Arithmetic & Geometric Progression

Arithmetic Progression

➢ **Series of the form→**

a, a + d, a + 2d, a + 3d . . . . . .

is called Arithmetic Progression, when they increase or decrease by a common difference

e.g.→ 5, 12, 19, 26, 33

Common difference, d = 12 – 5 = 7

19 – 12 = 7

26 – 19 = 7

➢ $a_1, a_2, a_3 \ldots\ldots\ldots, T_n$

d = common difference

= Second term – Ist term

$= a_2 - a_1$

$\boxed{T_n = a + (n-1)d}$

$a \rightarrow 1^{st}$ term

n → no. of terms

d → Common difference

➢ **Sum of n terms in A.P**

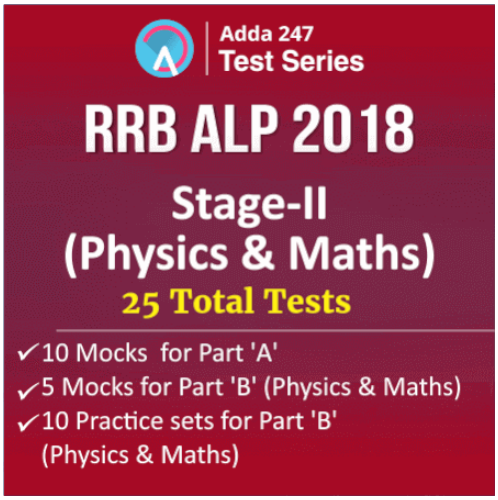
$S_n = \frac{n}{2}[2a + (n-1)d]$

Or

$S_n = \frac{n}{2}[\text{First term} + \text{last term}]$

➢ **Total no. of term**

$= \frac{\text{Last term} - \text{First term}}{\text{Common difference}} + 1$



Geometric Progression

- a, ar, ar^2, ar^3 . . . . . ar^{n-1}

Common Ratio (r) = $\frac{\text{Second term}}{\text{First term}}$

n^{th} term $(T_n) = ar^{n-1}$

- **Sum of G.P, Sn** = $\frac{a(r^n-1)}{r-1}$ where r > 1

Or

$S_n = \frac{a(1-r^n)}{1-r}$ where $r < 1$

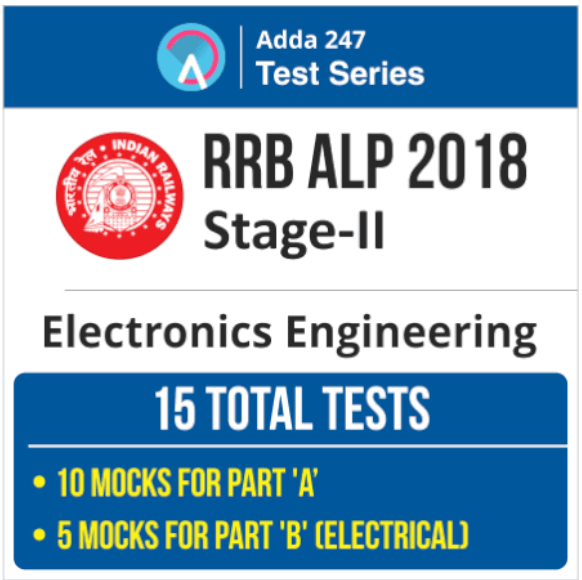
- **Sum of an Infinite Geometric Progression when r < 1**

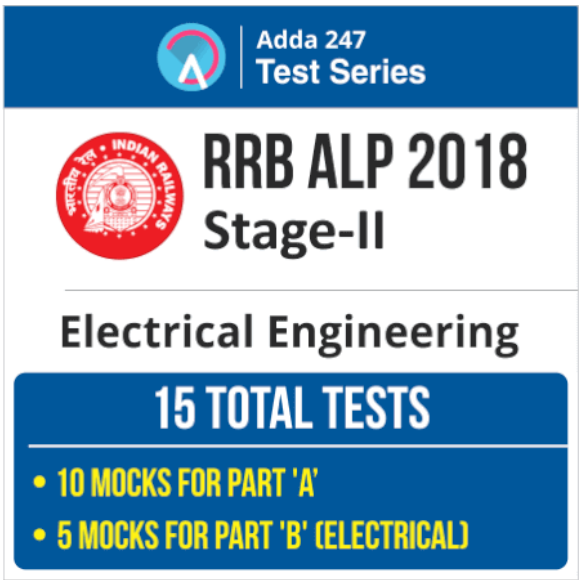
$S_\infty = \frac{a}{1-r}$

- The figure made by joining the mid-points of a square and the area of thus made square is half the actual square.
- The figure made by joining the mid-points of a right-angle triangle is right angle triangle and the area thus made triangle is $1/4^{th}$ of the actual triangle.
- To find the **sum of First n natural number.**

S = 1 + 2 + 3 + 4 + ... n

$$\boxed{S = \frac{n(n+1)}{2}}$$

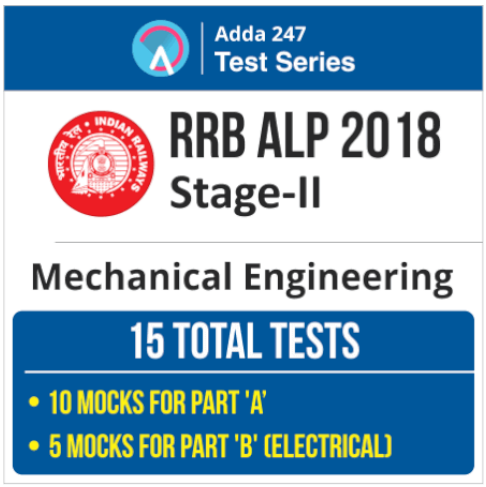




➢ To find the **sum of the Squares of the 1st n natural numbers.**

$S = 1^2 + 2^2 + 3^2 + ... + n^2$

$$S = \frac{n(n+1)(2n+1)}{6}$$



➢ To find the **sum of the cubes of the 1st n natural numbers.**

$S = 1^3 + 2^3 + 3^3 + ... + n^3$

$$S = \left[\frac{n(n+1)}{2}\right]^2$$

➢ To find the **sum of first n odd natural numbers.**

$S = 1 + 3 + 5 + ... + (2n - 1)$

$S = n^2$

➢ To find the **sum of first n even natural numbers.**

$S = 2 + 4 + 6 + ... + 2n$

$S = n(n+1)$

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