MATHS

BOOKS - CENGAGE

SEQUENCES AND SERIES

Solved Examples And Exercises

1. Find the sum to n terms of the series $1/(1 \times 2) + 1/(2 \times 3) + 1/(3 \times 4) + \quad + 1/n(n+1)$.

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2. If $\sum_{r=1}^{n} T_r = (3^n - 1)$, then find the sum of $\sum_{r=1}^{n} \frac{1}{T_r}$.

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3. Find the sum to n terms of the series $3 + 15 + 35 + 63 +$

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4. Find the sum to n terms of the series $1^2 - 2^2 + 3^2 - 4^2 + 5^2 - 6^2 + \ldots$

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5. If $\sum_{r=1}^{n} T_r = n(2n^2 + 9n + 13)$, then find the sum $\sum_{r=1}^{n} \sqrt{T_r}$.

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6. Find the sum of series $31^3 + 32^3 + \ldots . + 50^3$

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7. Find the sum of first n terms of the series $1^3 + 3 \times 2^2 + 3^3 + 3 \times 4^2 + 5^3 + 3 \times 6^2 + ..$ When

(i) n is even (ii) n is odd

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8. Find the sum of the series $1 \times n + 2(n-1) + 3 \times (n-2) + \ldots + (n-1) \times 2 + n \times 1.$

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9. Find the sum up to the 17^{th} term of the series $\frac{1^3}{1} + \frac{1^3 + 2^3}{1+3} + \frac{1^3 + 2^3 + 3^3}{1+3+5} + \ldots$

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

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

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12. If a, b, c are in A.P., then prove that the following are also in A.P. $a\left(\frac{1}{b}+\frac{1}{c}\right), b\left(\frac{1}{c}+\frac{1}{a}\right), c\left(\frac{1}{a}+\frac{1}{b}\right)$

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13. Find the sum of the following series: $\frac{1}{2}+\frac{1}{3^2}+\frac{1}{2^3}+\frac{1}{3^4}+\frac{1}{2^5}+\frac{1}{3^6}+\infty$

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14. Consider two A.P. s: $S_1 : 2, 7, 12, 17, 500 terms$ $and S_1 : 1, 8, 15, 22, 300 terms$ Find the number of common term. Also find the last common term.

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15. If pth, qth, and rth terms of an A.P. are $a, b, c,$ respectively, then show that $(a-b)r+(b-c)p+(c-a)q=0$

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16. The sum of the first four terms of an A.P. is 56. The sum of the last four terms is 112. If its first term is 11, then find the number of terms.

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17. Given two A.P. $2, 5, 8, 11......T_{60}$ and $3, 5, 79, ...T_{50}$. Then find the number of terms which are identical.

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18. In a certain AP, 5times the 5^{th} term is equal to 8 times the 8^{th} term. Its 13^{th} term is

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19. Find the term of the series $25, 22\frac{3}{4}, 20\frac{1}{2}, 18\frac{1}{4}$ which is numerically the smallest.

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20. If a, b, c, d, e are in A.P., the find the value of $a - 4b + 6c - 4d + e$.

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

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22. If $a, b, c \in R+$ form an A.P., then prove that $a+1/(bc), b+1/(ac), c+1/(ab)$ are also in A.P.

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23. Find the degree of the expression $(1+x)(1+x^6)(1+x^{11})\ldots\ldots.(1+x^{101})$.

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24. In an A.P. of 99 terms, the sum of all the odd-numbered terms is 2550. Then find the sum of all the 99 terms of the A.P.

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25. Divide 32 into four parts which are in A.P. such that the ratio of the product of extremes to the product of means is 7:15.

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

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

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28. Prove that the sum of n number of terms of two different A.P. s can be same for only one value of n.

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29. In an A.P. if $S_1 = T_1 + T_2 + T_3 + \ldots . + T_n (n odd) \dot{S}_2 = T_2 + T_4 + T_6 + \ldots \ldots . + T_{n-}$, then find the value of S_1 / S_2 in terms of n.

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30. The sum of the series $2, 5, 8, 11, \ldots \ldots$ is 60100, then n is

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31. The digits of a positive integer, having three digits, are in A.P. and their sum is 15. The number obtained by reversing the digits is 594 less than the original number. Find the number.

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32. If eleven A.M. ‘s are inserted between 28 and 10, then find the number of integral A.M. ‘s.

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33. Between 1 and 31, m numbers have been inserted in such a way that the resulting sequence is an A. P. and the ratio of 7^{th} and $(m-1)^{th}$ numbers is 5 : 9. Find the value of m.

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34. Find the sum of first 24 terms of the A.P. $a_1, a_2, a_3, \ldots,$ if it is known that $a_1 + a_5 + a_{10} + a_{15} + a_{20} + a_{24} = 225.$

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35. If the arithmetic progression whose common difference is nonzero the sum of first $3n$ terms is equal to the sum of next n terms. Then, find the ratio of the sum of the $2n$ terms to the sum of next $2n$ terms.

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

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37. If the first two terms of a H.P are 2/5 and 12 / 13 , respectively . Then find the largest term.

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38. Insert five arithmetic means between 8 and 26. or Insert five numbers between 8 and 26 such that the resulting sequence is an A.P.

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39. If a,b,c are in G/P and a-b,c-a, and b-c are H.P them prove that a+4b+c is equal to 0 .

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40. Find the number of terms in the series $20, 19\frac{1}{3}, 18\frac{2}{3}...$ the sum of which is 300. Explain the answer.

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41. If $x, yandz$ are in A.P., $ax, by, andcz$ in G.P. and a, b, c in H.P. then prove that $\frac{x}{z} + \frac{z}{x} = \frac{a}{c} + \frac{c}{a}$.

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42. Find the sum of all three-digit natural numbers, which are divisible by 7.

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43. If a,b,c and the d are in H.P then find the vlaue of $\dfrac{a^{-2}-d^{-2}}{b^{-2}-c^{-2}}$

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44. Prove that a sequence in an A.P., if the sum of its n terms is of the form $An^2+Bn, where A, B$ are constants.

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45. The product of three numbers in G.P is 125 and sum of their products taken in pairs is $\frac{175}{2}$.Find them.

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46. If the sequence $a_1, a_2, a_3, \ldots, a_n$ is an A.P., then prove that $a_1^2 - a_2^2 + a_3^2 - a_4^2 + \ldots + a_{2n-1}^2 - a_{2n}^2 = \frac{n}{2n-1}\left(a_1^2 - a_{2n}^2\right)$

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47. 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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48. Three non zero numbers a, b, c are in A.P. Increasing a by 1 or increasing c by 2, the number become in G.P then b equals

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

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

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51. If the sum of n terms of a G.P. is $3-\frac{3^{n+1}}{4^{2n}}$, then find the common ratio.

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52. Which term of the G.P. $2, 1, \frac{1}{2}, \frac{1}{4}, is \frac{1}{128}$?

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53. $'n' A. M's$ are inserted between a and 2b, and then between 2a and b. If p^{th} mean in each case is a equal, $\frac{a}{b}$ is equal to

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54. 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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55. The first and second term of a G.P. are x^{-4} and x^n respectively. If x^{52} is the 8^{th} term, then find the value of n.

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56. If $\frac{a+bx}{a-bx}=\frac{b-cx}{b-cx}=\frac{c+dx}{c-dx}(x\neq 0)$ then show that a, b, c and d are in G.P.

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57. If n arithmetic means are inserted between 2 and 38, then the sum of the resulting series is obtained as 200. Then find the value of n.

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58. 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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59. If a, b, c, d, e, f are A.M.s between 2 and 12, then find the sum $a+b+c+d+e+f$.

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60. Three numbers are in G.P. if we double the middle term, we get an A.P. Then the common ratio of G.P equals

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61. Divide 28 into four parts in an A.P. so that the ratio of the product of first and third with the product of second and fourth is 8:15.

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62. The fourth, seventh, and the last term of a G.P. are 10, 80, and 2560, respectively. Find the first term and the number of terms in G.P.

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63. If $(b-c)^2, (c-a)^2, (a-b)^2$ are in A.P., then prove that $\frac{1}{b-c}, \frac{1}{c-a}, \frac{1}{a-b}$ are also in A.P.

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64. 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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65. Let S_n denote the sum of first n terms of an A.P. If $S_{2n} = 3S_n,$ then find the ratio $S_{3n} / S_n.$

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66. If p,q and r are in A.P., show that the pth , qth and rth terms of any G.P. are in G.P.

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67. Find four number in an A.P. whose sum is 20 and sum of their squares is 120.

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68. Find the sum of the following series : $0.7 + 0.77 + 0.777 + \rightarrow n$ terms

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69. Find the sum of the series $\frac{1}{3^2+1} + \frac{1}{4^2+2} + \frac{1}{5^2+3} + \frac{1}{6^2+4} + \infty$

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70. Prove that in a sequence of numbers 49,4489,444889,44448889 in which every number is made by inserting 48-48 in the middle of previous as indicated, each number is the square of an integer.

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71. Find the sum of first 100 terms of the series whose general term is given by $a_k = (k^2 + 1)k!$

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72. If the product of three consecutive terms in G.P. is 216 and sum of their products in pairs is 156, find them.

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73. Find the sum of the series $\frac{2}{1 \times 2} + \frac{5}{2 \times 3} \times 2 + \frac{10}{3 \times 4} \times 2^2 + \frac{17}{4 \times 5} \times 2^3 + \rightarrow n$ terms.

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74. The sum of some terms of G.P. is 315 whose first term and the common ratio are 5 and 2, respectively. Find the last term and the number of terms.

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75. A sequence of numbers $A_{\cap} = 1, 2, 3$ is defined as follows : $A_1 = \frac{1}{2}$ and for each $n \geq 2$, $A_n = \left(\frac{2n-3}{2n}\right)A_{n-1}$, then prove that $\sum_{k=1}^{n} A_k < 1, n \geq 1$

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76. 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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77. Find the sum of the products of the ten numbers $\pm 1, \pm 2, \pm 3, \pm 4, and \pm 5$ taking two at a time.

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78. If a, b, c are in A.P., b, c, d are in G.P. and $\frac{1}{c}, \frac{1}{d}, \frac{1}{e}$ are in A.P. prove that a,c,e are in GP.

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79. Find the sum $\sum_{r=0}^{n} \hat{} (n+r)C_r$.

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80. Find the sum to n terms of the sequence $(x+1/x)^2, \left(x^2+1/x\right)^2, \left(x^3+1/x\right)^2, ,$

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81. Write the first five terms of each of the sequences and obtain the corresponding series:

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

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82. Prove that the sum to n terms of the series 11 + 103 + 1005 + ... Is (10/9)$(10^n - 1) + n^2$.

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83. If $a_{n+1} = \frac{1}{1 - a_n}$ for $n \geq 1$ and $a_3 = a_1$. then find the value of $(a_{2001})^{2001}$.

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84. Determine the number of terms in a G.P., if $a_1 = 3, a_n = 96 \text{ and } S_n = 189$

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85. Let $\{a_n\}(n \geq 1)$ be a sequence such that $a_1 = 1, and 3a_{n+1} - 3a_n = 1$ for all $n \geq 1$. Then find the value of a_{2002}.

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86. 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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87. If the pth term of an A.P. is q and the qth term is p , then find its rth term.

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88. Find the product of three geometric means between 4 and $1/4$

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89. If the (m+1)th,(n+1)th terms of an A.P. are in G.P. and m,n,r are in H.P., then find the value of the ratio of the common difference to the first term of the A.P.

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90. Insert four G.M's between 2 and 486.

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91. Find the sum $1^2 + (1^2 + 2^2) + (1^2 + 2^2 + 3^2) + \ldots .$ up to 22^{nd} find the sum when n is odd .

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92. If G is the geometric mean of $x and y$ then prove that $\frac{1}{G^2 - x^2} + \frac{1}{G^2 - y^2} = \frac{1}{G^2}$

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93. If the A.M. of two positive numbers $a and b (a > b)$ is twice their geometric mean. Prove that : $a : b = (2 + \sqrt{3}) : (2 - \sqrt{3})$.

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94. Sum of infinite number of terms in GP is 20 and sum of their square is 100. The common ratio of GP is

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95. Find the sum of the series $1 + 2(1 - x) + 3(1 - x)(1 - 2x) + \dots + n(1 - x)(1 - 2x)(1 - 3x)\dots($

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96. prove that $6^{1/2} \times 6^{1/4} \times 6^{1/8} \dots \infty = 6$

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97. Three numbers are in G.P. whose sum is 70. If the extremes be each multiplied by 4 and the means by 5, they will be in A.P. Find the numbers.

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98. If $x = a + \frac{a}{r} + \frac{a}{r^2} + \infty, y = b - \frac{b}{r} + \frac{b}{r^2} + \infty, andz = c + \frac{c}{r^2} + \frac{c}{r^4} + \infty$

prove that $\frac{xy}{z} = \frac{ab}{c}$.

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99. Find the sum $1 + 4 + 13 + 40 + 121 + \cdot$

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100. If each term of infinite G.P is twice the sum of terms following it, then find the comon ratio of the G.P.

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101. Find the sum to n terms of the series $1+\left(1+\frac{1}{2}+\frac{1}{2^2}\right)+\left(1+\frac{1}{2}+\frac{1}{2^2}+\frac{1}{2^3}+\frac{1}{2^4}\right)+\ldots$

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102. Find the sum of the following series: $(\sqrt{2}+1)+1+(\sqrt{2}-1)+\ldots\ldots.+\infty$

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103. If the set of natural numbers is partitioned into subsets $S_1=\{1\}, S_2=\{2,3\}, S_3=\{4,5,6\}$ and so on then find the sum of the terms in S_{50}.

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104. If $p(x) = \left(1 + x^2 + x^4 + \quad + x^{2n-2}\right) / \left(1 + x + x^2 + \quad + x^{n-1}\right)$ is a polomial in x , then find possible value of $n\cdot$

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105. If the sum of the squares of the first n natural numbers exceeds theri sum by $330,$ then find$n\cdot$

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

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107. If $\sum_{r=1}^{n} T_r = \frac{n}{8}(n+1)(n+2)(n+3)$ then find $\sum_{r=1}^{n} \frac{1}{T_r}$

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108. Find the sum to n terms of the series : $1 \times 2 \times 3 + 2 \times 3 \times 4 + 3 \times 4 \times 5 + \vdots$

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109. If the sum to infinity of the series $3 + (3 + d)\frac{1}{4} + (3 + 2d)\frac{1}{4^2} + \dots \infty$ is $\frac{44}{9}$, then find d.

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110. Find the sum to infinity of the series $1^2 + 2^2 x + 3^2 x^2 + \infty$.

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111. If a, b, c, d are in G.P., then prove that $\left(a^3 + b^3\right)^{-1}, \left(b^3 + c^3\right)^{-1}, \left(c^3 + d^3\right)^{-1}$ are also in G.P.

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112. Find the sum of the series $1 + 3x + 5x^2 + 7x^3 + \ldots\ldots n$ terms.

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113. In a geometric progression consisting of positive terms, each term equals the sum of the next terms. Then find the common ratio.

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114. If the A.M. between two positive numbers exceeds their G.M. by 2 and the G.M. exceeds their H.M. by 8/5, find the numbers.

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115. The A.M of two given positive numbers is 2.If the larger number is increased by 1, the G.M of the mubers becomes equal to the A.M of the given numbers .Then find the H.M

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116. Find the sum of the series `1+3x+5x^2+7x^3+..........∞

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117. If $\frac{a-x}{px}=\frac{a-y}{qy}=\frac{a-z}{rz}$ and p,q and r are in A.P., then prove that x,y,z are in H.P.

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118. Sum to infininty of the series $1+\frac{4}{5}+\frac{7}{5^2}+\frac{10}{5^3}+\ldots\ldots$ is

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119. Find the sum $\frac{1^2}{2} + \frac{3^2}{2^2} + \frac{5^2}{2^3} + \frac{7^2}{2^4} + \ldots \infty$

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120. If H is the harmonic mean between $PandQ$ then find the value of $H/P + H/Q$.

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121. If $T_r = r(r^2 - 1)$, then find $\sum_{r=2}^{\infty} \frac{1}{T}$.

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122. Insert four H.M.,s between 2/3 and 2/13.

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123. If a, b, c are respectively the $p^{th} q^{th}$ and r^{th} terms of a GP. Show that

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

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124. The A.M. and H.M. between two numbers are 27 and 122, respectively, then find their G.M.

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125. If $a, a_1, a_2, a_3 \ldots, a_{2n}$ b are in A.P and $a, g_1, g_2, g_3 \ldots g_{2n}$ b are in G.P in and h is the H.M of a and b, the prove that

$$\frac{a_1+a_{2n}}{g_1 g_{2n}}+\frac{a_2+a_{2n-1}}{g_2 g_{2n-1}}+\ldots+\frac{a_n+a_{n+1}}{g_n g_{n+1}}=\frac{2n}{h}$$

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126. If nine arthimatic means and nine harmonic means are inserted between 2 and 3 alternatively, then prove that A+6/H=5 (where A is any of the A.M.'s and H the corresponding H.M)

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127. If $x, 1, andz$ are in A.P. and $x, 2, andz$ are in G.P., then prove that $x, and4, z$ are in H.P.

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128. Find two numbers whose arithmetic mean is 34 and the geometric means is 16.

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129. If a, b, d and p are distinct non - zero real numbers such that $(a^2 + b^2 + c^2)p^2 - 2(ab + bc + cd)p + (b^2 + c^2 + d^2) \leq 0$ then n.

Prove that a, b, c, d are in G. P and ad = bc

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130. If the A.M. and G.M. between two numbers are in the ratio m : n, then prove that the numbers are in the ratio

$\left(m + \sqrt{m^2 - n^2}\right), \left(m - \sqrt{m^2 - n^2}\right).$

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131. Prove that $(666....6)^2 + (888.... .8) = 4444......4.$

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

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133. If a,b,c,d are distinct integers in an A.P. such that $d = a^2 + b^2 + c^2$, then find the value of a+b+c+d.

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134. The 8th and 14th term of a H.P. are 1/2 and 1/3, respectively. Find its 20th term. Also, find its general term.

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135. Find the number of common terms to the two sequences 17, 21, 25, 417 and 16, 21, 26, .., 466.

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136. If the 20th term of a H.P. is 1 and the 30 th term is -1/17, then find its largest term.

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137. Find the sum $\frac{3}{2} - \frac{5}{6} + \frac{7}{18} - \frac{9}{54} + \ldots\ldots \infty$

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138. If $a, b, c and d$ are in H.P., then prove that $(b+c+d)/a, (c+d+a)/b, (d+a+b)/c$ and $(a+b+c)/d$, are in A.P.

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139. The harmonic mean between two numbers is 21/5, their A.M 'A' and G.M 'G' satisfy the relation $3A + G^2 = 36$ Then find the sum of square of numbers

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140. The mth term of a H.P. is n and the nth term is m. Prove that its rth term is mn/r.

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141. The pth term of an A.P. is a and qth term is b. Then find the sum of its $(p + q)$ terms.

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142. If $a > 1, b > 1$ and $c > 1$ are in G.P. then show that $\frac{1}{1 + (\log)_e a}, \frac{1}{1 + (\log)_e b}, and \frac{1}{1 + (\log)_e c}$ are in H.P.

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143. Solve the equation (x+1)+(x+4)+(x+7)+...+(x+28)=155.

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144. If $a, b, andc$ be in G.P. and $a + x, b + x, andc + x$ in H.P. then find the value of x (a,b,c are distinct numbers) .

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145. The ratio of the sum 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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146. If first three terms of the sequence 1/16, a,b,1/6 are in geometric series and last three terms are in harmonic series, then find the values of a and b.

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147. The sum of first n, 2n and 3n terms of an A.P. are S_1, S_2, S_3 respectively. Prove that $S_3 = 3(S_2 - S_1)$.

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148. In a certain A.P., 5 times the 5th term is equal to 8 times the 8th terms then find its 13th term.

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149. If x is a positive real number different from 1, then prove that the numbers $\frac{1}{1+\sqrt{x}}, \frac{1}{1-x}, \frac{1}{a-\sqrt{x}}, \ldots$ are in A.P.

Also find their common difference.

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

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151. If $S_n = nP = \frac{n(n-1)}{2}$Q, where S_n denotes the sum of the first n terms of an A.P, then find the common difference.

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152. 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,and c are in A.P and $|a| < 1, |b| < 1$ and $|c|1$then prove that x,y and z are in H.P

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153. If the sum of the series $\sum_{n=0}^{\infty} r^n, |r| < 1$ is s , then find the sum of the series $\sum_{n=0}^{\infty} r^{2n}$.

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154. The value of $1^2 - 2^2 + 3^2 - 4^2 + \ldots.. + 11^2$ is equal to

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155. Find the sum $2 + 5 + 10 + 17 + 26 + \ldots.$

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156. Find the sum up to 20 terms.

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

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157. If $a, b, andc$ are in G.P. then prove that $\frac{1}{a^2-b^2}+\frac{1}{b^2}=\frac{1}{b^2-c^2}$.

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158. Find the value of $(32)(32)^{1/6}(32)^{1/36}\infty$.

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159. Find the sum of the series $1^2+3^2+5^2+\ldots.$ to n terms

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160. If the sum of the roots of the quadratic equation $ax^2 + bx + c = 0$ is equl to the sum of the squares of their reciprocals, then prove that $\frac{a}{c}, \frac{b}{a} and \frac{c}{b}$ are in H.P.

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161. The first term of an arithmetic progression is 1 and the sum of the first nine terms equal to 369. The first and the ninth term of a geometric progression coincide with the first and the ninth term of the arithmetic progression. Find the seventh term of the geometric progression.

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162. Let a,b ,c be positive integers such that $\frac{b}{a}$ is an integer. If a,b,c are in GP and the arithmetic mean of a,b,c, is b+2 then the value of $\frac{a^2 + a - 14}{a + 1}$ is

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163. Suppose that all the terms of an arithmetic progression (A.P.) are natural numbers. If the ratio of the sum of the first seven terms to the sum of the first eleven terms is 6: 11 and the seventh term lies in between 130 and 140, then the common difference of this A.P. is

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164. The sum of an infinite geometric series is 162 and the sum of its first n terms is 160. If the inverse of its common ratio is an integer, then which of the following is not a possible first term? 108 b. 144 c. 160 d. none of these

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165. If a, b, c are digits, then the rational number represented by $\odot\, cababab$ ...is $cab/990$ b. $(99c + ba)/990$ c. $(99c + 10a + b)/99$ d. $(99c + 10a + b)/990$

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166. If

$a = \underbrace{111....1}_{55\text{times}}, b = 1 + 10 + 10^2 + 10^3 + 10^4$ and $c = 1 + 10^5 + 10^{10} + \ldots$

then

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167. Consider the ten numbers $ar, ar^2, ar^3, \ldots, ar^{10}$. If their sum is 18 and the sum of their reciprocals is 6, then the product of these ten numbers is

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168. The sum of 20 terms of a series of which every even term is 2 times the term before it, every odd term is 3 times the term before it, the a. $\left(\frac{2}{7}\right)(6^{10} - 1)$ b. $\left(\frac{3}{7}\right)(6^{10} - 1)$ c. $\left(\frac{3}{5}\right)(6^{10} - 1)$ d. none of these

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169. Let a_n be the nth term of a G.P. of positive numbers. Let $\sum_{n=1}^{100} a_{2n} = \alpha and \sum_{n=1}^{100} a_{2n-1} = \beta$, such that $\alpha \neq \beta$, then the common ratio is α / β b. β / α c. $\sqrt{\alpha / \beta}$ d. $\sqrt{\beta / \alpha}$

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170. If the pth, qth, and rth terms of an A.P. are in G.P., then the common ratio of the G.P. is a. $\frac{pr}{q^2}$ b. $\frac{r}{p}$ c. $\frac{q+r}{p+q}$ d. $\frac{q-r}{p-q}$

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171. In a GP the first , third and fifth terms may be considered as the firs, fourth ,and sixteenth terms of an A.P. Then the fourth terms of the A.P knowing that its first terms is 5, is

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172. If a, b, c, d are in G.P, then $(b-c)^2+(c-a)^2+(d-b)^2$ is equal to

`

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173. If p^{th}, q^{th}, r^{th} and s^{th} terms of an A.P. are in G.P, then show that (p – q), (q – r), (r – s) are also in G.P.

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174. ABC is a right-angled triangle in which $\angle B = 90^0$ and $BC = a\cdot$ If n points $L_1, L_2, , L_n on AB$ is divided in $n+1$ equal parts and $L_1M_1, L_2M_2, , L_nM_n$ are line segments parallel to $BC and M_1, M_2, , M_n$ are on AC, then the sum of the lengths of $L_1M_1, L_2M_2, , L_nM_n$ is $\frac{a(n+1)}{2}$ b. $\frac{a(n-1)}{2}$ c. $\frac{an}{2}$ d. none of these

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175. If $(1-p)\left(1+3x+9x^2+27x^3+81x^4+243x^5\right)=1-p^6, p\neq 1$

then the value of $\frac{p}{x}$ is

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176. ABCD is a square of length a, $a\in N$, a > 1. Let $L_1, L_2, L_3...$ be points on BC such that $BL_1=L_1L_2=L_2L_3=....1$ and $M_1, M_2, M_3, ...$ be points on CD such that $CM_1=M_1M_2=M_2M_3=...=1$. Then $\sum_{n=1}^{a-1}\left((AL_n)^2+(L_nM_n)^2\right)$ is equal to :

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177. Let $T_r and S_r$ be the rth term and sum up to rth term of a series, respectively. If for an odd number n, $S_n=nandT_n=\frac{T_n-1}{n^2}, thenT_m$ (m being even)is a. $\frac{2}{1+m^2}$ b. $\frac{2m^2}{1+m^2}$ c. $\frac{(m+1)^2}{2+(m+1)^2}$ d. $\frac{2(m+1)^2}{1+(m+1)^2}$

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178. If

$(1 + 3 + 5 + \ldots.. + p) + (1 + 3 + 5 + \ldots. + q) = (1 + 3 + 5 + \ldots.. +$

where each set of parentheses contains the sum consecutive odd integers as shown , the smallest possible value of P+q+r (where$p > 6)$ is

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179. If $ax^3 + bx^2 + cx + d$ is divisible by $ax^2 + c, then a, b, c, d$ are in a. A.P. b. G.P. c. H.P. d. none of these

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180. The line $x + y = 1$ meets X-axis at A and Y-axis at B,P is the mid-point of AB, P_1 is the foot ofperpendicular from P to OA, M_1, is that of P_1, from OP; P_2, is that of M_1 from OA, M_2, is that of P_2, from OP; P_3 is that of M_2, from OA and so on. If P_n denotes the nth foot of the perpendicular on OA, then find OP_n.

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181. In a geometric series , the first term is a and common ratio is r. If S_n denotes the sum of the n terms and $U_n = \sum_{n=1}^{n} S_n$, then $rS_n + (1-r)U_n$ equals

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182. If , x,y and z are distinct prime numbers, then

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183. If $x, y, andz$ are in G.P. and $x+3+, y+3, andz+3$ are in H.P., then $y=2$ b. $y=3$ c. $y=1$ d. $y=0$

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184. If A.M., G.M., and H.M. of the first and last terms of the series of $100, 101, 102, \ldots n-1, n$ are the terms of the series itself, then the value of `n is '(100

A. a.200

B. b. 300

C. c. 400

D. d. 500

Answer: null

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185. In a sequence of (4n + 1) terms the first (2n + 1) terms are in AP whose common difference is 2, and the last (2n + 1) terms are in GP whose common ratio is 0.5. If the middle terms of the AP and GP are equal, then the middle term of the sequence is

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186. The coefficient of x^{49} in the product $(x-1)(x-3)(x-99)is-99^2$

b. 1 c. -2500 d. none of these

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187. Let $S=\frac{4}{19}+\frac{44}{19^2}+\frac{444}{19^3}+\ldots.+\ \text{up to}\ \infty$. Then S is equal to

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188. If $H_n=1+\frac{1}{2}+\ldots\ldots+\frac{1}{n}$, then the value of

$S_n=1+\frac{3}{2}+\frac{5}{2}+\ldots.+\frac{99}{50}is$

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189. The sum to infinity of the series $1+2r+3r^2+4r^3$+.....is 9/4 , then value of r is

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190. Find the sum $1+\frac{4}{5}+\frac{7}{25}+\frac{10}{125}+\ldots$

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191. If $a,\frac{1}{b},q,\frac{1}{r}$ form two arthimatic progression of the same common difference, then a,q,c are in A.P. If

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192. Suppose that $F(n+1)=\frac{2F(n)+1}{2}$ for n=1,2,3,... and F(1)=2. Then,F(101) equals

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193. In an A.P. of which a is the term, if the sum of the first p terms is zero, then the sum of the next q terms is

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194. If S_n denotes the sum of first n terms of an A.P. and $\frac{S_{3n}-S_{n-1}}{S_{2n}-S_{2n+1}}$=31, then the value n is

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195. If a,b,c are in A.P., then $a^3+c^3-8b^3$ is equal to

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196. The number of terms of an A.P. is even; the sum of the odd terms is 24, and of the even terms is 30, and the last term exceeds the first by 21/2 then the number of terms in the series is 8 b. 4 c. 6 d. 10

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197. The largest term common to the sequence 1,11,21,31,....to 100 terms and 31,36,41,46,...... to 100 tetms is

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198. If the sum of m terms of an A.P. is same as the sum of its n terms, then the sum of its (m+n) terms is

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199. If S_n denotes the sum of n terms of A.P., then $S_{n+3} - 3S_{n+2} + 3S_{n+1} - S_n = \ a\Big).2^S \_ n$ b). s_{n+1} c). $3S_n$ d). 0

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200. 150 workers were engaged to finish a piece of work in a certain number of days. Four workers dropped from the work on the second day.

Four workers dropped 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. [Let the no.of days to finish the work is 'r' then

$$150x = \frac{x+8}{2}[2 \times 150 + (x+8-1)(-4)]$$

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201. if a G.P (p+q)th term = m and (p-q) th term = n , then find its p th term

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202. If $A_1, A_2, G_1, G_2, ; and H_1, H_2$ are two arithmetic, geometric and harmonic means respectively, between two quantities $a and b, then ab$ is equal to

A. a.$A_1 H_2$

B. b. $A_2 H_1$

C. c. $G_1 G_2$

D. d. none of these

Answer: null

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203. Let S_1, S_2,... be square such that for each $n \geq 1$ the length of a side of S_n equal the length of a diagonal of S_{n+1}. If the length of a side of S_1 is 10 cm, then for which of the following values of n is the area of S_n less than 1 sq cm ?

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204. If $\frac{1}{b-a} + \frac{1}{b-c} = \frac{1}{a} + \frac{1}{c}$, then A. $a, b, andc$ are in H.P. B. $a, b, andc$ are in A.P. C. $b = a + c$ D. $3a = b + c$

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205. If a,b and c are in GP and x,y respectively, are the arithmetic means between a,b and b,c then the value of $\frac{a}{x} + \frac{c}{y}$ is

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206. Consider a sequence $\{a_n\} with a_1 = 2 and a_n = \frac{an^2 - 1}{a_{n-2}}$ for all $n \geq 3$, terms of the sequence being distinct. Given that $a_1 and a_5$ are positive integers and$a_5 \leq 162$ then the possible value $(s) of a_5$ can be a. 162 b. 64 c. 32 d. 2

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207. Which of the following can be terms (not necessarily consecutive) of any A.P.?

A. a. 1,6,19

B. b. $\sqrt{2}, \sqrt{50}, \sqrt{98}$

C. c. $\log 2, \log 16, \log 128$

D. d. $\sqrt{2}, \sqrt{3}, \sqrt{7}$

Answer: null

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208. The numbers 1, 4, 16 can be three terms (not necessarily consecutive) of

A. no A.P.

B. only on G.P.

C. infinite number o A.P.'s

D. infinite number of G.P.'s

Answer: null

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209. Each question has four choices a,b,c and d out of which only one is correct. Each question contains Statement 1 and Statement 2. Make your answer as: If both the statements are true and Statement 2 is the correct explanation of statement 1. If both the statements are True but Statement 2 is not the correct explanation of Statement 1. If Statement 1 is True and Statement 2 is False. If Statement 1 is False and Statement 2 is True. Statement 1: $\frac{\sin \pi}{18}$ is a root of $8x^3 - 6x + 1 = 0$ Statement 2: For any $\theta \in R, \sin 3\theta = 3 \sin \theta - 4 \sin^3 \theta$

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210. If $(1^2 - t_1) + (2^2 - t_2) + \ldots . + (n^2 - t_n) = \frac{n(n^2 - 1)}{3}$ then t_n is equal to

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211. If $b_{n+1} = \frac{1}{1 - b_n} f \text{ or } n \geq 1 and b_1 = b_3, then \sum_{r=1}^{2001} br^{2001}$ is equal to 2001 b. -2001 c. 0 d. none of these

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212. Let $a_1, a_2, a_3, \dots, a_{100}$ be an arithmetic progression with $a_1 = 3$ and $S_p = \sum_{i=1}^{p} a_i, 1 \le p \le 100$. For any integer n with $1 \le n \le 20$, let $m = 5n$. If $\frac{S_m}{S_n}$ does not depend on n, then a_2 is equal to ....

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213. If $1^2 + 2^2 + 3^2 + \dots + 2003^2 = (2003)(4007)(334)$ and $(1)(2003) + (2)(200$

equals

A. a.2005b. 2004c. 2003d. 2001

B.

C.

D.

Answer: null

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214. The sum of $0.\,2 + 0.004 + 0.\,00006 + 0.\,0000008 + \ldots$ to ∞ is $\frac{200}{891}$ b. $\frac{2000}{9801}$ c. $\frac{1000}{9801}$ d. none of these

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215. If $t_n = \frac{1}{4}(n+2)(n+3)$ for $n = 1, 2, 3, \ldots.$ then $\frac{1}{t_1} + \frac{1}{t_2} + \frac{1}{t_3} + \ldots. + \frac{1}{t_{2003}} =$

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216. The coefficient of x^{19} in the polynomial $(x-1)(x-2)\left(x-2^2\right)\ldots\ldots\left(x-2^{19}\right)$ is $2^{20}-2^{19}$ b. $1-2^{20}$ c. 2^{20} d. none of these

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217. If $1-\frac{1}{3}+\frac{1}{5}-\frac{1}{7}+\frac{1}{9}-\frac{1}{11}+=\frac{\pi}{4}$, then value of $\frac{1}{1\times 3}+\frac{1}{5\times 7}+\frac{1}{9\times 11}+$ is $\pi/8$ b. $\pi/6$ c. $\pi/4$ d. $\pi/36$

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218. The number of positive integral ordered pairs of (a, b) such that $6, a, b$ are in harmonic progression is ________.

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219. Let $a, b > 0,$ let $5a-b, 2a+b, a+2b$ be in A.P. and $(b+1)^2, ab+1, (a-1)^2$ are in G.P., then the value of $(a^{-1}+b^{-1})$ is _______.

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220. The difference between the sum of the first k terms of the series $1^3 + 2^3 + 3^3 + \quad + n^3$ and the sum of the first k terms of $1 + 2 + 3 + \quad + nis1980.$ The value of k is ________.

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221. Let a, b, c, d be four distinct real numbers in A.P. Then half of the smallest positive valueof k satisfying $2(a-b) + k(b-c)^2 + (c-a)^3 = 2(a-d) + (b-d)^2 + (c-d)^3$ is ________.

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222. Let $a_1, a_2, a_3, , a_{101}$ are in G.P. with $a_{101} = 25 and \sum_{i=1}^{201} a_1 = 625.$ Then the value of $\sum_{i=1}^{201} \frac{1}{a_1}$ equals__________.

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223. Let S= $\sum_{n=1}^{9999} \frac{1}{(\sqrt{n}+\sqrt{n+1})(\sqrt[4]{n}+\sqrt[4]{n+1})}$, then S equals

__________.

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224. The next term of the G.P. $x, x^2+2, andx^3+10$ is $\frac{729}{16}$ b. 6 c. 0 d. 54

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225. If $x^2+9y^2+25z^2=xyz\left(\frac{15}{x}+\frac{5}{y}+\frac{3}{z}\right), then\ x, y, andz$ are in H.P. b. $\frac{1}{x}, \frac{1}{y}, \frac{1}{z}$ are in A.P. c. x, y, z are in G.P. d. $\frac{1}{a}+\frac{1}{d}=\frac{1}{b}=\frac{1}{c}$

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226. If $1+2x+3x^2+4x^3+\infty \geq 4$, then a.least value of $xis1/2$ b.greatest value of $xis\frac{4}{3}$ c.least value of $xis2/3$ d.greatest value of x does not exists

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227. If $n > 1$, the value of the positive integer m for which $n^m + 1$ divides $a = 1 + n + n^2 + \ddot{+} n^{63}$ is/are 8 b. 16 c. 32 d. 64

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228. For an increasing A.P. $a_1, a_2, \ldots. a_n$ if $a_1 + a_3 + a_5 = -12$ and $a_1 a_3 a_5 = 80,$ then which of the following is/are true? a.$a_1 = -10$ b. $a_2 = -1$ c. $a_3 = -4$ d. $a_5 = +2$

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229. Q. Let n be an odd integer if $\sin n\theta = \sum_{r=0}^{n} (b_r) \sin^r \theta$, for every value of theta then b_0 and b_1---

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230. Let $S_n = \sum_{k=1}^{4n} (-1)\frac{k(k+1)}{2}k^2$. Then S_n can take value (s) 1056 b. 1088 c. 1120 d. 1332

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231. The 15th term of the series $2\frac{1}{2} + 1\frac{7}{13} + 1\frac{1}{9} + \frac{20}{23} + ..$ is

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232. Let $(a_1, a_2, a_3. \dots, a_{11})$ be real numbers satsfying $a_1 = 15, 27 - 2a_2 > 0$ and $a_k = 2a_{k-1} - a_{k-2}$ for $k = 3, 4. \dots, 11,$

If

$\frac{a_1^2 + a_2^2 + \dots\dots + a_{11}^2}{11} = 90$ then the value of $\frac{a_1 + a_2 + \dots\dots + a_1}{11}$

is equal to ________.

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233. If $x^2 + 9y^2 + 25z^2 = xyz\left(\frac{15}{2} + \frac{5}{y} + \frac{3}{z}\right), then\ x, y, and z$ are in H.P. b. $\frac{1}{x}, \frac{1}{y}, \frac{1}{z}$ are in A.P. c. x, y, z are in G.P. d. $\frac{1}{a} + \frac{1}{d} = \frac{1}{b} = \frac{1}{c}$

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234. Statement 1: If an infinite G.P. has 2nd term x and its sum is 4, then x belongs to$(-8, 1)$. Statement 2: Sum of an infinite G.P. is finite if for its common ratio r, $0 < |r| < 1$.

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235. statement 1: Let $p_1, p_2, \ldots, p_n$ and x be distinct real number such that $\left(\sum_{r=1}^{n-1} p_r^2\right)x^2 + 2\left(\sum_{r=1}^{n-1} p_r p_{r+1}\right)x + \sum_{r=2}^{n} p_r^2 \leq 0$ then $p_1, p_2, \ldots, p_n$ are in G.P. and when $a_1^2 + a_2^2 + a_3^2 + \ldots + a_n^2 = 0, a_1 = a_2 = a_3 = \ldots = a_n = 0$ Statement 2 : If $\frac{p_2}{p_1} = \frac{p_3}{p_2} = \ldots. = \frac{p_n}{p_{n-1}}$, then $p_1, p_2, \ldots, p_n$ are in G.P.

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236. If the sum of n terms of an A.P is cn (n-1)where $c \neq 0$ then the sum of the squares of these terms is

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237. If $|a| < 1 and |b| < 1$, then the sum of the series $1 + (1+a)b + (1+a+a^2)b^2 + (1+a+a^2+a^3)b^3 + \dots$ is

A. (a) $\dfrac{1}{(1-a)(1-b)}$

B. (b). $\dfrac{1}{(1-a)(1-ab)}$

C. (c.) $\dfrac{1}{(1-b)(1-ab)}$

D. (d.) $\dfrac{1}{(1-a)(1-b)(1-ab)}$

Answer: null

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238. Let $n \in N, n > 25.$ Let A, G, H deonote te arithmetic mean, geometric mean, and harmonic mean of 25 and $n\cdot$ The least value of n for which $A, G, H \in \{25, 26, n\}$ is a. 49 b. 81 c.169 d. 225

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239. If $a_1, a_2, a_3 (a_1 > 0)$ are three successive terms of a G.P. with common ratio $r,$ for which $a_3 > 4a_2 - 3a_1$ holds is given by

A. a. $1 < r < \ \rightarrow 3$

B. b. $-3 < r < \ -1$

C. c. $r > 3 \text{ or } r < 1$

D. d. none of these

Answer: null

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240. Three numbers form an increasing G.P. If the middle number is doubled, then the new numbers are in A.P. The common ratio of the G.P. is

A. (A) $2-\sqrt{3}$

B. (B) $3+\sqrt{3}$

C. (c) $2+\sqrt{3}$

D. (D) $3+\sqrt{2}$

Answer: null

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241. If $S_1, S_2, S_3, \ldots, S_m$ are the sums of n terms of m A.P.'s whose first terms are 1, 2, 4, ..., m and whose common differences are 1, 3, 5, ..., (2m-1) repectively, then show that

$$S_1+S_2+S_3+\ldots+S_n=\frac{1}{2}mn(mn+1)$$

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242. In a sequence of $(4n+1)$ terms, the first $(2n+1)$ terms are n A.P. whose common difference is 2, and the last $(2n+1)$ terms are in G.P. whose common ratio is 0.5 if the middle terms of the A.P. and LG.P. are equal ,then the middle terms of the sequence is $\frac{n.2n+1}{2^{2n}-1}$ b. $\frac{n.2n+1}{2^n-1}$

c. $n.2^n$ d. none of these

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243. Find the sum of n terms of the seriesf whose nth term is $T(n)=\frac{\tan x}{2^n}\times\frac{\sec x}{2^{n-1}}.$

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244. Find the value of $\sum_{i=0}^{\infty}\sum_{j=0}^{\infty}\sum_{k=0}^{\infty}\frac{1}{3^i3^j3^k}$.
$(\in ej\neq k)$

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245. Let $a_1, a_2, \ldots, a_n$ be real numbers such that

$$\sqrt{a_1} + \sqrt{a_2 - 1} + \sqrt{a_3 - 2} + \ldots + \sqrt{a_n - (n-1)}$$
$$= \frac{1}{2}(a_1 + a_2 + \ldots. + a_n) - \frac{n(n-3)}{4}$$

Then the value of find the value of $\sum_{i=1}^{100} a_i$

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246. If $\log_2(5 \times 2^x + 1), \log_4\left(2^{1-x} + 1\right)$ and 1 are in A.P., then x equals

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247. Let S_k, where $k = 1, 2,....,100$, denotes the sum of the infinite geometric series whose first term is $\frac{k-1}{k!}$ and the common ratio is $\frac{1}{k}$. Then, the value of $\frac{100^2}{100!} + \sum_{k=2}^{100} \left|\left(k^2 - 3k + 1\right) S_k\right|$ is....

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248. The real number x_1, x_2, x_3 satisfying the equation $x^3 - x^2 + \beta x + \gamma = 0$ are in AP. Find the intervals in which beta and gamma lie.

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249. Let a, b, c, d be real numbers in $G.P.$ If u, v, w satisfy the system of equations $u + 2v + 3w = 6, 4u + 5v + 6w = 12$ and $6u + 9v = 4$ then show that the roots of the equation $\left(\frac{1}{u} + \frac{1}{v} + \frac{1}{w}\right)x^2 + \left[(b-c)^2 + (c-a)^2 + (d-b)^2\right]x + u + v + w = 0$ and '20x^2 +10(a-d)^2 x-9=0` are reciprocals of each other.

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250. The sum of the first three terms of a strictly increasing G.P. is αs and sum of their squares is s^2 then if `alpha'^2=2, then the value of r is

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251. If $(\log)_3 2, (\log)_3(2^x-5) and (\log)_3\left(2^x-\frac{7}{2}\right)$ are in arithmetic progression, determine the value of $x\cdot$

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252. If p is the first of the n arithmetic means between two numbers and q be the first on n harmonic means between the same numbers. Then, show that q does not lie between p and $\left(\frac{n+1}{n-1}\right)^2 p$.

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253. The interior angles of a polygon are in arithmetic progression. The smallest angle is 120° and the common difference is 5° Find the number of sides of the polygon

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254. If $a_1, a_2, \ldots .. a_n$ are in arthimatic progression, where $a_i > 0$ for all I, then show that

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

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

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256. Find three numbers a,b,c between 2 & 18 such that; (G) their sum is 25 (ii) the numbers 2,a,b are consecutive terms of an AP & (ii) the numbers b,c, 18 are consecutive terms of a G.P.

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257. Find the sum $1+2\left(1+\frac{1}{50}\right)+3\left(1+\frac{1}{50}\right)^2+\ldots.50$ terms.

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258. The sum to 50 terms of the series

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

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259. If a_1, a_2, a_n are in A.P. with common difference $d \neq 0$, then the sum of the series $\sin d\left[\sec a_1 \sec a_2+(\sec)_2 \sec a_3+\ldots.+seca_{n-1}(\sec)_n\right]$ is : a.$\cos eca_n-\cos eca$ b. cot a_n- cot a c. $seca_n-seca$ d. $tana_n-tana$

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260. The sum of the series $a-(a+d)+(a+2d)-(a+3d)+$ up to $(2n+1)$ terms is- a. $-nd.$ b. $a+2nd.$ c. $a+nd.$ d. $2nd$

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261. If a,b and c are in GP and x,y respectively, are the arithmetic means between a,b and b,c then the value of $\frac{a}{x} + \frac{c}{y}$ is

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262. If a,b and c are in A.P and p and p are , respecitvely,A.M and G.M between a and b while q,q are , respectively the A.M and G.M. between b and c , then

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263. Find the sum $\frac{3}{1 \times 2} \times \frac{1}{2} + \frac{4}{2 \times 3} \times \left(\frac{1}{2}\right)^2 + \frac{5}{3 \times 4} \times \left(\frac{1}{2}\right)^2 + \rightarrow n$ terms.

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264. If the sum of n terms of the series

$$\frac{2n+1}{2n-1}+3\left(\frac{2n+1}{2n-1}\right)^2+5\left(\frac{2n+1}{2n-1}\right)^3+\ldots.$$

is 820 then the value of n is ______

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265. Let $x=1+3a+6a^2+10a^3+, |a|<1.$ $y=1+4b+10b^2+20b^3+, |b|<1.$ Find $S+1+3(ab)+5(ab)^2+$ in terms of $xandy.$

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

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267. A long a road lie an odd number of stones placed at intervals of 10 meters. These stones have to be assembled around the middle stone. A person can carry only one stone ar a time. A man started the job with one of the end stones by carrying them in succession. In carrying all the stones, the man covered a total distance of 3 kilometers. Then the total number of stones is

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268. Find a three – digit number such that its digits are in increasing G.P. (from left to right) and the digits of the number obtained from it by subtracting 100 form an A.P.

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269. If the terms $\sqrt{a-x}, \sqrt{x}, \sqrt{a+x}$ are in A.P and all are integers where a,x $>$ 0, then find the least composite value of a.

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270. If $\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \ldots \text{ to } \infty = \frac{\pi^2}{6}, \text{ then } \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + ..$ equals

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271. Find the coefficient of x^{18} in $\left(1 + x + 2x^2 + 3x^2 + \ldots + 18x^{18}\right)^2$

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272. If the sum of the first $2n$ terms of the A.P. 2, 5, 8, ..., is equal to the sum of the first n terms of A.P. 57, 59, 61, ..., then n equals

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273. Statement 1: If the arithmetic mean of two numbers is 5/2 geometric mean of the numbers is 2, then the harmonic mean will be 8/5. Statement 2: For a group of positive numbers $\left(G\dot{M}.\right)^2 = \left(A\dot{M}.\right)\left(H\dot{M}.\right)$.

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274. Let the positive numbers a, b, c, d be in AP. Then abc, abd, acd, bcd are

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275. If three positive real numbers a, b, c are in A.P and $abc = 4$, then the minimum possible value of b is

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276. Consider an infinite geometric series with first term a and common ratio r. If its sum is 4 and the second term is 3/4, then $a = \frac{4}{7}, r = \frac{3}{7}$ b. $a = 2, r = \frac{3}{8}$ c. $a = \frac{3}{2}, r = \frac{1}{2}$ d. $a = 3, r = \frac{1}{4}$

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277. The maximum sum of the series $20 + 19\frac{1}{3} + 18\frac{2}{3} + \ldots\ldots$ is (A) 310 (B) 300 (C) 0320 (D) none of these

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278. In the quadratic $ax^2 + bx + c = 0, D = b^2 - 4ac$ and $\alpha + \beta, \alpha^2 + \beta^2, \alpha^3 + \beta^3,$ are in G.P , where α, β are the roots of $ax^2 + bx + c,$ then (a) $\Delta \neq 0$ (b) $b\Delta = 0$ (c) cDelta = 0(d)Delta = 0`

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279. Let,$a_1, a_2 - a, a_3, \ldots$ be in harmonic progression with $a_1 = 5$ and $a_{20} = 25$ The least positive integer n for which $a_n < 0$

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280. An infinite G.P has first 13 term as a and sum 5 , then

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281. Let $S \subset (0, \pi)$ denote the set of values of x satisfying the equation $8^{1 + |\cos x| + \cos^2 x + |\cos^{3x}| \to \infty = 4^3}$. Then, $S =$ $\{\pi/3\}$ b. $\{\pi/3, 2\pi/3\}$ c. $\{-\pi/3, 2\pi/3\}$ d. $\{\pi/3, 2\pi/3\}$

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282. The value of $\sum_{r=0}^{n} (a + r + ar)(-a)^r$ is equal to

A. a.$(-1)^n\left[(n+1)a^{n+1} - a\right]$

B. b. $(-1)^n (n+1) a^{n+1}$

C. c. $(-1)^n \frac{(n+2)a^{n+1}}{2}$

D. d. $(-1)^n \frac{na^n}{2}$

Answer: null

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283. If $x_1, x_2..., x_{20}$ are in H.P and $x_1, 2, x_{20}$ are in G.P then $\sum_{r=1}^{19} x_r r_{x+1}$

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284. The sum of series $\frac{x}{1-x^2} + \frac{x^2}{1-x^4} + \frac{x^4}{1-x^8} +$ to infinite terms, if $|x| < 1,$ is

A. a. $\frac{x}{1-x}$

B. b. $\frac{1}{1-x}$

C. b. $\frac{1}{1-x}$

D. d. 1

Answer: null

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285. If

$b_i = 1 - a_i na = \sum_{i=1}^{n} a_i, nb = \sum_{i=1}^{n} b_i$ then $\sum_{i=1}^{n} a_b - i + \sum_{i=1}^{n} (a_i - a)^2 =$

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286. The greatest integer by which $1 + \sum_{r=1}^{30} r \times r!$ is divisible is a. composite number b. odd number c. divisible by 3 d. none of these

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287. $\lim_{n \to \infty} \sum_{r=1}^{n} \frac{r}{1 \times 3 \times 5 \times 7 \times 9 \times \dots \times (2r+1)}$ is equal to

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288. Value of $\left(1+\frac{1}{3}\right)\left(1+\frac{1}{3^2}\right)\left(1+\frac{1}{3^4}\right)\left(1+\frac{1}{3^8}\right)\ldots\ldots.\infty$ is equal to a.3 b. $\frac{6}{5}$ c. $\frac{3}{2}$ d. none of these

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289. If $\sum_{r=1}^{n} r^4 = I(n), \quad \text{then} \quad \sum_{r=1}^{n} (2r-1)^4$ is equal to

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290. If sum of an infinite G.P. $p, 1, 1/p, 1/p^2, \ldots.. is9/2$ then value of p is

a. 3 b. 3/2 c. 3 d. 9/2

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291. The sum of $i - 2 - 3i + 4$ up to 100 terms, where $i = \sqrt{-1}$ is a. $50(1-i)$ b. $25i$ c. $25(1+i)$ d. $100(1-i)$

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292. If $a_1, a_2, a_3 .... a_{2n+1}$ are in A.P then

$\frac{a_{2n+1} - a_1}{a_{2n+1} + a_1} + \frac{a_2 n - a_2}{a_{2n} + a_2} + ... + \frac{a_{n+2} - a_n}{a_{n+2} + a_n}$ is equal to

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293. If the sides of a triangle are in GP and its largest angle is twice tha smallset then the common ratio r satisfies the inequality

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294. For the series,

$$S = 1 + \frac{1}{(1+3)}(1+2)^2 + \frac{1}{(1+3+5)}(1+2+3)^2 + \frac{1}{(1+3+5+7)}($$

+...

A. (A)7th term is 16

B. (B)7th term is 18

C. C)Sum of first 10 terms is $\frac{505}{4}$

D. (D)Sum of first 10 terms is $\frac{45}{4}$

Answer: null

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295. If first and $(2n-1)^t h$ terms of an AP, GP. and HP. are equal and their nth terms are a, b, c respectively, then

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296. Let $a_1, a_2, , a_{10}$ be in A.P. and h_1, h_2, h_{10} be in H.P. If $a_1 = h_1 = 2 and a_{10} = h_{10} = 3, then a_4 h_7$ is

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297. The harmonic mean of the roots of the equation $(5+\sqrt{2})x^2-(4+\sqrt{5})x+8+2\sqrt{5}=0$ is

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298. Find the sum $(x+2)^{n-1}+(x+2)^{n-2}(x+1)^{+}(x+2)^{n-3}(x+1)^2+\ +(x+1)^{n-1}$

A. a.$(x+2)^{n-2}-(x+1)^n$

B. b. $(x+2)^{n-2}-(x+1)^{n-1}$

C. c. $(x+2)^n-(x+1)^n$

D. d. none of these

Answer: null

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299. If $ln(a+c), ln(a-c) and ln(a-2b+c)$ are in A.P., then (a) a, b, c are in A.P. (b) $a^2, b^2, c^2,$ are in A.P. (c) a, b, c are in G.P. d. (d) a, b, c are in H.P.

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

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301. The sum to n terms of the series $\frac{1}{2}+\frac{3}{4}+\frac{7}{8}+\frac{15}{16}+\ldots\ldots$ is

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302. The third term of a geometric progression is 4. Then find the product of the first five terms.

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303. In triangle ABC, Medians AD and CE are drawn. If $AD = 5, \angle DAC = \frac{\pi}{8}, and \angle ACE = \frac{\pi}{4}$, then the area of the triangle ABC is equal to $\frac{25}{9}$ (b) $\frac{25}{3}$ (c) $\frac{25}{18}$ (d) $\frac{10}{3}$

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304. Suppose a, b, c are in a.P and a^2, b^2, c^2 are in G.P. If $a < b < c$ and $a + b + c = \frac{3}{2}$ then the value of a Is

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305. If x,y and z are pth ,qth and rht terms, respectively of an A.P and also of a G.P then prove that $x^{x-y}y^{z-x}z^{x-y}=1$

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306. The sum of the first n terms of the series $\frac{1}{\sqrt{2}+\sqrt{5}}+\frac{1}{\sqrt{5}+\sqrt{8}}+\frac{1}{\sqrt{8}+\sqrt{11}}+\ldots$ is

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307. If $a, b, andc$ are in H.P., then th value of $\frac{(ac+ab-bc)(ab+bc-ac)}{(abc)^2}$ is $\frac{(a+c)(3a-c)}{4a^2c^2}$ b. $\frac{2}{bc}-\frac{1}{b^2}$ c. $\frac{2}{bc}-\frac{1}{a^2}$ d. $\frac{(a-c)(3a+c)}{4a^2c^2}$

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308. If $a_1, a_2, a_3 \ldots a_n$ are in H.P and $f(k) = \left(\sum_{r=1}^{n} a_r\right) - a_k$ then $\frac{a_1}{f(1)}, \frac{a_2}{f(3)}, \ldots, \frac{a_n}{f(n)}$ are in

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309. If a, b, c are in A.P., the $\frac{a}{bc}, \frac{1}{c}, \frac{1}{b}$ will be in a. A.P b. G.P. c. H.P. d. none of these

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310. Let $a + ar_1 + ar_1^2 + \ldots\ldots + \infty$ and $a + ar_2 + ar_2^2 + \ldots + \infty$ be two infinite series of positive numbers with the same first term. The sum of the firest series is r_1 and the value of the second series is r_2 . Then the value of $(r_1 + R_2)$ is ________.

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311. The coefficient of the quadratic equation $ax^2 + (a+d)x + (a+2d) = 0$ are consecutive terms of a positively valued, increasing arithmetic sequence. Then the least integral value of d/a such that the equation has real solutions is ________.

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312. Let S denote sum of the series $\frac{3}{2^3} + \frac{4}{2^4 .3} + \frac{5}{2^6 .3} + \frac{6}{2^7 .5} + \infty$ Then the value of S^{-1} is ________.

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313. Let the sum of first three terms of G.P. with real terms be 13/12 and their product is -1. If the absolute value of the sum of their infinite terms is S, then the value of $7S$ is _____.

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314. Given a, b, c are in A.P. b, c, d are in G.P. and c, d, e are in H.P. If $a = 2 \text{ and } e = 18,$ then the sum of all possible value of c is _______.

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315. The terms a_1, a_2, a_3 from an arithmetic sequence whose sum s 18. The terms $a_1 + 1, a_2, a_3, \ + 2,$ in that order, form a geometric sequence. Then the absolute value of the sum of all possible common difference of the A.P. is _______.

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316. Let $f(x) = 2x + 1.$ Then the number of real number of real values of x for which the three unequal numbers $f(x), f(2x), f(4x)$ are in G.P. is 1 b. 2 c. 0 d. none of these

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317. Concentic circles of radii 1,2,3......,100 cm are drewn. The interior of the smallest circle is colored red and the angular regions are colored altermately green and red, so that no two adjacent regions are of the same colour . Then the total area of the green regions in sq.cm is equal to

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318. Let $\{t_n\}$ be a sequence of integers in G.P. in which $t_4 : t_6 = 1 : 4$ and $t_2 + t_5 = 216.$ then t_1 is

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319. If $x, 2y, 3z$ are in AP where the distinct numbers x,y,z are in GP then the common ratio r satisfies the inequality

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320. If x, y, z are real and $4x^2 + 9y^2 + 16z^2 - 6xy - 12yz - 8zx = 0, thenx, y, z$ are in a. A.P. b. G.P. c. H.P. d. none of these

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321. If $a_1, a_2, \ldots. a_n$ are in H.P then $\frac{a_1}{a_2 +, a_3, \ldots, a_n}, \frac{a_2}{a_1 + a_3 + \ldots. + a_n}, \ldots, \frac{a_n}{a_1 + a_2 + \ldots. + a_{n-1}}$ are in

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322. If $H_1, H_2, , H_{20} are 20$ harmonic means between 2 and 3, then $\frac{H_1 + 2}{H_1 - 2} + \frac{H_{20} + 3}{H_{20} - 3} =$ a. 20 b.21 c. 40 d. 38

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323. A pack contains n cards numbered from 1 to n. Two consecutive numbered cards are removed from the pack and the sum of the numbers on the remaining cards is 1224. If the smaller of the numbers on the removed cards is k, then $k - 20$ is equal to

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324. Let $a_n = 16, 4, 1, $ be a geometric sequence. Define P_n as the product of the first n terms. Then the value of $\frac{1}{4}\sum_{n=1}^{\infty} P_n^{\frac{1}{n}}$ is ________.

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325. If he equation $x^3 + ax^2 + bx + 216 = 0$ has three real roots in G.P., then b/a has the value equal to _____.

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326. Let T_r denote the rth term of G.P for r=1,2,3 ...If for some postive intergers m and n, we have $T_m = 1/n^2$ and $T_n = 1/m^2$ then find the vlaue of $T_{(m+n)/2}$

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327. Let $A_n = \left(\frac{3}{4}\right) - \left(\frac{3}{4}\right)^2 + \left(\frac{3}{4}\right)^3 + \ldots + (-1)^{n-1}\left(\frac{3}{4}\right)^n$

$B_n = 1 - A_n$. Find a least odd natural number n_0, so that $B_n > A_n, \forall n \geq n_0$

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328. For a positive integer n let $a(n) = 1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \ldots + \frac{1}{(2^n) - 1}$, then

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329. If $x > 1, y > 1, z > 1$ are in G.P then $\frac{1}{1+\log x}, \frac{1}{1+\log y}, \frac{1}{1+\log z}$ are in

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330. .Let $a_1, a_2, \ldots\ldots\ldots\ldots$ be positive real numbers in geometric progression. For each n, let $A_n G_n, H_n$, be respectively the arithmetic mean, geometric mean & 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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331. The fourth power of the common difference of an arithmetic progression with integer entries is added to the product of any four consecutive of it. Prove that the resulting sum is the squares of an integer.

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332. If a, b, c are in AP, a^2, b^2, c^2 are in HP, then prove that either $a = b = c$ or $a, b, -\frac{c}{2}$ form a GP.

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333. Let a and b be positive real numbers. If a, A_1, A_2, b are in arthimatic progression, a $G_1, G_2,$ b are in geometric progression and a, H_1, H_2,b are in harmonic progression, show that $\frac{G_1G_2}{H_1H_2} = \frac{A_1 + A_2}{H_1 + H_2} = \frac{(2a+b)(a+2b)}{9ab}$.

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334. The sum of an infinite G.P. is 57 and the sum of their cubes is 9747, then the common ratio of the G.P. is

A. $a.1/2$

B. b. $2/3$

C. c. $1/6$

D. d. none of these

Answer: null

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335. If $a^2+b^2, ab+bc, \text{ and } b^2+c^2$ are in G.P then a, b, c are in

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336. If x, y, z are in G.P. and $a^x=b^y=c^z$, then $(\log)_b a=(\log)_a c$ b. $(\log)_c b=(\log)_a c$ c. $(\log)_b a=(\log)_c b$ d. none of these

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337. After striking the floor, a certain ball rebounds (4/5)th of height from which it has fallen. Then the total distance that it travels before coming to rest, if it is gently dropped of a height of 120 m is $1260m$ b. $600m$ c. $1080m$ d. none of these

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338. If S dentes the sum to infinity and S_n the sum of n terms of the series $1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \ldots\ldots$, such that $S - S_n < \frac{1}{1000}$ then the least value of n is

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339. The first term of an infinite geometric series is $21.$ The second term and the sum of the series are both positive integers. Then which of the following is not the possible value of the second term 12 b. 14 c. 18 d. none of these

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340. Given that $x+y+z=15 when a, x, y, z, b$ are in A.P. and $\frac{1}{x}+\frac{1}{y}+\frac{1}{z}+=\frac{5}{3} when a, x, y, z, b$ are in H.P.

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341. Let $a_1, a_2, a_3 \ldots \ldots, a_n$ be in G.P such that $3a_1+7a_2+3a_3-4a_5=0$ Then common ratio of G.P can be

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342. The consecutive digits of a three digit number are in G.P. If middle digit is increased by 2, then they form an A.P. If 792 is subtracted from this, then we get the number constituting of same three digits but in reverse order. Then number is divisible by a. 7 b. 49 c. 19 d. none of these

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343. If $\sum_{r=1}^{n} r(r+1)(2r+3) = an^4 + bn^3 + cn^2 + dn + e,$ then a. $a - b = d - c$ b. $e = 0$ c. $a, b - 2/3, c - 1$ are in A.P. d. $\frac{c}{a}$ is an integer

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344. The terms of an infinitely decreasing G.P. in which all the terms are positive, the first term is 4, and the difference between the third and fifth terms is $32/81$, then $r = 1/3$ b. $r = 2\sqrt{2}/3$ c. $S_{\infty} = 6$ d. none of these

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345. If a,x, and b and b are in A.P .., a,y , and a,z,b are in H.P such that x=9z and $a > 0, b > 0$ then

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346. If $a, b, andc$ are in G.P., then $a+b, 2b, andb+c$ are in a. A.P b. G.P. c. H.P. d. none of these

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347. $a, b, cx \in R^+$ such that $a, b, andc$ are in A.P. and $b, candd$ are in H.P., then $ab = cd$ b. $ac = bd$ c. $bc = ad$ d. none of these

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348. The harmonic mean of two numbers is 4. Their arithmetic mean A and the geometric mean G satisfy the relation $2A + G^2 = 27.$ Find two numbers.

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