



MATHS

BOOKS - OMEGA PUBLICATION

SEQUENCE AND SERIES

Questions

1. Write the first five terms of the sequence whose n th term is $a_n = (-1)^{n+1} 2^{n+1}$



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2. Find the indicated terms of the sequences given below whose n th terms are:

$$a_n = \frac{n(n-2)}{n+3}, a_{20}$$



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3. Write the first five terms of the sequences given below and obtain the corresponding

series: $a_1 = -1, a_n = \frac{a_{n-1}}{n}, n \geq 2$



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4. The Fibonacci sequence is defined by

$$1 = a_1 = a_2 \text{ and } a_n = a_{n-1} + a_{n-2}, \quad n > 2.$$

Find $\frac{a_{n+1}}{a_n}$, for $n = 1, 2, 3, 4, 5$



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



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6. In an A.P., the first term is 2 and the sum of the first five terms is one-fourth of the next five terms. Show that 20th term is -112.



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7. In an A.P., if p^{th} term is $\frac{1}{q}$ and q^{th} term is $\frac{1}{p}$, prove that the sum of first pq terms is $\frac{1}{2}(pq + 1)$, where $p \neq q$.



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8. If the sum of a certain number of terms of the A.P. 25, 22, 19, ... is 116. Find the last term.



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9. The sums of n terms of two arithmetic progressions are in the ratio $5n + 4 : 9n + 6$. Find the ratio of their 18th terms.



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10. The ratio of the sums of m and n terms of an A.P. is $m^2 : n^2$. Show that the ratio of m^{th} and n^{th} term is $(2m - 1) : (2n - 1)$.



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11. Sum of first p, q and 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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12. Insert five numbers between 8 and 26 such that the resulting sequence is an A.P.



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13. If $\frac{a^n + b^n}{a^{n-1} + b^{n-1}}$ is the A.M. between a and b, then find the value of n.



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14. Between 1 and 31, m numbers have been inserted in such a way that the resulting

sequence is an A. P. and the ratio of 7th and $(m - 1)^{th}$ numbers is 5 : 9. Find the value of m.



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15. The difference between any two consecutive interior angles of a polygon is 5° . If the smallest angle is 120° , find the number of the sides of the polygon.



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16. Write the first five terms of the sequence

whose n th term is $a_n = \frac{n - 2}{3}$



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17. A sequence is given $5, \frac{20}{7}, \frac{80}{49}, \dots$. Find the

Common Ratio of the given sequence



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18. Let $x = 1 + a + a^2 + \dots$ And

$y = 1 + b + b^2 + \dots$ where $|a| < 1$ and $|b| < 1$

. Prove that:

$$1 + ab + a^2b^2 + \dots = \frac{xy}{x + y - 1}.$$



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19. The 4th term of a G.P. is square of its second term, and the first term is -3. Determine its 7th term.



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20. Which term of the following sequence:-

$\sqrt{3}, 3, 3\sqrt{3}, \dots$ is 729?



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21. The 5th, 8th and 11th terms of a G.P. are p , q and x , respectively. Show that $q^2 = ps$.



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22. Find the sum to indicated number of terms of the geometric progressions given below:-
0.15, 0.015, 0.0015, ... 20 terms.



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23. The sum of first three terms of a G.P. is 16 and the sum of the next three terms is 128. Determine the first term, the common ratio and the sum to n terms of the G.P.



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24. The sum of first three terms of a GP. is $\frac{13}{12}$ and their product is - 1. Find the common ratio and the terms.



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25. 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.



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26. Find a G.P. for which sum of the first two terms is -4 and the fifth term is 4 times the third term.



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27. Find the sum to n terms of the sequence 8, 88, 888, 8888,...



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28. If the first and the n th terms of a GP are a and b respectively and if P is the product of the first n terms, then P^2 is equal to



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29. Find the sum of the products of the corresponding terms of the sequence 2,4,8,16,32 and 128, 32, 8, 2, $\frac{1}{2}$.



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30. Show that the ratio of the sum of first n terms of a G.P. to the sum of terms from $(n+1)$ th to $(2n)$ th term is $\frac{1}{r^n}$.



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31. The sum of two numbers is 6 times their geometric mean, show that numbers are in the ratio $(3 + 2\sqrt{2}) : (3 - 2\sqrt{2})$.



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32. If A and G be A.M. and G.M., respectively between two positive numbers, prove that the numbers are $A \pm \sqrt{(A + G)(A - G)}$.



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33. How many terms of the series $\sqrt{3} + 3 + 3\sqrt{3} + \dots$ will make the sum $39 + 13\sqrt{3}$?



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34. The number of bacteria in a certain culture doubles every hour. If there were 30 bacteria present in the culture originally, how many bacteria will be present at the end of 2nd hour, 4th hour and n th hour ?



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35. If A.M. and G.M of roots of a quadratic equation are 8 and 5 respectively, then obtain the quadratic equation.



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36. Find the sum of the series

$$1 \cdot 2 \cdot 3 + 2 \cdot 3 \cdot 4 + 3 \cdot 4 \cdot 5 + \dots \text{ upto } n \text{ terms}$$

.



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37. Find the sum to n terms of the series

$$3 \times 8 + 6 \times 11 + 9 \times 14 + \dots$$



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38. Find the sum to n terms of the series

$$1^2 + (1^2 + 2^2) + (1^2 + 2^2 + 3^2) + \dots$$



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39. Find the sum of n terms of the series:

$$\frac{1}{1 \cdot 2} + \frac{1}{2 \cdot 3} + \frac{1}{3 \cdot 4} + \dots + \frac{1}{n(n+1)}$$



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40. Find the sum to n terms of the series whose n th term is $n^2 + 2^n$.



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Important Questions From Miscellaneous Exercise

1. Let the sum of $n, 2n, 3n$ terms of an A.P. be S_1, S_2 and S_3 , respectively, show that $S_3 = 3(S_2 - S_1)$



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2. Find the sum of all two digit numbers which when divided by 4, yields 1 as remainder.



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3. If $f(x)$ is a function satisfying $f(x + y) = f(x)f(y)$ for all $xy \in n$ such that $f(1) = 3$ and $\sum_{x=1}^n f(x) = 120$. Then, the value of n is



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4. The sum of some terms of GP. is 315 whose first term and the common ratio are 5 and 2 respectively. Find the last term and the number of terms.



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5. The sum of three numbers in G.P. is 56. If we subtract 1, 7, 21 from these numbers in that order, we obtain an arithmetic progression. Find the numbers.



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6. A GP. consists of an even number of terms. If the sum of all the terms is 5 times the sum of terms occupying odd places then find, its common ratio.



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7. If $\frac{a + bx}{a - bx} = \frac{b + cx}{b - cx} = \frac{c + dx}{c - dx}$ ($x \neq 0$),

then show that a,b,c and d are G.P.



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



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9. If a,b,c,d are in G.P., prove that $(a^n + b^n)$, $(b^n + c^n)$, $(c^n + d^n)$ are in G.P.



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10. The ratio of the A.M. and G.M. of two positive numbers a and b is $m : n$. Show that

$$a : b = \left(m + \sqrt{m^2 - n^2} \right) : \left(m - \sqrt{m^2 - n^2} \right)$$



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11. Find the sum to n terms of the following series $5 + 55 + 555 + \dots$



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12. Find the sum to n terms $0.6 + 0.66 + 0.666$
+



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13. The sum of first 9 terms of the series

$$\frac{1^3}{1} + \frac{1^3 + 2^3}{1 + 3} + \frac{1^3 + 2^3 + 3^3}{1 + 3 + 5} + \dots \text{ is}$$



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14. Find the sum of first n terms of the series.

$$3 + 7 + 13 + 21 + 31 + \dots$$



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15. If S_1, S_2, S_3 are the sum of first n natural numbers, their squares and their cubes respectively. Show that $9S_2^2 = S_3(1 + 8S_1)$



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16. Show that :

$$\frac{1 \times 2^2 + 2 \times 3^2 + \dots + n \times (n + 1)^2}{1^2 \times 2 + 2^2 \times 3 + \dots + n^2(n + 1)} = \frac{3n + 5}{3n + 1}$$



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17. Let S be the sum, P the product and R the sum of reciprocals of n terms in a G.P. Prove that

$$P^2 R^n = S^n.$$



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18. A farmer, buys a used tractor for Rs.. 12000. He pays Rs.6000 cash and agrees to pay the balance, in. annual installment of Rs. 500 plus 12% interest on, the unpaid, amount. How much will the tractor cost him ?



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19. Shamshad Ali buys a scooter for Rs 22000 He pays Rs. 4000 cash And agrees to pay the balance in annual installment of Rs 1000 plus

10% interest on the unpaid amount. How much will the scooter cost him?



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20. A manufacturer reckons that the value of a machine, which costs him Rs. 15625, will depreciate each year by 20%. Find the estimated value at the end of 5 years.



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21. Dipesh writes letters to four of his friends. He asks each of them to copy the letter and mail to four different persons with the request that they continue the chain similarly. Assuming that the chain is not broken and that it costs 25 paise to mail one letter, find the total money spent on postage till the 8th set of letters is mailed.



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22. Find the sum of the sequence 7, 77, 777, 7777,.....up to n terms.



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Multiple Choice Questions Mcqs

1. If a, b, c, d, e, f are in A.P., then $e - c$ is equal to

A. $2(c-a)$

B. $2(f-d)$

C. $2(d-c)$

D. $d-c$

Answer: C



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2. The fourth term of an A.P. is 4. Then the sum of the first 7 terms is:

A. 4

B. 28

C. 16

D. 40

Answer: B



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3. The two geometric means between 1 and 64 are

A. 1 and 64

B. 8 and 16

C. 4 and 16

D. 3 and 16

Answer: C



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4. If second term of a GP. is 2 and the sum of its infinite terms is 8, then its first term is

A. $\frac{1}{4}$

B. $\frac{1}{2}$

C. 2

D. 4

Answer: D



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5. If A.M. between two numbers is 5 and their G.M is 4, then their H.M is:

A. $\frac{16}{5}$

B. $\frac{14}{5}$

C. $\frac{11}{5}$

D. none of these

Answer: A



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6. The following consecutive terms

$\frac{1}{1 + \sqrt{x}}$, $\frac{1}{1 - x}$, $\frac{1}{1 - \sqrt{x}}$ of a series are in:

A. H.P.

B. G.P

C. A.P

D. A.P, G.P

Answer: D



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7. $\frac{1}{1.2} - \frac{1}{2.3} + \frac{1}{3.4} - \frac{1}{4.5} + \dots$ is:

A. $2 \cdot \log 2^{-1}$

B. $3 \log 2$

C. $4 \log 2^{-1}$

D. none of these

Answer: D



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8. If the p th term of an A.P. is q and the q th is p , then the r th term is

A. $q-p+r$

B. $p-q+r$

C. $p+q+r$

D. $p+q-r$

Answer: D



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9. $\cos x = b$. For what value of b do the roots of the equation form an A.P.?

A. -1

B. $\frac{1}{2}$

C. $\frac{\sqrt{3}}{2}$

D. none of these

Answer: A



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10. In a certain AP, 5 times the 5th term is equal to 8 times the 8th term, its 13th term is

- A. 0
- B. -1
- C. -12
- D. -13

Answer: A



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11. If the first term of an A.P. is 2 and common difference is 4, then sum of its 40 terms is:

A. 3200

B. 1600

C. 200

D. 2800

Answer: A



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12. The product $(32), (32)^{1/6}, (32)^{1/36}, \dots, \infty$ is equal to:

A. 16

B. 64

C. 32

D. 0

Answer: B



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13. If the first two terms of harmonic progression be $\frac{1}{2}$, $\frac{1}{4}$ then the harmonic means of first four numbers is:

A. 5

B. $\frac{1}{5}$

C. 10

D. $\frac{1}{10}$

Answer: B



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14. A G.P consists of an even number of terms. If Sum of all terms of a G.P is 5 times the sum of odd terms. The common ratio is:

A. 2

B. 3

C. 4

D. 5

Answer: C



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15. Three numbers a, b and c are in A.P if:

A. $a = b + c$

B. $b = a - c$

C. $2b = a + c$

D. $2c = a + b$

Answer: C



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16. If the third term of an A.P is 12 and the seventh term is 24, then the 10th term is:

A. 26

B. 39

C. 30

D. 33

Answer: D



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