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## MATHS

# BOOKS - S CHAND MATHS (ENGLISH) 

## SEQUENCE AND SERIES

## Example

1. Find the rule that determines the sequence $-2,-1,0,1, \ldots$. Use this rule to find the fifth, sixth, seventh and eighth terms of the sequence .

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2. Find the general term of the sequence $4,10,28,82, \ldots \ldots$
3. If for a sequence $\left(T_{n}\right),(i) S_{n}=2 n^{2}+3 n+1(i i) S_{n}=2\left(3^{n}-1\right)$ find $T_{n}$ and hence $T_{1}$ and $T_{2}$

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4. The nth term of an A.P. is $4 n-1$. Write down the first 4 terms and the 18 th term of the A.P..

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5. Find the 9th and pth terms of the A.P. 2,5,8.

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6. Which term of the series $31+29+27+\ldots$. Is 3 ?

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7. The 8th term of a series in an A.P. is 23 and the 102 nd term is 305 . Find the series .

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8. In a certain A.P., the 24th term is twice the 10th term . Prove that the 72nd term is twice the 34 th term .

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9. If $p$ times the $p$ th terms of an A.P. is equal to $q$ times the qth term prove that $(\mathrm{p}+\mathrm{q})$ th terms is zero .
(a) $p+q$
(b) pq
(c) 1
(d) 0
10. If $a, b$ and $c b$ respectively the $p$ th , $q$ th and $r$ th terms of an A.P. prove that
$a(q-r)+b(r-p)+c(p-q)=0$

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11. Find the sum of (i) 20 terms (ii) $n$ terms of the progression $1,3,5,7,9, \ldots$.

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12. Find the sum of the series $72+70+68+\ldots+40$

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13. The sum of n terms of an A.P. is $4 n^{2}+5 n$. Find the series.
14. How many terms of the A.P. $24,20,16, \ldots$ must be taken so that the sum may be 72? Explain the double answer.

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15. On each birthday johan received from his father रु 5 for each year of his age. Find the total sum John had received by the time he was 21 years old.

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16. The sums of $n$ terms of two arithmetic series are in the ratio of $2 n+1$ :
$2 n-1$. Find the ratio of their 10 th terms .

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17. The sums of first $p, q, r$ terms of an A.P. are $a, b, c$ respectively. Prove that
$\frac{a}{p}(q-r)+\frac{b}{q}(r-p)+\frac{c}{r}(p-q)=0$

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18. A man saved रु 16,500 in 10 years. In each year after the first he saved 100 more than he did in the preceding year. How much did he save in the first year?

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19. 80 coins are placed in a st. line on the ground. The distance between any two consecutive coins is 10 metres. How far must a person travel to bring them one by one to a basket placed 10 metres behind the first coin?

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20. Find the arithmetic mean between 5 and 9 .

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21. Insert 4 arithmetic means between 3 and 23 .

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22. The sum of three consecutive numbers in A.P. is 51 and the product of their extremes is 273 . Find the numbers.

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23. The sum of four numbers in A.P. is 28 and the sum of their squares is 216 . Find the number's.

## - Watch Video Solution

24. If a,b,c are in A.P. prove that the following are also in A.P.
$\frac{1}{b c}, \frac{1}{c a}, \frac{1}{a b}$

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25. If a,b,c are in A.P. prove that the following are also in A.P.
$b+c, c+a, a+b$

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26. If a,b,c are in A.P. prove that the following are also in A.P.
$a^{2}(b+c), b^{2}(c+a), c^{2}(a+b)$

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27. If a,b,c are in A.P. prove that the following are also in A.P.
$\frac{a(b+c)}{b c}, \frac{b(c+a)}{c a}, \frac{c(a+b)}{a b}$
28. The first three terms of a geometric progression are 48,24,12 . What are the common ratio and fourth term of this sequence?

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29. The $n$th term of a geometric progression is $2(1.5)^{n-1}$ for all values of
$n$. Write down the value of a (the first term) and the common ratio ( $r$ ).

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30. Find the (1) sixth term, (ii) nth term of the sequence $2,6,18, \ldots$.

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31. Write the G.P. whose 4th term is 54 and the 7 th term is 1458.
32. Which term of the series $8+1.6+0.32+\ldots$ is 0.00256 ?

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33. If $a, b, c$ are three consecutive terms of an A.P. and $x, y, z$ are three consecutive terms of a G.P., then prove that $x^{b-c} \cdot y^{c-a} \cdot z^{a-b}=1$

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34. Find the geometric mean of 6 and 24 .

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35. Insert 3 real geometric means between 3 and $\frac{3}{16}$.

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36. Find two number whose arithmetic mean is 34 and the geometric mean is 16 .

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37. Find the sum of each of the series:
$5-10+20$-.. "to" 6 terms.

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38. Find the sum of each of the series:
$4+2+1+\frac{1}{2}+\frac{1}{4}+\ldots$ to 10 terms

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39. Find the sum of each of the series:
$243+324+432+\ldots$. to $n$ terms
40. The inventor of the chess board suggested a reward of one grain of wheat for the first square, 2 grains for the second, 4 grains for the third and so on, doubling the amount of the grains for subsequent squares. How many grains would have to be given to the inventor? (There are 64 squares in the chess board).

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41. How many terms of the series $2+6+18+$... must be taken to make the sum equal to 728 ?

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42. An insect starts from a point and travels in a straight path one mm in the first second and half of the distance covered in the previous second
in the succeeding second. In how much time would it reach a point 3 mm away from its starting point?

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43. Sum to $n$ terms the series:
$7+77+777+\ldots$

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44. Sum to n terms the series :
$0.7+0.77+0.777+\ldots$

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45. Sum the following series to n terms and to infinity
$1-\frac{1}{2}+\frac{1}{4}-\frac{1}{8}+\ldots$.
46. The first term of a G.P. is 2 more than the second term and the sum to infinity is 50 . Find the G.P.

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47. Find the value of $0.4 \overline{23}$

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48. The side of a given square is equal to $a$. The mid-points of its sides are joined to form a new square. Again, the mid-points of the sides of this new square are joined to form another square. This process is continued indefinitely. Find the sum of the areas of the squares and the sum of the perimeters of the squares.
49. Find three real numbers in G.P. whose sum is 30 and product is 216 .

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50. The sum of the first three terms of G.P. is 7 and the sum of their squares is 21 . Determine the first five terms of the G:P.

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51. If $\mathrm{a}, \mathrm{b}, \mathrm{c}, \mathrm{d}$ are in G.P., prove that $a^{2}-b^{2}, b^{2}-c^{2}, c^{2}-d^{2}$ are also in G.P.

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52. Find the nth term of the series
$\frac{1}{3}+\frac{3}{9}+\frac{5}{27}+\frac{7}{81}+\ldots$
53. Find the nth term of the series
$1+2^{2} x+3^{2} x^{2}+4^{2} x^{3}+\ldots$.

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54. Find the sum of the series
$1+4 \mathrm{x}+7 x^{2}+\ldots$ to n terms. Hence write down the sum to infinity when $x<1$ numerically .

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55. Sum to infinity
$1^{2}+2^{2} x+3^{2} x^{2}+4^{2} x^{3}+\ldots . X<1$ numerically.

## - Watch Video Solution

56. Sum to infinity
$1+(1+b) r+\left(1+b+b^{2}\right) r^{2}+\left(1+b+b^{2}+b^{3}\right) r^{3}+\ldots \quad, r \quad$ and $b$ being proper fractions.

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57. Show that $2^{\frac{1}{4}} \times 4^{\frac{1}{8}} \times 8^{\frac{1}{16}} \times 16^{\frac{1}{32}} \times \ldots \infty=2$.

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58. Find the $n$th term and then the sum to $n$ terms of the series $3.5+4.7+$ $5.9+\ldots$

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59. Find the $n$th terms and the sum to $n$ term of the series:
$1^{2}+\left(1^{2}+2^{2}\right)+\left(1^{2}+2^{2}+3^{2}\right)+\ldots$
60. Find the $n$th terms and the sum to $n$ term of the series:
$1^{2}+3^{2}+5^{2}+\ldots$.

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61. Find the $n$th terms and the sum to n term of the series:

$$
1.4 .7+2.5 .8+3.6 .9+\ldots
$$

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62. Find the sum of the series:
63. $n+2 .(n-1)+3 .(n-2)++(n-1) .2+n .1$.

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63. The natural numbers are grouped as follows:
(1),(2,3) , (4,5,6), (7,8,9,10), ...

Find an expression for the first term of the nth group.

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64. Find the $n$th term and deduce the sum to $n$ terms of the series
$4+11+22+37+56+\ldots$

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65. Find the nth term and deduce the sum to $n$ terms of the series $1+5+13+29+\ldots$.

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66. Sum up $5+55+555+\ldots .$. to $n$ terms .
67. Find the nth term sum of $n$ terms and sum to infinity terms of the series $\frac{1}{2.5}+\frac{1}{5.8}+\frac{1}{8.11}+\ldots$

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68. Sum up to n terms the series

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## Exercise 14 A

1. Write the first five terms of the sequence using the given rule. In each case, the initial value of the index is 1 .
$a_{n}=2 n$
2. Write the first five terms of the sequence using the given rule. In each case, the initial value of the index is 1 .
$a_{n}=3 n-2$

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3. Write the first five terms of the sequence using the given rule. In each case, the initial value of the index is 1.

$$
a_{n}=n^{2}+5
$$

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4. Write the first five terms of the sequence using the given rule. In each case, the initial value of the index is 1.
$a_{n}=\frac{(-1)^{n-1}}{n^{3}}$

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5. Write the first five terms of the sequence using the given rule. In each case, the initial value of the index is 1.
$a_{n}=n$th prime number for all natural numbers n .

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6. Write the first four terms of the sequence whose nth term is given

$$
\frac{2 n+1}{2 n-1}
$$

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7. Write the first four terms of the sequence whose nth term is given
$\frac{n^{2}+1}{n}$

## - Watch Video Solution

8. Write the first four terms of the sequence whose nth term is given
9. Write the first four terms of the sequence whose nth term is given $\sin ^{n} 30^{\circ}$

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10. Write the first four terms of the sequence whose nth term is given
$(-1)^{n} \sin \frac{n \pi}{2}$

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11. Write the first four terms of the sequence whose nth term is given
$(-1)^{n-1} \cos \frac{n \pi}{4}$

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12. Find the first 4 terms and the 20th term of the sequence whose $S_{n}=\frac{3}{2}\left(3^{n}-1\right)$.

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13. Find the 10th term of the sequence whose sum to $n$ terms is $6 n^{2}+7$

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## Exercise 14 B

1. Write the first six terms of an A.P. in which
$a=5, d=4$

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2. Write the first six terms of an A.P. in which

$$
a=98, d=-3
$$

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3. Write the first six terms of an A.P. in which
$a=7 \frac{1}{2}, d=1 \frac{1}{2}$

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4. Write the first six terms of an A.P. in which
$a=x, d=3 x+2$

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5. Write the 5th and 8th terms of an AP whose 10th term is 43 and the common difference is 4 .
6. In each of the following find the terms required. (a) The seventh term of 2, 7, 12.... (b) The fifth term of $21,28,35$, ... (c) The eighteenth term of 9,5 , 1,....

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7. Find the first four terms and the eleventh term of the series whose nth term is $4 \mathrm{n}-2$

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8. The 5th term of an A.P. is 11 and the 9th term is 7 . Find the 16th term.

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9. Which term of the series $5,8,11$...... is 320 ?

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10. The fourth term of an A.P. is ten times the first. Prove that the sixth term is four times as greater as the second term.

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11. The fourth term of an A.P. is equal to 3 times the first term, and the seventh term exceeds twice the third term by 1. Find the first term and the common difference.

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12. Which term of the progression $19,18 \frac{1}{5}, 17 \frac{2}{5}, \ldots .$. is the first negative term?
13. Find the value of $k$ so that $8 k+4,6 k-2$, and $2 k+7$ will form an A.P.

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14. Find $a, b$ such that $7.2, a, b, 3$ are in A.P.

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15. Determine 2nd term and 5'th term of an A.P. whose 6th term is 12 and 8th term is 22

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16. Prove that the product of the 2nd and 3rd terms of an A.P. exceeds the product of the 1st and 4th by twice the square of the difference between
the 1st and 2nd.

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17. The 2 nd, 31 st and last term of an A.P. are $7 \frac{3}{4}, \frac{1}{2}$ and $-6 \frac{1}{2}$ respectively. Find the first term and the number of terms.

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18. If 7 times the 7 th term of an A.P. is equal to 11 times its 11 th term, show that the 18th term of the A.P. is zero.

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19. Determine $k$ so that $k+2,4 k-6$ and $3 k-2$ are three consecutive terms of an A.P
20. The pth term of an A.P. is $q$ and the qth term is $p$, show that the mth term is $\mathrm{p}+\mathrm{q}-\mathrm{m}$.

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21. Let $T$ be the $r$ th term of an A.P. whose first term is $a$ and conmon difference is $d$. If for some positive integers $m, n, T_{n}=\frac{1}{m}, T_{m}=\frac{1}{n}$ then $(a-d)$ equals

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22. Given that the $(p+1)$ th term of an A.P. is twice the $(q+1)$ th term, prove that the $(3 p+1)$ th term is twice the $(p+q+1)$ th term.

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## Exercise 14 C

1. Find the sum of:

10 terms of $5+8+11+\ldots$,

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2. Find the sum of:

18 terms of $57+49+41+$

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3. Find the sum of:
n terms of 4, 7, 10, ....

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4. Find the sum of:

24 terms and n terms of $2 \frac{1}{2}, 3 \frac{1}{3}, 4 \frac{1}{6}, 5, \ldots \ldots$,
5. Find the sum of: $101+99+97+\ldots . .47$.

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6. Find the sum of all the numbers between 100 and 200 which are divisible by 7 .

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7. The sum of a series of terms in A.P. is 128 . If the first term is 2 and the last term is 14 , find the common difference.
8. The sum of 30 terms of a series in A.P., whose last term is 98 , is 1635 . Find the first term and the common difference.

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9. If the sums of the first 8 and 19 terms of an A.P. are 64 and 361 respectively, find (i) the common difference and (ii) the sum of $n$ terms of the series.

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10. Find the number of terms of the series $21,18,15,12 \ldots$ which must be taken to give a sum of zero.

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11. The sum of n terms of an A.P. series is $\left(n^{2}+2 n\right)$ for all values of n . Find the first 3 terms of the series:

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12. The third term of an arithmetical progression is 7, and the seventh term is 2 more than 3 times the third term. Find the first term, the common difference and the sum of the first 20 terms.

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13. The interior angles of a polygon are in arithmetic progression. The smallest angle is $52^{\circ}$ and the common difference is $8^{\circ}$. Find the number of sides of the polygon.

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14. Determine the sum of first 35 terms of an A.P. if $t_{2}$, $=1$ and $t_{7},=-22$.

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15. Find the sum of all natural numbers between 100 and 1000 which are multiples of 5 .

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16. How many terms of the A.P. $1,4,7 \ldots$.... are needed to give the sum 715 ?

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17. Find the rth term of an A.P., sum of whose first n terms is $2 n+3 n^{2}$.

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18. In an arithmetical progression, the sum of $p$ terms is $m$ and the sum of q terms is also m . Find the sum of $(\mathrm{p}+\mathrm{q})$ terms.

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19. The sum of the first fifteen terms of an arithmetical progression is 105 and the sum of the next fifteen terms is 780 . Find the first three terms of the arithmetical progression,

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20. The sum of the first six terms of an arithmetic progression is 42 . The ratio of the 10 th term to the 30 th term of the A.P. is $\frac{1}{3}$ Calculate the first term and the 13th term.

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21. A sum of रु6240 is paid off in 30 instalments, such that each instalment is 10 more than the preceding instalment. Calculate the value of the first instalment.

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22. The $n$th term of an A.P. is $p$ and the sum of the first $n$ term is $s$. Prove that the first term is
$\frac{2 s-p n}{n}$

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23. The sum of the first n terms of the arithmetical progression 3, $5 \frac{1}{2}, 8, \ldots$ is equal to the $2 n$th term of the arithmetical progression $16 \frac{1}{2}, 28 \frac{1}{2}, 40 \frac{1}{2}$. Calculate the value of $n$.

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24. If the sum of the first 4 terms of an arithmetic progression is $p$, the sum of the first 8 terms is $q$ and the sum of the first 12 terms is $r$, express $3 p+r$ in terms of $q$.

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25. The last term of an A.P. $2,5,8,11, \ldots$ is .x. The sum of the terms of the A.P. is 155 . Find the value of $x$.

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26. A gentleman buys every year Banks' certificates of value exceeding the last year's purchase by 25 . After 20 years he finds that the total value of the certificates purchased by him is 7,250 . Find the value of the certificates purchased by him in the 1st year and in the 13th year.

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27. If the sums of the first $n$ terms of two A.P.'s are in the ratio $7 n-5: 5 n+17$, show that the 6th terms of the two series are equal.

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28. If the ratio of the sum of m terms and n terms of an A.P. be $m^{2}: n^{2}$, prove that the ratio of its $m$ th and $n$th terms is $(2 m-1):(2 n-1)$.

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29. Let $a_{1}, a_{2}, a_{3}, \ldots$ be terms of an A.P. If
$\frac{a_{1}+a_{2}+\ldots .+a_{p}}{a_{1}+a_{2}+\ldots . .+a_{q}}=\frac{p^{2}}{q^{2}}(p \neq q)$ then find $\frac{a_{6}}{a_{21}}$.

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30. If the sum of $\mathrm{n}, 2 \mathrm{n}, 3 \mathrm{n}$ terms of an A.P are $S_{1}, S_{2}, S_{3}$, respectively, prove that $S_{3}=3\left(S_{2}-S_{1}\right)$.

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31. If the sum of $p$ terms of an A.P. is $q$ and the sum of $q$ terms is $p$, show that the sum of $(p+q)$ terms is $-(p+q)$.

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32. The ratio between the sum of $n$ terms of two A.P.'s is $(7 n+1):(4 n+27)$.

Find the ratio of their 11 th terms.

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Exercise 14 D

1. Find the A.M. between:

6 and 12
2. Find the A.M. between:

5 and 22

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3. Find the A.M. between:
$(\cos \theta+\sin \theta)^{2}$ and $(\cos \theta-\sin \theta)^{2}$

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4. Find the A.M. between:
$(x+y)^{2}$ and $(x-y)^{2}$

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5. Insert :
(i) 3 arithmetic means between 5 and 17 .
(ii) 4 arithmetic means between 17 and 52

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6. Find two numbers whose product is 91 and whose A.M. is 10 .

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7. If $p$ arithmetic means are inserted between $a$ and $b$, prove that
$d=\frac{b-a}{p+1}$

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8. The sum of three numbers in A.P. is 33 , and the sum of their squares is 461 . Find the numbers.

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9. There are four numbers in A. P., the sum of the two extremes is 8 , and the product of the middle two is 15. What are the numbers?

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10. The sum of the first three terms of an A.P. is 36 while their product is 1620. Find the A.P.

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11. The angles of a triangle are in A.P. If the greatest angle is double the least, find the angles.

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12. The sum of the first three consecutive terms of an A.P. is 9 and the sum of their squares is 35 . Find $S_{n}$
13. $a_{1}, a_{2}, a_{3}, a_{4}, a_{5}$, are first five terms of an A.P. such that $a_{1}+a_{3}+a_{5}=-12$ and $a_{1} \cdot a_{2} \cdot a_{3}=8$. Find the first term and the common difference.

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14. The angles of a quadrilateral are in A.P. and the greatest angle is double the first angle. Find the circular measure of the least angle.

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15. If $a, b, c$ are in A.P. show that
$a\left(\frac{1}{b}+\frac{1}{c}\right), b\left(\frac{1}{c}+\frac{1}{a}\right), c\left(\frac{1}{a}+\frac{1}{b}\right)$ are in A.P.

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16. If $\frac{1}{x}, \frac{1}{y}, \frac{1}{z}$ are A.P. show that $\mathrm{xy}, \mathrm{zx}, \mathrm{yz}$ are in A.P.

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17. If $\frac{1}{x}, \frac{1}{y}, \frac{1}{z}$ are A.P. show that $x y, z x, y z$ are in A.P.

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18. If $\frac{1}{x}, \frac{1}{y}, \frac{1}{z}$ are A.P. show that
$\frac{y+z}{x}, \frac{z+x}{y}, \frac{x+y}{z}$ are in A.P.

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19. If $(b+c)^{-1},(c+a)^{-1},(a+b)^{-1}$ are in A.P. then show that $\frac{a}{b+c}, \frac{b}{c+a}, \frac{c}{a+b}$ are also in A.P.
20. If $\frac{b+c-a}{a}, \frac{c+a-b}{b}, \frac{a+b-c}{c}$ are in A.P. then prove that $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are also in A.P.

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21. If $\mathrm{x}, \mathrm{y}, \mathrm{z}$ are in A.P. show that $(x y)^{-1},(z x)^{-1},(y z)^{-1}$ are also in A.P.

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22. If $a^{2}, b^{2}, c^{2}$ are in A.P, pove that $\frac{a}{a+c}, \frac{b}{c+a}, \frac{c}{a+b}$ are in A.P .

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1. Find: (i) the 7 th term of $2,4,8, \ldots$ (ii) the 9 th term of $1, \frac{1}{2}, \frac{1}{2^{2}}, \ldots$ (iii) the nth term of $\frac{15}{8}, \frac{3}{8}, \frac{3}{40}$

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2. The second term of a G.P. is 18 and the fifth term is 486 . Find:
(i) the first term, (ii) the common ratio

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3. Find the value of $x$ for which $x+9, x-6,4$ are the first three terms of a geometrical progression and calculate the fourth term of progression in this case

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4. If $5, x, y, z, 405$ are the first five terms of a geometric progression, find the values of $x, y$, and $z$.

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5. Insert 3 geometric means between 16 and 256 .

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6. Insert 5 geometric means between $\frac{1}{3}$ and 243.

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7. If the A.M. and G.M. between two numbers are respectively 17 and 8 , find the numbers.

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8. The second, third and sixth terms of an A.P. are consecutive terms of a geometric progression. Find the common ratio of the geometric progression.

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9. The 5th, 8th and 11th terms of a G.P. are P, Q and S respectively. Show that $Q^{2}={ }^{\prime} P S$.

## D Watch Video Solution

10. The $(p+q)$ th term and ( $p-q)$ th terms of a G.P. are $a$ and $b$ respectively.

Find the pth term.

## - Watch Video Solution

11. If the pth, th, rth terms of a G.P. are $x, y, z$ respectively, prove that $x^{q-r} \cdot y^{r-p} \cdot z^{p-q}=1$.

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12. In a set of four numbers, the first three are in G.P. and the last three are in A.P. with difference 6 . If the first number is the same as the fourth, find the four numbers.

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13. If $a^{\frac{1}{x}}=b^{\frac{1}{y}}=c^{\frac{1}{z}}$ and $\mathrm{a}, \mathrm{b}, \mathrm{c}$ are in G.P., prove that $\mathrm{x}, \mathrm{y}, \mathrm{z}$ are in A.P.

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14. If one G.M., $G$ and two A.M's $p$ and $q$ be inserted between two given numbers, prove that
$G^{2}=(2 p-q)(2 q-p)$

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15. Construct a quadratic equation in $x$ such that the A.M. of its roots is $A$ and G.M. is G.

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16. The fourth term of a G.P. is greater than the first term, which is positive, by 372. The third term is greater than the second by 60 . Calculate the common ratio and the first term of the progression.

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17. The first, eighth and twenty-second terms of an A.P. are three consecutive terms of a G.P. Find the common ratio of the G.P. Given also
that the sum of the first twenty-two terms of the A.P.is 275 , find its first term.

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## Exercise 14 F

1. Find the sum to 8 terms of
$3+6+12+\ldots$

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2. Find the sum to

20 terms of $2+6+18+. . .$.
3. Find the sum to

10 terms of $1+\sqrt{3}+3+\ldots$.

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4. Find the sum to
n terms of $3 \frac{3}{8}+2 \frac{1}{4}+1 \frac{1}{2}+\ldots$.

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5. Sum the series to infinity :
$1+\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\ldots$
( Watch Video Solution
6. Sum the series to infinity :
$16,-8,4, \ldots .$.
7. Sum the series to infinity :
$\sqrt{2}-\frac{1}{\sqrt{2}}+\frac{1}{2(\sqrt{2})}-\frac{1}{4 \sqrt{2}}+\ldots$.

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8. Sum the series to infinity :
$\sqrt{3}+\frac{1}{\sqrt{3}}+\frac{1}{3 \sqrt{3}}+\ldots$

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9. Find the sum of a geometric series in which $a=16, r=\frac{1}{4}, l=\frac{1}{64}$.

## Watch Video Solution

10. Find the sum of the series $81-27+9-\ldots \ldots . \frac{1}{27}$.
11. The first three terms of a G.P. are $x x+3, x+9$. Find the value of $x$ and the sum of first eight terms.

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12. Of how many terms is, $\frac{55}{72}$ the sum of the series $\frac{2}{9}-\frac{1}{3}+\frac{1}{2}-\ldots$ ?

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13. The second term of a G.P. is 2 and the sum of infinite terms is 8 . Find the first term.

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14. Find the value of $0.23434343434 \ldots$.... regarding it as a geometric series.
15. Evaluate : (a) $0.9 \overline{7}(b) 0.2345^{\circ}$

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16. Find a rational number which when expressed as a decimal will have
$1.2 \overline{56}$ as its expansion.

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17. If $a+b+\ldots .+\mathrm{I}$ is a G.P., prove that its sum is $\frac{b l-a^{2}}{b-a}$.

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18. The $n$th term of a geometrical progression is $\frac{2^{2 n-1}}{3}$ for all values of $n$.

Write down the numerical values of the first three terms and calculate
the sum of the first 10 terms, correct to 3 significant figures.

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19. A geometrical progression of positive terms and an arithmetical progression have the same first term. The sum of their first terms is 1 , the sum of their second terms is $\frac{1}{2}$ and the sum of their third terms is 2 . Calculate the sum of their fourth terms.

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20. In a geometric progression, the third term exceeds the second by 6 and the second exceeds the first by 9 . Find (i) the first term, (ii) the common ratio and (iii) the sum of the first ten terms.

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21. In an infinite geometric progression, the sum of first two terms is 6 and every terms is four times the sum of all the terms that it . Find :
(i) the geometric progression and (ii) its sum to infinity .

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22. Three numbers are in A.P. and their sum is 15 . If 1,4 and 19 be added to these numbers respectively the number are in G.P. Find the numbers .

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23. Calculate the least number of terms of the geometric progression $5+$ $10+20+\ldots$ whose sum would exceed $10,00,000$.

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24. If S is the sum, P the product and R the sum of the reciprocals of n terms in G.P., prove that $P^{2}=\left(\frac{S}{R}\right)^{n}$.

## - Watch Video Solution

25. Find the sum of the first n terms of the series:
$0.2+0.22+0.222+\ldots . n-$ terms

## - Watch Video Solution

26. If $\frac{2}{3}=\left(x-\frac{1}{y}\right)+\left(x^{2}-\frac{1}{y^{2}}\right)+\ldots$ To $\infty$
and $x y=2$ then calculate the values of $x$ and $y$ with the condition that $x$ $<1$.

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27. $S_{1}, S_{2}, S_{3}, \ldots, S_{n}$ are sums of n infinite geometric progressions. The first terms of these progressions are $1,2^{2}-1,2^{3}-1, \ldots, 2^{n}-1$ and the common ratios are $\frac{1}{2}, \frac{1}{2^{2}}, \frac{1}{2^{3}}, \ldots ., \frac{1}{2^{n}}$. Calculate the value of $S_{1},+S_{2},+\ldots+S_{n}$.

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28. Find three numbers $a, b, c$ between 2 and 18 such that:
(i) their sum is 25 , and
(ii) the numbers $2, \mathrm{a}, \mathrm{b}$ are consecutive terms of an arithmetic progression, and
(iii) the numbers $b, c, 18$ are consecutive terms of a geometric progression.

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29. Three numbers, whose sum is 21 , are in A.P. If $2,2,14$ are added to them respectively, the resulting numbers are in G.P. Find the numbers.

## (D) Watch Video Solution

30. 

$X=1+a+a^{2}+a^{3}+\ldots+\infty$ and $y=1+b+b^{2}+b^{3}+\ldots+\infty$ show that $1+a b+a^{2} b^{2}+a^{3} b^{3}+\ldots+\infty=\frac{x y}{x+y-1}$, where $0<a<1$ and 0

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31. If $S_{1}, S_{2}, S_{3}, \ldots \ldots, S_{p}$ are the sums of infinite geometric series whose first terms are $1,2,3 \ldots . \ldots$. and whose common ratios are $\frac{1}{2}, \frac{1}{3}, \ldots . \frac{1}{p+1}$ respectively, prove that
$S_{1}+S_{2}+S_{3}+\ldots+S_{p}=\frac{1}{2} p(p+3)$.

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1. Find three numbers in G.P. whose sum is 19 and product is 216 .

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2. The sum of the first three terms of a G.P. is $\frac{13}{12}$ and their product is -1 . Find the G.P.

## - Watch Video Solution

3. The product of first three terms of a G.P. is 1000 . If we add 6 to its second term and 7 to its third term, the resulting three terms form an A.P.

Find the terms of the G.P.

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4. If $a, b$, care in G.P. show that the are also in G.P.
$\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$
5. If $a, b, c$ are in G.P. show that
$\frac{1}{a^{2}}, \frac{1}{b^{2}}, \frac{1}{c^{2}}$ are also in G.P.

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6. If $a, b, c$ are in G.P. show that the are also in G.P.
$a^{2}, b^{2}, c^{2}$
7. If $a, b, c, d$ are in G. P., show that the following are also in G. P.
$b^{2} c^{2}, c^{3} a^{2}, a^{2} b^{2}$

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8. If $a, b, c, d$ are in G. P., show that $a+b, b+c, c+d$ are also in G. P.

## - Watch Video Solution

9. If $a, b, c, d$ are in G. P., show that they are also in G. P.
$a^{2}+b^{2}, b^{2}+c^{2}, c^{2}+d^{2}$

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10. If $a, b, c, d$ are in G.P. prove that
$(b+c)(b+d)=(c+a)(c+d)$

## D Watch Video Solution

11. If $a, b, c, d$ are in G.P. prove that
$(a-d)^{2}=(b-c)^{2}+(c-a)^{2}+(d-b)^{2}$
12. If the pth, qth and rth terms of an A. P. are in G.P., prove that the common ratio of the G.P. is
$\frac{q-r}{p-q}$.

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13. If $\frac{1}{x+y}, \frac{1}{2 y}, \frac{1}{y+z}$ are the three consecutive terms of an A.P. prove that $\mathrm{x}, \mathrm{y}, \mathrm{z}$ are the three consecutive terms of a G.P.

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## Exercise 14 H

1. Sum up to n terms the series
$1+2 \mathrm{x}+3 x^{2}+4 x^{3}+\ldots$
2. Sum up to n terms the series
$1+3 x+5 x^{2}+7 x^{3}+\ldots$

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3. Sum up to n terms the series
$2.1+3.2+4.4+5.8+\ldots$.

## - Watch Video Solution

4. Sum up to n terms of series
$\frac{1}{2}+\frac{3}{6}+\frac{5}{18}+\ldots$

- Watch Video Solution

5. Sum up to n terms the series
$\frac{3}{2}-\frac{5}{6}+\frac{7}{18} \ldots$
6. Sum up to n terms the series
$1-\frac{2}{5}+\frac{3}{5^{2}}-\frac{4}{5^{3}}+\ldots$

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7. Sum up the series
$\frac{2}{3}+\frac{5}{9}+\frac{8}{27}+\frac{11}{81}+\ldots$. to $n$ terms and hence find the sum to infinity.

Sum up to infinity given that $\mathrm{x}<$ numerically .

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8. $1+4 x^{2}+7 x^{4}+\ldots$
9. Find the sum of
$x+2 x^{2}+3 x^{3}+4 x^{4}+\ldots$

## (D) Watch Video Solution

10. $1^{2}+3^{2} x+5^{2} x^{2}+7^{2} x^{3}+\ldots$.

## - Watch Video Solution

11. Show that the square root of $3^{\frac{1}{2}} \times 9^{\frac{1}{4}} \times 27^{\frac{1}{8}} \times 81^{\frac{1}{16}} \times \ldots$ to infinity is
12. 

[ Note: When we are asked to find the square root of a number, it is presumed that we have to find the principal square root.]

Find the sum of the series $\frac{1}{2}+\frac{2}{4}+\frac{3}{8}+\frac{4}{10}+\ldots \infty$ and substitute in (1).]

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12. Find the sum to $n$ terms of the series whose $n$th term is $n(n+2)$

## Watch Video Solution

13. Find the sum to n terms of the series whose nth term is
$3 n^{2}+2 n$

## - Watch Video Solution

14. Find the sum to $n$ terms of the series whose $n$th term is $4 n^{3}+6 n^{2}+2 n$

## - Watch Video Solution

15. Find the sum of the series
$3 \times 5+5 \times 7+7 \times 9+\ldots$ to n terms
16. Find the sum of the series
$1^{2}+3^{2}+5^{2}+\ldots$ to $n$ terms

## - Watch Video Solution

17. Find the sum of the series
$2^{2}+4^{2}+6^{2}+\ldots$ to $n$ terms.

## - Watch Video Solution

18. Find the nth term and the sum to $n$ terms of the series $1.2+2.3+3.4+$
19. Sum up to $n$ terms the series $1.2^{2}+2.3^{2}+3.4^{2}+\ldots$

## - Watch Video Solution

20. Sum up $1+(1+2)+(1+2+3)+\ldots+(1+2+3+\ldots+n)$.

## - Watch Video Solution

21. The sum to $n$ terms of series
$1+\left(1+\frac{1}{2}+\frac{1}{2^{2}}\right)+\left(1+\frac{1}{2}+\frac{1}{2^{2}}+\frac{1}{2^{3}}\right)+$ is

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22. Sum up to n terms the series where nth terms is $2^{n}-1$

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23. The number of terms common between the series $1+2+4+8+\ldots \ldots$. to 100 terms and $1+4+7+10+\ldots . .$. to 100 terms is

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24. Sum up $3+5+11+29+\ldots$. To $n$ terms .

## - Watch Video Solution

25. Sum to n terms the series $7+77+777+\ldots .$.

## - Watch Video Solution

26. Sum to n terms the series $1+3+7+15+31+\ldots$

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27. Find the sum to $n$ terms of the series (1.2.3) $+(2.3 .4)+(3.4 .5)$...'

## - Watch Video Solution

28. Find the sum of the series to n terms and to infinity :
$\frac{1}{1.3}+\frac{1}{3.5}+\frac{1}{5.7}+\frac{1}{7.9}+\ldots$

## - Watch Video Solution

29. Sum to n terms the series whose nth terms is $\frac{1}{4 n^{2}-1}$

## - Watch Video Solution

30. Natural numbers are written as $1,(2,3),(4,5,6)$..

Show that the sum of number in the nth group is $\frac{n}{2}(n+1)$.

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31. If the sum of first $n$ terms of an A.P. is $\mathrm{cn}^{2}$ then the sum of squares of these n terms is

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## Chapter Test

1. Write down the first five terms of the sequence, whose nth term is $(-1)^{n-1}, 5^{n+1}$

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2. If the 3 rd and the 6 th terms of an A.P. are 7 and 13 respectively, find the first' term and the common difference.
3. Find the sum of all natural numbers between 100 and 1000 which are multiple of 5 .

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4. How many terms of the A.P., $-6, \frac{-11}{2},-5$... are needed to give the sum-25 ?

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5. Determine the sum of the first 35 terms of an A.P. if $a_{2},=2$ and $a_{7},=22$.

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6. If the first term of an A.P. is 2 and the sum of first five terms is equal to one-fourth of the sum of the next five terms, show that the 20th term is

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7. Insert 3 arithmetic means between 2 and 10 .

## ( Watch Video Solution

8. Find 12th term of a G.P. whose 8th term is 192 and the common ratio is 2.

## D Watch Video Solution

9. The first term of a G.P. is 1 . The sum of the third and fifth terms is 90 .

Find the common ratio of the G.P.

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10. The sum of first three terms of a G.P. is $\frac{39}{10}$ and their product is 1 . Find the common ratio and the terms.

## - Watch Video Solution

11. The sum of some terms of $a$ G.P. is 315 whose first term and the common ratio are and 2, respectively. Find the last term and the number of terms.

## - Watch Video Solution

12. Find the sum of the series $0.6+0.66+0.666+\ldots$ to the $n$ terms

## - Watch Video Solution

13. The sum of an infinite series is 15 and the sum of the squares of these terms is 45 . Find the series.
14. Insert three geometric means between 1 and 256 .

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15. In the sum to infinity of the series
$3+(3+x) \frac{1}{4}+(3+2 x) \frac{1}{4^{2}}+\ldots$. is $\frac{44}{9}$ find x .

## - Watch Video Solution

16. Find the sum to n terms of the series $3.8+6.11+9.14+\ldots$

## - Watch Video Solution

17. Find the sum $5^{2}+6^{2}+7^{2}+\ldots+20^{2}$.

## - Watch Video Solution

18. If in a geometric progression consisting of positive terms, each term equals the sum of the next two terms, then the common ratio of this progression equals
A. $\sqrt{5}$
B. $\frac{1}{2}(\sqrt{5}-1)$
C. $\frac{1}{2}(1-\sqrt{5})$
D. $\frac{1}{2} \sqrt{5}$

## Answer: B

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19. If the first term of an infinite G.P. is 1 and each term is twice the sum of the succeeding terms, then the sum of the series is
A. 2
B. $\frac{5}{2}$
C. $\frac{7}{2}$
D. $\frac{3}{2}$

## Answer: D

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20. If fifth term of a G.P. is 2 , then the product of its first 9 terms is
A. 256
B. 512
C. 1024
D. none of these

## Answer: B

21. The sum of three decreasing numbers in A.P. is 27 . If-1,-1, 3 are added to them respectively, the resulting series is in G.P. The numbers are
A. 5,9,13
B. $15,9,3$
C. 13,9,5
D. $17,9,1$

## Answer: D

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22. The first two terms of a geometric progression add up to 12. The sum of the third and the fourth terms is 48 . If the terms of the geometric progression are alternately positive and negative, then the first term is
A. -4
B. -12
C. 12
D. 4

## Answer: B

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23. The sum to infinity of the series $1+\frac{2}{3}+\frac{6}{3^{2}}+\frac{14}{3^{4}}+\ldots i s$
A. 6
B. 2
C. 3
D. 4

## Answer: B

24. The sum of all odd numbers between 1 and 100 which are divisible by 3 , is
A. 83667
B. 90000
C. 83660
D. None of these

## Answer: A

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25. If $a, b, c$ are in $G . P$. and $x, y$ are arithmetic means of $a, b$ and $b, c$ respectively, then $\frac{1}{x}+\frac{1}{y}$ is equal to
A. $\frac{2}{b}$
B. $\frac{3}{b}$
C. $\frac{b}{3}$
D. $\frac{b}{2}$

## Answer: A

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