SEQUENCE AND SERIES-ARITHMETIC AND GEOMETRIC PROGRESSIONS



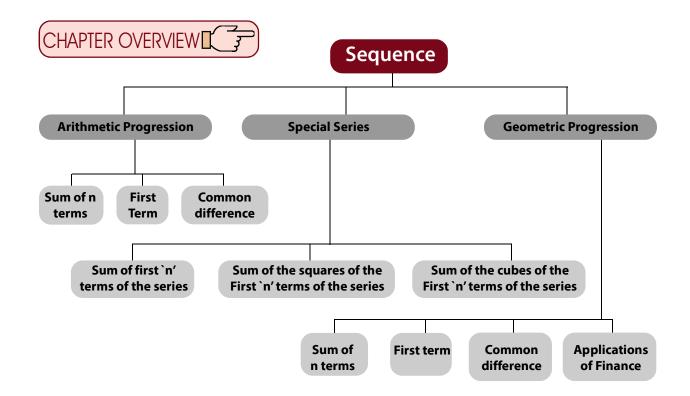
LEARNING OBJECTIVES

Often students will come across a sequence of numbers which are having a common difference, i.e., difference between the two consecutive pairs are the same. Also another very common sequence of numbers which are having common ratio, i.e., ratio of two consecutive pairs are the same. Could you guess what these special type of sequences are termed in mathematics?

Read this chapter to understand that these two special type of sequences are called Arithmetic Progression and Geometric Progression respectively. Further learn how to find out an element of these special sequences and how to find sum of these sequences.

These sequences will be useful for understanding various formulae of accounting and finance.

The topics of sequence, series, A.P. G.P. find useful applications in commercial problems among others; viz., to find interest earned through compound interest, depreciations after certain amount of time and total sum earned on recurring deposits, etc.





(6.1 SEQUENCE

Let us consider the following collection of numbers-

- (1) 28, 2, 25, 27, —
- (2) 2,7,11,19,31,51,———
- (3) 1, 2, 3, 4, 5, 6, ———
- (4) 20, 18, 16, 14, 12, 10, ———

In (1) the nos. are not arranged in a particular order. In (2) the nos. are in ascending order but they do not obey any rule or law. It is, therefore, not possible to indicate the number next to 51.

In (3) we find that by adding 1 to any number, we get the next one. Here the number next to 6 is 6 + 1 = 7.

In (4) if we subtract 2 from any number we get the nos. that follows. Here the number next to 10 is 10 - 2 = 8.

Under these circumstances, we say, the numbers in the collections (1) and (2) do not form sequences whereas the numbers in the collections (3) & (4) form sequences.

Thus a sequence may be defined as follows:—

to some definite rule or law, there is a definite value of a called the term or element of the sequence, corresponding to any value of the natural number n.

Clearly, a_1 is the 1st term of the sequence, a_2 is the 2nd term,, a_n is the nth term.

In the nth term a_n , by putting $n = 1, 2, 3, \dots$ successively, we get $a_1, a_2, a_3, a_4, \dots$

Thus it is clear that the nth term of a sequence is a function of the positive integer n. The nth term is also called the general term of the sequence. To specify a sequence, nth term must be known, otherwise it may lead to confusion. A sequence may be finite or infinite.

If the number of elements in a sequence is finite, the sequence is called *finite sequence*; while if the number of elements is unending, the sequence is infinite.

A finite sequence a_1 , a_2 , a_3 , a_4 ,, a_n is denoted by $\{a_i\}_{i=1}^n$ and an infinite sequence a_1 , a_2 ,

 $a_{4'}$, a_{n} is denoted by $\left\{ \left. a_{n} \right. \right\}_{n=1}^{\infty}$ or simply by $\{a_n\}$ where a_n is the nth element of the sequence.

Example:

- 1) The sequence $\{1/n\}$ is 1, 1/2, 1/3, 1/4...
- 2) The sequence $\{(-1)^n n\}$ is $-1, 2, -3, 4, -5, \dots$
- 3) The sequence $\{n\}$ is 1, 2, 3, ...
- 4) The sequence $\{ n / (n + 1) \}$ is $1/2, 2/3, 3/4, 4/5 \dots$
- 5) A sequence of even positive integers is 2, 4, 6,
- A sequence of odd positive integers is 1, 3, 5, 7,

All the above are infinite sequences.

Example:

- A sequence of even positive integers within 12 i.e., is 2, 4, 6, 8, 10.
- A sequence of odd positive integers within 11 i.e., is 1, 3, 5, 7, 9.

All the above are finite sequences.



6.2 SERIES

An expression of the form $a_1 + a_2 + a_3 + \dots + a_n + \dots$ which is the sum of the elements of the sequence { a n} is called a *series*. If the series contains a finite number of elements, it is called a *finite series*, otherwise called *an infinite series*.

If $S_n = u_1 + u_2 + u_3 + u_4 + \dots + u_n$, then S_n is called the sum to n terms (or the sum of the first n terms) of the series and the term sum is denoted by the Greek letter Σ .

Thus, $S_n = \sum_{r=1}^{n} u_r$ or simply by $\sum u_{n}$.

"ILLUSTRATIONS:

- (i) $1+3+5+7+\dots$ is a series in which 1st term = 1, 2nd term = 3, and so on.
- (ii) $2-4+8-16+\dots$ is also a series in which 1st term = 2, 2nd term = -4, and so on.

(6.3 ARITHMETIC PROGRESSION (A.P.)

A sequence $a_1, a_2, a_3, \ldots, a_n$ is called an Arithmetic Progression (A.P.) when $a_2 - a_1 = a_3 - a_2 = \ldots$ $= a_n - a_{n-1}$. That means A. P. is a sequence in which each term is obtained by adding a constant d to the preceding term. This constant 'd' is called the *common difference* of the A.P. If 3 numbers a, b, c are in A.P., we say

b - a = c - b or a + c = 2b; b is called the arithmetic mean between a and c.

2,5,8,11,14,17,... is an A.P. in which d = 3 is the common difference.

2) 15,13,11,9,7,5,3,1,–1, is an A.P. in which –2 is the common difference.

Solution: In (1) 2nd term = 5, 1st term = 2, 3rd term = 8,

so 2nd term – 1st term = 5 - 2 = 3, 3rd term – 2nd term = 8 - 5 = 3

Here the difference between a term and the preceding term is same that is always constant. This constant is called common difference.

Now in generel an A.P. series can be written as

$$a, a + d, a + 2d, a + 3d, a + 4d, \dots$$

where 'a' is the 1st term and 'd' is the common difference.

Thus 1^{st} term $(t_1) = a = a + (1-1) d$

$$2^{nd}$$
 term (t_2) = $a + d = a + (2 - 1) d$

$$3^{rd}$$
 term $(t_3) = a + 2d = a + (3 - 1) d$

$$4^{th}$$
 term $(t_4) = a + 3d = a + (4 - 1) d$

.....

 n^{th} term $(t_n) = a + (n-1) d$, where n is the position number of the term.

Using this formula we can get

$$50^{\text{th}}$$
 term (= t_{50}) = a+ (50 – 1) d = a + 49d

Example 1: Find the 7th term of the A.P. 8, 5, 2, -1, -4,....

Solution: Here
$$a = 8, d = 5 - 8 = -3$$

Now $t_7 = 8 + (7 - 1) d$
 $= 8 + (7 - 1) (-3)$
 $= 8 + 6 (-3)$
 $= 8 - 18$
 $= -10$

Example 2: Which term of the AP $\frac{3}{\sqrt{7}}$, $\frac{4}{\sqrt{7}}$, $\frac{5}{\sqrt{7}}$is $\frac{17}{\sqrt{7}}$?

Solution:
$$a = \frac{3}{\sqrt{7}}$$
, $d = \frac{4}{\sqrt{7}} - \frac{3}{\sqrt{7}} = \frac{1}{\sqrt{7}}$, $t_n = \frac{17}{\sqrt{7}}$

We may write

$$\frac{17}{\sqrt{7}} = \frac{3}{\sqrt{7}} + (n-1) \times \frac{1}{\sqrt{7}}$$

or,
$$17 = 3 + (n-1)$$

or,
$$n = 17 - 2 = 15$$

Hence, 15th term of the A.P. is $\frac{17}{\sqrt{7}}$.

Example 3: If 5th and 12th terms of an A.P. are 14 and 35 respectively, find the A.P.

Solution: Let a be the first term & d be the common difference of A.P.

$$t_5 = a + 4d = 14$$

$$t_{12} = a + 11d = 35$$

On solving the above two equations,

$$7d = 21 = i.e., d = 3$$

and
$$a = 14 - (4 \times 3) = 14 - 12 = 2$$

Hence, the required A.P. is 2, 5, 8, 11, 14,....

Example 4: Divide 69 into three parts which are in A.P. and are such that the product of the first two parts is 483.

Solution: Given that the three parts are in A.P., let the three parts which are in A.P. be a - d, a, a + d.......

Thus
$$a - d + a + a + d = 69$$

or
$$3a = 69$$

or
$$a = 23$$

So the three parts are 23 - d, 23, 23 + d

Since the product of first two parts is 483, therefore, we have

$$23(23-d)=483$$

or
$$23 - d = 483 / 23 = 21$$

or
$$d = 23 - 21 = 2$$

Hence, the three parts which are in A.P. are

$$23 - 2 = 21, 23, 23 + 2 = 25$$

Hence the three parts are 21, 23, 25.

Example 5: Find the arithmetic mean between 4 and 10.

Solution: We know that the A.M. of a & b is = (a + b)/2

Hence, The A. M between 4 & 10 = (4 + 10) / 2 = 7

Example 6: Insert 4 arithmetic means between 4 and 324.

Solution: Here
$$a = 4$$
, $d = ? n = 2 + 4 = 6$, $t_n = 324$

Now
$$t_n = a + (n-1) d$$

or $324 = 4 + (6-1) d$

or
$$320 = 5d$$
 i.e., $= i.e.$, $d = 320 / 5 = 64$

So the
$$1^{st} AM = 4 + 64 = 68$$

 $2^{nd} AM = 68 + 64 = 132$
 $3^{rd} AM = 132 + 64 = 196$
 $4^{th} AM = 196 + 64 = 260$

Sum of the first n terms

Let S be the Sum, a be the 1st term and ℓ the last term of an A.P. If the number of term is n, then t_n = ℓ . Let d be the common difference of the A.P.

Now
$$S = a + (a + d) + (a + 2d) + ... + (\ell - 2d) + (\ell - d) + \ell$$

Again $S = \ell + (\ell - d) + (\ell - 2d) + + (a + 2d) + (a + d) + a$

On adding the above, we have

$$2S = (a + \ell) + (a + \ell) + (a + \ell) + \dots + (a + \ell)$$

$$= n(a + \ell)$$
or
$$S = n(a + \ell) / 2$$

Note: The above formula may be used to determine the sum of n terms of an A.P. when the first term a and the last term is given.

Now
$$\ell = t_n = a + (n-1) d$$

∴ $S = \frac{n\{a+a+(n-1)d\}}{2}$
 $S = \frac{n}{2}\{2a+(n-1)d\}$

Note: The above formula may be used when the first term a, common difference d and the number of terms of an A.P. are given.

Sum of 1st n natural or counting numbers

$$S = 1 + 2 + 3 + \dots + (n-2) + (n-1) + n$$

 $S = n + (n-1) + (n-2) + \dots + 3 + 2 + 1$

Again

or

On adding the above, we get

or
$$2S = (n+1) + (n+1) + \dots$$
 to n terms
or $2S = n(n+1)$
 $S = n(n+1)/2$

Then Sum of first n natural number is n(n + 1) / 2

i.e.
$$1 + 2 + 3 + \dots + n = \frac{n(n+1)}{2}$$
.

Sum of 1st n odd number

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

Sum of first n odd number

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

Since $S = n\{2a + (n-1)d\} / 2$, we find

$$S = \frac{n}{2} \{ 2.1 + (n-1) 2 \} = \frac{n}{2} (2n) = n^2$$

or
$$S = n^2$$

Then sum of first, n odd numbers is n^2 , i.e. $1 + 3 + 5 + \dots + (2n - 1) = n^2$

Sum of the Squares of the first n natural nos.

Let
$$S = 1^2 + 2^2 + 3^2 + \dots + n^2$$

Adding both sides term by term,

or
$$n^3 = 3S - 3 n (n + 1) / 2 + n$$

or $2n^3 = 6S - 3n^2 - 3n + 2n$
or $6S = 2n^3 + 3n^2 + n$
or $6S = n (2n^2 + 3n + 1)$
or $6S = n (n + 1) (2n + 1)$
 $S = n (n + 1) (2n + 1) / 6$

Thus sum of the squares of the first n natural numbers is $\frac{n(n+1)(2n+1)}{6}$

i.e.
$$1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$$
.

Similarly, sum of the cubes of first n natural numbers can be found out as $\left\{\frac{n(n+1)}{2}\right\}^2$ by taking the identity

$$m^4$$
 – (m – 1) 4 = $4m^3$ – $6m^2$ + $4m$ – 1 and putting m = 1, 2, 3,...., n .

Thus

$$1^3 + 2^3 + 3^3 + \dots + n^3 = \left\{ \frac{n(n+1)}{2} \right\}^2$$

EXERCISE 6 (A)

Choose the most appropriate option (a), (b), (c) or (d).

- 1. The nth element of the sequence 1, 3, 5, 7,.....is
 - (a) n

- (b) 2n 1
- (c) 2n + 1
- (d) none of these

- 2. The nth element of the sequence -1, 2, -4, 8 is
 - (a) $(-1)^n 2^{n-1}$
- (b) 2^{n-1}
- (c) 2ⁿ

(d) none of these

- 3. $\sum_{i=4}^{7} \sqrt{2i-1}$ can be written as
 - (a) $\sqrt{7} + \sqrt{9} + \sqrt{11} + \sqrt{13}$

(b) $2\sqrt{7} + 2\sqrt{9} + 2\sqrt{11} + 2\sqrt{13}$

(c) $2\sqrt{7} + 2\sqrt{9} + 2\sqrt{11} + 2\sqrt{13}$

(d) none of these.

4.	The sum to ∞ of the ser	ries –5, 25, –125, 625,	can be written as	
	(a) $\sum_{k=1}^{\infty} (-5)^k$	(b) $\sum_{k=1}^{\infty} 5^k$	$(c) \sum_{k=1}^{\infty} -5^k$	(d) none of these
5.	The first three terms of (a) -1, 0, 3	sequence when nth term (b) 1, 0, 2	m t_n is $n^2 - 2n$ are (c) $-1, 0, -3$	(d) none of these
6.	Which term of the prog (a) 21^{st}	gression –1, –3, –5, is (b) 20 th	-39 (c) 19 th	(d) none of these
7.	The value of x such that (a) 15	t $8x + 4$, $6x - 2$, $2x + 7$ w (b) 2	rill form an AP is (c) 15/2 (d)	none of the these
8.	The m th term of an A. P (a) m + n +r	orallist is n and n th term is m. (b) n + m – 2r		(d) $m+n-r$
9.	The number of the term	ns of the series $10 + 9\frac{2}{3}$	$+9\frac{1}{3} + 9 + \dots$ will	amount to 155 is
	(a) 30	(b) 31	(c) 32	(d) none of these
10.	The nth term of the series (a) $3n - 10$	ies whose sum to n term (b) 10n – 2	ns is $5n^2 + 2n$ is (c) $10n - 3$	(d) none of these
11.	The 20 th term of the pro (a) 58	O	is (c) 50	(d) none of these
12.	The last term of the ser (a) 44	ies 5, 7, 9, to 21 terms (b) 43	s is (c) 45	(d) none of these
13.	The last term of the A.I. (a) 8.7	P. 0.6, 1.2, 1.8, to 13 ter (b) 7.8	rms is (c) 7.7	(d) none of these
14.	The sum of the series 9 (a) -18,900	, 5, 1, to 100 terms is (b) 18,900	(c) 19,900	(d) none of these
15.	The two arithmetic mea	ans between –6 and 14 is	s	
	(a) 2/3,1/3	(b) $2/3$, $7\frac{1}{3}$	(c) $-2/3$, $-7\frac{1}{3}$	(d) none of these
16.	The sum of three integers (a) 2, 8, 5	ers in AP is 15 and their (b) 8, 2, 5	product is 80. The integ	gers are (d) 8, 5, 2
17.	The sum of n terms of a (a) 8, 14, 20, 26	an AP is 3n ² + 5n. The se (b) 8, 22, 42, 68	eries is (c) 22, 68, 114,	(d) none of these
18.	The number of number (a) 5,090	rs between 74 and 25,556 (b) 5,097	6 divisible by 5 is (c) 5,095	(d) none of these
19.	The pth term of an AP (a) n $(3n + 1)$	is $(3p - 1)/6$. The sum o (b) $n(3n + 1)/12$	of the first n terms of the (c) $n/12(3n-1)$	AP is (d) none of these
20.	The arithmetic mean be (a) 50	etween 33 and 77 is (b) 45	(c) 55	(d) none of these

- 21. The 4 arithmetic means between -2 and 23 are
 - (a) 3, 13, 8, 18
- (b) 18, 3, 8, 13
- (c) 3, 8, 13, 18
- (d) none of these
- 22. The first term of an A.P is 14 and the sums of the first five terms and the first ten terms are equal in magnitude but opposite in sign. The 3rd term of the AP is
 - (a) $6\frac{4}{11}$

(b) 6

- (c) 4/11
- (d) none of these
- 23. The sum of a certain number of terms of an AP series -8, -6, -4, is 52. The number of terms is
 - (a) 12

(b) 13

(c) 11

- (d) none of these
- 24. The first and the last term of an AP are -4 and 146. The sum of the terms is 7171. The number of terms is
 - (a) 101

(b) 100

(c)99

- (d) none of these
- 25. The sum of the series $3\frac{1}{2} + 7 + 10\frac{1}{2} + 14 + ...$ to 17 terms is
 - (a) 530

- (b) 535
- (c) $535 \frac{1}{2}$
- (d) none of these



(6.4 GEOMETRIC PROGRESSION (G.P.)

If in a sequence of terms each term is constant multiple of the proceeding term, then the sequence is called a Geometric Progression (G.P). The constant multiplier is called the common ratio

- **Examples:** 1) In 5, 15, 45, 135,.... common ratio is 15/5 = 3
 - 2) In 1, 1/2, 1/4, 1/9 ... common ratio is (1/2)/1 = 1/2
 - 3) In 2, -6, 18, -54, common ratio is (-6) / 2 = -3

Illustrations: Consider the following series:-

Here second term / first term = 4/1 = 4; third term / second term = 16/4 = 4

fourth term/third term = 64/16 = 4 and so on.

Thus, we find that, in the entire series, the ratio of any term and the term preceding it, is a constant.

(ii)
$$1/3 - 1/9 + 1/27 - 1/81 + \dots$$

Here second term $/ 1^{st} \text{ term} = (-1/9) / (1/3) = -1/3$

third term / second term = (1/27) / (-1/9) = -1/3

fourth term / third term = (-1/81) / (1/27) = -1/3 and so on.

Here also, in the entire series, the ratio of any term and the term preceding one is constant.

The above mentioned series are known as **Geometric Series**.

Let us consider the sequence a, ar, ar^2 , ar^3 ,

 1^{st} term = a, 2^{nd} term = ar = ar 2^{-1} , 3^{rd} term = ar 2^{-1} , 4^{th} term = ar 3^{-1} = ar 4^{-1} ,

nth term of GP $t_n = ar^{n-1}$ Similarly

Thus, common ratio =
$$\frac{\text{Any term}}{\text{Preceding term}} = \frac{t_n}{t_{n-1}}$$

= $\frac{t_n}{t_{n-1}}$

Thus, general term of a G.P is given by ar ⁿ⁻¹ and the general form of G.P. is

 $a + ar + ar^2 + ar^3 + \dots$

For example,
$$r = \frac{t_2}{t_1} = \frac{ar}{a}$$

So
$$r = \frac{t_2}{t_1} = \frac{t_3}{t_2} = \frac{t_4}{t_3} = \dots$$

Example 1: If a, ar, ar², ar³, be in G.P. Find the common ratio.

Solution: 1^{st} term = a, 2^{nd} term = ar

Ratio of any term to its preceding term = ar/a = r = common ratio.

Example 2: Which term of the progression 1, 2, 4, 8,... is 256?

Solution:
$$a = 1, r = 2/1 = 2, n = ? t_n = 256$$

 $t_n = ar^{n-1}$

$$256 = 1 \times 2^{n-1}$$
 i.e., $2^8 = 2^{n-1}$ or, $n - 1 = 8$ i.e., $n = 9$

Thus 9th term of the G. P. is 256



or

6.5 GEOMETRIC MEAN

If a, b, c are in G.P we get $b/a = c/b \Rightarrow b^2 = ac$, b is called the geometric mean between a and c

Example 1: Insert 3 geometric means between 1/9 and 9.

Solution:
$$1/9, -, -, -, 9$$

 $a = 1/9, r = ?, n = 2 + 3 = 5, t_n = 9$
we know $t_n = ar^{n-1}$
or $1/9 \times r^{5-1} = 9$
or $r^4 = 81 = 3^4 => r = 3$
Thus $1^{st} G. M = 1/9 \times 3 = 1/3$
 $2^{nd} G. M = 1/3 \times 3 = 1$
 $3^{rd} G. M = 1 \times 3 = 3$

Example 2: Find the G.P where 4th term is 8 and 8th term is 128/625

Solution: Let a be the 1st term and r be the common ratio.

By the question $t_4 = 8$ and $t_8 = 128/625$

So
$$ar^3 = 8$$
 and $ar^7 = 128 / 625$

Therefore ar⁷ / ar³ =
$$\frac{128}{625' 8}$$
 => r⁴ = 16 / 625 =($\pm 2/5$)⁴ => r = 2/5 and -2/5

Now
$$ar^3 = 8 \Rightarrow a \times (2/5)^3 = 8 \Rightarrow a = 125$$

Thus the G. P is

When
$$r = -2/5$$
, $a = -125$ and the G.P is -125 , 50 , -20 , 8 , $-16/5$,......

Finally, the G.P. is 125, 50, 20, 8, 16/5,

Sum of first n terms of a G P

Let a be the first term and r be the common ratio. So the first n terms are a, ar, ar^2 , ar $^{n-1}$.

If S be the sum of n terms,

$$S_n = a + ar + ar^2 + \dots + ar^{n-1}$$
 (i)

Now
$$rS_n = ar + ar^2 + + ar^{n-1} + ar^n$$
 (ii)

Subtracting (i) from (ii)

$$S_n - rS_n = a - ar^n$$

or
$$S_n(1-r) = a(1-r^n)$$

or

$$S_n = a (1-r^n) / (1-r)$$
 when $r < 1$
 $S_n = a (r^n - 1) / (r - 1)$ when $r > 1$

If
$$r = 1$$
, then $S_n = a + a + a + \dots$ to n terms
= na

If the nth term of the G. P be l then $\ell = ar^{n-1}$

Therefore,
$$S_n = (ar^n - a) / (r - 1) = (a r^{n-1} r - a) / (r - 1) = \frac{\ell r - a}{r - 1}$$

So, when the last term of the G. P is known, we use this formula.

Sum of infinite geometric series

$$S = a (1 - r^n) / (1 - r)$$
 when $r < 1$
= $a (1 - 1/R^n) / (1 - 1/R)$ (since $r < 1$, we take $r = 1/R$).

If
$$n \to \infty$$
, $1/R^n \to 0$

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

i.e. Sum of G.P. upto infinity is $\frac{a}{1-r}$, where r < 1

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

Example 1: Find the sum of 1 + 2 + 4 + 8 + ... to 8 terms.,

Solution: Here
$$a = 1$$
, $r = 2/1 = 2$, $n = 8$
Let $S = 1 + 2 + 4 + 8 + \dots$ to 8 terms
$$= 1 (2^8 - 1) / (2 - 1) = 2^8 - 1 = 255$$

Example 2: Find the sum to n terms of $6 + 27 + 128 + 629 + \dots$

Solution: Required Sum=
$$(5+1) + (5^2+2) + (5^3+3) + (5^4+4) + ...$$
 to n terms
= $(5+5^2+5^3+.....+5^n) + (1+2+3+...+n$ terms)
= $\{5(5^n-1)/(5-1)\} + \{n(n+1)/2\}$
= $\{5(5^n-1)/4\} + \{n(n+1)/2\}$

Example 3: Find the sum to n terms of the series

$$3 + 33 + 333 + \dots$$

Solution: Let S denote the required sum.

i.e.
$$S = 3 + 33 + 333 + \dots$$
 to n terms
 $= 3 (1 + 11 + 111 + \dots$ to n terms)
 $= \frac{3}{9} (9 + 99 + 999 + \dots$ to n terms)
 $= \frac{3}{9} \{(10 - 1) + (10^2 - 1) + (10^3 - 1) + \dots + (10^n - 1)\}$
 $= \frac{3}{9} \{(10 + 10^2 + 10^3 + \dots + 10^n) - n\}$
 $= \frac{3}{9} \{10 (1 + 10 + 10^2 + \dots + 10^{n-1}) - n\}$
 $= \frac{3}{9} [\{10 (10^n - 1) / (10 - 1)\} - n]$
 $= \frac{3}{81} (10^{n+1} - 10 - 9n)$

$$=\frac{1}{27}\left(10^{n+1}-9n-10\right)$$

Example 4: Find the sum of n terms of the series 0.7 + 0.77 + 0.777 + ... to n terms **Solution:** Let S denote the required sum.

i.e.
$$S = 0.7 + 0.77 + 0.777 + \dots$$
 to n terms
 $= 7 (0.1 + 0.11 + 0.111 + \dots$ to n terms)
 $= \frac{7}{9} (0.9 + 0.99 + 0.999 + \dots$ to n terms)
 $= \frac{7}{9} \{(1 - 1/10) + (1 - 1/10^2) + (1 - 1/10^3) + \dots + (1 - 1/10^n)\}$
 $= \frac{7}{9} \{n - \frac{1}{10} (1 + 1/10 + 1/10^2 + \dots + 1/10^{n-1})\}$
So $S = \frac{7}{9} \{n - \frac{1}{10} (1 - 1/10^n)/(1 - 1/10)\}$
 $= \frac{7}{9} \{n - (1 - 10^{-n}) / 9\}$
 $= \frac{7}{81} \{9n - 1 + 10^{-n}\}$

Example 5: Evaluate 0.2175 using the sum of an infinite geometric series.

Solution: $0.2175 = 0.2175757575 \dots$

$$0.21\dot{7}\dot{5} = 0.21 + 0.0075 + 0.000075 + \dots$$

$$= 0.21 + 75 (1 + 1/10^{2} + 1/10^{4} + \dots) / 10^{4}$$

$$= 0.21 + 75 \{1 / (1 - 1/10^{2}) / 10^{4} \}$$

$$= 0.21 + (75/10^{4}) \times 10^{2} / 99$$

$$= 21/100 + (3/4) \times (1/99)$$

$$= 21/100 + 1/132$$

$$= (693 + 25)/3300 = 718/3300 = 359/1650$$

Example 6: Find three numbers in G. P whose sum is 19 and product is 216.

Solution: Let the 3 numbers be a/r, a, ar.

According to the question $a/r \times a \times ar = 216$

or
$$a^3 = 6^3 = a = 6$$

So the numbers are 6/r, 6, 6r

Again
$$6/r + 6 + 6r = 19$$

or
$$6/r + 6r = 13$$

or
$$6 + 6r^2 = 13r$$

or
$$6r^2 - 13r + 6 = 0$$

or
$$6r^2 - 4r - 9r + 6 = 0$$

or
$$2r(3r-2) - 3(3r-2) = 2$$

or
$$(3r-2)(2r-3) = 0$$
 or, $r = 2/3$, $3/2$

So the numbers are

$$6/(2/3)$$
, 6 , $6 \times (2/3) = 9$, 6 , 4

or
$$6/(3/2)$$
, 6 , $6 \times (3/2) = 4$, 6 , 9

EXERCISE 6 (B)

Choose the most appropriate option (a), (b), (c) or (d)

- The 7^{th} term of the series 6, 12, 24,.....is

- (b) 834
- (c) 438
- (d) none of these

- t_o of the series 6, 12, 24,...is
 - (a) 786

- (b) 768
- (c) 867
- (c) none of these

- t_{12} of the series –128, 64, –32,is
 - (a) -1/16

- (c) 1/16
- (d) none of these

- The 4^{th} term of the series 0.04, 0.2, 1, ... is
 - (a) 0.5

- (b) 1/2
- (c) 5

(d) none of these

- 5. The last term of the series $1, 2, 4, \dots$ to 10 terms is
 - (a) 512

- (b) 256
- (c) 1024
- (d) none of these

- The last term of the series 1, -3, 9, -27 up to 7 terms is 6.

- (b) 729
- (c) 927
- (d) none of these

- 7. The last term of the series x^2 , x, 1, to 31 terms is
 - (a) x^{28}

- (b) 1/x
- (c) $1/x^{28}$
- (d) none of these

- The sum of the series -2, 6, -18, to 7 terms is 8.
 - (a) -1094
- (b) 1094
- (c) -1049
- (d) none of these

- 9. The sum of the series 243, 81, 27, to 8 terms is
 - (a) 36

- (b) $\left(36\frac{13}{30}\right)$ (c) $36\frac{1}{9}$
- (d) none of these

- 10. The sum of the series $\frac{1}{\sqrt{3}} + 1 + \frac{3}{\sqrt{3}} + \dots$ to 18 terms is
 - (a) 9841 $\frac{(1+\sqrt{3})}{\sqrt{3}}$
- (b) 9841
- (d) none of these

11.	The second term of a G (a) 16, 36, 24, 54,				(d) none of these
12.	The sum of 3 numbers (a) 3, 27, 9	of a G P is 39 and their j (b) 9, 3, 27	-		nbers are (d) none of these
13.	In a G. P, the product o (a) 3/2			8. The middle term 2/5	is (d) none of these
14.	If you save 1 paise todayour total savings in tw	vo weeks will be	•	aise the succeeding ₹ 163.83	•
15	(a) ₹ 163	(b) ₹ 183	` ′	X 103.03	(d) none of these
15.	Sum of n terms of the s (a) 4/9 { 10/9 (10 ⁿ -1) -n		(b)	10/9 (10 ⁿ -1)-n none of these	
16.	Sum of n terms of the s (a) $1/9 \{n - (1 - (0.1)^n + (0.1)^n / (0$		(b)	is) 1/9 {n – (1–(0.1) ⁿ),) none of these	/9}
17.	The sum of the first 20 t ratio is	erms of a G. P is 244 tim	` ′		terms. The common
	(a) $\pm\sqrt{3}$	(b) ±3	(c)	$\sqrt{3}$	(d) none of these
18.	Sum of the series 1 + 3	+ 9 + 27 +is 364. The	nun	nber of terms is	
	(a) 5	(b) 6	(c)	11	(d) none of these
19.	The product of 3 numb (a) 9, 3, 27	ers in G P is 729 and the (b) 27, 3, 9		m of squares is 819. 3, 9, 27	The numbers are (d) none of these
20.	The sum of the series 1 (a) $2^n - 1$			1/2 ⁿ – 1	(d) none of these
21.	The sum of the infinite	GP 14, – 2, + 2/7, – 2/4	9,+	is	
	(a) $4\frac{1}{12}$	(b) $12\frac{1}{4}$	(c)	12	(d) none of these
22.	The sum of the infinite (a) 0.33	G. P. 1 - 1/3 + 1/9 - 1/2 (b) 0.57		is 0.75	(d) none of these
23.	The number of terms to (a) 10	be taken so that 1 + 2 - (b) 13		- 8 + will be 8191 is 12	(d) none of these
24.	Four geometric means (a) 12, 36, 108, 324	between 4 and 972 are (b) 12, 24, 108, 320	(c)	10, 36, 108, 320	(d) none of these

"ILLUSTRATIONS:

(I) A person is employed in a company at ₹ 3000 per month and he would get an increase of ₹ 100 per year. Find the total amount which he receives in 25 years and the monthly salary in the last year.

SOLUTION:

He gets in the 1st year at the Rate of 3000 per month;

In the 2nd year he gets at the rate of ₹ 3100 per month;

In the 3rd year at the rate of ₹ 3200 per month so on.

In the last year the monthly salary will be

₹
$$\{3000 + (25 - 1) \times 100\} = ₹ 5400$$

Total amount = ₹ 12 (3000 + 3100 + 3200 +... + 5400)
$$\left[Use S_n = \frac{n}{2} (a+l) \right]$$

- $= 712 \times 25/2 (3000 + 5400)$
- = ₹ 150 × 8400
- = ₹ 12,60,000
- (II) A person borrows ₹ 8,000 at 2.76% Simple Interest per annum. The principal and the interest are to be paid in the 10 monthly instalments. If each instalment is double the preceding one, find the value of the first and the last instalment.

SOLUTION:

Interest to be paid = $2.76 \times 10 \times 8000 / 100 \times 12 = ₹ 184$

Total amount to be paid in 10 monthly instalment is ₹ (8000 + 184) = ₹ 8184

The instalments form a GP with common ratio 2 and so $\stackrel{?}{\stackrel{?}{\sim}} 8184 = a (2^{10} - 1) / (2 - 1)$,

a = 1st instalment

Here a = ₹8184 / 1023 = ₹8

The last instalment = ar $^{10-1}$ = 8 × 2 9 = 8 × 512 = ₹ 4096



SUMMARY

- **Sequence:** An ordered collection of numbers a_1 , a_2 , a_3 , a_4 ,, $a_{n'}$ is a sequence if according to some definite rule or law, there is a definite value of a_{n_1} called the term or element of the sequence, corresponding to any value of the natural number n.
- ♦ An expression of the form $a_1 + a_2 + a_3 + \dots + a_n + \dots$ which is the sum of the elements of the sequence $\{a_n\}$ is called a *series*. If the series contains a finite number of elements, it is called a *finite series*, otherwise called *an infinite series*.
- ♦ **Arithmetic Progression:** A sequence $a_1, a_2, a_3, \ldots, a_n$ is called an Arithmetic Progression (A.P.) when $a_2 a_1 = a_3 a_2 = \ldots = a_n a_{n-1}$. That means A. P. is a sequence in which each term is obtained by adding a constant d to the preceding term. This constant 'd' is called the *common difference* of the A.P. If 3 numbers a, b, c are in A.P., we say

b - a = c - b or a + c = 2b; b is called the arithmetic mean between a and c.

$$n^{th}$$
 term $(t_n) = a + (n-1) d$,

Where a = First Term

 $d = Common difference = t_n - t_{n-1}$

Sum of n terms of AP=

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

• Sum of the first n terms : Sum of 1st n natural or counting numbers

$$S = n(n + 1)/2$$

Sum of 1st n odd numbers : $S = n^2$

Sum of the Squares of the first, n natural numbers

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

sum of the cubes of the first n natural numbers is

$$\left\{\frac{n(n+1)}{2}\right\}^2$$

◆ **Geometric Progression (G.P).** If in a sequence of terms each term is constant multiple of the proceeding term, then the sequence is called a Geometric Progression (G.P). The constant multiplier is called the *common ratio*

$$= \frac{\text{Any term}}{\text{Preceding term}} = \frac{t_n}{t_{n-1}}$$

$$= ar^{n-1}/ar^{n-2} = r$$

• Sum of first n terms of a G P:

$$S_n = a (1 - r^n) / (1 - r)$$
 when $r < 1$

$$S_n = a (r^n - 1) / (r - 1) \text{ when } r > 1$$

Sum of infinite geometric series

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

- A.M. of a & b is = (a + b)/2
- If a, b, c are in G.P we get $b/a = c/b => b^2 = ac$, b is called the geometric mean between a and c

EXERCISE 6 (C)

Choose the most appropriate option (a), (b), (c) or (d).
--

1.	Three numbers are in A form a G. P. The number		1, 5, 15 are added to the	m respectively, they
	(a) 5, 7, 9	(b) 9, 5, 7	(c) 7, 5, 9	(d) none of these
2.	The sum of $1 + 1/3 + 1$	$\sqrt{3^2 + 1/3^3 + \dots + 1/3^{n-1}}$	is	
	(a) 2/3	(b) 3/2	(c) 4/5	(d) none of these
3.	The sum of the infinite	series $1 + 2/3 + 4/9 +$	is	
	(a) $1/3$	(b) 3	(c) 2/3	(d) none of these
4.	The sum of the first two common ratio is	terms of a G.P. is 5/3 a	and the sum to infinity o	of the series is 3. The
	(a) 1/3	(b) 2/3	(c) $-2/3$	(d) none of these
5.	If p, q and r are in A.P. (a) 0	and x , y , z are in $G.P.$ th (b) -1	nen x^{q-r} . y^{r-p} . z^{p-q} is equa (c) 1	l to (d) none of these
6.	The sum of three number mean by 5, the products (a) 12, 18, 40			ed each by 4 and the (d) none of these
7.	The sum of 3 numbers i are is G. P. The number (a) 26, 5, –16	s are	19 be added to them res(c) 5, 8, 2	pectively, the results (d) none of these
_	• •			(a) Horic of these
8.	Given x, y, z are in G.P. (a) A.P.		/p , 1/q, 1/σ are in (c) Both A.P. and G.P	. (d) none of these
9.	If the terms $2x$, $(x+10)$ a	nd (3x+2) be in A.P., the	e value of x is	
	(a) 7	(b) 10	(c) 6	(d) none of these
10.	If A be the A.M. of two (a) A < G	positive unequal quant (b) A>G	ities x and y and G be the following (c) $A \ge G$	neir G. M, then $(d) A \leq G$
11.	The A.M. of two positive (a) (72, 8)	ve numbers is 40 and the (b) (70, 10)	eir G. M. is 24. The num (c) (60, 20)	bers are (d) none of these
12.	Three numbers are in A numbers are in G.P. The	e numbers are		em respectively, the
	(a) 2, 6, 7	(b) 4, 6, 5	(c) 3, 5, 7	(d) none of these
13.	The sum of four numb numbers are	ers in G. P. is 60 and t	the A.M. of the first an	d the last is 18. The
	(a) 4, 8, 16, 32	(b) 4, 16, 8, 32	(c) 16, 8, 4, 20	(d) none of these
14.	A sum of ₹ 6240 is paid preceeding installment.			is ₹ 10 more than the
	(a) ₹36	(b) ₹30	(c) ₹ 60	(d) none of these
15.	The sum of $1.03 + (1.03)$ (a) $103 \{(1.03)^n - 1\}$			(d) none of these

16.	If x, y, z are in A.P. and (a) $(x - z)^2 = 4x$			(d) none of these
17.	The numbers x , 8 , y are		rs x, y, –8 are in A.P. The	
18.	The nth term of the seri			(di) illotte of direct
10.	(a) 20	(b) 21		(d) none of these
19.	The sum of n terms of a	a G.P. whose first terms	s 1 and the common rat	io is $1/2$, is equal to
	$1\frac{127}{128}$. The value of n is			
	(a) 7	(b) 8	(c) 6	(d) none of these
20.	t_4 of a G.P. in x, $t_{10} = y$ a	$nd t_{16} = z. Then$		
	(a) $x^2 = yz$		(c) $y^2 = zx$	(d) none of these
21.	If x , y , z are in G.P., then	n		
	(a) $y^2 = xz$ (b) y ((c) $2y = x + z$	(d) none of these
22.	The sum of all odd num	nbers between 200 and 3	300 is	
	(a) 11,600	(b) 12,490	(c) 12,500	(d) 24,750
23.	The sum of all natural r (a) 28,405		nd 1000 which are divis (c) 28,540	2
24.	If unity is added to the	sum of any number of	terms of the A.P. 3, 5, 7	, 9, the resulting
	sum is	, and the second		
	(a) 'a' perfect cube	(b) 'a' perfect square	(c) 'a' number	(d) none of these
25.	The sum of all natural r (a) 10,200	numbers from 100 to 300 (b) 15,200) which are exactly divi (c) 16,200	sible by 4 or 5 is (d) none of these
26.	The sum of all natural r (a) 2,200	numbers from 100 to 300 (b) 2,000		sible by 4 and 5 is (d) none of these
27.	A person pays ₹ 975 b	y monthly instalment	each less then the form	ner by ₹ 5. The first
	instalment is ₹ 100. The		re amount will be paid i	is
	(a) 10 months	(b) 15 months	(c) 14 months	(d) none of these
28.	A person saved ₹ 16,50			
	than he did in the prece (a) ₹ 1000	eding year. The amount (b) ₹1500	of money he saved in the (c) ₹ 1200	he 1 st year was (d)none of these
29.	At 10% C.I. p.a., a sum (` '	` '
<i></i>	is	of money accumulate to	1 7025 H15 years. The s	ant nivested initially
	(a) ₹5976.37	(b) ₹5970	(c) ₹5975	(d) ₹5370.96
30.	The population of a cour is the year 2015 is estim		5 and is growing at 2% p	a C.I. the population
	(a) 5705	(b) 6005	(c) 6700	(d) none of these

ANSWERS

Exercise 6 (A)

- **1.** (b) **2.** (a) **3.** (a) **4.** (a) **5.** (a) **6.** (b) **7.** (c) **8.** (d)
- 9. (a), (b) 10 (c) 11. (a) 12. (c) 13. (b) 14. (a) 15. (b) 16. (c), (d)
- 17. (a) 18. (b) 19. (b) 20. (c) 21. (c) 22. (a) 23. (b) 24. (a)
- **25.** (c)

Exercise 6 (B)

- 1. (a) 2. (b) 3. (c) 4. (c) 5. (a) 6. (b) 7. (c) 8. (a)
- 9. (d) 10. (a) 11. (c) 12. (c) 13. (a) 14. (c) 15. (a) 16. (b)
- 17. (a) 18. (b) 19. (c) 20. (a) 21. (b) 22. (c) 23. (b) 24. (a)

Exercise 6 (C)

- 1. (a) 2. (d) 3. (b) 4. (b), (c) 5. (c) 6. (b), (c) 7. (a), (b) 8. (a)
- 9. (c) 10. (b) 11. (a) 12. (c) 13. (a) 14. (d) 15. (b) 16. (a)
- 17. (a), (b) 18. (c) 19. (b) 20. (c) 21. (a) 22. (c) 23. (a) 24. (b)
- 25. (c) 26. (a) 27. (b) 28. (c) 29. (a) 30. (d)

ADDITIONAL QUESTION BANK

- 1. If *a*, *b*, *c* are in A.P. as well as in G.P. then
 - (a) They are also in H.P. (Harmonic Progression)
- (b) Their reciprocals are in A.P.

(c) Both (a) and (b) are true

- (d) Both (a) and (b) are false
- 2. If a, b, c be respectively p^{th} , q^{th} and r^{th} terms of an A.P. the value of a(q-r)+b(r-p)+c(p-q) is ______.
 - (a) 0

(b) 1

- (c) -1
- (d) None
- 3. If the p^{th} term of an A.P. is q and the q^{th} term is p the value of the r^{th} term is _____.
 - (a) p-q-r

- (b) p + q r
- (c) p + q + r
- (d) None
- 4. If the p^{th} term of an A.P. is q and the q^{th} term is p the value of the $(p+q)^{th}$ term is _____.
 - (a) 0

(b)

- (c) -1
- (d) None

- 5. The sum of first *n* natural number is _____.
 - (a) (n/2)(n+1)
- (b) (n/6)(n+1)(2n+1)
- (c) $[(n/2)(n+1)]^2$
- (d) None

6.	The sum of square of first <i>n</i>	natural number is	·	
	(a) $(n/2)(n+1)$	(b) $(n/6)(n+1)(2n+1)$	(c) $[(n/2)(n+1)]^2$	(d) None
7.	The sum of cubes of first n	natural number is	.	
	(a) $(n/2)(n+1)$	(b) $(n/6)(n+1)(2n+1)$	(c) $[(n/2)(n+1)]^2$	(d) None
8.	The sum of a series in A.F. number of terms is		17 and the common	difference –2. the
	(a) 6	(b) 12	(c) 6 or 12	(d) None
9.	Find the sum to n terms of	(1-1/n) + (1-2/n) + (1-3/n)	/n) +	
	(a) ½(n–1)	(b) ½(n+1)	(c) (<i>n</i> –1)	(d) (n+1)
10.	If S_n the sum of first n term	s in a series is given by 2	$2n^2 + 3n$ the series is	in
	(a) A.P.	(b) G.P.	(c) H.P.	(d) None
11.	The sum of all natural num	abers between 200 and 4	00 which are divisibl	le by 7 is
	(a) 7,730	(b) 8,729	(c) 7,729	(d) 8,730
12.	The sum of natural number	rs upto 200 excluding th	ose divisible by 5 is	·
	(a) 20,100	(b) 4,100	(c) 16,000	(d) None
13.	If a , b , c be the sums $(a/p)(q-r)+(b/q)(r-p)+(b/q)(r-p)$		pectively of an A	.P. the value of
	(a) 0	(b) 1	(c) – 1	(d) None
14.	If S_1 , S_2 , S_3 be the respective $S_3 \div (S_2 - S_1)$ is given by	-	ms of <i>n</i> , 2 <i>n</i> , 3 <i>n</i> an	A.P. the value of
	(a) 1	(b) 2	(c) 3	(d) None
15.	The sum of n terms of two n the two series are equal.	A.P.s are in the ratio of (7	7n-5)/(5n+17) . Then t	term of
	(a) 12	(b) 6	(c) 3	(d) None
16.	Find three numbers in A.P.	whose sum is 6 and the	product is –24	
	(a) -2, 2, 6	(b) -1, 1, 3	(c) 1, 3, 5	(d) 1, 4, 7
17.	Find three numbers in A.P.	whose sum is 6 and the	sum of whose squar	re is 44.
	(a) -2, 2, 6	(b) -1, 1, 3	(c) 1, 3, 5	(d) 1, 4, 7

18.	Find three numbers in A.P.	whose sum is 6 and the	sum of their cubes is	s 232.
	(a) -2, 2, 6	(b) -1, 1, 3	(c) 1, 3, 5	(d) 1, 4, 7
19.	Divide 12.50 into five parts 2:3	in A.P. such that the firs	t part and the last par	rt are in the ratio of
	(a) 2, 2.25, 2.5, 2.75, 3	(b) -2, -2.25, -2.5, -2.75	5, –3	
	(c) 4, 4.5, 5, 5.5, 6	(d) -4, -4.5, -5, -5.5, -6		
20.	If <i>a</i> , <i>b</i> , <i>c</i> are in A.P. then the	value of $(a^3 + 4b^3 + c^3)/[b(a^3 + 4b^3 + c^3)]$	$(a^2 + c^2)$] is	
	(a) 1	(b) 2	(c) 3	(d) None
21.	If <i>a</i> , <i>b</i> , <i>c</i> are in A.P. then the	value of $(a^2 + 4ac + c^2)/(a^2 + 4ac + c^2)$	ab + bc + ca) is	
	(a) 1	(b) 2	(c) 3	(d) None
22.	If a , b , c are in A.P. then (a/	bc) (b + c), (b/ca) (c + a),	(c/ab) (a + b) are in _	·
	(a) A.P.	(b) G.P.	(c) H.P.	(d) None
23.	If a , b , c are in A.P. then a^2 (1)	$b+c$), $b^2(c+a)$, $c^2(a+b)$	are in	
	(a) A.P.	(b) G.P.	(c) H.P.	(d) None
24.	If $(b+c)^{-1}$, $(c+a)^{-1}$, $(a+b)^{-1}$ a	are in A.P. then a^2 , b^2 ,	c ² are in	
	(a) A.P.	(b) G.P.	(c) H.P.	(d) None
25.	If a^2 , b^2 , c^2 are in A.P. the	en $(b+c)$, $(c+a)$, $(a+b)$	are in	
	(a) A.P.	(b) G.P.	(c) H.P.	(d) None
26.	If a^2 , b^2 , c^2 are in A.P. the	en $a/(b+c)$, $b/(c+a)$, $c/(a$	+b) are in	·
	(a) A.P.	(b) G.P.	(c) H.P.	(d) None
27.	If $(b+c-a)/a$, $(c+a-b)/b$, (a	+b-c)/c are in A.P. the	n a, b, c are in	·
	(a) A.P.	(b) G.P.	(c) H.P.	(d) None
28.	If $(b-c)^2$, $(c-a)^2$, $(a-b)^2$ are	e in A.P. then $(b-c)$, $(c-$	a), (a – b) are in	·
	(a) A.P.	(b) G.P.	(c) H.P.	(d) None

29.	If $a b c$ are in A.P. then $(b +$	c), (c + a), (a + b) are in _	·	
	(a) A.P.	(b) G.P.	(c) H.P.	(d) None
30.	Find the number which sh 5, 7, 9, 11resulting in		m of any number of t	terms of the A.P. 3,
	(a) -1	(b) 0	(c) 1	(d) None
31.	The sum of n terms of an A	.P. is $2n^2 + 3n$. Find the	e n th term.	
	(a) $4n + 1$	(b) 4n - 1	(c) 2n + 1	(d) 2n - 1
32.	The p^{th} term of an A.P. is 1	$/q$ and the q^{th} term is $1/q$	p. The sum of the (p)	g) th term is
	(a) $\frac{1}{2}$ (pq+1)	(b) $\frac{1}{2}$ (pq-1)	(c) pq+1	(d) pq-1
33.	The sum of <i>p</i> terms of an <i>A</i>	A.P. is q and the sum of	q terms is p . The sum	m of $p + q$ terms is
	(a) - (p + q)	(b) $p + q$	(c) $(p-q)^2$	(d) $p^2 - q^2$
34.	If $S_{1,}S_{2,}S_{3}$ be the sums of n respective common different			eing unity and the
	(a) 1	(b) 2	(c) –1	(d) None
35.	The sum of all natural numbers	pers between 500 and 10	00, which are divisibl	e by 13, is
	(a) 28,400	(b) 28,405	(c) 28,410	(d) None
36.	The sum of all natural num	bers from 100 and 300,	which are divisible b	y 4, is
	(a) 10,200	(b) 30,000	(c) 8,200	(d) 2,200
37.	The sum of all natural num	bers from 100 to 300 excl	uding those, which a	are divisible by 4, is
	(a) 10,200	(b) 30,000	(c) 8,200	(d) 2,200
38.	The sum of all natural num	bers from 100 to 300, w	hich are divisible by	5, is
	(a) 10,200	(b) 30,000	(c) 8,200	(d) 2,200
39.	The sum of all natural num	bers from 100 to 300, w	hich are divisible by	4 and 5, is
	(a) 10,200	(b) 30,000	(c) 8,200	(d) 2,200
40.	The sum of all natural num	bers from 100 to 300, w	hich are divisible by	4 or 5, is
	(a) 10,200	(b) 8,200	(c) 2,200	(d) 16,200

41.	If the n terms of two A.P. is	s are in the ratio (3n+4	4) : (n+4) the ratio o	of the fourth term
	(a) 2	(b) 3	(c) 4	(d) None
42.	If <i>a</i> , <i>b</i> , <i>c</i> , <i>d</i> are in A.P. then			
	(a) $a^2 - 3b^2 + 3c^2 - d^2 = 0$	(b) $a^2+3b^2+3c^2+d^2=0$	(c) $a^2 + 3b^2 + 3c^2 - d$	² =0 (d) None
43.	If <i>a</i> , <i>b</i> , <i>c</i> , <i>d</i> , <i>e</i> are in A.P. then	1		
	(a) $a - b - d + e = 0$	(b) $a - 2c + e = 0$	(c) $b - 2c + d = 0$	(d) all the above
44.	The three numbers in A.P.	whose sum is 18 and pro	oduct is 192 are	
	(a) 4, 6, 8	(b) -4, -6, -8	(c) 8, 6, 4	(d) both (a) & (c)
45.	The three numbers in A.P.,	whose sum is 27 and the	sum of their squares	is 341, are
	(a) 2, 9, 16 (b) 16, 9, 2	(C) both (a) and (b)	(d) -2, -9, -16	
46.	The four numbers in A.P., v	whose sum is 24 and the	ir product is 945, are	·
	(a) 3, 5, 7, 9	(b) 2, 4, 6, 8	(c) 5, 9, 13, 17	(d) None
47.	The four numbers in A.P., w	hose sum is 20 and the s	sum of their squares i	is 120, are
	(a) 3, 5, 7, 9	(b) 2, 4, 6, 8	(c) 5, 9, 13, 17	(d) None
48.	The four numbers in A.P. w first and fourth beinf 85 are		nd third being 22 and	l the product of the
	(a) 3, 5, 7, 9	(b) 2, 4, 6, 8	(c) 5, 9, 13, 17	(d) None
49.	The five numbers in A.P. w	ith their sum 25 and the	sum of their square	s 135 are
	(a) 3, 4, 5, 6, 7	(b) 3, 3.5, 4, 4.5, 5	(c) -3, -4, -5, -6, -7	
	(d) -3, -3.5, -4, -4.5, -5			
50.	The five numbers in A.P. w	ith the sum 20 and prod	luct of the first and la	ast 15 are
	(a) 3, 4, 5, 6, 7	(b) 3, 3.5, 4, 4.5, 5	(c) -3, -4, -5, -6, -7	
	(d) -3, -3.5, -4, -4.5, -5			
51.	The sum of n terms of 2, 4,	6, 8 is		
	(a) n(n+1)	(b) $(n/2)(n+1)$	(c) n(n-1)	(d) (n/2)(n-1)
52.	The sum of n terms of $a+b$,	2a, 3a–b, is		
	(a) n(a-b)+2b	(b) n(a+b)	(c) both the above	(d) None

5 2	The sum of u terms of (v x	$x^{1/2} (x^{2} + x^{2}) (x + x^{2})^{2}$	io	
53.	The sum of n terms of $(x + y)^2 - 2(n - 1)xy$			(d) None
54.	The sum of n terms of $(1/n)$ (a) 0	(n-1), (1/n) (n-2), (1/n) (b) (1/2)(n-1)		(d) None
55.	The sum of n terms of 1.4, 3 (a) $(n/2)(4n^2+5n-1)$.7, 5.10 Is (b) n(4n²+5n-1)	(c) (n/2)(4n ² –5n–1)	(d) None
56.	The sum of n terms of 1^2 , 3^2	² , 5 ² , 7 ² ,is		
	(a) $(n/3)(4n^2-1)$	(b) $(n/2)(4n^2-1)$	(c) $(n/3)(4n^2+1)$	(d) None
57.	The sum of n terms of 1, (1	+ 2), (1 + 2 + 3) is		
	(a) $(n/3)(n+1)(n-2)$	(b) $(n/3)(n+1)(n+2)$	(c) $n(n+1)(n+2)$	(d) None
58.	The sum of n terms of the se	eries $1^2/1+(1^2+2^2)/2+(1^2+2^2)$	² +2 ² +3 ²)/3+is	
	(a) (n/36)(4n ² +15n+17) (c) (n/12)(4n ² +15n+17)		(b) (n/12)(4n²+15n+ (d) None	-17)
59.	The sum of n terms of the se	eries 2.4.6 + 4.6.8 + 6.8.1	0 + is	
	(a) $2n(n^3+6n^2+11n+6)$ (c) $n(n^3+6n^2+11n+6)$		(b) $2n(n^3-6n^2+11n-6)$ (d) $n(n^3+6n^2+11n-6)$	•
60.	The sum of n terms of the se	eries $1.3^2 + 4.4^2 + 7.5^2 + 1$	$0.6^2 + \dots$ is	
	(a) $(n/12)(n+1)(9n^2+49n+44)$)– 8 <i>n</i>	(b) $(n/12)(n+1)(9n^2-1)$	+49n+44)+8n
	(c) $(n/6)(2n+1)(9n^2+49n+44)$)–8 <i>n</i>	(d) None	
61.	The sum of n terms of the se	eries 4 + 6 + 9 + 13	. is	
	(a) $(n/6)(n^2+3n+20)$	(b) $(n/6)(n+1)(n+2)$	(c) $(n/3)(n+1)(n+2)$	(d) None
62.	The sum to n terms of the se	eries 11, 23, 59, 167	is	
	(a) $3^{n+1}+5n-3$	(b) $3^{n+1}+5n+3$	(c) $3^n + 5n - 3$	(d) None
63.	The sum of n terms of the se	eries 1/(4.9)+1/(9.14)+1/((14.19)+1/(19.24)+	is
	(a) $(n/4)(5n+4)^{-1}$	(b) $(n/4)(5n+4)$	(c) $(n/4)(5n-4)^{-1}$	(d) None
64.	The sum of n terms of the se	eries 1 + 3 + 5 +	Is	
	(a) n^2	(b) $2n^2$	(c) $n^2/2$	(d) None

65.	The sum of n terms of the series $2 + 6 + 10 + \dots$ is				
	(a) $2n^2$	(b) n^2	(c) $n^2/2$	(d) $4n^2$	
66.	The sum of n terms of the se	eries 1.2 + 2.3 + 3.4 +	Is		
	(a) $(n/3)(n+1)(n+2)$	(b) $(n/2)(n+1)(n+2)$	(c) $(n/3)(n+1)(n-2)$	(D) None	
67.	The sum of n terms of the se	eries 1.2.3 + 2.3.4 + 3.4.5	+is		
	(a) $(n/4)(n+1)(n+2)(n+3)$		(b) $(n/3)(n+1)(n+2)$	(n+3)	
	(c) $(n/2)(n+1)(n+2)(n+3)$		(d) None		
68.	The sum of n terms of the se	eries 1.2+3.2²+5.2³+7.2⁴+	is		
	(a) $(n-1)2^{n+2}-2^{n+1}+6$	(b) $(n+1)2^{n+2}-2^{n+1}+6$	(c) $(n-1)2^{n+2}-2^{n+1}-6$	(d) None	
69.	The sum of n terms of the se	eries 1/(3.8)+1/(8.13)+1	1/(13.18)+ is		
	(a) $(n/3)(5n+3)^{-1}$	(b) $(n/2)(5n+3)^{-1}$	(c) $(n/2)(5n-3)^{-1}$	(d) None	
70.	The sum of n terms of the se	eries 1/1+1/(1+2)+1/(1	+2+3)+ is		
	(a) $2n(n+1)^{-1}$	(b) $n(n+1)$	(c) $2n(n-1)^{-1}$	(d) None	
71.	The sum of n terms of the se	eries $2^2+5^2+8^2+$ is			
	(a) $(n/2)(6n^2+3n-1)$	(b) $(n/2)(6n^2-3n-1)$			
	(c) $(n/2)(6n^2+3n+1)$	(d) None			
72.	The sum of n terms of the se	eries $1^2+3^2+5^2+$ is			
	(a) $\frac{n}{3} (4n^2 - 1)$	(b) $n^2(2n^2+1)$	(c) n(2n-1)	(d) $n(2n+1)$	
73.	The sum of n terms of the se	eries 1.4 + 3.7 + 5.10 +	is		
	(a) $\frac{n}{3} (4n^2 + 5n + 5)$	(b) $(n/2)(5n^2+4n-1)$			
	(c) $(n/2)(4n^2+5n+1)$	(d) None			
74.	The sum of n terms of the se	eries $2.3^2 + 5.4^2 + 8.5^2 + \dots$	is		
	(a) $(n/12)(9n^3+62n^2+123n+2)$	2)	(b) $(n/12)(9n^3-62n^2-$	+123 <i>n</i> -22)	
	(c) $(n/6)(9n^3+62n^2+123n+22n+22n+22n+22n+22n+22n+22n+22n+22n+$	2)	(d) None		
75.	The sum of n terms of the se	eries 1 + (1 + 3) + (1 + 3	+ 5) + is		
	(a) $(n/6)(n+1)(2n+1)$	(b) $(n/6)(n+1)(n+2)$	(c) $(n/3)(n+1)(2n+1)$	(d) None	

76.	The sum of n terms of the se	eries $1^2 + (1^2 + 2^2) + (1^2 + 2^2 + 1^2)$	3 ²)+ is	
	(a) $(n/12)(n+1)^2(n+2)$	(b) $(n/12)(n-1)^2(n+2)$	(c) $(n/12)(n^2-1)(n+2)$) (d) None
77.	The sum of n terms of the se	eries 1+(1+1/3)+(1+1/3+1	/3 ²)+is	
	(a) (3/2)(1-3 ⁻ⁿ)	(b) $(3/2)[n-(1/2)(1-3^{-n})]$	(c) Both	(d) None
78.	The sum of n terms of the se	eries n.1+(n-1).2+(n-2).3-	+is	
	(a) $(n/6)(n+1)(n+2)$	(b) $(n/3)(n+1)(n+2)$	(c) $(n/2)(n+1)(n+2)$	(d) None
79.	The sum of n terms of the se	eries 1 + 5 + 12 + 22 +	is	
	(a) $(n^2/2)(n+1)$	(b) $n^2 (n+1)$	(c) $(n^2/2)(n-1)$	(d) None
80.	The sum of n terms of the se	eries 4 + 14 + 30 + 52 + 8	0 + is	
	(a) $n(n+1)^2$	(b) $n(n-1)^2$	(c) $n(n^2-1)$	(d) None
81.	The sum of n terms of the se	eries 3 + 6 + 11 + 20 + 37	+ is	
	(a) $2^{n+1}+(n/2)(n+1)-2$	(b) $2^{n+1} + (n/2)(n+1)-1$	(c) $2^{n+1} + (n/2)(n-1)-2$	d) None
82.	The n^{th} terms of the series is	1/(4.7) + 1/(7.10) + 1/(10.13) + is	
	(a) $(1/3)[(3n+1)^{-1}-(3n+4)^{-1}]$		(b) $(1/3)[(3n-1)^{-1}-(3n-1)^{-1}]$	ı+4) ⁻¹]
	(c) $(1/3)[(3n+1)^{-1}-(3n-4)^{-1}]$		(d) None	
83.	In question No.(82) the sum	of the series upto n is		
	(a) $(n/4)(3n+4)^{-1}$	(b) $(n/4)(3n-4)^{-1}$	(c) $(n/2)(3n+4)^{-1}$	(d) None
84.	The sum of n terms of the se	eries $1^2/1+(1^2+2^2)/(1+2)$	+(1 ² +2 ² +3 ²)/(1+2+3)+	is
	(a) (n/3)(n+2)	(b) $(n/3)(n+1)$	(c) $(n/3)(n+3)$	(d) None
85.	The sum of n terms of the se	eries $1^3/1+(1^3+2^3)/2+(1^3+1)$	-2^3+3^3)/3+ is	
	(a) $(n/48)(n+1)(n+2)(3n+5)$		(b) $(n/24)(n+1)(n+2)$	(3 <i>n</i> +5)

(d) None

(c) (n/48)(n+1)(n+2)(5n+3)

86.	The value of $n^2 + 2n[1+2+3+$	+(n-1)] is		
	(a) n ³	(b) n ²	(c) n	(d) None
87.	2 ⁴ⁿ -1 is divisible by			
	(a) 15	(b) 4	(c) 6	(d) 64
88.	3^{n} - $2n$ - 1 is divisible by			
	(a) 15	(b) 4	(c) 6	(d) 64
89.	n(n-1)(2n-1) is divisible by			
	(a) 15	(b) 4	(c) 6	(d) 64
90.	$7^{2n}+16n-1$ is divisible by			
	(a) 15	(b) 4	(c) 6	(d) 64
91.	The sum of n terms of the se	eries whose n th term 3n	² +2n is is given by	
	(a) $(n/2)(n+1)(2n+3)$		(b) $(n/2)(n+1)(3n+2)$)
	(c) $(n/2)(n+1)(3n-2)$		(d) $(n/2)(n+1)(2n-1)$	3)
92.	The sum of n terms of the se	eries whose n^{th} term n.2	n is is given by	
	(a) $(n-1)2^{n+1}+2$	(b) $(n+1)2^{n+1}+2$	(c) $(n-1)2^n+2$	(d) None
93.	The sum of n terms of the se	eries whose n^{th} term 5.3	n+1+2n is is given by	у
	(a) $(5/2)(3^{n+2}-9)+n(n+1)$		(b) $(2/5)(3^{n+2}-9)+n($	n+1)
	(c) $(5/2)(3^{n+2}+9)+n(n+1)$		(d) None	
94.	If the third term of a G.P. is t	the square of the first and	d the fifth term is 64 t	the series would be
	(a) $4 + 8 + 16 + 32 + \dots$		(b) $4 - 8 + 16 - 32 +$	
	(c) both		(d) None	
95.	Three numbers whose sum they are in G.P. The number		they are added by 1	, 4, 19 respectively
	(a) 2, 5, 8	(b) 26, 5, –16	(c) Both	(d) None
96.	If a, b, c are the p th , q th ar	nd r^{th} terms of a G.P. r	espectively the valu	ue of a ^{q-r} .b ^{r-p} .c ^{p-q}
	is (a) 0	(b) 1	(c) - 1	(d) None

97. If a, b, c are in A.P. and x, y, z in G.P. then the value of $x^{b-c}.y^{c-a}.z^{a-b}$ is						
	(a) 0	(b) 1	(c) -1	(d) None		
98.	If a , b , c are in A.P. and x ,	y, z in G.P. then the valu	e of $(x^b.y^c.z^a)$ ÷ $(x^c.y^a)$.a.z ^b) is		
	(a) 0	(b) 1	(c) –1	(d) None		
99.	The sum of n terms of the	series 7 + 77 + 777 +	is			
	(a) $(7/9)[(1/9)(10^{n+1}-10)-r$	ո]	(b) (9/10)[(1/9)(10	(b) $(9/10)[(1/9)(10^{n+1}-10)-n]$		
	(c) $(10/9)[(1/9)(10^{n+1}-10)$	-n]	(d) None			
100.	The least value of n for wh 7000 is	ich the sum of n terms of	the series $1 + 3 + 3^2 +$	is greater than		
	(a) 9	(b) 10	(c) 8	(d) 7		
101.	If 'S' be the sum, 'P' the property is the of S ⁿ and		f the reciprocals of n	terms in a G.P. then		
	(a) Arithmetic Mean	(b) Geometric Mean	(c) Harmonic Mea	n (d) None		
102.	Sum upto ∞ of the series	$8+4\sqrt{2}+4+$ is				
	(a) $8(2+\sqrt{2})$	(b) $8(2-\sqrt{2})$	(c) $4(2+\sqrt{2})$	(d) $4(2-\sqrt{2})$		
103.	Sum upto ∞ of the series	1/2+1/3 ² +1/2 ³ +1/3 ⁴ +1/2	⁵ +1/3 ⁶ + is			
	(a) 19/24	(b) 24/19	(c) 5/24	(d) None		
104.	If $1+a+a^2+\infty=x$ an	$d 1+b+b^2+\infty=y tl$	nen $1 + ab + a^2b^2 + .$	∞ is given by		
	(a) $(xy)/(x+y-1)$	(b) $(xy)/(x-y-1)$	(c) $(xy)/(x+y+1)$	(d) None		
105.	If the sum of three number	rs in G.P. is 35 and their	product is 1000 the i	numbers are		
	(a) 20, 10, 5	(b) 5, 10, 20	(c) both	(d) None		
106.	If the sum of three number	rs in G.P. is 21 and the sur	m of their squares is	189 the numbers are		
	(a) 3, 6, 12	(b) 12, 6, 3	(c) both	(d) None		
107.	If <i>a</i> , <i>b</i> , <i>c</i> are in G.P. then th	e value of $a(b^2+c^2)-c(a^2)$	+b ²) is			
	(a) 0	(b) 1	(c) - 1	(d) None		

108.	If a , b , c , d are in G.P. then the	ne value of b(ab-cd)-(c	$+a)(b^2-c^2)$ is	
	(a) 0	(b) 1	(c) -1	(d) None
109.	If a , b , c , d are in G.P. then the	ne value of (ab+bc+cd)	$(a^2+b^2+c^2)(b^2+c^2+c^2)$	-d ²) is
	(a) 0	(b) 1	(c) –1	(d) None
110.	If a , b , c , d are in G.P. then a	+b, b+c, c+d are in		
	(a) A.P.	(b) G.P.	(c) H.P.	(d) None
111.	If a , b , c are in G.P. then a^2 +	b^2 , $ab+bc$, b^2+c^2 are in	1	
	(a) A.P.	(b) G.P.	(c) H.P.	(d) None
112.	If a , b , x , y , z are positive no $z=(2ab)/(a+b)$ then	umbers such that a , x , b	are in A.P. and a, y,	b are in G.P. and
	(a) <i>x</i> , <i>y</i> , <i>z</i> are in G.P.	(b) $x \ge y \ge z$	(c) both	(d) None
113.	If a , b , c are in G.P. then the	value of (a-b+c)(a+b+c	$(a^2+b^2+c^2)^2$	²) is given by
	(a) 0	(b) 1	(c) –1	(d) None
114.	If <i>a</i> , <i>b</i> , <i>c</i> are in G.P. then the	value of $a(b^2+c^2)-c(a^2-c^2)$	+b ²) is given by	
	(a) 0	(b) 1	(c) –1	(d) None
115.	If <i>a</i> , <i>b</i> , <i>c</i> are in G.P. then the	value of $a^2b^2c^2(a^{-3}+b^{-3})$	a^3+c^{-3})- $(a^3+b^3+c^3)$ is §	given by
	(a) 0	(b) 1	(c) –1	(d) None
116.	If a , b , c , d are in G.P. then ($(a-b)^2$, $(b-c)^2$, $(c-d)^2$ are	ein	
	(a) A.P.	(b) G.P.	(c) H.P.	(d) None
117.	If a , b , c , d are in G.P. then the	ne value of $(b-c)^2+(c-a)^2$	$(a-b)^2 - (a-d)^2$ is gi	ven by
	(a) 0	(b) 1	(c) -1	(d) None
118.	If (a-b), (b-c), (c-a) are in (G.P. then the value of (a	+b+c) ² -3(ab+bc+ca)	is given by
	(a) 0	(b) 1	(c) –1	(d) None
119.	If $a^{1/x} = b^{1/y} = c^{1/z}$ and a, b, c as	re in G.P. then x , y , z are	e in	
	(a) A.P.	(b) G.P.	(c) H.P.	(d) None

120.	If $x = a + a/r + a/r^2 + \dots$	$\infty, y = b - b/r + b/r^2 -$	$-\dots \infty$, and $z = c$	$+ c/r^2 + c/r^4 +$		
	∞ , then the value of $\frac{xy}{z} - \frac{ab}{c}$ is					
	(a) 0	(b) 1	(c) -1	(d) None		
121.	If <i>a</i> , <i>b</i> , <i>c</i> are in A.P. <i>a</i> , <i>x</i> , <i>b</i> are	e in G.P. and b , y , c are i	n G.P then x^2 , b^2 , y	y² are in		
	(a) A.P.	(b) G.P.	(c) H.P.	(d) None		
122.	If a, b-a, c-a are in G.P. and	d $a=b/3=c/5$ then a, b,	c are in			
	(a) A.P.	(b) G.P.	(c) H.P.	(d) None		
123.	If a, b, (c+1) are in G.P. an	d $a = (b-c)^2$ then a, b, c	are in			
	(a) A.P.	(b) G.P.	(c) H.P.	(d) None		
124.	If S_1, S_2, S_3,S_n are th	e sums of infinite G.P.s	whose first terms a	re 1, 2, 3n and		
	whose common ratios are 1	$/2, 1/3, \dots 1/(n+1)$ the	en the value of $S_1 + S_2$	$S_2 + S_3 + \dots S_n$ is		
	(a) $(n/2) (n+3)$	(b) (n/2) (n+2)	(c) (n/2) (n+1)	(d) $n^2/2$		
125.	The G.P. whose 3^{rd} and 6^{th} to (a) 4, -2, 1	erms are 1, –1/8 respect (b) 4, 2, 1	•	(d) None		
126	In a G.P. if the $(p+q)$ th term		•			
120.	(a) $(mn)^{1/2}$	(b) mn	(c) (m+n)	(d) (m-n)		
127.	The sum of n terms of the se	eries is $1/\sqrt{3} + 1 + 3/\sqrt{3} +$				
	(a) $(1/6) (3+\sqrt{3}) (3^{n/2}-1)$		(b) $(1/6)(\sqrt{3}+1)(3$	$^{n/2}$ -1)		
	(c) $(1/6) (3+\sqrt{3}) (3^{n/2}+1)$		(d) None			
128.	The sum of n terms of the se	eries 5/2 – 1 + 2/5 –	is			
	(a) $(1/14) (5^n + 2^n)/5^{n-2}$	(b) $(1/14) (5^n-2^n)/5^{n-2}$	(c) both	(d) None		
129.	The sum of n terms of the se	eries 0.3 + 0.03 + 0.003 +	is			
	(a) $(1/3)(1-1/10^n)$	(b) (1/3)(1+1/10 ⁿ)	(c) both	(d) None		
130.	The sum of first eight terms ratio is	of G.P. is five times the s	um of the first four to	erms. The common		
	(a) $\sqrt{2}$	(b) $-\sqrt{2}$	(c) both	(d) None		

131.	If the sum of n terms of a G.P. with first term 1 and common ratio 1/2 is 1+127/128, the value of n is			
	(a) 8	(b) 5	(c) 3	(d) None
132.	If the sum of n terms of a G.l	P. with last term 128 and	common ratio 2 is 25	55, the value of n is
	(a) 8	(b) 5	(c) 3	(d) None
133.	How many terms of the G.F	P. 1, 4, 16 are to be tal	ken to have their sun	n 341?
	(a) 8	(b) 5	(c) 3	(d) None
134.	The sum of n terms of the se	eries 5 + 55 + 555 +	is	
	(a) $(50/81) (10^{n}-1)-(5/9)n$		(b) $(50/81) (10^n + 1)$	-(5/9)n
	(c) $(50/81) (10^n + 1) + (5/9)n$		(d) None	
135.	The sum of n terms of the se	eries 0.5 + 0.55 + 0.555 +	is	
	(a) $(5/9)$ n- $(5/81)(1-10^{-n})$		(b) (5/9)n+(5/81)(1	-10 ⁻ⁿ)
	(c) $(5/9)n+(5/81)(1+10^{-n})$		(d) None	
136.	The sum of n terms of the se	eries $1.03+1.03^2+1.03^3+1.0$	+ is	
	(a) $(103/3)(1.03^{n}-1)$	(b) $(103/3)(1.03^n + 1)$	(c) $(103/3)(1.03^{n+1}-1.03^{n+1})$	1) (d) None
137.	The sum upto infinity of the	e series 1/2 + 1/6 + 1/18	3 + is	
	(a) 3/4	(b) 1/4	(c) 1/2	(d) None
138.	The sum upto infinity of the	e series $4 + 0.8 + 0.16 +$	is	
	(a) 5	(b) 10	(c) 8	(d) None
139.	The sum upto infinity of the	e series $\sqrt{2}+1/\sqrt{2}+1/(2+1)$	$\sqrt{2}$)+ is	
	(a) $2\sqrt{2}$	(b) 2	(c) 4	(d) None
140.	The sum upto infinity of the	e series $2/3 + 5/9 + 2/27$	$7 + 5/81 + \dots$ is	
	(a) 11/8	(b) 8/11	(c) 3/11	(d) None

	(a) 16, 4	(b) 4, 16	(c) both	(d) None		
151.	. The numbers x , 8, y are in G.P. and the numbers x , y , -8 are in A.P. The values of x , y are					
	(a) 1, 3, 9	(b) 9, 3, 1	(c) both	(d) None		
150.	If the continued product of pairs is 39 the numbers are _	three numbers in G.P.	is 27 and the sum of	f their products in		
	(a) 2/9, 2/3, 2, 6, 18	(b) 18, 6, 2, 2/3, 2/9	(c) both	(d) None		
149.	Find five numbers in G.P. su	ch that their product is 3	32 and the product of	the last two is 108.		
	(a) 1/3, 1, 3	(b) 3, 1, 1/3	(c) both	(d) None		
148.	Three numbers in G.P. with	their sum 13/3 and sur	n of their squares 91,	/9 are		
	(a) 10, 30, 90	(b) 90, 30, 10	(c) both	(d) None		
147.	Three numbers in G.P. with	their sum 130 and their	product 27,000 are _	·		
	(a) 10, 8, 32/5	(b) 10, 8, 5/2	(c) 10, 10/3, 10/9	(d) None		
	If the first term of a G.P. exce is	eeds the second term by	2 and the sum to infi	nity is 50 the series		
	(a) 1/4, 1/16, 1/64	(b) 1/4, –1/16, 1/64	(C) 1/4, 1/8, 1/16	. (d) None		
145.	The infinite G.P. with first to	erm $1/4$ and sum $1/3$ is				
	(a) 1, 1/2, 1/4	(b) 1, -1/2, 1/4	(c) -1, -1/2, -1/4	(d) None		
144.	If the sum of infinite terms i	n a G.P. is 2 and the sur	m of their squares is	4/3 the series is		
	(a) 23/48	(b) 25/48	(c) 1/2	(d) None		
143.	The sum upto infinity of the	e series $4/7-5/7^2+4/7^3-5$	5/7 ⁴ + is			
	The sum upto infinity of the $(a) 7/3$	(b) 3/7	(c) 4/7	(d) None		
	(a) $(1/2)(4+3\sqrt{2})$			(d) None		
141.	The sum upto infinity of the	e series $(\sqrt{2}+1)+1+(\sqrt{2}-1)$	1)+ is			

ANSWERS

1.	(c)	31.	(a)	61.	(a)	91.	(a)	121.	(a)
2.	(a)	32.	(a)	62.	(a)	92.	(a)	122.	(a)
3.	(b)	33.	(a)	63.	(a)	93.	(a)	123.	(a)
4.	(a)	34.	(b)	64.	(a)	94.	(c)	124.	(a)
5.	(a)	35.	(b)	65.	(a)	95.	(c)	125.	(a)
6.	(b)	36.	(a)	66.	(a)	96.	(b)	126.	(a)
7.	(c)	37.	(b)	67.	(a)	97.	(b)	127.	(a)
8.	(c)	38.	(c)	68.	(d)	98.	(b)	128.	(c)
9.	(a)	39.	(d)	69.	(a)	99.	(a)	129.	(a)
10.	(a)	40.	(d)	70.	(a)	100.	(a)	130.	(c)
11.	(b)	41.	(a)	71.	(a)	101.	(b)	131.	(a)
12.	(c)	42.	(a)	72.	(a)	102.	(a)	132.	(a)
13.	(a)	43.	(d)	73.	(a)	103.	(a)	133.	(b)
14.	(c)	44.	(d)	74.	(a)	104.	(a)	134.	(a)
15.	(b)	45.	(c)	75.	(a)	105.	(c)	135.	(a)
16.	(a)	46.	(a)	76.	(a)	106.	(c)	136.	(a)
17.	(a)	47.	(b)	77.	(b)	107.	(a)	137.	(a)
18.	(a)	48.	(c)	78.	(a)	108.	(a)	138.	(a)
19.	(a)	49.	(a)	79.	(a)	109.	(a)	139.	(a)
20.	(c)	50.	(b)	80.	(a)	110.	(b)	140.	(a)
21.	(b)	51.	(a)	81.	(a)	111.	(b)	141.	(a)
22.	(a)	52.	(d)	82.	(a)	112.	(c)	142.	(a)
23.	(a)	53.	(b)	83.	(a)	113.	(a)	143.	(a)
24.	(a)	54.	(b)	84.	(a)	114.	(a)	144.	(a)
25.	(c)	55.	(a)	85.	(a)	115.	(a)	145.	(a)
26.	(a)	56.	(a)	86.	(a)	116.	(b)	146.	(a)
27.	(c)	57.	(d)	87.	(a)	117.	(a)	147.	(c)
28.	(c)	58.	(a)	88.	(b)	118.	(a)	148.	(c)
29.	(a)	59)	(a)	89.	(c)	119.	(a)	149.	(a)
30.	(c)	60.	(a)	90.	(d)	120.	(a)	150.	(c)
151.	(a)								

NOTES

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