**Arithmetic Progression**

Arithmetic Progression in short AP is a sequence of numbers or terms in which each term except the first term is obtained by adding a fixed number or constant to the preceding term.

Common difference is given by  d = t2 – t1 = t3 – t2 =……..

The nth term is also denoted with l or b.

General term of AP is tn = a + (n – 1)d

Where a is the first term, d is the common difference and n is the number of term.

The common difference is the difference between two successive terms that is t2 – t1 = t3 – t2 = t4 – t3 =….

The sum of first n terms of an AP is given by Sn =  or 

Or



Where **l = a + (n – 1)d** is called the **last term**.

Let us consider the following set of members:
1, 5, 9, 13, 17………….
9, 12, 15, 18, 21 ……..
-5, 0, 5, 10, 15………
1.3, 1.6, 1.9, 2.2 ……..…

All these sets follow certain rules. In first set 5 - 1 = 9 - 5 = 13 - 9 = 17 - 13 = 4

In second set 12 - 9 = 15 - 12 = 18 - 15 = 21 - 18 = 3

and so on. In first set the number after 17 in 17 + 4 = 21 and in second set number after 21 is 21 + 3 = 24. In this way we find that in first set second number is 1+ 4 = 5, third number is 5 + 4 = 9 = 1 + 2 x 4 and so on.

On the basis of above discussion we can consider the following series

a, a + d, a + 2d, a + 3d, .........................

Here a = 1, d = 4

a + d = 1 + 4 = 5

a + 2d = 1 + 2 x 4 = 9

and so on

Thus we can say that

a = First term

a + d = Second term

a + 2d = Third term

a + 3d = Fourth term and son on

 nth term = a + (n - 1)d

Here First term = t1 = a

Second term = t2 = a + d

and hence, tn = a + (n - 1)d

d is called common difference and the series is called arithmetic progression

Let s = 1 + 2 + 3 + 4 + 5 + 6 + 7 + + 8 + 9 + 10 and writting in reversed order

S = 10 + 9 + 8 + 7 + 6 + 5 + 4 + 3 + 2 + 1

Adding these two we get 2s = 11 + 11 + 11 + 11 + 11 + 11 + 11 = 11 + 11 + 11

= 10 X 11

 s = (10 X 11)/2 = 55

In similar way, if



Adding we get





**Example 1.**

Find the common difference of the A.P. 2, 5, 8, 11, 14….........

**Solution**

 Here a = 2, a + d = 5, a + 2d = 8



**Example 2**

Show that p - q, p and p + q from consecutive terms of an A.P.

**Solution:-**p + q - p = p - (p - q) = q = c.d.

Hence p - q, p and p + q from consective terms of an A.P.

**Example 3.**

Find A.P. whose 5th term is 24 and difference between 7th term and 10th term is 15.

**Solution**

t5 = a + 4d = 24

t7 = a + 6d

t10 = a + 9d

t10 - t7 = 15



Hence the A. P. is 4, 9, 14, 19, 24, 29, 34, .................................

 **Example 4.**

Find the sum of first n terms of odd natural number.

**Solution:-** Given series is 1, 3, 5, 7, 9,------------

a = 1, d = 2



 **Example 5.**

Common difference of an A.P. is -2 and first term is 80. Find the sum if last term is 10.

**Solution**

Here a = 80, d = -2, tn = 10

Using, tn = a + (n - 1)d

10 = 80 + (n - 1) (-2)

10 - 80 = -2n + 2

-70 - 2 = -2n

n = 36



**Example 6**

Find the sum of first 30 terms of an A. P. whose nth term is 2 + 1/2n

**Solution**

tn = 2 + 1/2n

tn - 1 = 2 + 1/2( n- 1)

tn - tn - 1 = 2 + 1/2n - 2 - 1/2(n - 1)

d = 1/2

a = t1 = 2 + 1/2 X 1 = 5/2

n = 30

****