HARMONIC PROGRESSION & MISC.

WHAT IS A PROGRESSION ?

A Progression is a list of things (usually numbers) that are in order.

Example : 2 (1st term) 4 (2nd term) 8......... (3rd term) ← Dots Denote Infinite Progression

TYPE OF PROGRESSION

| Arithmetic Progression | Geometric progression | Harmonic Progression | Arithmetico Geometric progression | Miscellaneous Progression |

HARMONIC PROGRESSION

➡ It is a sequence in which the reciprocal of the terms are in Arithmetic Progression.

➡ If $a, a + d, a + 2d, \ldots\ldots$ in Arithmetic Progression.

then $\dfrac{1}{a}, \dfrac{1}{a+d}, \dfrac{1}{a+2d}, \ldots$ in Harmonic Progression.

➡ n^{th} term of the Harmonic term is $T_n = \dfrac{1}{a + (n-1)d}$

➡ Sum of 'n' terms ⟹ No direct way but can be found with the help of A.P.

➡ If $a_1, a_2, \ldots\ldots a_n$ in Arithmatic Progression the Harmonic mean H_m is

$$\dfrac{n}{H_m} = \dfrac{1}{a_1} + \dfrac{1}{a_2} + \ldots\ldots + \dfrac{1}{a_n}$$

➡ $R.M.S \geq AM \geq GM \geq HM$

➡ $GM^2 = AM \times HM$ ➡ AM, GM, and HM are in Geometric Progression.

MISCELLANEONS PROGRESSION

Sequences which sometimes follow a particular pattern and sometimes not.

POWER SERIESES

➡ Sum of the first 'n' natural number $1 + 2 + 3 + \ldots n = \sum n = \dfrac{n(n+1)}{2}$

➡ Sum of Squares of the first 'n' natural numbers $1^2 + 2^2 + 3^2 + \ldots n^2 = \sum n^2 = \dfrac{n(n+1)(2n+1)}{6}$

➡ Sum of cubes of the first 'n' natural numbers $1^3 + 2^3 + \ldots + n^3 = \sum n^3 = \dfrac{[n(n+1)]^2}{4} = (1 + 2 + \ldots n)^2$