ARITHMETIC PROGRESSIONS

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CONTENTS

TYPES OF PROGRESSIONS AND THEIR APPLICATIONS

1. **<u>Arithmetic Progressions</u>** -

   When we travel by an auto or a taxi we are first charged at a fixed amount to which for every additional kilometre we are charged an extra amount. So as the fixed fare we may first pay, say ₹12 and for every additional kilometre we pay say ₹5, as a result the payment rate after every km is an A.P. i.e, 12,17,22,27,32......

2. **<u>Geometric Progressions</u>** -

   A single bacteria divides into 2 every second. The sequence of the number of bacteria at every second forms a G.P. i.e., 1, 2, 4, 8,16, 32,...... (powers of 2)

3. **<u>Harmonic Progressions</u>**-

   These progressions are used in the designing of musical instruments and are not very simple. The reciprocals of the terms of a H.P are in A.P. An example is 1, 1/4, 1/7, 1/10,..........

ARITHMETIC PROGRESSIONS

- Consider the following sequences
  - 1, 2, 3, 4,..............

  2, 2, 2, 2,.........

  100, 70, 40, 10, -20,.......
- Each of the numbers in each sequence is called a term.
- The difference between any 2 consecutive terms in each sequence is a constant.
- These are the properties of an A.P. i.e.,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.

COMMON DIFFERENCE OF AN A.P.

- The fixed number that is added to every term to obtain its succeeding term is called the common difference of the A.P.
- This is represented by d.
- The common difference can be positive, negative or zero.
- $d=a_n-a_{n-1}$

GENERAL FORM OF AN A.P.

- a, a+d, a+2d, a+3d, a+4d,………… is called the general form of Arithmetic Progressions.

FINITE AND INFINITE A.P.

- Progressions containing only a finite number of terms is called a finite A.P.
- Progressions that do not have an finite number of terms is called an infinite A.P.

'N'TH TERM OF AN A.P.

- 1st term of A.P=a
- 2nd term of A.P=a+d
- 3rd term of A.P=a+2d
- 4th term of A.P=a+3d
- ......and so on...
- By now you would have noticed that the coefficient of d is 1 less than the number of the term in the sequence.
- Therefore the general formula for the 'n'th term, $a_n=a+(n-1)d$

SUM OF THE FIRST 'N' TERMS OF AN A.P.

- The sum of the first 'n' terms of an A.P is denoted by S_n.
- S_n=[n{2a+(n-1)d}]/2 and it is also equal to S_n=[n(a+l)]/2, where l is is the 'n'th term of the A.P.

ARITHMETIC MEAN

- If a, b, c are in A.P, then b=(a+c)/2.
- b is the arithmetic mean(commonly known as average)of a and c.

SUMMARY

- An A.P is a list of numbers obtained by adding a fixed number d to the preceding term, except the first term. The number d is called the common difference.
- General form of an A.P : a, a+d, a+2d, a+3d, a+4d,..........
- In an A.P, the value of d is given by $a_{k+1} - a_k$
- The 'n' term in the A.P, $a_n = a+(n-1)d$, where a is the first term, d is the common difference.
- The sum of the first 'n' terms of the A.P, $S_n=[n\{2a+(n-1)d\}]/2$. It is also equal to $[n(a+l)]/2$