MATHS

BOOKS - MODERN PUBLICATION

SEQUENCES AND SERIES

Example

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

$a_n = 2n + 5.$

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2. Write the first three terms in the sequences defined by the following :

$a_n = \frac{n-3}{4}.$

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3. Write the first five terms of the following functions whose nth terms are :

$a_n = 2^n$.

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4. Write the first five terms of the following functions whose nth terms are :

$t_n = \frac{2n-3}{6}$.

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5. Write the first five terms of the following functions whose nth terms are :

$a(n) = (-1)^{n-1} 5^{n+1}$.

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6. Write the first five terms of the following functions whose nth terms are :

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

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7. What is the 20th term of the sequence defined by : $a_n = (n-1)(2-n)(3+n)$?

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8. Let the sequence be defined as follows : $a_1 = 3$, $a_n = 3a_{n-1} + 2$, for all n> 1. Find the first four terms of the sequence.

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9. Find as indicated in the following case :

$t_1 = 1, t_n = 2t_{n-1}, (n > 1), t_6$.

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10. Find as indicated in the following case :

$S_n = S_{n-1} - 1, (n > 2), S_1 = S_2 = 2, S_5.$

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11. Find the 960th and 961st terms of the sequence given by :

$$t_n = \begin{cases} \frac{n}{\frac{n}{96} - 1}, & \text{if n is not the square of a natural number} \\ 6\frac{1}{2}, & \text{if n is the square of a natural number.} \end{cases}$$

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12. Let a (n) be the finite sequence with 9 terms, a (1), a (2), ... a(9) defined as follows :

$$a(n)=\begin{cases}1 & \text{If the digit n occurs infinitely many times in the decimal expansion of } \frac{4}{3};\\ 2 & \text{If the digit n occurs odd number of times in the decimal expansion of } \frac{4}{3};\\ 3 & \text{If the digit n occurs an even number of times in the decimal expansion of } \frac{4}{3}.\end{cases}$$

Find all the terms of the sequence.

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13. Find 'd' and write the next four terms of the following arithmetic progression : $-1, \frac{1}{4}, \frac{3}{2}, \ldots\ldots\ldots$

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14. Find the nth term of the sequence 5,2,-1,-4,-7, ...

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15. Show that the sequence : log a, log (ab), $\log\left(ab^2\right)$, $\log\left(ab^3\right)$,..... is an A.P. Find its nth term.

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16. Which term in the A.P. 5, 2, -1, ... is -22 ?

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17. Which term of the sequence : $20, 19\frac{1}{4}, 18\frac{1}{2}, 17\frac{3}{4}$, ... is the first negative term ?

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18. Which term of the sequence : 8-6i, 7 - 4i, 6- 2i,..... is pure imaginary ?

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19. A sequence $\{a_n\}$ is given by : $a_n = n^2 - 1, n \in N$. Show that it is not an A.P.

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20. Determine 2nd term and rth term of an A.P. whose 6th term is 12 and 8th term is 22 .

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21. Determine the 25th term of an AP., whose 9th term is -6 and common difference is $\frac{5}{4}$.

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

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23. The number of terms common to two AP's $3, 7, 11, \ldots, 407$ and $2, 9, 16, \ldots, 709$ is

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24. If the pth, qth and rth terms of an A.P. be x,y,z repsectively, then show that : $x(q-r)+y(r-p)+z(p-q)=0$

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25. Find the sum of indicated number of terms of the following arithmetic progression : 16, 11, 6,....., n terms, 23 terms.

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26. Out of l, a, n, d and S_n, determine the ones that are missing from the following : $a = \frac{17}{2}, d = \frac{3}{2}, n = 64.$

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27. Find the sum to n terms of the sequence $\{a_n\}$, where $a_n = 5 - 6n, n \in N.$

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

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29. Determine the sum of first thirty five terms of an arithematic progression if $t_2 = 2$ and $t_7 = 22$.

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

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31. If the 12th term of an A.P. is -13 and the sum of the first four terms is 24, what is the sum of the first 10 terms ?

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32. Find the common difference of an A.P. whose first term is 100 and the sum of whose first six terms is five times the sum of the next six terms.

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33. Find the sum of all 3-digit numbers which leave remainder 2, when divided by 5.

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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. 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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36. Let S_n denote the sum of n terms of an AP, if $S_{2n} = 3S_n$, then the ratio $\frac{S_{3n}}{S_n}$ is equal to

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37. Find the sum of first 24 terms of on AP $t_1, t_2, t_3, ...,$ if it is known that $t_1 + t_5 + t_{10} + t_{15} + t_{20} + t_{24} = 225.$

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38. The income of a person is ₹ 3,00,000 in the first year and receives an increase of % 10,000 to his income per year for the next 19 years. Find the total amount, he receives in 20 years.

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39. A manufacturer of PC's produced 600 sets in the third year and 700 sets in the seventh year. Assuming that the production uniformly increases by a fixed number every year, find:- the production in the first year.

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40. A manufacturer of TV sets produced 600 sets in the third year and 700 sets I the seventh year. Assuming that the production increases uniformly by a fixed number every year, find : the production in the 10th year

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41. A manufacturer of TV sets produced 600 sets in the third year and 700 sets I the seventh year. Assuming that the production increases uniformly by a fixed number every year, find : the total production in first 7 years.

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42. Insert 3 A.M.'s between 3 and 19.

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43. There are n arithmetic means between 3 and 17. The ratio of the last mean to the first mean is 3: 1. Find the value of n.

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44. The sum of two numbers is $\frac{13}{6}$. An even number of arithmetic means are inserted between them and their sum exceeds their number by 1. Find the number of means inserted.

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45. If $\log_{10} 2, \log_{10}(2^x - 1)$ and $\log_{10}(2^x + 3)$ are in A.P., then find the value of x.

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46. If the roots of the equation : $a(b-c)x^2 + b(c-a)x + c(a-b) = 0$ are equal, show that $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are in A.P.

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47. The sum of three numbers in A.P. is -3 and their product is 8. Find the numbers.

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48. Find four terms in A.P. whose sum is 20 and the sum of whose squares is 120.

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49. The digits of a positive integer having three digits are in AP and their sum is 15. The number obtained by reversing the digits is 594 less then the original number. Find the number.

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50. If the fourth Power of the common difference of an A.P. with integer entries is added to the product of any four consecutive terms of it, prove that the resulting Sum is the square of an integer.

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51. If a, b, c are in A.P., prove that :

$(bc)^{-1}$, $(ca)^{-1}$ and $(ab)^{-1}$ are also in A.P.

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52. If a, b, c are in A.P., prove that :

$\frac{a(b+c)}{bc}, \frac{b(c+a)}{ca}, \frac{c(a+b)}{ab}$ are also in A.P.

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53. If a, b, c are in A.P., prove that :

$\frac{ab+ac}{bc}, \frac{bc+ba}{ca}, \frac{ca+cb}{ab}$ are also in A.P.

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54. If a^2, b^2, c^2 are in A.P. Prove that $\frac{a}{b+c}, \frac{b}{c+a}, \frac{c}{a+b}$ are also in A.P.

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55. If $a^2(b+c), b^2(c+a), c^2(a+b)$ are in A.P., show that : either a, b, c are in A.P. or ab + bc + ca =0.

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56. Find the indicated terms in the following : a= 1, r= 1.2 , t_4, t_n.

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57. Find the 10th term of the geometric series : 5+ 25 + 125 +..... Also, find its nth term.

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58. Which term of the following sequence:- 2, $2\sqrt{2}$, 4,.....is 128?

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59. The first term of a G.P. is 1. The sum of the third term and fifth term is 90. Find the common ratio of G.P.

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60. 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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61. In a finite G.P., the product of the terms equidistant from the beginning and the end is always same and equal to the product of first and last terms.

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62. Show that the products of the corresponding terms of the sequences a, ar, ar^2,...ar^{n-1} and A, AR, AR^2,.....AR^{n-1} form a G.P, and find the common ratio.

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63. If the pth , qth , rth , terms of a GP . Are x,y,z respectively prove that :

$x^{q-r}.\, y^{r-p}.\, z^{p-q} = 1$

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64. Prove that the product of first 'n' terms of a G.P., whose first term is 'a' and last term is'l', is $(al)^{\frac{n}{2}}$.

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65. 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 nth hour ?

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66. Evaluate : $\sum_{j=1}^{10} \left\{ \left(\frac{1}{2}\right)^{j-1} + \left(\frac{1}{5}\right)^{j+1} \right\}.$

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67. Find the sum of first n terms and the sum of first 5 terms of the geometric series : $1 + \frac{2}{3} + \frac{4}{9} +$ .....

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68. Determine the number n in a geometric progression $\{a_n\}$, if $a_1 = 3, a_n = 96$ and $S_n = 189$.

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69. Find the sum of the series : 11 + 103 + 1005 +.... to n terms.

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70. Find the sum to n terms of the series :

$$\left(x+\frac{1}{x}\right)^2+\left(x^2+\frac{1}{x^2}\right)^2+\left(x^3+\frac{1}{x^3}\right)^2+\ldots\ldots.$$

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71. Find the least value of n for which the sum $1+3+3^2+\ldots\ldots$ to n terms is greater than 7000.

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72. Sum to n terms : $4+44+444+\ldots\ldots\ldots$

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

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74. If S_n denotes the sum of n terms of a G.P. whose first term and common ratio are a and r respectively, then :

$$S_1 + S_3 + S_5 + \ldots . + S_{2n-1} = \frac{an}{1-r} - \frac{ar\left(1-r^{2n}\right)}{(1-r)^2(1+r)}.$$

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

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77. An insect starts from a point and travels in a straight path 1 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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78. Insert three numbers between the numbers 1 and 256 so that the resulting sequence is a G.P.

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79. A.M. between two numbers is 10 and their G.M is 8. Find the numbers.

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80. The A.M. between two distinct positive numbers is twice the G.M. between them. Find the ratio of the greater to the smaller.

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81. If one geometric mean G and two arithmetic means A_1 and A_2 be inserted between two given quantities, prove that : $G^2 = (2A_1 - A_2)(2A_2 - A_1)$.

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82. 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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83. Find all the sequences, which are simultaneously arithmetic and geometric progressions.

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

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

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88. If p, q, r are in A.P. while x, y, z are in G.P., prove that $x^{q-r}.\ y^{r-p}.\ z^{p-q}=1.$

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89. Verify that 10,-9, 8.1,..... is a geometric progression. Find the sum to infinity of the G.P.

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90. Find the sum to infinity of the G.P. $-\frac{3}{4}, \frac{3}{16}, -\frac{3}{64}, \ldots\ldots$

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91. Prove that : $3^{\frac{1}{2}} \times 3^{\frac{1}{4}} \times 3^{\frac{1}{8}} \times \ldots\ldots\ldots \to \infty = 3.$

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92. The first term of a G.P. is 2 and the sum to infinity is 6. Find the common ratio.

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93. If $A = 1 + r^a + r^{2a} + \ldots\ldots\ldots \to \infty$ and $B = 1 + r^b + r^{2b} + \ldots\ldots\ldots . \to \infty$, prove that $r = \left(\frac{A-1}{A}\right)^{1/a} = \left(\frac{B-1}{B}\right)^{1/b}$.

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94. Use geometric series to express 0.555 = 0.5 as a rational number .

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95. Evaluate : $.2\overline{345}$.

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96. Which rational number has the decimal expansion $0.3\overline{56}$?

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97. For 0ltphilt(pi)/(2)" if " x=sum_(n=0)^(oo)cos^(2n)phi,y=sum_(n=0)^(oo)sin^(2n)phi" and "z=sum_(n=0)^(oo)cos^(2n)phisin^(2n)phi`, then

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98. A square is drawn by joining the mid-points of the sides of a give square. A third square is drawn inside the scond square in the same way and this process continues indefiniely. If a side of the first square is 16 cm, then determine the sum of the areas of all the squares.

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99. Find the sum to infinity by finding the sum to n terms or directly of the series : $1+\frac{3}{2}+\frac{5}{2^2}+\frac{7}{2^3}+$ .....

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100. If the sum to infinity of the series : $3+(3+d)\times\frac{1}{4}+(3+2d)\times\frac{1}{4^2}+$ ..... is $4\frac{8}{9}$, find d. Also name the series.

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101. 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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102. Find the sum of n terms of the series : $1^2+3^2+5^2+\ldots$

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103. Find the sum to n terms of the series given below whose nth terms is given by $n(n+1)(n+4)$.

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104. Find the sum of the series $1 \cdot 2 \cdot 3 + 2 \cdot 3 \cdot 4 + 3 \cdot 4 \cdot 5 + \ldots.$ upto n terms .

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105. The sum of first 9 terms of the series $\frac{1^3}{1} + \frac{1^3 + 2^3}{1+3} + \frac{1^3 + 2^3 + 3^3}{1+3+5} + \ldots\ldots\ldots$ is

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106. Sum to n terms the series : $1^2 - 2^2 + 3^2 - 4^2 + 5^2 - 6^2 + \ldots$

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107. Sum the series :

$1(2-\omega)\left(2-\omega^2\right) + 2(3-\omega)\left(3-\omega^2\right)\ldots\ldots(n-1)(n-\omega)\left(n-\omega^2\right)$

where ω and ω^2 are non-real cube roots of unity.

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108. Find the sum of of the products of first n natural numbers, taken two at a time .

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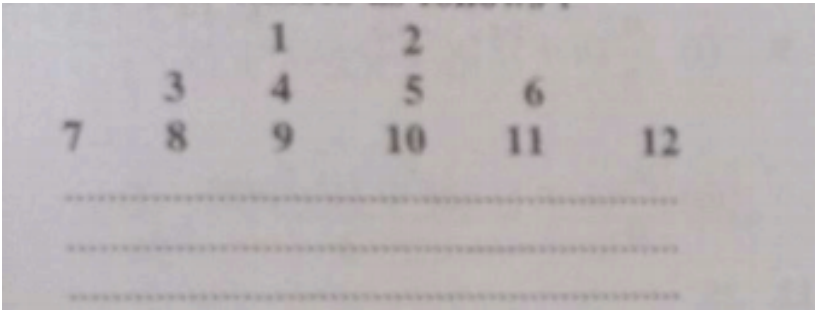
109. The sequence N of natural numbers is divided into classes as follows :



Show that the sum of the numbers in the nth row is $n\left(2n^2+1\right)$.

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110. Sum up the following series to n terms : 3+7+ 14+ 24+ 37 + ...

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111. Find the nth term and the sum of n terms of the series : 6 +9 +21 + 69 + 261 + ...

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112. Sum the following upto n terms :

$1 + (1 + x) + (1 + x + x^2) + (1 + x + x^2 + x^3) + \ldots..$

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113. If the sum of the roots of the equation $ax^2 + bx + c = 0$ is equal to the sum of the squares of their reciprocals, then show that bc^2, ca^2, ab^2 are in A.P.

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114. If the sum of the roots of $ax^2bx + c = 0$ is equal to the sum of the squares of their reciprocals, then show that $\frac{c}{a}, \frac{a}{b}, \frac{b}{c}$ are in A.P.

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115. If $a_1, a_2, \ldots\ldots\ldots, a_n$ are in A.P. and $a_i > 0$ for all i , prove that : $\frac{1}{\sqrt{a}_1 + \sqrt{a}_2} + \frac{1}{\sqrt{a}_2 + \sqrt{a}_3} + \ldots\ldots\ldots\ldots + \frac{1}{\sqrt{a_{n-1}} + \sqrt{a}_n} = \frac{n-1}{\sqrt{a}_1 + \sqrt{a}_n}$

.

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116. Suppose x and y are two real numbers such that the rth mean between x and 2y is equal to the rth mean between 2x and y when n arithmatic means are inserted between them in both the cases. Show that : $\frac{n+1}{r} - \frac{y}{x} = 1$.

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117. Does there exist a geometric progression containing 27, 8 and 12 as three of its terms. If it exists, how many such progressions are possible ?

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118. Let S be the sum, P the product and R the sum of reciprocals of n terms in a G.P. Prove that $P^2R^n = S^n$.

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119. If |x|<1 and |y|<1, find the sum to infinity of the series : $(x+y)+\left(x^2+xy+y^2\right)+\left(x^3+x^2y+xy^2+y^3\right)+$ .....

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120. a, b, c are the first three terms of a geometrical series. If the harmonic mean of a and b is 12 and that of b and c is 36, find the first five terms of series.

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121. Statement I The triangle so obtained is an equilateral triangle.

Statement II If roots of the equations be $\tan A, \tan B$ and $\tan C$ then $\tan A + \tan B + \tan C = 3\sqrt{3}$

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122. Let a,b,c and d are real numbers in GP. Suppose u,v,w satisfy the system of equations $u + 2y + 3w = 6, 4u + 5y + 6w = 12$ and $6u + 9v = 4$. Further consider the expressions

$$f(x) = \left(\frac{1}{u} + \frac{1}{v} + \frac{1}{w}\right)x^2 + \left[(b-c)^2 + (c-a)^2 + (x-b)^2\right]$$

$x + u + v + w = 0$ and $g(x) = 20x^2 + 10(a-d)^2 x - 9 = 0$

$(b-c)^2 + (c-a)^2 + (d-b)^2$ is equal to

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123. The real numbers x_1, x_2, x_3 satisfying the equation $x^3 - x^2 + \beta x + \gamma = 0$ are in A.P. Find the intervals in which β and γ lie.

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124. Let x be the arithmetic mean and y, z be two geometric means between any two positive numbers. Then, prove that $\frac{y^3 + z^3}{xyz} = 2$.

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125. The sum of three numbers in G.P. is 42. If the first two numbers are increased by 2 and third is decreased by 4, the resulting numbers form A.P. Find the numbers of G.P.

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126. If the sum of the roots of the equation $ax^2 + bx + c = 0$ is equal to the sum of the squares of their reciprocals, then show that bc^2, ca^2, ab^2 are in A.P.

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127. Let a_1, a_2,..... be positive real numbers in geometric progression. For each n, let A_n, G_n, H_n be respectively the arithmetic mean, geometric mean and harmonic mean of $a_1, a_2 \ldots\ldots\ldots a_n$. Find an expression ,for the geometric mean of $G_1, G_2, \ldots\ldots . G_n$ in terms of $A_1, A_2, \ldots\ldots . , A_n, H_1, H_2, \ldots\ldots . , H_n$.

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128. If $a > 0, b > 0, c > 0$, prove that : $(a + b + c)\left(\frac{1}{a} + \frac{1}{b} + \frac{1}{c}\right) \geq 9$.

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129. If a_m be the mth term of an AP, show that $a_1^2 - a_2^2 + a_3^2 - a_4^2 + ... + a_{2n-1}^2 - a_{2n}^2 = \frac{n}{(2n-1)}(a_1^2 - a_{2n}^2)$.

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Exercise

1. Write the first three terms of the sequence defined by the following :

$a_n = n(n+2)$.

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2. Write the first five terms of the sequences given below whose nth terms are: $a_n = \frac{n}{n+1}$

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3. Write the first five terms of the following functions whose nth terms are :

$a_n = 2^n$.

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4. Write the first four terms of the following sequence whose nth terms are :

$\frac{n}{n+1}$.

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5. Write the first four terms of the following sequence whose nth terms are :

$n^2 - 16$.

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6. Write the first four terms of the following sequence whose nth terms are :

$$\frac{3^n}{2^n+1}.$$

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7. Write the first four terms of the following sequence whose nth terms are :

$$\frac{n+4}{n+1}.$$

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8. Write the first four terms of the following sequence whose nth terms are :

$$\log\left(1+\frac{1}{n}\right).$$

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9. Write the first five terms of the following sequence whose nth terms are :

$a_n = 2n + 5.$

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10. Write the first five terms of the following sequence whose nth terms are :

$a_n = n(n + 1).$

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11. Write the first five terms of the following sequence whose nth terms are :

$a_n = \frac{n - 3}{4}.$

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12. Write the first five terms of the sequences given below whose nth terms are: $a_n = \frac{n}{n+1}$

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13. Write the first five terms of the sequences given below whose nth terms are: $a_n = n\frac{n^2+5}{4}$

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14. What is the 19th term of the sequence : $a(n) = \frac{n(n-2)}{n+3}$?

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15. Find the term indicated in the following case :

$t_n = 4^n + n^2 - n + 1, t_3.$

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16. Find the term indicated in the following case :

$h(n) = n^2 - 3n + 4, h(10).$

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17. Find the term indicated in the following case :

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

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18. Find the term indicated in the following case :

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

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19. Find the term indicated in the following case :

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

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20. Find the first five terms of the sequence and write corresponding series given by:

$\{(a_1 = -1), (a_n = a_{n-1} + 2, n \geq 2).$

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21. Find the first five terms of the sequence and write corresponding series given by:

$\begin{cases} a_1 = a_2 = 1 \\ a_n = a_{n-1} + a_{n-2} n \geq 3 \end{cases}$.

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22. Find the first six terms of the sequence whose first term is 1 and whose (n+1)th term is obtained by adding n to the nth term.

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23. Write the next term of the sequence :

$\frac{1}{6}, \frac{1}{3}, \frac{1}{2}, \ldots\ldots$

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24. Write the next term of the sequence :

$\frac{1}{6}, \frac{1}{3}, \frac{2}{3}, \ldots\ldots$

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25. Find the terms indicated in the following case :

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

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26. Find the terms indicated in the following case :

$a_n = 2^n - \frac{5}{2}, a_8, a_{12}.$

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27. Find the terms indicated in the following case :

$a_n = (n-1)(2-n)(3+n), a_1, a_2, a_3.$

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28. Find the term(s) indicated in the following case :

$t_n = t_{n-1} + 3(n > 1), t_1 = 1, t_4.$

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29. Find the term(s) indicated in the following case :

$T_n = \frac{T_{n-1}}{T_{n-2}}, (n > 2), T_1 = 1, T_2 = 2, T_6.$

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30. Write the first five terms of the sequences given below and obtain the corresponding series: $a_1 = 3, a_n = 3a_{n-1} + 2 \ \forall n > 1$

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31. 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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32. Write the first five terms of the sequences given below and obtain the corresponding series: $a_1 = a_2 = 2, a_n = a_{n-1} - 1, n > 2$

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33. Write the first six terms of following sequence :

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

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34. Write the first six terms of following sequence :

$a_1 = 4, a_{n+1} = 2na_n.$

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35. Write the first six terms of following sequence :

$a_1 = 1/2, a_2 = -1, a_{n+2} = a_n a_{n+1}.$

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36. Write the first six terms of following sequence :

$a_1 = a_2 = 2, a_n = a_{n-1} - 1, (n > 2).$

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37. The sequence a(n) is defined by : a(n) =(n-1)(n- 2) (n -3). Show that the first three terms of the sequence are zero, but the rest of the terms are positive.

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38. The Fibonacci sequence is defined by $1 = a_1 = a_2$ and $a_n = a_{n-1} + a_{n-2}, n > 2$. Find $\frac{a_{n+1}}{a_n}$, for n = 1, 2, 3, 4, 5

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39. Find the 21st and 42nd terms of the sequence defined by : $t_n = \begin{cases} 0 & \text{if } n \text{ is odd} \\ 1 & \text{if } n \text{ is even} \end{cases}$.

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40. Find the 18th and 25th terms of the sequence defined by :

$$t_n = \begin{cases} n(n+2) & \text{if } n \text{ is even natural number} \\ \frac{4n}{n^2+1} & \text{if } n \text{ is odd natural number} \end{cases}.$$

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41. Find the 440th and 441 st terms of the sequence given by :

$$t_n = \begin{cases} \frac{n}{\frac{n}{44}-1} & \text{if } n \text{ is not the square of a natural number} \\ 2.7 & \text{if } n \text{ is the square of a natural number.} \end{cases}.$$

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42. A sequence of numbers $a_0, a_1, a_2, a_3,$ ..... satisfies the relation $a_n^2 - a_{n-1}a_{n+1} = (-1)^n$. Find a_3, given $a_0 = 1$ and $a_1 = 3$.

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43. Consider the sequence defined by $t_n = an^2 + bn + c$. If $t_2 = 3, t_4 = 13$ and $t_7 = 113$, show that $3t_n = 17n^2 - 87n + 115$.

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44. Find 'd' and write the next four terms of the following A.P.' s :

0,-3,-6,-9,..... .

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45. Find 'd' and write the next four terms of the following A.P.' s :

$\frac{1}{6}, \frac{1}{3}, \frac{1}{2}$,.....

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46. Find 'd' and write the next four terms of the following A.P.' s :

$-1, \frac{1}{4}, \frac{3}{2}$,.....

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47. Find 'd' and write the next four terms of the following A.P.' s :

$x + y, x - y, x - 3y,$ .....

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48. Find 'd' and write the next four terms of the following A.P.' s :

$2x - 3y, \ -2x + 3y - 6x + 9y,$.....

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49. Find the general term of the A.P. given by : x+b, x + 3b, x + 5b,.....

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50. Find the indicated term(s) of the following A.P.' s :

-1,-2-3,-4, ..., t_{100}.

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51. Find the indicated term(s) of the following A.P.' s :

$n-1, n-2, n-3, \ldots\ldots\ldots\ldots, a_m.$

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52. Find the indicated term(s) of the following A.P.' s :

a=3 ,d=2, $a_{10}, a_n.$

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53. Find the indicated term(s) of the following A.P.' s :

$a = \frac{1}{5}, d = \frac{2}{3}, a_{18}, a_n.$

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54. Find the 20th, 25 th and nth term of the A.P. given by : 21,16,11,6,1,-4,-9,.....

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55. Is 310 a term of the A.P. 3,8, 13, 18,..... ?

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56. Which term in the A.P. 68, 64 60, ... is - 8 ?

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57. Which term in the A.P. 1, 6, 11, 16,..... is 301 ?

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58. Determine the number of terms in the A.P. $17, 14\frac{1}{2}, 12, \ldots\ldots\ldots, -38.$

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59. Determine k so that k+2, 4k-6 and 3k-2 are three consecutive terms of an A.P.

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60. Determine k so that : 8k + 4, 6k-2, 2k-7, are the three consecutive terms of an A.P.

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61. Determine k so that : $\frac{2}{3}, k, \frac{5}{8}$, are the three consecutive terms of an A.P.

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62. Show that the linear function in n i.e. f(n)=an+b determines an arithmetic progression, where a,b are constants.

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63. The third term of an A.P. is 25 and the tenth term is - 3. Find the first term and the common difference.

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64. The 10th term of an A.P. is 52 and the 16th term is 82. Determine the 32nd term.

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65. The 3rd term of an A.P. is 1 and 6th term is -11. Determine its 15th term and rth term.

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66. In an A.P., the third term is p and the fourth term is q, find the 10th term and the general term.

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67. The first term of an A.P. is -4 and 10th term is 14. Determine the 30th term.

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68. In an A.P., the mth term is $\frac{1}{n}$ and the nth term is $\frac{1}{m}$, find the (mn)th term.

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69. The 4th term of an A.P. is equal to 3 times the first term and 7^{th} term exceeds twice the 3rd term by 1. Find the first term and common difference.

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70. The 2nd, 31st and last terms 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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71. If the pth,term of an A.P. is q and the qth is p, then the rth term is

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72. In an A . P , if mth Term is n and nth term is m , where $m \neq n$, find the pth term .

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73. If pth term of an A.P. is c and the qth term is d, what is the rth term ?

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74. 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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75. For the A.P., $a_1, a_2, a_3,$ ....., if $\frac{a_4}{a_7} = \frac{2}{3}$, find $\frac{a_6}{a_8}$.

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76. If $a_1, a_2, a_3, \ldots\ldots\ldots\ldots, a_n$ be an A.P. of non-zero terms, prove that :

$$\frac{1}{a_1 a_2} + \frac{1}{a_2 a_3} + \ldots\ldots\ldots\ldots + \frac{1}{a_{n-1} a_n} = \frac{n-1}{a_1 a_n}.$$

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77. If $a_1, a_2, \ldots\ldots\ldots, a_n$ are in A.P. and $a_i > 0$ for all i , prove that :

$$\frac{1}{\sqrt{a}_1 + \sqrt{a}_2} + \frac{1}{\sqrt{a}_2 + \sqrt{a}_3} + \ldots\ldots\ldots\ldots + \frac{1}{\sqrt{a_{n-1}} + \sqrt{a}_n} = \frac{n-1}{\sqrt{a}_1 + \sqrt{a}_n}$$

.

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78. If $a_1, a_2, a_3, \ldots\ldots\ldots\ldots, a_n$ are in A.P. with common difference d, prove that :

$$\sin d[\cos eca_1 \cos eca_2 + \cos eca_2 \cos eca_3 + \ldots. \cos eca_{n-1} \cos eca_n] = \cot a$$

.

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79. If m times the mth term is equal to n times the nth term of an A.P. prove that(m+n)th term of an A.P. is zero.

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80. Find the sum of indicated number of terms of the following A.P.'s :

5, 2, -1, - 4, -7, ..., n terms.

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81. Find the sum of indicated number of terms of the following A.P.'s :

$-1, \frac{1}{4}, \frac{3}{2}, \ldots\ldots$, 81 terms.

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82. Find the sum of indicated number of terms of the following A.P.'s :

2, 4, 6, ..., 100 terms.

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83. Find the sum of indicated number of terms of the following A.P.'s :

$-0.5,\ -1.0,\ -1.5,$ ..... , 10 terms, 50 terms .

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84. Find the sum of indicated number of terms of the following A.P.'s :

x+y, x-y, x -3y, ... , 22 terms .

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85. Out of k, a, n, d and S_n, determine the ones that are missing from the following :

l=8,n=8, $S_8 = -20.$

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86. Out of l, a, n, d and S_n, determine the ones that are missing from the following :

a = -3030, l= -1530, n = 51.

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87. How many terms of the sequence 18, 16, 14.... should be taken so that their sum is zero ?

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88. How many terms of the sequence -12,-9, -6, -3, ... must be taken to make the sum 54 ?

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89. How many terms of the sequence -6, $\frac{-11}{2}$, -5,.... must be taken to make the sum - 25 ?

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90. Find the sum of the series : 72 + 70 + 68 +....+ 40?

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91. Find the sum of first n natural numbers.

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92. Find the sum of first 100 natural numbers.

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93. Find the sum to n terms of the A.P. whose kth term is 5k + 1.

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94. If the sum of n terms of an A.P. is $\left(pn + qn^2\right)$, where p and g are constants, find the common difference.

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95. 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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96. Find the sum of 32 terms of an A.P. whose third term is 1 and the 6th term is -11.

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

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98. If the first term of an A.P. is 2 and the sum of the first five terms is equal to one-fourth of the sum of the next five terms, find the sum of first 30 terms.

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99. If the 12th term of an A.P. is -13 and the sum of the first four terms is 24, what is the sum of the first 10 terms ?

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100. Show that the sum of n consecutive odd integers beginning with 1 equals n^2?

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101. Show that the sum of first n even numbers is equal to $\left(1+\frac{1}{n}\right)$ times the sum of first n odd numbers.

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

(A) 100200

(B) 1002001

(C)1000201

(D) 100002

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103. Find the sum of all natural numbers between 99 and 1001 which are multiples of 5.

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104. Find the sum of first hundred even natural numbers divisible by 5.

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105. Find the sum of all integers between 50 and 500, which are divisible by 7.

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106. Find the sum of all numbers between 200 and 400 which are divisible by 7.

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107. How many terms are there in A.P. whose first and fifth terms are -14 and 2 respectively and the sum of terms is 40 ?

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108. If the sum of the first n terms of a sequence is of the form $An^2 + Bn$, where A, B are constants independent of n, show that the sequence is an A.P. Is the converse true ? Justify your answer.

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109. If the 5th and 12th terms of an A.P. are 30 and 65 respectively, what is the sum of the first 20 terms ?

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110. If the first term a_1 of an A.P. is 22, the common difference d = -4 and the sum to n terms is 64, find n. Explain the double answer.

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111. 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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112. If the sum of first p terms of an A.P. is equal to the sum of the first q terms, then find the sum of the first (p+ q) terms.

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113. If 'S' is the sum of a finite A.P. whose first term is 'a' and last term is 'l', show that its common difference is equal to $\frac{l^2 - a^2}{2S - a - l}$.

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114. In an A.P., of which a is the first term, if the sum of the first p terms is zero, show that the sum of the next q terms is $\frac{-a(p+q)q}{p-1}$.

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115. The sum of n terms of two arithmetic series are in the ratio of $\frac{7n+1}{4n+27}$. Find the ratio of their 12th terms.

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116. The sum of n terms of arithmetic progressions are in the ratio (3n+ 8): (7n+ 15). Find the ratio of their 12th terms.

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117. 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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118. A man saves ₹3200 during the first year, ₹ 3600 in the next year, ₹ 4000 in the third year. If he continues his saving in this sequence, in how many years will he have Rs. 200000 ?

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119. A gentleman buys every year Bank's certificates of value exceeding the last year's purchase by ₹25. After 20 years he finds that the value of the certificates purchased by him is ₹ 7250. Find the value of the certificates bought by him : in the first year.

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120. A gentleman buys every year Bank's certificates of value exceeding the last year's purchase by ₹25. After 20 years he finds that the value of the certificates purchased by him is ₹ 7250. Find the value of the certificates bought by him : in the 13th year.

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121. If in an A.P. $S_1 = 6$ and $S_7 = 105$, prove that :

$S_n, S_{n-3} : : (n+3), (n-3)$.

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122. In an A.P., $S_3 = 6$ and $S_6 = 3$ prove that:

$2(2n+1)S_{n+4} = (n+4)S_{2n+1}$.

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123. 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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124. If 'a' and 'b' are respectively the pth and qth terms of an A.P., show that the sum of (p + q) terms is $\frac{p+q}{2}\left[(a+b)+\frac{a-b}{p-q}\right]$.

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125. 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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126. Find the A.M. between :

3.7 and 5.5.

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127. Find the A.M. between :

6 and -8.

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128. Insert 3 arithmetic means between :

3 and 15.

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129. Insert 3 arithmetic means between :

5 and 21.

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130. Insert 5 arithmetic means between 8 and 26.

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131. Insert 6 arithmetic means between 3 and 24.

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132. Insert 10 arithmetic means between 2 and 57.

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133. If A is the A.M. between a and b, prove that :

$$(A-a)^2+(A-b)^2=\frac{1}{2}(a-b)^2.$$

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134. If A is the A.M. between a and b, prove that :

$4(a-A)(A-b)=(a-b)^2.$

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135. If A_1 and A_2 are two A.M.'s between a and b, prove that :

$(2A_1-A_2)(2A_2-A_1)=ab.$

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136. If A_1 and A_2 are two A.M.'s between a and b, prove that :

$A_1+A_2=a+b.$

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137. Insert 10 A.M.'s between 5 and -17 and prove that their sum is ten times the A.M. between them.

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138. n arithmetic means are inserted between 3 and 17 such that ratio of first and the last means is 1: 3, find n.

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139. If a, b, c are in A.P., then prove that :

$(a-c)^2 = 4(b^2 - ac)$.

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140. If a, b, c are in A.P., prove that :

$a^3 + 4b^3 + c^3 = 3b(a^2 + c^2)$.

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141. 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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142. 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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143. Between 1 and 31, n A.M's have been inserted in sucha a way that the ratio of 7th and (m-1)th means is 5:9, find the value of m.

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144. Find three numbers in A.P. :

whose sum is 21 and product is 315.

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145. Find three numbers in A.P. :

whose sum is 24 and Product is 440.

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146. 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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147. The sum of three Consecutive terms of an A.P. is 15 and sum of their Squares is 83. Find the terms.

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148. The sum of three consecutive terms of an A.P. is 9 and the sum of their squares is 35. Find the terms.

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149. Split 69 into three parts in A.P. such that the product of the two smaller parts is 483.

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150. Solve the equation :

$1 + 6 + 11 + 16 + \ldots . + x = 148$

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151. Solve the equation :

$2 + 5 + 8 + 11 + \ldots\ldots + x = 345.$

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152. The sum of four numbers in A.P. is 4 and their product is 385. Find the numbers.

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153. Find four terms in A.P. whose sum is 20 and the sum of whose squares is 120.

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154. We are given an A.P. with 1st term a and common difference d.

If each of its terms is increased by the same quantity k, is the resulting progression also an A.P. ? If so, find its common difference.

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155. We are given an A.P. with 1st term a and common difference d.

If each of the terms is multiplied by the same number c, is the resulting progression also an A.P. ? If so, find its common difference.

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156. If a, b, c are in A.P., prove that :

$b+c, c+a, a+b$ are also in A.P.

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157. If a, b, c are in A.P., prove that :

$\frac{1}{\sqrt{b}+\sqrt{c}}, \frac{1}{\sqrt{c}+\sqrt{a}}, \frac{1}{\sqrt{a}+\sqrt{b}}$ are also in A.P.

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158. If a, b, c are in A.P., prove that :

$(b+c)^2-a^2, (c+a)^2-b^2, (a+b)^2-c^2$ are also in A.P.

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159. If $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are in A.P., prove that : $\frac{b+c}{a}, \frac{c+a}{b}, \frac{a+b}{c}$ are also in A.P.

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160. If $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are in A.P., prove that : $a(b+c), b(c+a), c(a+b)$ are also in A.P.

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161. If $a+b+c \neq 0$ and $\frac{b+c}{a}, \frac{c+a}{b}, \frac{a+b}{c}$ are in A.P., prove that : $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are also in A.P.

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162. If a^2, b^2, c^2 are in A.P. Prove that $\frac{a}{b+c}, \frac{b}{c+a}, \frac{c}{a+b}$ are also in A.P.

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163. 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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164. Find 'r' and write the fourth term of the following progressions :

5, 0.5, 0.05,.....

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165. Find 'r' and write the next four terms of the following progressions :

$-\frac{2}{3}$, -6, -54,.....

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166. Find the 20th and nth terms of the G.P. $\frac{5}{2}, \frac{5}{4}, \frac{5}{8}, ...$

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167. Find the indicated term(s) of the following G.P.'s :

$12, 8, \frac{16}{3}, \ldots\ldots\ldots\ldots\ldots\ldots, t_6, t_{10}.$

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168. Which term of the geometric sequences :

2, 8, 32, is 131072 ?

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169. Which term of the following sequence:- $\sqrt{3}, 3, 3\sqrt{3}$,....is 729?

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170. Which term of the following sequence:- $\frac{1}{3}, \frac{1}{9}, \frac{1}{27}$,.....is $\frac{1}{19683}$?

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171. For what values of x, the numbers $-\frac{2}{7}$,x, $-\frac{7}{2}$ are in G.P.?

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172. In a G.P., the third term is 24 and the 6th term is 192. Find the 10th term .

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173. In a G.P., the third term is 24 and the 6th term is 192. Find the 8th term .

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

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175. The first term of a G.P. is 1. The sum of the third term and fifth term is 90. Find the common ratio of G.P.

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176. 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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177. The 4th term of a G.P. is square of second term and first term is -3. Determine its 6th term.

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178. The 4th, 7th and 10th terms of a GP. are a, b, c respectively. Show that $b^2 = ac$.

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179. 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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180. If the 4th, 10th and 16th terms of a G.P. are x, y and z, respectively. Prove that x, y, z are in G.P.

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181. If $a > 0, b > 0, c > 0$ be respectively the pth, qth and rth terms of a G.P. are $a, b, c,$ prove that : $(q-r)\log a + (r-p)\log b + (p-q)\log c = 0.$

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182. If pth term of a G.P. is P and its qth term is Q, prove that the nth term is $\left(\frac{P^{n-q}}{Q^{n-p}}\right)^{\frac{1}{p-q}}$.

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183. The terms of a G.P. with first term 'a' and common ratio 'r' are squared. Is the resulting sequence also a G.P. ? If it is so, find its first term, common ratio and the nth term.

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184. If the first and the nth 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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185. If x, y, z are three positive numbers forming a geometric sequence, then show that $\log_a x, \log_a y, \log_a z$ form an arithmetic sequence , a being positive and not equal to 1.

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186. The $(m+n)th$ and $(m-n)th$ terms of a GP are p and q, respectively. Then, the mth term of the GP is

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187. If a,b,c are in A.P. and x,y,z are in G.P., then show that $x^{b-c}.\, y(c-a).\, z(a-b) = 1.$

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188. Evaluate $\sum_{k=1}^{11}\left(2+3^{k}\right).$

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189. Evaluate : $\sum_{i=1}^{18}\left(2^{i}+3^{i-1}\right).$

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190. Find the sum to indicated number of terms of the geometric progressions given below:- $\sqrt{7}, \sqrt{21}, 3\sqrt{7}$,.....n terms.

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191. Find the sums of the indicated number of terms of the following geometric progressions :

$2, -\frac{1}{2}, \frac{1}{8}$, ..., n terms, 12 terms.

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192. Find the sums of the indicated number of terms of the following geometric progressions :

$1, \frac{1}{3}, \frac{1}{9}$ ....., n terms, 5 terms.

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193. 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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194. Find the sum to indicated number of terms of the geometric progressions given below:- $x^3, x^5, x^7,$ ... n terms(if $x \neq \pm 1$).

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195. Find the sum to indicated number of terms of the geometric progressions given below:- $1, -a, a^2, -a^3,$ ... n terms (if $a \neq -1$).

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196. Find the sums of the indicated number of terms of the following geometric progressions :

$x^2 - y^2, x - y, \frac{x-y}{x+y},$ ...., n terms $(x + y \neq 1)$.

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197. How many terms of G.P. $3, 3^2, 3^3,$ ... are needed to give the sum 120?

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198. How many terms of a G.P. $3, \frac{3}{2}, \frac{3}{4}, \ldots\ldots\ldots$ are needed to give the sum $\frac{3069}{512}$?

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199. Determine the number n of terms of the G.P. 3,6,12, ... so that $S_n = 381$.

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200. Given a G.P. with a= 1,$r = \sqrt{2}$. Find S_{20}.

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201. Given a G.P. with a= 729 and 7th term 64, determine S_7.

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202. If $\{a_n\}$ is a G.P. and $a_1 = 4$,r=5, find a_6 and S_6.

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203. 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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204. 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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205. 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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206. Find the sum to.n terms of the following series $5 + 55 + 555$+.....

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207. Sum to n terms:

9+ 99 + 999 + ...

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208. Sum to n terms:

3 + 33+ 333 +.....

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

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210. Sum to n terms:

8 + 88 + 888+.....

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211. The sum of first 20 terms of the sequence $0.7, 0.77, 0.777, \ldots\ldots$ is

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

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213. Sum to n terms:

0.3+ 0.33 +0.333 +.....

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214. Sum to n terms:

0.5+0.55 + 0.555 +...

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

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216. If $\frac{1}{1+l} = v$, prove that : $v + v^2 + v^3 + \ldots\ldots\ldots + v^n = \frac{1 - v^n}{l}$.

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217. Find the sum to n terms of the sequence : $1, -1, 1, -1, \ldots\ldots, (-1)^{n+1}, \ldots\ldots\ldots$

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218. If the sum of first 10 terms is 33 times the sum of first 5 terms of G.P., find the common ratio.

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219. 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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220. 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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221. If S_1, S_2, S_3 be the sum of n, 2n, 3n terms of a G.P., show that : $S_1(S_3 - S_2) = (S_2 - S_1)^2$.

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222. An inventor of the chess board suggested a reward of one grain of wheat for 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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223. 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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224. A machine is depreciated at the rate of 10 % yearly and the ultimate scrap value was ₹ 6561. Find the effective life of the machine. The price of the machine is ₹ 10,000.

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225. Insert two numbers between 3 and 81 so that the resulting sequence is G.P.

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226. Insert 4 geometric means between 6 and 192.

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227. The A.M. between two numbers is 20 and their G.M. is 16. Find the numbers.

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228. a, b, c are in G.P. and x and y are the A.M.'s between a, b and b, c respectively. Show that :

$$\frac{a}{x}+\frac{c}{y}=2.$$

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229. a, b, c are in G.P. and x and y are the A.M.'s between a, b and b, c respectively. Show that :

$$\frac{1}{x}+\frac{1}{y}=\frac{2}{b}.$$

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230. 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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231. 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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232. If G_1 is the first of n geometric means between a and b, show that : $G_1^{n+1}=a^n b$.

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233. If G is the geometric mean between two distinct positive numbers a and b, then show that $\frac{1}{G-a}+\frac{1}{G-b}=\frac{1}{G}$.

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

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235. If one geometric mean G and two arithmetic means p amd q be inserted between two quantities, then show that $G^2 = (2p - q)(2q - p)$.

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236. If a is the A.M. of b and c and the two geometric means are G_1 and G_2, then prove that $G_1^3 + G_2^3 = 2abc$

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237. If p ,q, r are in A.P., a is G.M. between p, q and b is G.M. between q, r, then prove that a^2, q^2, b^2 are in A.P.

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238. Find n such that $\frac{a^n + b^n}{a^{n-1} + b^{n-1}}$ may be the geometric mean between two quantities a and b.

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239. 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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240. If A and G are the A.M. and G.M. respectively between any two distinct positive numbers a and b then show that A > G.

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241. 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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242. 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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243. The sum of three numbers in A.P. is 15. If 1, 4 and 19 are added to the numbers, the resulting numbers are in G.P. Find the numbers.

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244. The sum of three numbers which are consecutive terms of an A.P. is 21. If the second number is reduced by 1 and the third is increased by 1, we obtain three consecutive terms of a G.P. Find the numbers.

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245. There are four numbers such that the first three of them form an arithmetic Sequence and the last three form a geometric Sequence. The sum of the first and third terms is 2 and that of second and fourth is 26. What are these numbers ?

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246. The sum of first three terms of a 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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247. Find three numbers in G.P. : whose sum is 30 and whose Product is 216.

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248. Find three numbers in G.P. : whose sum is 38 and whose product is 1728.

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249. Find three numbers in G.P. whose sum is 35 and sum of their squares is 525.

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250. If a, b,c are in G.P., prove that the following are also in G.P. :

$a^2, b^2, c^2.$

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251. If a, b,c are in G.P., prove that the following are also in G.P. :

a^3, b^3, c^3.

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252. If a, b,c are in G.P., prove that the following are also in G.P. :

$a^2 + b^2, ab + bc, b^2 + c^2$.

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253. If a,b,c, d are in G.P., show that :

$a + b, b + c$ and $c + d$ are also in G.P.

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254. If a,b,c, d are in G.P., show that :

a^2+b^2, b^2+c^2 and c^2+d^2 are also in G.P.

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

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257. If a, b and c are three consecutive terms of an A.P.,prove that k^a, k^b and k^c are three consecutive terms of a G.P. Assume k to be a non-zero

real number.

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

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259. The sum of four numbers in G.P. is 60 and the arithmetic mean of the first and the last is 18. Find the numbers.

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260. Find S_∞, for the following infinite G.P.'s :

$1, \frac{1}{2}, \frac{1}{2^2}, \ldots\ldots\ldots\ldots \to \infty.$

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261. Find S_∞, for the following infinite G.P.'s :

$1, \frac{1}{3}, \frac{1}{9}, \ldots\ldots\ldots\ldots \to \infty.$

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262. Find S_∞, for the following infinite G.P.'s :

$5, \frac{20}{7}, \frac{80}{49}, \ldots\ldots\ldots\ldots \to \infty.$

Watch Video Solution

263. Find S_∞, for the following infinite G.P.'s :

$50, 42.5, 36.125, \ldots\ldots\ldots\ldots \to \infty.$

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264. Find S_∞, for the following infinite G.P.'s :

$0.3, 0.18, 0.108, \ldots\ldots\ldots\ldots \to \infty.$

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265. Sum the following series :

$(\sqrt{2}+1)+1+(\sqrt{2}-1)+\ldots\ldots+\infty.$

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266. Sum the following Series :

$\frac{2}{5}+\frac{3}{5^2}+\frac{2}{5^3}+\frac{3}{5^4}+\ldots\ldots\ldots\ldots\to\infty.$

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267. The value of $9^{\frac{1}{3}}, 9^{\frac{1}{9}}.9^{\frac{1}{27}}\ldots\ldots\ldots\ldots\ldots up\to\infty$ is:

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268. Given a G.P. with a= 729 and 7th term 64, determine S_7.

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269. The common ratio of a G.P. is $-\frac{4}{5}$ and the sum to infinity is $\frac{80}{9}$. Find the first term.

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270. Find S_∞ of G.P. whose first term is 28 and the fourth term is $\frac{4}{49}$.

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271. The sum of an infinite number of terms of a G.P. is 15 and the sum of their squares is 45. Find the G.P.

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272. Evaluate the following :

$0.\overline{45}$.

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273. Evaluate the following :

$1.\ \overline{36}.$

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274. Evaluate the following :

$0.2\overline{35}.$

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275. Evaluate the following :

$0.\ \overline{712}.$

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276. Find a rational number of the following which will have as its expansion :

$0.6\bar{8}.$

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277. Find a rational number of the following which will have as its expansion :

$0.1\bar{5}.$

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278. Find a rational number of the following which will have as its expansion :

$1.2\overline{56}.$

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279. Find a rational number of the following which will have as its expansion :

$0.23\bar{4}.$

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280. Let $x = 1 + a + a^2 + ...$ And $y = 1 + b + b^2 + ...$ where $|a| < 1$ and $|b| < 1$. Prove that: $1 + ab + a^2b^2 + ... = \frac{xy}{x + y - 1}.$

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281. One side of a equilateral triangle is 24 cm. The mid-points of its sides are joined to form another triangle whose mid-points, in turn, are joined to form still another triangle. This process continues, indefinitely. Find the sum of the perimeters of all the triangles.

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282. Find the sum to n terms of the following series :

$1+\frac{3}{2}+\frac{5}{2^2}+\frac{7}{2^3}+\ldots\ldots\ldots$

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283. Find the sum to n terms of the following series :

$1+\frac{2}{3}+\frac{3}{3^2}+\frac{4}{3^3}+\ldots\ldots$

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284. Find the sum to n terms of the following series :

$3+5\times\frac{1}{4}+7\times\frac{1}{4^2}+\ldots\ldots$

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285. Find the sum to n terms of the following series :

$1+2x+3x^2+4x^3+\ldots\ldots\ldots$ when |x|<1.

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286. Find the sum to n terms of the following series :

$1 + 3x + 5x^2 + 7x^3 +$ ..... when |x|<1.

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287. Find the sum to n terms of the following series :

$1 + 4x + 7x^2 + 10x^3 +$ ..... when |x|<1.

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288. Find the sum to infinity of the following series :

$2 + \frac{3}{2} + 1 + \frac{5}{8} +$ .....

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289. Find the sum to infinity of the following series :

$1+\frac{2}{3}+\frac{3}{3^2}+\frac{4}{3^3}+\ldots\ldots$

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290. Find the sum to infinity of the following series :

$1-\frac{3}{2}+\frac{5}{4}-\frac{7}{8}+\ldots\ldots\ldots$

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291. Find the sum to infinity of the following series :

$1-\frac{2}{3}+\frac{3}{3^2}-\frac{4}{3^3}+\frac{5}{3^4}-\ldots\ldots$

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292. If the sum to infinity of the series $3+5r+7r^2+\ldots\ldots\ldots is\frac{44}{9}$.

Find r.

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293. If the sum to infinity of the series : $1-(1+d)\times\frac{1}{3}+(1+2d)\times\frac{1}{9}-(1+3d)\times\frac{1}{27}+$ ..... is $\frac{9}{16}$, find d .

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294. Sum to n terms the series : $2+5x+8x^2+11x^3+\ldots\ldots\ldots, |x|<1.$

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295. Prove that : $2^{\frac{1}{4}}\times4^{\frac{1}{8}}\times8^{\frac{1}{16}}\times16^{\frac{1}{32}}\times\ldots\ldots\to\infty=2.$

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296. Find the sum of the following series :

$2^2 + 4^2 + 6^2$ + ... to n terms .

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297. Find the sum of the following series :

$1^3 + 3^3 + 5^3$+ .... to n terms .

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298. Find the sum of the following series :

1.3+3.5+5.7+ .... to n terms .

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299. Find the sum of the following series :

1.2+2.3+3.4+ .... to n terms .

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300. Find the sum of n terms of the series $1.\ 2^2 + 2.\ 3^2 + 3.\ 4^2 +$

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301. Find the sum of the following series :

$3.1^2 + 5.2^2 + 7.3^2$+ .... to n terms .

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302. Find the sum of the following series :

$1.3.5 + 2.4.6 + 3.5.7$ + ... to n(n+2)(n+4) .

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303. Find the sum of the following series :

$5.6 + 6.7 + 7.8+$ .... to 25 terms .

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304. Find the sum of the following series :

$3.8 + 6.11 + 9.14 +$ .... to n terms .

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305. Find the sum of the following series :

$2^2 + 5^2 + 8^2+$.... to 15 terms .

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306. Find the sum to n terms of the series given below:-

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

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307. Find the sum of the following series :

$1+(1+2)+(1+2+3)+$ .... to n terms .

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308. Find the sum to n terms of the series

$1^2+\left(1^2+2^2\right)+\left(1^2+2^2+3^2\right)+$ .....

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309. The sum of first 9 terms of the series

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

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310. Find the sum of the first a terms of the series whose nth term is:

$n(n+3)$.

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311. Find the sum of the first a terms of the series whose nth term is:

$3n^2+5$.

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312. Find the sum of n terms of the series whose nth term is given by

n^2+2^n

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313. Find the sum S_n of the cubes of the first n terms of an A.P. and show that the sum of first n terms of the A.P. is a factor of S_n .

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314. Show that the sum of the cubes of any number of consecutive integers is divisible by sum of those integers.

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315. An odd of stones lie along a straight path, the distance between any two consecutive stones being 10 m. The stones are to the collected at the place where the middle stone lies. A man can carry only one stone at a time. He starts carrying the stones beginning from the extreme stone. If he covers a path of 3 km, how many stones are there ?

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316. Find the sum of n terms of the following series :

$1 + 3 + 6 + 10 +$.....

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317. Find the sum of n terms of the following series :

$2 + 5 + 10 + 17 +$ .....

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318. Find the sum of n terms of the following series :

$1 + 3 + 7 + 13 +$.....

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319. Find the sum of n terms of the following series :

$1 + 5 + 13 + 29 + 61 +$ .....

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320. Find the sum of n terms of the following series :

$1 + 3 + 7 + 15 + 31 +$.....

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321. Find the sum of n terms of the following series :

$7 + 77 + 777 +$.....

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322. Find the sum of n terms of the following series :

$5 + 11 + 19 + 29 + 41 +$ .....

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

$3 + 7 + 13 + 21 + 31 +$ .....

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324. Find the sum of n terms of the series whose nth term is :

$2^{n-1} - 1.$

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325. Find the sum of n terms of the series whose nth term is :

$2^{n+1} + 4(n+1)(n-2).$

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326. Write the first six terms of the following sequence :

$a_1 = a_2 = 1, a_n = a_{n-1} + a_{n-2} (n \geq 3).$

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327. Which term of the progression $19, 18\frac{1}{5}, 17\frac{2}{5}, \ldots\ldots\ldots$ is the first negative term ?

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328. Each term of an A.P. is doubled. Is the resulting sequence also an A.P. ? If it is, write its first term common difference and nth term.

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329. In an A.P., the mth term is $\frac{1}{n}$ and the nth term is $\frac{1}{m}$, find the (mn)th term.

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330. If a, b, c are in A.P., then prove that :

$(a-c)^2 = 4(b^2 - ac)$.

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331. Show that the sequence : log a, log (ab), $\log\left(ab^2\right)$, $\log\left(ab^3\right)$,..... is an A.P. Find its nth term.

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332. How many number of two digits are divisible by 7 ?

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333. If S_n denotes the sum of n terms of an A.P. whose first term is a, and the common difference is d Find: = Sn - 2Sn + S(n +2)` .

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334. If $S_1, S_2, S_3, ..., S_p$ are the sums of n terms of p AP's whose first terms are $1, 2, 3, \ldots, p$ and common differences are $1, 2, 3, \ldots, (2p-1)$ respectively, show that $S_1 + S_2 + S_3 + ... + S_p = \frac{1}{2}np(np+1)$.

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335. If the sum of m terms of an AP is equal to the sum of either the next n terms or the next p terms, then prove that $(mn)\left(\frac{1}{m} - \frac{1}{p}\right) = (m+p)\left(\frac{1}{m} - \frac{1}{n}\right)$.

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336. If the sum of first p terms of an A.P. is equal to the sum of the first q terms, then find the sum of the first (p+ q) terms.

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337. The first term of an A.P. is a, the second term is b and last term is c. Show that the sum of A.P. is : $\frac{(b+c-2a)(c+a)}{2(b-a)}$.

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338. Find the sum of all numbers in the first 1000 integers, which are neither divisible by 5 nor by 2.

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339. A man gets an appointment with two options Either he can accept ₹ 45 per day for 30 days or ₹ 30 on the first day with an increase of ₹ 1.50 per day for 30 days. Which of the options will be beneficial to him ? How much will he gain by that choice ?

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340. 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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341. 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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342. Two cars start together in the same direction at the same place.The first goes with the speed of 10km/hr. The second goes at the speed of 8 km/hr in the first hour and increases the speed by $\frac{1}{2}$ km each succeeding hour. After how many hours will the second car overtake the first if both cars go non-stop ?

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343. The ages of the students of a class form an A.P. whose common difference is 4 months. If the youngest student is 8 years old and the sum of the ages of all the students of the class 1s 168 years, find the number of students in the class.

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344. If $b^2+c^2, c^2+a^2, a^2+b^2$ are in A.P. prove that : $\frac{1}{b+c}, \frac{1}{c+a}, \frac{1}{a+b}$ are also in A.P.

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345. If $a^{-1}, b^{-1}, c^{-1}, d^{-1}$ are in A.P., then show that : $b=\frac{2ac}{a+c}$ and $\frac{b}{d}=\frac{3a-c}{a+c}$.

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346. If $a_1 = 1, a_2 = 5$ find the common difference and 5th term of A.P

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347. If the A.M. between pth and qth terms of an A.P. be equal to the A.M. between rth and sth terms of the A.P., show that p +q= r+s.

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348. If a, b, c are in A.P., prove that :

$a^3 + 4b^3 + c^3 = 3b(a^2 + c^2)$.

Watch Video Solution

349. If $a^2(b + c), b^2(c + a), c^2(a + b)$ are in A.P., show that : either a, b, c are in A.P. or ab + bc + ca =0.

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350. If the mth, nth and pth terms of a G.P. form three consecutive terms of a geometric sequence, prove that m, n and p form three consecutive terms of an arithmetic sequence.

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351. If x,y,z are in G.P. and $a^x = b^y = c^z$, prove that $\log_b a . \log_b c = 1$.

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352. We are given two G.P.'s, one with the first term 'a' and common ratio ‘r’ and the other with first term ‘b’ and common ratio ‘s’. Show that the sequence formed by the product of corresponding terms is a G.P. Find its first term and the common ratio. Show also that the sequence formed by the quotient of corresponding terms is G.P. Find its first term and common ratio.

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353. If S_n represents the sum of n terms of a G.P. whose first term and common ratio are a and r respectively. Prove that :

$$S_1 + S_2 + S_3 + \ldots . + S_m = \frac{am}{1-r} - \frac{ar(1-r^m)}{(1-r)^2}.$$

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354. If a, b, c are in GP, show that the equations $ax^2 + 2bx + c = 0$ and $dx^2 + 2ex + f = 0$ have a common root if $\frac{a}{d}, \frac{b}{e}, \frac{c}{f}$ are in HP

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355. Find the derivative of the following

$$y = x + \frac{1}{x} + \sin x$$

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356. The sum of the first three consecutive terms of G.P. is 13 and the sum of their Squares is 91. Determine the G.P.

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357. If $\frac{1}{a+b}+\frac{1}{b+c}=\frac{1}{b}$, prove that a, b, c are in G.P.

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358. 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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359. The height of a plant at a certain date is 1.6 metre. If it increases by 5 cm in the following year and if the increase in each year is half of that in the following years, show that the plant will never be 1.7 metre high.

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360. If $|x|<1$ and $|y|<1$, find the sum to infinity of the series : $(x+y)+\left(x^2+xy+y^2\right)+\left(x^3+x^2y+xy^2+y^3\right)+$ .....

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361. 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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362. Prove the following by using the principle of mathematical induction for all $n \in N$:-

$$1+\frac{1}{(1+2)}+\frac{1}{(1+2+3)}+\ldots+\frac{1}{(1+2+3+\ldots n)}=\frac{2n}{(n+1)}.$$

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363. Find the sum of the series

$1 \cdot n+2 \cdot (n-1)+3 \cdot (n-2)+4 \cdot (n-3)+\ldots+(n-1) \cdot 2+n \cdot 1$

also, find the coefficient of x^{n-1} in th cxpansion of $\left(1+2x+3x^2+\ldots.nx^{n-1}\right)^2$.

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364. Find the sum of n terms of the series: $\frac{1}{1.2}+\frac{1}{2.3}+\frac{1}{3.4}+\dot{+}$ 1/n $(n\dot{+}1)$

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365. Obtain the sum of the series : $\frac{1}{1.4}+\frac{1}{4.7}+\frac{1}{7.10}+$ ..... to n terms.

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366. Find the sum of n terms of the series $\frac{1}{1+1^2+1^4}+\frac{2}{1+2^2+2^4}+\frac{3}{1+3^2+3^4}+\ldots\ldots$

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367. Show that : $\frac{1\times 2^2+2\times 3^2+..+n\times(n+1)^2}{1^2\times 2+2^2\times 3+..+n^2(n+1)}=\frac{3n+5}{3n+1}$.

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368. 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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369. A man deposited ₹ 10,000 in a bank at the rate of 5% simple interest annually. Find the amount in 15th year since he deposited the amount and also calculate the total amount after 20 years.

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370. If a, b, c are in A.P. then 3^a, 3^b, 3^c are in:

A. A.P.

B. G.P.

C. H.P.

D. None of these.

Answer:

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

A. 36

B. 39

C. 30

D. 33

Answer:

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372. 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-e.

Answer:

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373. The third term of a GP is 3. What is the product of the first five terms?

A. 4^3

B. 4^5

C. 4^4

D. None of these.

Answer:

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374. 5th term of a G.P. is 2, then the product of first 9 terms is:

A. 256

B. 128

C. 512

D. None of these.

Answer:

Watch Video Solution

375. If the pth , qth , rth , terms of a GP . Are x,y,z respectively prove that :

$x^{q-r}. y^{r-p}. z^{p-q} = 1$

A. 0

B. 1

C. pqr

D. lmn.

Answer:

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376. The sum of the first n odd number is :

A. 2n

B. n^2

C. $\frac{n(n-1)}{2}$

D. $\frac{n(n+1)}{2}$.

Answer:

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377. If the sum of n natural numbers is one sixth of their squares, then n is :

A. 6

B. 7

C. 8

D. None of these.

Answer:

Watch Video Solution

378. The sum of the numbers 1, 4, 9, 16, ... , 100 is :

A. 380

B. 383

C. 385

D. 386

Answer:

Watch Video Solution

379. If p, q, r are in A.P. while x, y, z are in G.P., prove that $x^{q-r}.y^{r-p}.z^{p-q}=1.$

A. 1

B. $x+y+z$

C. xyz

D. $p+q+r.$

Answer:

Watch Video Solution

380. If $a^x=b^y=c^z$ and a, b, c are in G.P. then x,y,z are in :

A. A.P.

B. G.P.

C. H.P.

D. None of these.

Answer:

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381. If a,b,c are in AP and $(a+2b-c)(2b+c-a)(c+a-b)=\lambda abc$, then λ is

A. $\frac{abc}{2}$

B. abc

C. 2abc

D. 4abc.

Answer:

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382. 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.

A. 0

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

C. 1

D. -1.

Answer:

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383. Sum of the series $1^2 + 3^2 + 5^2 + \ldots + n^2$ is :

A. $\frac{n}{3}\left(4n^2 - 1\right)$

B. $\frac{n}{3}\left(4n^2 - n\right)$

C. $\frac{n}{3}\left(4n^2 + 1\right)$

D. $\frac{n}{3}\left(4n^2 + n\right)$.

Answer:

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384. $11^3 + 12^3 + 13^3 + ... + 20^3$ is :

A. an even integer

B. odd integer divisible by 5

C. multiple of 10

D. odd integer but not a multiple of 5.

Answer:

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385. If the 10th term of a G.P. is 9 and 4th term is 4, then its 7th term is :

A. 6

B. 36

C. $\frac{4}{9}$

D. $\frac{9}{4}$.

Answer:

Watch Video Solution

386. The 6th term of a G.P. is 32 and its 8th term is 128, then the value of the common ratio is :

A. -1

B. 2

C. 4

D. -4.

Answer:

Watch Video Solution

387. $11^3 + 12^3 + 13^3 + ... + 20^3$ is :

A. An odd integer divisible by 5

B. An even integer

C. Multiple of 10

D. None of these.

Answer:

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388. A boy goes to school from his home at a speed of x km/hr. and comes back at a speed of y km/hr., then the average speed is given by :

A. A.M.

B. G.M.

C. H.M.

D. Any of these.

Answer:

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389. If $a, a_1, a_2, a_3, \ldots\ldots, a_{2n}$b are in AP and $a, b_1, b_2, b_3, \ldots\ldots, b_{2n}$b are in GP and h is the HM of a and b, then $\frac{a_1 + a_{2n}}{b_1 b_{2n}} + \frac{a_2 + a_{2n-1}}{b_2 b_{2n-1}} + \ldots. + \frac{a_n + a_{n+1}}{b_n b_{n+1}}$ is equal to

A. 2nh

B. $\frac{n}{h}$

C. nh

D. $\frac{2n}{h}$.

Answer:

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390. The sum of the products of the ten numbers $\pm 1,\ \pm 2,\ \pm 3,\ \pm 4,\ \pm 5$ takung two at a time, is

A. $-\dfrac{n(n+1)}{2}$

B. $\dfrac{n(n+1)(2n+1)}{6}$

C. $-\dfrac{n(n+1)(2n+1)}{6}$

D. 0

Answer:

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391. Find the value of the expression $\sum_{i=1}^{n}\sum_{j=1}^{i}\sum_{k=1}^{j} 1.$

A. $\dfrac{n(n+1)(2n+1)}{6}$

B. $\left[\dfrac{n(n+1)}{2}\right]^2$

C. $\dfrac{n(n+1)}{2}$

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

Answer:

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392. If x is a positive number different from 1, such that $\log_a x$, $\log_b x$ and $\log_c x$ are in AP, then

A. G.P.

B. A.P.

C. H.P.

D. G.P. but not in H.P.

Answer:

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393. For what value of m, $\frac{a^{m+1}+b^{m+1}}{a^m+b^m}$ is the arithmetic mean of a and b ?

A. 1

B. 0

C. 2

D. None of these.

Answer:

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394. If a, b, c are in G.P. and x, y are arithmetic mean 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:

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395. A student read common difference of an A.P. as -3 instead of 3 and obtained the sum of first 10 terms as -30. Then the actual sum of first 10 terms is equal to :

A. 240

B. 120

C. 300

D. 180

Answer:

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396. If $a_1 = 1$ and $a_n = na_{n-1}$, for all positive integers $n \geq 2$, then a_5 is equal to :

A. 125

B. 120

C. 100

D. 24

Answer:

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397. If $a_1, a_2, \ldots\ldots\ldots, a_n$ are in A.P.with common difference $d \neq 0$, then $[\sin d][\sec a_1 \sec a_2 + \sec a_2 \sec a_3 + \ldots\ldots\ldots\ldots + \sec a_{n-1} \sec a_n]$ is equal to :

A. $\cot a_n - \cot a_1$

B. $\cot a_1 - \cot a_n$

C. $\tan a_n - \tan a_1$

D. $\tan a_n - \tan a_{n-1}$.

Answer:

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398. The arithmetic mean of first n odd natural numbers is :

A. 2n

B. n(n+ 1)

C. n

D. $\frac{n}{2}$.

Answer:

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399. In a sequence of 21 terms the first 11 terms are in A.P. with common difference 2. and the last 11 terms are in G.P. with common ratio 2. If the middle tem of the A.P. is equal to the middle term of the G.P., then the middle term of the entire sequence is

A. $-\frac{10}{31}$

B. $\frac{10}{31}$

C. $\frac{32}{31}$

D. $-\frac{31}{32}$.

Answer:

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400. If the sum to 2n terms of the A.P. 2, 5, 8, 11, ... is equal to the sum to n terms of 57, 59, 61, 63, ..., then n=

A. 10

B. 11

C. 12

D. 13

Answer:

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401. The third term of a GP is 3. What is the product of the first five terms?

A. 15

B. 81

C. 243

D. cannot be determined.

Answer:

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402. If the sum of the first two terms and the sum of the first four terms of a geometric progression with positive common ratio are 8 and 80 respectively then what is the 6th term ?

A. 88

B. 243

C. 486

D. 1458

Answer:

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403. If n> 1 and $\log_2 x, \log_3 x, \log_x 16$, are in G.P., then what is x equal to ?

A. 9

B. 8

C. 4

D. 2

Answer:

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404. In a geometric progression with first term a and common ratio r, what is the arithmetic mean of first five terms ?

A. $a + 2r$

B. ar^2

C. $a\left(r^5 - 1\right)(r - 1)$

D. $a\left(r^5 - 1\right) / [5(r - 1)]$.

Answer:

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405. The harmonic mean of two numbers is 21.6. If one of the numbers is 27, then what is the other number ?

A. 16.2

B. 17.3

C. 18

D. 20

Answer:

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406. Given that α, γ are roots of the equation $Ax^2 - 4x + 1 = 0, and \beta, \delta$ the roots of the equation of $Bx^2 - 6x + 1 = 0,$ such that $\alpha, \beta, \gamma, and \delta$ are in H.P., then

A. 3,8

B. -3,-8

C. 3,-8

D. -3,8.

Answer:

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407. Consider an infinite geometric series with first term a and common ratio r. If its sum is 4 and the second term is $\frac{3}{4}$, then :

A. $a = \frac{7}{4}, r = \frac{3}{7}$

B. $a = 2, r = \frac{3}{8}$

C. $a = \frac{3}{2}, r = \frac{1}{2}$

D. $a = 3, r = \frac{1}{4}.$

Answer:

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408. Sum of the n terms of the series $\frac{3}{1^2}+\frac{5}{1^2+2^2}+\frac{7}{1^2+2^2+3^3}+\ldots\ldots$ is

A. $\frac{n}{n+1}$

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

C. $\frac{6n}{n+1}$

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

Answer:

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409. Let α and β be the roots of $x^2-x+p=0$ and γ and δ be the root of $x^2-4x+q=0$. If $\alpha, \beta,$ and γ, δ are in G.P., then the integral values of p and q, respectively, are

A. -2,- 32

B. -2,3

C. -6,3

D. - 6, - 32.

Answer:

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410. Let the positive numbers a, b, c, d be in A.P. Then abc, abd, acd, bcd are:

A. not in A.P/ G.P/ H.P.

B. in A.P.

C. in GP.

D. in H.P.

Answer:

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411. If the sum to 2n terms of the A.P. 2, 5, 8, 11, ... is equal to the sum to n terms of 57, 59, 61, 63, ..., then n=

A. 10

B. 12

C. 11

D. 13

Answer:

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412. Suppose a, b, c are in AP and a^2, b^2, c^2 are in GP, If $a > b > c$ and $a + b + c = \frac{3}{2}$, than find the values of a and c.

A. $\frac{1}{2\sqrt{2}}$

B. $\frac{1}{2\sqrt{3}}$

C. $\frac{1}{2} - \frac{1}{\sqrt{3}}$

D. $\frac{1}{2} - \frac{1}{\sqrt{2}}$.

Answer:

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413. 5th term of a G.P. is 2, then the product of first 9 terms is:

A. 256

B. 512

C. 1024

D. None of these.

Answer:

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414. Find the sum of n terms of the series $1.\ 2^2 + 2.\ 3^2 + 3.\ 4^2 +$

A. $\frac{n(n+1)}{2}$

B. $\frac{n^2(n+1)}{2}$

C. $\frac{n(n+1)^2}{4}$

D. $\left[\frac{n(n+1)}{2}\right]^2$.

Answer:

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415. If the A.M of two numbers is 9 and G.M is 4, then these numbers are roots of the equation:

A. $x^2 + 18x + 16 = 0$

B. $x^2 - 18x + 16 = 0$

C. $x^2 + 18x - 16 = 0$

D. $x^2 - 18x - 16 = 0$.

Answer:

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416. Let T_r be the rth term of an A.P. whose first term is a and common difference is d. If for some positive integers, m,n, $m \neq n, T_m = \frac{1}{n}$ and $T_n = \frac{1}{m}$, then a-d equals :

A. 0

B. 1

C. $\frac{1}{mn}$

D. $\frac{1}{m} + \frac{1}{n}$.

Answer:

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417. An infinite G.P. has first term 'x' and sum '5', then x belongs to ,

A. $x < -10$

B. $-10 < x < 0$

C. $0 < x < 10$

D. xgt 10.

Answer:

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418. If $x = \sum_{n=0}^{\infty} a^n, y = \sum_{n=0}^{\infty} b^n, z = \sum_{n=0}^{\infty} c^n$, where a ,b, c are in A.P. and |a|<1, |b| <1, |c|<1, then x,y,z are in :

A. A.P.

B. G.P.

C. H.P.

D. A-G progression.

Answer:

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419. In the quadratic equation $ax^2 + bx + c = 0$. if $\delta = b^2 - 4ac$ and $\alpha + \beta, \alpha^2 + \beta^2, \alpha^3 + \beta^3$ are in G.P. and α, β are the roots of $ax^2 + bx + c = 0$

A. $\Delta \neq 0$

B. $b\Delta = 0$

C. $c\Delta = 0$

D. $\Delta = 0$.

Answer:

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420. The value of $\sum_{n=1}^{10} \left(\sin. \frac{2n\pi}{11} - \cos. \frac{2n\pi}{11} \right)$ is equal to

A. i

B. 1

C. -1

D. $-i$.

Answer:

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421. Let $a_1, a_2, a_3, \ldots\ldots\ldots$ be terms are in AP, if $\frac{a_1 + a_2 + \ldots\ldots + a_p}{a_1 + a_2 + \ldots\ldots + a_q} = \frac{p^2}{q^2}, p \neq q$ then $\frac{a_6}{a_{21}}$ equals

A. $\frac{41}{11}$

B. $\frac{7}{2}$

C. $\frac{2}{7}$

D. $\frac{11}{41}$.

Answer:

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422. If 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. $\frac{1}{2}\sqrt{5}$

B. $\sqrt{5}$

C. $\frac{1}{2}(\sqrt{5}-1)$

D. $\frac{1}{2}(1-\sqrt{5})$.

Answer:

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423. The first two terms of a geometric progression add upto 12 the sum of the third and the fourth terms is 48, if the terms of the geometric progression are alternately positive and negetive, then the first term is

A. 4

B. -4

C. -12

D. 12

Answer:

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424. $1+\frac{2}{3}+\frac{6}{3^2}+\frac{10}{3^3}+\frac{14}{3^4}+\ldots\infty=$

A. 2

B. 3

C. 4

D. 6

Answer:

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425. If the sum of first n terms of an AP is `cn^(2), then the sum of squares of these n terms is

A. $\frac{n\left(4n^2-1\right)c^2}{6}$

B. $\frac{n\left(4n^2+1\right)c^2}{3}$

C. $\frac{n\left(4n^2-1\right)c^2}{3}$

D. $\frac{n\left(4n^2+1\right)c^2}{6}$.

Answer:

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426. A person is to count 4500 currency notes, Let a_n denote the number of notes he courts in the nth minute. If $a_1 = a_2 = \ldots\ldots . = a_{10} = 150$ and $a_{10}, a_{11}, \ldots\ldots\ldots$ are in an A.P. with common difference -2, then the time taken by him to count all notes is :

A. 24 minutes

B. 34 minutes

C. 125 minutes

D. 135 minutes .

Answer:

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427. A man saves Rs. 200 in each of the first three months of his service. In each of the subsequent months his saving increases by Rs. 40 more than the saving of immediately previous month. His total saving from the start of swrvice will be Rs. 11040 after

A. 18 months

B. 19 months

C. 20 months

D. 21 months.

Answer:

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428. Let a_n be the nth term of an AP, if $\sum_{r=1}^{100} a_{2r} = \alpha$ and $\sum_{r=1}^{100} a_{2r-1} = \beta$, then the common difference of the AP is

A. $\alpha - \beta$

B. $\frac{\alpha - \beta}{100}$

C. $\beta - \alpha$

D. $\frac{\alpha - \beta}{200}$.

Answer:

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429. 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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430. Find the sum S_n of the cubes of the first n terms of an A.P. and show that the sum of first n terms of the A.P. is a factor of S_n .

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431. In a G.P the sum of the first and last terms is 66, the product of the second and the second last term is 128, and the sum of the terms is 126 If the decresing G.P is considered , then find the number of terms

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432. The sum of first ten terms of an A.P. is 155 and the sum of first two terms of a G.P. is 9. The first term of the A.P. is equal to the common ratio of the G.P., and the first term of the G.P. is equal to the common difference of the A.P. Find the two progressions.

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433. Find three numbers a,b,c between 2 and 18 such that : their sum is 25. if 2,a,b are in AP and b,c,18 are in GP

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434. Find three numbers a,b,c between 2 and 18 such that : their sum is 25. if 2,a,b are in AP and b,c,18 are in GP

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435. Find three numbers a,b,c between 2 and 18 such that : their sum is 25. if 2,a,b are in AP and b,c,18 are in GP

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