Subject : Mathematics
Class : XI

Kannada

Sequence and Series

An arithmetic progression (A.P.): $a, a+d, a+2d \ldots\ldots\ldots\ldots a+(n-1)d$ is an A.P.

Let a be the first term and d be the common difference of an A.P., then n^{th} term $= t_n = a+(n-1)d$

The sum of first *n* terms of are A.P.

$$S_n = \frac{n}{2}\left[2a+(n-1)d\right] = \frac{n}{2}\left[a+\ell\right]$$

r^{th} term of an A.P. when sum of first r terms is given is $t_r = S_r - S_{r-1}$.

Properties of A.P.

(i) If a, b, c are in A.P

$\Rightarrow 2b = a+c$ & if a, b, c, d are in A.P.

$\Rightarrow a+d = b+c$.

(ii) Three numbers in A.P. can be taken as $a-d, a, a+d$; four numbers in A.P. can be taken as $a-3d, a-d, a+d, a+3d$; five numbers in A.P. are $a-2d, a-d, a, a+d, a+2d$ & six terms in A.P. are $a-5d, a-3d, a-d, a+d, a+3d, a+5d$ etc.

(iii) Sum of the terms of an A.P. equidistant from the beginning & end = sum of first & last term.

Arithmetic Mean (Mean or Average) (A.M.):

If three terms are in A.P. then the middle term is called the A M. between the other two, so if a, b, c are in A.P., b is A.M. of a & c.

n-Arithmetic Means Between Two Numbers:

If a, b are any two given numbers & a, $A_1 A_2 \ldots A_n, b$ are in A.P. then $A_1 A_2, \ldots A_n$ are the A.M .

$$A_1 = a+\frac{b-a}{n+1}, A_2 = a+\frac{2(b-a)}{n+1}, \ldots\ldots, A_n = a+\frac{n(b-a)}{n+1}$$

$\sum_{r=1} A_r = nA$ where A is the single A M. between a & b.

Geometric Progression: $a, ar, ar^2, ar^3, ar^4 \ldots$ with a as the first term & r as common ratio.

(i) n^{th} terms $= ar^{n-1}$

(ii) Sum of the first n terms i.e. $S_n = \begin{cases} \dfrac{a\left(r^n -\right)}{r-1}, & r \neq 1 \\ na & r = 1 \end{cases}$

Geometric Means (Mean Proportional) (GM.):

(a) If $a.b,c>0$ are in G P. b is the G M between $a\&c$, then $b^2=ac$

***n* Geometric Means Between Positive Number a, b :** If a,b are two given numbers & $a.G_1,G_2\ldots\ldots,G_3b$ are in G.P Then $G_1,G_2,\ G_3\ldots\ldots..,G_n$ are n GM.s between $a\&b.G_2=\mathrm{a(b/a)}^{2/n+1}..G_n=\ a(b/a)^{n/n+1}$

Harmonic Mean (H.M.):

If a,b,c are in HP., b is the H.M. between $a\&c$, then $b=\dfrac{2ac}{a+c}$

H.M, H of $a_1,a_2,..a_n$ is given by $\dfrac{1}{H}=\dfrac{1}{n}\left[\dfrac{1}{a_1}+\dfrac{1}{a_2}+\ldots\ldots+\dfrac{1}{a_n}\right]$

Relation between Means:

$G^2=AH$, A.M. > G.M. ≥ H.M. and A.M. = G.M. = H.M.

if $a_1=a_2=a_3=\ldots\ldots..=a_n$

Important Results

(i) $\sum_{r=1}^{n}\left(a_r\pm b_r\right)=\sum_{r=1}^{n}a_r\pm\sum_{r=1}^{n}b_r$

(ii) $\sum_{r=1}^{n}ka_r=k\sum_{r=1}^{n}a_r$

(iii) $\sum_{r=1}^{n}k=nk$ where k is a constant,

(iv) $\sum_{r=1}^{n}r=1+2+3+\ldots\ldots\ldots+n=\dfrac{n\left(n+1\right)}{2}$

(v) $\sum_{r=1}^{n}r^2=1^2+2^2+3^2+\ldots\ldots\ldots\ldots+n^2=\dfrac{n\left(n+1\right)\left(2n+1\right)}{6}$ vi)

(vi) $\sum_{=1}r^3=1^3+2^3+3^3+\ldots\ldots\ldots+n^3=\dfrac{n^2(n+1)^2}{4}$

vii) $\sum_{i<j=1}^{n}a_ia_j=\left(a_1+a_2+\ldots\ldots\ldots+a_n\right)^2-\left(a_1{}^2+a_2{}^2+\ldots\ldots+a_n^2\right)$



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