AP, GP, HP

Arithmetic Progression (A.P.)

1. An arithmetic progression is a sequence of numbers in which each term is derived from the preceding term by adding or subtracting a fixed number called the common difference "d"

   For example, the sequence 9, 6, 3, 0,-3, ... is an arithmetic progression with -3 as the common difference. The progression -3, 0, 3, 6, 9 is an Arithmetic Progression (AP) with 3 as the common difference.

2. The general form of an Arithmetic Progression is a, a + d, a + 2d, a + 3d and so on. Thus nth term of an AP series is $T_n = a + (n - 1) d$, where $T_n = n^{th}$ term and a = first term. Here d = common difference = $T_n - T_{n-1}$.

3. Sum of first 'n' terms of an AP: S =(n/2)[2a + (n- 1)d]

4. The sum of n terms is also equal to the formula, (sum) = n/2(a + l) where l is the last term.

5. $T_n = S_n - S_{n-1}$, where $T_n = n^{th}$ term

6. When three quantities are in AP, the middle one is called as the arithmetic mean of the other two. If a, b and c are three terms in AP then b = (a + c)/2

Geometric Progression (G.P.)

1. A geometric progression is a sequence in which each term is derived by multiplying or dividing the preceding term by a fixed number called the common ratio. For example, the sequence 4, -2, 1, - 1/2,.... is a Geometric Progression (GP) for which - 1/2 is the common ratio.

2. The general form of a GP is a, ar, ar^2, ar^3 and so on.

3. The nth term of a GP series is $T_n = ar^{n-1}$, where a=first term and r = common ratio = T_n/T_{n-1}) .

4. The formula applied to calculate sum of first n terms of a GP:

5. When three quantities are in GP, the middle one is called as the geometric mean of the other two. If a, b and c are three quantities in GP and b is the geometric mean of a and c i.e. b =√ac

6. The sum of infinite terms of a GP series S_∞ = a/(1-r) where 0< r<1.

7. If a is the first term, r is the common ratio of a finite G.P. consisting of m terms, then the nth term from the end will be = ar^{m-n}.

8. The nth term from the end of the G.P. with the last term l and common ratio r is $l/(r^{(n-1)})$.

Harmonic Progression (H.P.)

1. A series of terms is known as a HP series when their reciprocals are in arithmetic progression.

   Example: 1/a, 1/(a + d), 1/(a+2d), and so on are in HP because a, a + d, a + 2d are in AP.

2. The nth term of a HP series is $T_n = 1/[a + (n-1)d]$.

3. In order to solve a problem on Harmonic Progression, one should make the corresponding AP series and then solve the problem.

4. nth term of H.P. = 1/(nth term of corresponding A.P.)

5. If three terms a, b, c are in HP, then $b = 2ac/(a+c)$.

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