X PROGRESSION

A succession of numbers formed and arranged in a definite order according to certain definite rule, is called a *progression*.

1. **Arithmetic Progression (A.P.) :** If each term of a progression differs from its preceding term by a constant, then such a progression is called an arithmetical progression. This constant difference is called the *common difference of the A.P.*
An A.P. with first term a and common difference d is given by $a, (a + d), (a + 2d), (a + 3d), \ldots$

The nth term of this A.P. is given by $T_n = a + (n - 1)\, d$.

The sum of n terms of this A.P.

$$S_n = \frac{n}{2}[2a + (n - 1)\, d] = \frac{n}{2} \text{ (first term + last term)}$$

SOME IMPORTANT RESULTS :

(i) $(1 + 2 + 3 + \ldots + n) = \dfrac{n(n + 1)}{2}$.

(ii) $(1^2 + 2^2 + 3^2 + \ldots + n^2) = \dfrac{n(n + 1)(2n + 1)}{6}$.

(iii) $(1^3 + 2^3 + 3^3 + \ldots + n^3) = \dfrac{n^2 (n + 1)^2}{4}$.

2. **Geometrical Progression (G.P.) :** A progression of numbers in which every term bears a constant ratio with its preceding term, is called a *geometrical progression*.
The constant ratio is called the common ratio of the G.P.
A G.P. with first term a and common ratio r is :

$$a, ar, ar^2, ar^3, \ldots$$

In this G.P. $T_n = ar^{n-1}$.

Sum of the n terms, $S_n = \dfrac{a(1 - r^n)}{(1 - r)}$.