payment by Rs15 every month .How long will it take him to clear the loan ?

9. The ratio of the sums of m and n terms of an AP is  $m^2 : n^2$ . show that the ratio of the mth and nth terms is  $(2m-1) : (2n-1)$ .
10. In an AP , the sum of first n terms is  $\frac{3n^2}{2} + \frac{5n}{2}$ , Find its 25<sup>th</sup> term.