SEQUENCE, SERIES & PROGRESSION

Arithmetic Progression

$a_n = a_1 + (n-1)d$

$S_n = \dfrac{n(a_1 + a_n)}{2}$

Concept: Number of terms = $\dfrac{a_n - a_1}{d} + 1$

Geometric Progression

$a_n = ar^{(n-1)}$

$S_n = \dfrac{a(1-r^n)}{(1-r)}$

Sum till infinite terms $= \dfrac{a}{1-r}$ **(Valid only when r<1)**

Concept: Sum of first n odd numbers
$\Rightarrow 1+3+5+ \ldots +(2n-1) = n^2$

Concept: Sum of first n even numbers
$\Rightarrow 2+4+6+ \ldots +2n = n(n+1)$

Concept: If you have to consider 3 terms in an AP, consider {a-d, a, a+d}. If you have to consider 4 terms, consider {a-3d, a-d, a+d, a+3d}

Concept: If all terms of an AP are multiplied with k or divided with k, the resultant series will also be an AP with the common difference dk or d/k respectively.

Concept: Sum of first n natural numbers $= \dfrac{n(n+1)}{2}$

Concept: Sum of squares of first n natural numbers $= \dfrac{n(n+1)(2n+1)}{6}$

Concept: Sum of cubes of first n natural numbers $= \left[\dfrac{n(n+1)}{2}\right]^2$