



CHAPTER

8

Sequences and Series

Sr. No.	Concept	Formulas	Other information
1.	Sequence	Sequence is a function whose domain is a subset of natural numbers. It represents the images of $1, 2, 3, \dots, n$ as $f_1, f_2, f_3, \dots, f_n$, where $f_n = f(n)$.	
2.	Series	If $a_1, a_2, a_3, \dots, a_n$ is a sequence, then the expression $a_1 + a_2 + a_3 + \dots + a_n$ is a series.	
3.	Finite Series	A series having finite number of terms is called a finite series.	
4.	Infinite Series	A series having infinite number of terms is called a infinite series.	
5.	Arithmetic Progression	(I) n^{th} term of A.P. $(T_n) = a + (n - 1) d$ (where a = first term of A.P. and d = common difference) (II) Sum of n term of A.P. $(S_n) = \frac{n}{2} [2a + (n - 1)d]$	Thus, if a, A, b are in A.P., then A is the A.M. between a and b . So, $A - a = b - A$, [their common difference are equal] $\Rightarrow 2A = a + b$ $\Rightarrow A = \frac{a + b}{2}$ $\therefore$ A.M. between two numbers = Half of their sum
6.	An Important Result	Sum of n A.M.'s between two quantities is n times the single A.M. between them.	

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7.	Geometric Progression	We can say that, a sequence $a_1, a_2, \dots, a_n$ is called geometric progression (geometric sequence), if it follows the relation $\frac{a_{k+1}}{a_k} = r$ (constant).	The constant ratio is called Common ratio of the G.P. and it is denoted by r . In a G.P., we usually denote the first term by a , the n^{th} term by T_n or a_n . Thus, G.P. can be written as, $a, ar^2, ar^3 \dots$ and so on.
8.	General Term of a G.P	$T_n = ar^{n+1}$ or $l = ar^{n-1}$,	If a is the first term of a G.P. and its common ratio is r , then general term or n^{th} term, where l is the last term.
9.	Sum of First n Terms of a GP.	$S_n = \frac{a(1-r^n)}{1-r}$, where $r < 1$ and $S_n = \frac{a(r^n-1)}{r-1}$, where $r > 1$	If a and r are the first term and common ratio of a G.P. respectively.
10.	Geometric Mean	Geometric mean (G.M.) $b^2 = ac$	Geometric mean between a and b is $\sqrt{ab}$ or If a, b, c are in G.P.
11.	Some Important Results	(I) If $G_1, G_2, G_3, \dots, G_n$ are n numbers inserted between a and b so that the resulting sequence is G.P., then $G_k = a\left(\frac{b}{a}\right)^{\frac{k}{n+1}}, 1 \leq k \leq n$ (II) If three terms of G.P. are to be taken, then we choose as $\frac{a}{r}, a, ar$. (III) $S_\infty = a + ar + ar^2 + ar^3 + \dots \infty$ term if $-1 < r < 1 \Rightarrow S_\infty = \frac{a}{1-r}$. Such that $-1 < r < 1$	(I) Reciprocals of terms in G.P. always form a G.P. (II) If a, b, c are in G.P. then ak, bk, ck are also in G.P. where $k \neq 0$ and $\frac{a}{k}, \frac{b}{k}, \frac{c}{k}$ also in G.P. where $k \neq 0$. (III) In a G.P., the product of the terms equidistant from the beginning and

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		(IV) If A and G be A.M. and G.M. of two given positive real number 'a' and 'b' respectively then $A = \frac{a+b}{2}, G = \sqrt{ab} \text{ and } A \geq G.$	from the end is always same and equal to the product of the first and the last terms.



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