



MATHS

BOOKS - V PUBLICATION

SEQUENCES AND SERIES

Questionbank

1. Write the first three terms in each of the following sequences defined by the following:

i) $a_n = 2n + 5$ ii) $a_n = \frac{n - 3}{4}$



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2. What is the 20^{th} term of the sequence defined by

$$a_n = (n - 1)(2 - n)(3 + n)?$$

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3. Let the sequence a_n be defined as

$$a_1 = 1, a_n = a_{n-1} + 2 \text{ for } n \geq 2. \text{ Find first five terms}$$

and write corresponding series.

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4. Write the first five terms of the sequence if n^{th} term is

$$a_n = n(n + 2)$$

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5. Write the first five terms of the sequence if n^{th} term is

$$a_n = \frac{a}{n + 1}$$

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6. Write the first 5 terms of the sequence whose n^{th} term is given below $a_n = 2^n$

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7. Write the first 5 terms of each of the sequences whose n^{th} terms are given below $a_n = \frac{2n - 3}{6}$

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8. Write the first 5 terms of each of the sequences whose

n^{th} terms are given below $a_n = (-1)^{n-1}5^{n+1}$



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9. Write the first 5 terms of each of the sequences whose

n^{th} terms are given below $a_n = \frac{n(n^2 + 5)}{4}$



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10. Find the indicated terms in the sequence whose n^{th}

term is

$$a_n = 4n - 3, a_{17}, a_{24}$$



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11. Find the indicated term in the sequence whose n^{th}

terms is

$$a_n = \frac{n^2}{2^n}, a_7$$



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12. Find the indicated term in the sequence whose n^{th}

term is

$$a_n = (-1)^{n-1} n^3, a_9$$



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13. Find the indicated term in the sequence whose n^{th} term is

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

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14. Write the first five terms of each of the sequences in the corresponding series.

$$a_1 = 3, a_n = 3a_{n-1} + 2 \text{ for all } n > 1$$

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15. Write the first five terms of the sequence in the corresponding series.

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

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16. The Fibonacci sequence is defined by $1 = a_1 = a_2$ and

$$a_n = a_{n-1} + a_{n-2}, n > 2. \text{ Find } \left(\frac{a_{n+1}}{a_n} \right) \text{ for } n=1,2,3,4,5$$

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17. In an A.P. if m^{th} term is n and the n^{th} term is m , where

$m \neq n$, find the p^{th} term.

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18. If the sum of n terms of an A.P. is $nP + \frac{1}{2}n(n - 1)Q$, where P and Q are constants, find the common difference.

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19. The sum of n terms of two arithmetic progressions, are in the ratio $(3n + 8) : (7n + 15)$. Find the ratio of their 12^{th} terms.

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20. The income of a person is Rs. 300000 in the first year and he receives an increase of Rs. 10000 to his income per

year for the next 19 yéars. find the total amount, he received in 20 years.



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21. Insert 6 arithmetic means between 3 and 24.



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22. Find the sum of odd integers from 1 to 2001



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23. Find the sum of all natural numbers between 100 and 1000 which are multiple of 5.

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

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26. If the m^{th} terms of an AP is $\frac{1}{n}$ and the n^{th} term is $\frac{1}{m}$, prove that the sum of the first mn terms is $\frac{1}{2}(mn + 1)$

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27. If the sum of certain number of terms of the AP 25,22,19,.....is 116, then find the last term.

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28. Find the sum of n terms of the AP, whose K^{th} term is $a_k = 5K + 1$.

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29. If the sum of n terms of an A.P. is $pn + qn^2$, where p and q are constants, find the common difference.



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30. The sums of n terms of two A.P.s are in the ratio $(5n + 4) : (9n + 6)$. Find the ratio of their 18^{th} terms.



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31. If the sum of p terms of an AP is the same as the sum of its q terms, show that the sum of its $(p + q)$ terms is zero.



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32. The sum of the first p, q, r terms of an AP 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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33. 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} terms is $(2m - 1) : (2n - 1)$.



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34. If the sum of n terms of an A.P is $3n^2 + 5n$ and its m^{th} term is 164. Find the value of m .

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35. Insert five numbers between 8 and 26 such that the resulting sequence is an AP.

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

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37. 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 7^{th} and $(m - 1)^{th}$ numbers in 5:9. Find the value of m .



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38. A man starts repaying a loan as a first instalment of Rs. 100. If he increases the instalment by Rs. 5 every month, what amount he will pay in the 30^{th} instalment.



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



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40. Find the 10^{th} and n^{th} terms of the G.P. 5, 25, 125, . . .



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41. Which term of the G.P., 2, 8, 32, . . , up to n terms is 131072?



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42. In a.G.P., the 3rd term is 24 and the 6th term is 192 . Find the 10th term.

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43. Using progression, find the sum of first five terms of the series $1 + \frac{2}{3} + \frac{4}{9} + \dots$

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44. How many terms of the GP $3, \frac{3}{2}, \frac{3}{4}, \dots$ are needed to give the sum $\frac{3069}{512}$?

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



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46. Find the sum to n terms of the sequence

7, 77, 777, 7777,



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47. A person has 2 parents, 4 grandparents, 8 great grandparents, and so on. Find the number of his ancestors during the ten generations preceding his own.



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48. Insert three numbers between 1 and 256 so that the resulting sequence is a GP.



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49. If AM and GM of two numbers are 10 and 8 respectively, find the numbers.



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50. Find the 20^{th} and n^{th} terms of the G. $P, \frac{5}{2}, \frac{5}{4}, \frac{5}{8} \dots$



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



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52. The 5^{th} , 8^{th} and 11^{th} terms of a GP are p , q and s respectively. Prove that $q^2 = ps$.



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53. The 4^{th} term of a G.P. is square of its second term and the first term is -3. Determine its 7^{th} term.



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54. Which term of the following sequences

(a) $2, 2\sqrt{2}, 4, \dots$ is 128?

(b) $\sqrt{3}, 3, 3\sqrt{3}$ in..., is 729?

(c) $\frac{1}{3}, \frac{1}{9}, \frac{1}{27}, \dots$ is $\frac{1}{19683}$?



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55. For what value of x , the numbers $-\frac{2}{7}, x, -\frac{7}{2}$ are in

G.P ?



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56. Find the sum to 20 terms of 0.15,0.015,0.0015,..



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57. Find the sum to n terms of the G.P. $\sqrt{7}, \sqrt{21}, 3\sqrt{7} \dots$



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58. Find the sum to n terms of the G.P.

$1, -a, a^2, -a^3, \dots (a \neq -1)$



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59. Find the sum to n terms of the G.P.

$$x^3, x^5, x^7, \dots (x \neq \pm 1)$$

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60. Evaluate $\sum_{K=1}^{11} (2 + 3^K)$

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

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62. How many terms of GP $3, 3^2, 3^3, \dots$ are needed to give the sum 120?

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

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64. Given a G. P with $a = 729$ and 7^{th} term 64, determine S_7 ?

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65. The sum of the first two terms of a GP is -4 and the fifth term is 4 times the third term.

Find the GP.

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66. If the 4^{th} , 10^{th} and 16^{th} terms of a G.P. are x , y and z respectively. Prove that x , y , z are in G.P.

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67. Find the sum to n terms of the series: 8, 88, 888,.....

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

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69. Find four numbers forming a geometric progression in which the third term is greater than first term by 9, and the second term is greater than the 4th by 18.

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70. If the p^{th} , q^{th} and r^{th} terms of a GP are a, b, c respectively, show that $a^{q-r}b^{r-p}c^{p-q} = 1$

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71. If the first and the n^{th} term of a G.P. are a and b , respectively, and if P is the product of n terms, prove that $P^2 = (ab)^n$.

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

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73. If a, b, c and d are in $G.P$, show that $(a^2 + b^2 + c^2)(b^2 + c^2 + d^2) = (ab + bc + cd)^2$.

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74. Insert two numbers between 3 and 81 iso that the resulting sequence is $G. P$

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75. Find the value of n so that $\frac{a^{n+1} + b^{n+1}}{a^n + b^n}$ may be the geometric mean between a and b

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

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77. 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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78. The number of bacteria in a certain culture doubles every hour. If there are 30 bacteria present in the culture

originally, how many bacteria will be present at the end of the 2nd hour, 4th hour and n^{th} hour?

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79. What will Rs. 500 amounts to in 10 years after its deposit in a bank which pays annual interest rate of 10 % compounded annually.

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80. 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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81. Find the sum to n terms of the series:

$$5 + 11 + 19 + 29 + 41 \dots$$



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82. Find the sum of the first n terms of the series whose n th term is $n(n + 3)$.



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83. Find the sum to n terms of the series

$$1 \times 2 + 2 \times 3 + 3 \times 4 + 4 \times 5 + \dots$$



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84. Find the sum to n terms of the given series

$$1 \times 2 + 2 \times 3 + 3 \times 4 + 4 \times 5 + \dots$$

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85. Find the sum to n terms of the series .

$$1 \times 2 \times 3 + 2 \times 3 \times 4 + 3 \times 4 \times 5 + \dots$$

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86. Find the sum to n terms of the series

$$3 \times 1^2 + 5 \times 2^2 + 7 \times 3^2 + \dots$$

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87. Find the sum to n terms of this series.

$$\frac{1}{1 \times 2} + \frac{1}{2 \times 3} + \frac{1}{3 \times 4} + \dots$$

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88. Find the sum of the series .

$$5^2 + 6^2 + 7^2 + \dots 20^2$$

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89. Find the sum to 'n' terms of the series

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

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90. Find the sum to n terms of each of the series in the following .

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

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91. Find the sum to n terms of the series in the following
 n^{th} terms is given by

$$n(n + 1)(n + 4)$$

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92. Find the sum to n terms of the series whose n^{th} terms
is given by

$$n^2 + 2^n$$



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93. Find the sum to n terms of the series in the following

n^{th} terms is given by

$$(2n - 1)^2$$



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94. If p^{th} , q^{th} , r^{th} and s^{th} terms of an A.P are in $G. P$, then

show that $(p - q)$, $(q - r)$, $(r - s)$ are also in $G. P$



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95. If a, b, c are in AP and $a^{\frac{1}{x}} = b^{\frac{1}{y}} = c^{\frac{1}{z}}$ prove that x, y, z are in AP.

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96. If a, b, c, d and p are different real numbers such that $(a^2 + b^2 + c^2) \cdot p^2 - 2(ab + bc + cd)p + (b^2 + c^2 + d^2) \leq 0$, then show that a, b, c and d are in $G. P.$

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97. If p, q, r are in $G. P.$, and the equations, $px^2 + 2qx + r = 0$ and $dx^2 + 2ex + f = 0$ have a common root, then show that $\frac{d}{p}, \frac{e}{q}, \frac{f}{r}$ are in $A. P.$

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98. Show that the sum of $(m + n)^{th}$ and $(m - n)^{th}$ terms of an A.P. is equal to twice the m^{th} term.

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99. If the sum of three numbers in an A.P. is 24 and their product is 440, find the numbers.

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100. If S_1 , S_2 and S_3 are respectively the sums of n , $2n$ and $3n$ terms of an AP. Prove that $S_3 = 3(S_2 - S_1)$



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101. Find the sum of multiple of 7 between 200 and 400.

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102. Find the sum of integers from 1 to 100 that are divisible-by 2 or 5 .

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

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104. If f is a function satisfying $f(x + y) = f(x) \cdot f(y)$ for all $x, y \in \mathbb{N}$ such that $f(1) = 3$. And $\sum_{x=1}^n f(x) = 120$, find the value of n .

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105. The sum of some terms of G.P. 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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106. 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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107. 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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108. A G.P 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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109. The sum of the first four terms of an A.P. is 56. The sum of the last four terms is 112. If its first term is 11, then find the number of terms.



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110. 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 in G.P.



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111. 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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112. The p^{th} , q^{th} and r^{th} terms of an A.P. are a, b, c respectively. Show that

$$(q - r)a + (r - p)b + (p - q)c = 0$$

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113. 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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114. 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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115. If a and b are the roots of $x^2 - 3x + p = 0$ and c and d are roots of $x^2 - 12x + q = 0$ where a, b, c, d form a $G.P.$ Prove that $(q + p) : (q - p) = 17 : 15$

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116. 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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117. If a, b, c are in A.P, b, c, d are in G.P. and $\frac{1}{c}, \frac{1}{d}, \frac{1}{e}$ are in A. P. Prove that a, c, e are in G.P.

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

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119. Find the 20^{th} term of the series $2 \times 4 + 4 \times 6 + 6 \times 8 + \dots$, + n terms.

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120. Find the sum of the first n terms of the series $: 3 + 7 + 13 + 21 + 31 + \dots$

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121. 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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122. Find the sum to n terms of the series:

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

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123. 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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124. A farmer buys a used tractor for Rs. 12,000. He pays Rs. 6000 cash and agrees to pay the balance in 12 annual

instalments of Rs. 500 plus 12% interest on the unpaid amount How much will the tractor cost the farmer?

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125. Shamshad Ali buys a scooter for Rs. 22000. He pays Rs. 4000 cash and agrees to pay the balance in annual instalment of Rs. 1000 plus 10% interest on the unpaid amount. How much will the scooter cost him?

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126. A person writes a letter to four of his friends. He asks each one of them to copy the letter and mail to four different persons with instruction that they move the

chain similarly. Assuming that the chain is not broken and that it costs 50 paise to mail one letter. Find the amount spent on the postage when 8^{th} set of letter is mailed.

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127. A man deposited Rs. 10000 in a bank at the rate of 5% simple interest annually. Find the amount in. 15^{th} year since he deposited the amount and also calculate the total amount after 20 years.

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128. 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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129. 150 workers were engaged to finish a job in a certain number of days. 4 , workers dropped out on second day, 4 more workers dropped out on third day and so on. It took 8 more days to finish the work. Find the number of days in which the work was completed.



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130. Write the first 'three terms of the sequences whose nth term T_n is given by:

$$\text{i) } \frac{2^{n+1}}{2n+1}$$

$$\text{ii) } \frac{1 - (-1)^n}{4}$$



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131. Show that the sequence:

$\log a, \log\left(\frac{a^2}{b}\right), \log\left(\frac{a^3}{b^2}\right) \dots$ is an A.P.



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132. Which term of the sequence 37, 32, 27, 22, ... is -103



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133. Find the 20^{th} term of the series $2 \times 4 + 4 \times 6 + 6 \times 8 + \dots$, + n terms.

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134. The 7^{th} term of an AP is 34 and the 15^{th} term is 74. Find the 40^{th} term.

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

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136. Find the sum of all three digit numbers which leave the remainder 1 when divided by 4.

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137. If the 'sum of first m terms of an $A. P.$ be n and the sum of first n terms be m , show that the sum of first $m + n$ terms is $-(m + n)$

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138. Insert three A.M.s between 11 and 14



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139. Find the n^{th} and 9^{th} terms of the sequence
3, 6, 12, 24, . .



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140. For what value of n , the n^{th} terms of the series
 $5 + 10 + 20 + \dots$ and $1280 + 640 + 320 + \dots$ are equal



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