MATHS

BOOKS - CENGAGE MATHS (HINGLISH)

SEQUENCES AND SERIES

Solved Examples And Exercises

1. Find the sum of the following series to n terms

$5 + 7 + 13 + 31 + 85 + \ldots$

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2. 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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3. 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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4. Find the sum to n terms of the series $3 + 15 + 35 + 63 +$

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5. Sum of n terms the series : $1^2 - 2^2 + 3^2 - 4^2 + 5^2 - 6^2 +$

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

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8. Find the sum of n terms of the series $1^3 + 3.2^2 + 3^3 + 3.4^2 + 5^3 + 3.6^2 + \ldots\ldots.$ when (i)n is odd (ii)n is even

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9. 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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10. Find the sum of the series $\frac{1^3}{1} + \frac{1^3 + 2^3}{1+3} + \frac{1^3 + 2^3 + 3^3}{1+3+5} +$ up to n terms.

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11. 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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12. 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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13. 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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14. The Fibonacci sequence is defined by $1 = a_1 = a_2$ and $a_n = a_{n-1} + a_{n-2}, n > 2$. Find $\frac{a_{n+1}}{a_n}, f$ or $n = 5$.

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15. Consider the sequence defined by $a_n = an^2 + bn + \cdot$ If $a_1 = 1, a_2 = 5, and a_3 = 11,$ then find the value of a_{10}.

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16. Show that the sequence 9, 12, 15, 18, ... is an A.P. Find its 16th term and the general term.

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17. A sequence of integers $a_1, a_2, \ldots\ldots, a_n$ satisfies $a_{n+2} = a_{n+1} - a_n$ for $n \geq 1$. Suppose the sum of first 999 terms is 1003 and the sum of the first 1003 terms is -99. Find the sum of the first 2002 terms.

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18. Write down the sequence whose nth term is

(i) $\frac{2^n}{n}$ (ii) $\frac{3+(-1)^n}{3^n}$

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19. Write the first three terms of the sequence defined by $a_1=2, a_{n+1}=\frac{2a_n+3}{a_n+2}$.

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20. Find the sequence of he numbers defined by $a_n=\begin{cases}\frac{1}{n}, whe\cap isodd\frac{1}{n}, whe\cap iseven\end{cases}$

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21. Find the sum of n terms of the sequence $(a_n), where a_n = 5 - 6n, n \in N$.

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22. Show that the sequence $\log a, \log(ab), \log(ab^2), \log(ab^3),$ is an A.P. Find the nth term.

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23. 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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24. Consider two A.P.

$S_1 : 2, 7, 12, 17, \ldots 500$ terms

and $S_2: 1, 8, 15, 22, \ldots 300$ terms

Find the number of common term. Also find the last common term.

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25. 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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26. 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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27. Given two A.P. $2, 5, 8, 11 \ldots \ldots T_{60}$ and $3, 5, 79, \ldots \ldots \ldots T_{50}$. Then find the number of terms which are identical.

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28. 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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29. 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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30. How many terms are there in the A.P. 3, 7, 11, ... 407?

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

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

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33. If $a, b, c \in R+$ form an A.P., then prove that $a+\frac{1}{bc}, b+\frac{1}{ac}, c+\frac{1}{ab}$ are also in A.P.

(a) A.P.

(b) G.P.

(c) H.P.

(d) none of these

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

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35. 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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36. 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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37. Show $(m+n)thand(m-n)th$ terms of an A.P. is equal to twice the mth terms.

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

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

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41. If the sum of the series 2, 5, 8, 11, ... is 60100, then find the value of n.

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42. 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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43. If eleven A.M. 's are inserted between 28 and 10, then find the number of integral A.M. 's.

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44. 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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45. Find the sum of first 24 terms of the A.P. $a-1, a_2, a_3,$ if it is inown that $a_1+a_5+a_{10}+a_{15}+a_{20}+a_{24}=225.$

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46. 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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47. The sum 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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48. If the first two terms of as H.P. are 2/5 and 12/13, respectively. Then find the largest term.

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49. 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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50. If a, b, c are in G.P. and $a-b, c-a, andb-c$ are in H.P., then prove that $a+4b+c$ is equal to 0.

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

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

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54. If $a, b, c, andd$ are in H.P., then find the value of $\frac{a^{-2} - d^2}{b^{-2} - c^2}$.

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

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57. If the sequence $a_1, a_2, a_3, a_n, \cdot$ forms an A.P., then prove that $a12 - a22 + a32 + \quad + a42 = \frac{n}{2n-1}(a12 - a2n2)$

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58. 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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59. Three non-zero numbers $a, b, and c$ are in A.P. Increasing a by 1 or increasing c by 2, the numbers are in G.P. Then find b.

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60. 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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61. 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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62. 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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63. Which term of the G.P. $2, \frac{1}{2}, \frac{1}{4}, is \frac{1}{128}$?

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64. $'n' A. M' s$ are inserted between a and 2b, and then between 2a and b. If $p^t h$ mean in each case is a equal, $\frac{a}{b}$ is equal to

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

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67. If $\frac{a+bx}{a-bx}=\frac{b+cx}{b-cx}=\frac{c+dx}{c-dx}(x\neq0)$, then show that a, b, c and d are in G.P.

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68. 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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69. The first terms of a G.P. is 1. The sum of the third and fifth terms is 90. Find the common ratio of the G.P.

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70. 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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71. Three numbers are in G.P. If we double the middle term, we get an A.P. Then find the common ratio of the G.P.

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72. 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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73. 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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74. 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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75. 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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76. 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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77. If $p, q, andr$ are inA.P., show that the pth, qth, and rth terms of any G.P. are in G.P.

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

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

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80. 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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81. 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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82. Find the sum of first 100 terms of the series whose general term is given by $a_k=\left(k^2+1\right)k!$

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83. If the continued product o three numbers in a G.P. is 216 and the sum of their products in pairs is 156, find the numbers.

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84. 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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85. 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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86. A sequence of numbers $A_n, n = 1, 2, 3, . .$ 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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87. The sum of three numbers in GP. 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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88. 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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89. If a, b, c are in A.P., b, c, d are in G.P. and $\frac{1}{c}, \frac{1}{d}, \frac{1}{e}$ are in A.P. prove that a, c, e are in G.P.

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

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

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92. Write the first five terms of the following sequence and obtain the corresponding series. $a_1 = a_2 = 2, a_n = a_{n-1} - 1, n > 2$

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93. 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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94. 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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95. Determine the number of terms in a G.P., if $a_1 = 3, a_n = 96, and S_n = 189.$

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96. 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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97. Let S e the sum, P the product, adn R the sum of reciprocals of n terms in a G.P. Prove that $P^2 R^n = S^n$.

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98. 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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99. Find the product o three geometric means between 4 and 1/4.

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100. if $(m+1)th, (n+1)th$ and $(r+1)th$ term of an AP are in GP.and m, n and r in HP. . find the ratio of first term of A.P to its common difference

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

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102. Find the sum $1^2+(1^2+2^2)+(1^2+2^2+3^2)+$ up to 22nd term.

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

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104. 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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105. The sum of infinite number of terms in G.P. is 20 and the sum of their squares is 100. Then find the common ratio of G.P.

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106. Find the sum of the series $1 + 2(1 - x) + 3(1 - x)(1 - 2x) + + n(1 - x)(1 - 2x)(1 - 3x)[1 - (n -$

.

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107. Prove that $6^{1/2} \times 6^{1/4} \times 6^{1/8} \infty = 6.$

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108. 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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109. 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 $\frac{xy}{z} = \frac{ab}{.}$

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110. Find the sum of n terms in the given sequence

$1 + 4 + 13 + 40 + 121 + \ldots$

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111. If each term of an infinite G.P. is twice the sum of the terms following it, then find the common ratio of the G.P.

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112. The sum to n terms of series $1+\left(1+\frac{1}{2}+\frac{1}{2^2}\right)+\left(1+\frac{1}{2}+\frac{1}{2^2}+\frac{1}{2^3}+\frac{1}{2^4}\right)+$ is

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

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

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

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

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118. 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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119. 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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120. If the sum to infinity of the series $3 + (3+d)\frac{1}{4} + (3+2d)\frac{1}{4^2} + \infty$ is $\frac{44}{9}$, then find ..

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

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122. 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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123. Find the sum of the series $1 + 3x + 5x^2 + 7x^2 + \rightarrow n$ terms.

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124. 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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125. If the A.M. between two numbers exceeds their G.M. by 2 and the GM. Exceeds their H.M. by 8/5, find the numbers.

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126. The AM of teo given positive numbers is 2. If the larger number is increased by 1, the GM of the numbers becomes equal to the AM to the given numbers. Then, the HM of the given numbers is

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127. Find the sum of the series $1 + 3x + 5x^2 + 7x^3 + \dots\dots\dots$ upto n terms.

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

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129. Find the sum of n terms of the series $1+\frac{4}{5}+\frac{7}{5^2}+\frac{10}{5^3}+\ldots\ldots$

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

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

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

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133. Insert four H.M.'s between 2/3 and 2/13.

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134. If $a, b, andc$ are respectively, the pth, qth , and rth terms of a G.P., show that $(q-r)\log a + (r-p)\log b + (p-q)\log c = 0.$

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

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136. If $a, a_1, a_2, a_3, a_{2n}, b$ are in A.P. and $a, g_1, g_2, g_3, , g_{2n}, b$. are in G.P. and h s the H.M. of $aandb,$ then prove that $\frac{a_1 + a_{2n}}{g_1 g_{2n}} + \frac{a_2 + a_{2n-1}}{g_1 g_{2n-1}} + + \frac{a_n + a_{n+1}}{g_n g_{n+1}} = \frac{2n}{h}$

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137. If nine arithmetic 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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138. 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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139. Find two numbers whose arithmetic mean is 34 and the geometric mean is 16.

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140. If a, b, c, d and p are distinct real numbers such that $(a^2+b^2+c^2)p^2-2(ab+bc+cd)p+\left(b^2+c^2+d^2\right)\leq 0,$ then prove that a, b, c, d are in G.P.

(a) AP

(b) GP

(c) HP

(d) ab = cd

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141. If A.M. and G.M. between two numbers is 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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142. Prove that $(6666)^2 + (8888) = 44444.$

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143. If a is the A.M. of b and c and the two geometric mean are G_1 and G_2, then prove that $G_1^3 + G_2^3 = 2ab \cdot$

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144. 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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145. 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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146. Find the number of common terms to the two sequences 17,21,25,...,417 and 16,21,26,...,466.

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

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

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149. 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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150. 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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151. The mth term of a H.P is n and the nth term is m . Proves that its rth term is mn/r.

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152. 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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153. 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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154. Solve the equation $(x+1)+(x+4)+(x+7)+\;+(x+28)=155.$

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155. If $a, b, andc$ be in G.P. and $a+x, b+x, andc+x$ in H.P. then find the value of $x(a, bandcaredist \in ctvmbers)$.

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156. The ratio of the sum of m and n terms of an A.P. is $m^2 : n^2$. Show that the ratio mth and nth term is (2m-1) : (2n-1).

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157. If first three terms of the sequence $1/16, a, b, \frac{1}{6}$ are in geometric series and last three terms are in harmonic series, then find the values of $a and b\cdot$

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

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159. 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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160. If x is a positive real number different from 1, then prove that the numbers $\frac{1}{1+\sqrt{x}}, \frac{1}{1-x}, \frac{1}{1-\sqrt{x}},$, are in A.P. Also find their common difference.

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161. 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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162. 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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163. Find the sum $\sum_{r=1}^{n} r(r+1)(r+2)(r+3)$.

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164. Find the sum $\sum_{r=1}^{n} \frac{r}{(r+1)!}$ where n!=1 $\times 2 \times 3 \ldots . n.$

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165. Find the sum $\sum_{r=1}^{n} \frac{1}{r(r+a)(r+2)(r+3)}$

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166. Find the sum $1+\frac{1}{1+2}+\frac{1}{1+2+3}+\ldots\ldots\ldots+\frac{1}{1+2+3+\ldots\ldots\ldots+n}$.

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167. Find the sum to n terms of the series $\frac{1}{1+1^2+1^4}+\frac{2}{1+2^2+2^4}+\frac{3}{1+3^2+3^4}+\ldots\ldots\ldots$ that means $t_r=\frac{r}{r^4+r^2+1}$ find $\sum_1^n$

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168. Find the sum to n terms of the series $3/\left(1^2\times 2^2\right)+5/\left(2^2\times 3^2\right)+7/\left(3^2\times 4^2\right)+\cdot$

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169. Find the sum $\sum_{r=1}^{n}\frac{1}{(ar+b)(ar+a+b)}$.

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170. If $x = \sum_{n=0}^{\infty} a^n, y = \sum_{n=0}^{\infty} b^n, z = \sum_{n=0}^{\infty} c^n, wherera, b, andc$ are in A.P. and $|a| < , |b| < 1, and|c| < 1,$ then prove that $x, yandz$ are in H.P.

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

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172. Find the sum of the series $\sum_{k=1}^{360} \left(\frac{1}{k\sqrt{k+1} + (k+1)\sqrt{k}} \right)$

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173. Find the sum $\frac{1^4}{1\times 3}+\frac{2^4}{3\times 5}+\frac{3^4}{5\times 7}+\ldots\ldots+\frac{n^4}{(2n-1)(2n+1)}$

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174. Find the value of $11^2+12^2+13^2+\ +20^2$.

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

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176. 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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177. 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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178. Find the value of $(32)(32)^{1/6}(32)^{1/36}\infty$.

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

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180. If $S = \frac{1}{1 \times 3 \times 5} + \frac{1}{3 \times 5 \times 7} + \frac{1}{5 \times 7 \times 9} + ..$ to infinity, then find the value of $[36S]$, where [.] represents the greatest integer function.

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181. 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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182. Let T_r denote the rth term of a G.P. for $r = 1, 2, 3,$ If for some positive integers $m and n,$ we have $T_m = 1/n^2$ and $T_n = 1/m^2$, then find the value of $T_{m+n/2}$.

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183. 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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184. 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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185. 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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186. If the sides of a right-angled triangle are in A.P., then the sines of the acute angles are $\frac{3}{5}, \frac{4}{5}$ b. $\frac{1}{\sqrt{3}}, \sqrt{\frac{2}{3}}$ c. $\frac{1}{2}, \frac{\sqrt{3}}{2}$ d. none of these

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187. 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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188. 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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189. If $a = \underbrace{111.\dots.1}_{55\text{times}}, b = 1 + 10 + 10^2 + 10^3 + 10^4$ and $c = 1 + 10^5 + 10^{10} + \dots$

then

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190. 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 a.81 b. 243 c. 343 d.324

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191. 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 first tem being unity is $\left(\frac{2}{7}\right)\left(6^{10}-1\right)$ b. $\left(\frac{3}{7}\right)\left(6^{10}-1\right)$ c.$\left(\frac{3}{5}\right)\left(6^{10}-1\right)$ d. none of these

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192. 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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193. 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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194. In a G.P. the first, third, and fifth terms may be considered as the first, fourth, and sixteenth terms of an A.P. Then the fourth term of the A.P., knowing that its first term is 5, is 10 b. 12 c. 16 d. 20

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195. If a,b,c,d be in G.P. show that `(b-c)^2+(c-a)^2+(d-b)^2=(a-d)^2.

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196. If the pth, qth, rth, and sth terms of an A.P. are in G.P., t hen $p-q, q-r, r-s$ are in a. A.P. b. G.P. c. H.P. d. none of these

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197. 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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198. 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 $\frac{p}{x} is$ a $\frac{1}{3}$ b. 3 c. $\frac{1}{2}$ d. 2

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

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200. 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, $S_n = n$ and $T_n = \frac{T_n - 1}{n^2}$,then T_m (m being even) is $\frac{2}{1+m^2}$ 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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201. If $(1+3+5+\ +p)+(1+3+5+\ +q)=(1+3+5+\ +r)$ where each set of parentheses contains the sum of consecutive odd integers as shown, the smallest possible value of $p+q+r(where p > 6)$ is 12 b. 21 c. 45 d. 54

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202. 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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203. 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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204. In a geometric series, the first term is a and common ratio is $r \cdot$ If S_n denotes the sum of the terms and $U_n = \sum_{n=1}^{n} S_n, then r S_n + (1 + \; = \; - r) U_n$ equals 0 b. n c. na d. nar

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205. If $x, y, andz$ are distinct prime numbers, then $x, y, andz$ may be in A.P. but not in G.P. $x, y, andz$ may be in G.P. but not in A.P. $x, y, andz$ can neither be in A.P. nor in G.P. none of these

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206. 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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207. If A.M., G.M., and H.M. of the first and last terms of the series of $100, 101, 102, \dots n - 1, n$ are the terms of the series itself, then the value of `ni s(100

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208. The sum $1 + 3 + 7 + 15 + 31 + \ldots \rightarrow 100$ terms is $2^{100} - 102b$ b. $2^{99} - 101$ c. $2^{101} - 102$ d. none of these

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209. 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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210. 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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211. Let $S = \frac{4}{19} + \frac{44}{19^2} + \frac{444}{19^3} + up \to \infty$. Then s is equal to $40/9$ b. $38/81$ c. $36/171$ d. none of these

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212. If $H_n = 1 + \frac{1}{2} + + \frac{1}{n}.$, then the value of $S_n = 1 + \frac{3}{2} + \frac{5}{3} + + \frac{99}{50}$ is $H_{50} + 50$ b. $100 - H_{50}$ c. $49 + H_{50}$ d. $H_{50} + 100$

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213. If the sum to infinity of the series $1 + 2r + 3r^2 + 4r^3 +$ is 9/4, then value of r is (a)$1/2$ b. $1/3$ c. $1/4$ d. none of these

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214. The sum o f series $1+\frac{4}{5}+\frac{7}{5^2}+\frac{10}{5^3}+\infty$ is $7/16$ b. $5/16$ c. $104/64$ d. $35/16$

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215. The sum 20 terms of a series whose rth term is given by $T_r=(-1)^r\left(\frac{r^2+r+1}{r!}\right)$ is

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216. Consider the sequence 1,2,2,4,4,4,8,8,8,8,8,8,8,8,... Then 1025th terms will be 2^9 b. 2^{11} c. 2^{10} d. 2^{12}

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217. If $a, \frac{1}{b}, c$ and $\frac{1}{p}, q, \frac{1}{r}$ form two arithmetic progressions of the common difference, then a, q, c are in A.P. if p, b, r are in A.P. b. $\frac{1}{p}, \frac{1}{b}, \frac{1}{r}$

are in A.P. c. p, b, r are in G.P. d. none of these

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218. Suppose that $F(n+1) = \left(2\frac{F(n+1)}{2} f \text{ or } n = 1, 2, 3 and F(1) = 2. Then \dot{F}(101)\right.$ equals 50 b. 52 c. 54 d. none of these

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219. In an A.P. of which a is the first term if the sum of the first p terms is zero, then the sum of the next q terms is a. $\frac{a(p+q)p}{q+1}$ b. $\frac{a(p+q)p}{p+1}$ c. $-\frac{a(p+q)q}{p-1}$ d. none of these

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220. 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 of n is 21 b. 15 c.16 d. 19

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221. If $a, b, and c$ are in A.P., then $a^3 + c^3 - 8b^3$ is equal to $2abc$ b. $6abc$ c. $4abc$ d. none of these

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222. 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 10/2 then the number of terms in the series is 8 b. 4 c. 6 d. 10

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223. The largest term common to the sequences $1, 11, 21, 31, \ldots\ldots$ to 100 terms and $31, 36, 41, 46, \ldots.$ to 100 terms is 381 b. 471 c. 281 d. none of these

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224. If the sum of m terms of an A.P. is the same as teh sum of its n terms, then the sum of its $(m+n)$ terms is mn b. $-mn$ c. $1/mn$ d. 0

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

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226. About 150 workers were engaged to finish a piece of work in a certain number of days. Four workers stopped working on the second day, four more workers stopped their work on the third day and so on. It took 8 more days to finish the work. Then the number of days in which the work was completed is 29 days b. 24 days c. 25 days d. none of these

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227. 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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228. There are infinite geometric progressions of for which 27,8 and 12 are three of its terms (not necessarily consecutive). Statement 2: Given terms are integers.

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229. 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_1H_2 b. A_2H_1 c. G_1G_2 d. none of these

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230. Let $S_1, S_2,$ be squares such that for each $n \geq 1,$ the length of a side of S_n equals 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 value of n is the area of S_n less than 1 sq. cm? a. 5 b. 7 c. 9 d. 10

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

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232. If $a, b, and c$ are in G.P. and $x and y,$ respectively, be arithmetic means between $a, b, and b, c, then$ $\frac{a}{x} + \frac{c}{y} = 2$ b. $\frac{a}{x} + \frac{c}{y} = \frac{c}{a}$ c. $\frac{1}{x} + \frac{1}{y} = \frac{2}{b}$ d. $\frac{1}{x} + \frac{1}{y} = \frac{2}{ac}$

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233. Consider a sequence $\{a_n\} with a_1 = 2 and a_n = \frac{an - 12}{a_{n-2}}$ 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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234. Which of the following can be terms (not necessarily consecutive) of any A.P.? a. 1,6,19 b. $\sqrt{2}, \sqrt{50}, \sqrt{98}$ c. $\log 2, \log 16, \log 128$ d. $\sqrt{2}, \sqrt{3}, \sqrt{7}$

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

A. No AP

B. only one G.P

C. infinite number o A.P's

D. infinite number of G.P's

Answer: null

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236. 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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237. If $\left(1^2 - t_1\right) + \left(2^2 - t_2\right) + + \left(n^2 - t_n\right) + = \frac{n\left(n^2 - 1\right)}{3}$, then t_n is equal to n^2 b. $2n$ c. $n^2 - 2n$ d. none of these

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238. 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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239. Let $a_1, a_2, a_3, , a_{100}$ be an arithmetic progression with $a_1 = 3 and s_p = \sum_{i=1}^{p} a_i, 1 \leq p \leq 100.$ For any integer n with $1 \leq n \leq 20,$ let$m = 5n.$ If $\frac{S_m}{S_n}$ does not depend on $n,$ then a_2 is________.

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240. If

$1^2 + 2^2 + 3^2 + \quad + 2003^2 = (2003)(4007)(334) and (1)(2003) + (2)(2002) +$

equals 2005 b. 2004 c. 2003 d. 2001

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241. The value of $\sum_{i=1}^{n}\sum_{j=1}^{i}\sum_{k=1}^{j} 1 = 220,$ then the value of n equals a.11 b. 12 c.10 d. 9

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242. The sum of $0.\ 2 + 0004 + 0.\ 00006 + 0.\ 0000008 + \ldots$ to ∞ is $\frac{200}{891}$ b. $\frac{2000}{9801}$ c. $\frac{1000}{9801}$ d. none of these

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

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

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245. 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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246. The positive integer n for which $2 \times 2^2 + 3 \times 2^3 + 4 \times 2^4 + \ldots\ldots + n \times 2^n = 2^{n+10}$ is a.510 b. 511 c. 512 d. 513

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247. If t_n denotes the nth term of the series $2 + 3 + 6 + 11 + 18 + \ldots then t_{50}$ $49^2 - 1$ b. 49^2 c. $50^2 + 1$ d. $49^2 + 2$

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

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249. 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 $\left(a^{-1} + b^{-1}\right)$ is ______.

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250. 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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251. The value of the $\sum_{n=0}^{\infty} \frac{2n+3}{3^n}$ is equal to________.

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252. If the roots of $10x^3 - nx^2 - 54x - 27 = 0$ are in harmonic oprogresion, then n eqauls ________.

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253. The 5th and 8th terms of a geometric sequence of real numbers are 7! And 8! Respectively. If the sum to first n tems of the G.P. is 2205, then n equals______.

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254. 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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255. 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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256. Let $S = \sum_{n=1}^{9999} \frac{1}{\left(\sqrt{n} + \sqrt{n+1}\right)(n4 + n + 14)}$, then S equals __________.

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

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258. If $x^2 + 9y^2 + 25z^2 = xyz\left(\frac{15}{x} + \frac{5}{y} + \frac{3}{z}\right), then\ x, y, and z$ 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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259. If the sum of n terms of an A.P. is given by $S_n = a + bn + cn^2, wherea, b, c$ are independent of $n, then$ (a) $a = 0$ (b) common difference of A.P. must be $2b$ (c) common difference of A.P. must be $2c$ (d) first term of A.P. is $b + c$

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260. Let $E = \frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} +$ Then, a.$E < 3$ b. $E > 3/2$ c. $E > 2$ d. $E < 2$

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261. If $1 + 2x + 3x^2 + 4x^3 + \infty \geq 4$, then least value of $\xi s1/2$ greatest value of $\xi s\frac{4}{3}$ least value of $\xi s2/3$ greatest value of x does not exists

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262. If $p, q, andr$ are in A.P., then which of the following is/are true? pth, qth, and rth terms of A.P. are in A.P. pth, qth, rth terms of G.P. are in G.P. pth, qth, rth terms of H.P., are in H.P. none of these

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263. 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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264. For an increasing A.P. a_1, a_2, a_n if $a_1 = a_2 + a_3 + a_5 = -12$ and $a_1a_3a_5 = 80,$ 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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265. If $p(x) = \frac{1 + x^2 + x^4 + \quad + x}{1 + x + x^2 + \quad + x^{n-1} \hat{} \ (2n - 2)}$ is a polynomial in $x, the \cap$ can be 5 b. 10 c. 20 d. 17

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266. Q. Let n be an add integer if sin ntheta-sum_(r=0)^n(b_r)sin^rtheta, for every value of theta then ---

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267. 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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268. The 15th term of the series $2\frac{1}{2} + 1\frac{7}{13} + 1\frac{1}{9} + \frac{20}{23} + is$ $\frac{10}{39}$ b. $\frac{10}{21}$ c. $\frac{10}{23}$ d. none of these

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269. Le $a_1, a_2, a_3, , a_{11}$ be real numbers satisfying $a_1 = 15, 27 - 2a_2 > 0anda_k = 2a_{k-1} - a_{k-2}$ for $k = 3, 4, , 11.$ If $\frac{a12 + a22 + \ldots + a112}{11} = 90,$ then the value of $\frac{a1 + a2 + \; + a11}{11}$ is equals to ______.

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270. 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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271. 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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272. Statement 1: $1^{99} + 2^{99} + \ + 100^{99}$ is divisible by 10100. Statement 2: $a^n + b^n$ is divisible by $a + b$ if n is odd.

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273. 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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274. If S_n denote the sum of first n terms of an A.P. whose first term is $a and S_{nx} / S_x$ is independent of x, $then S_p =$ p^3 b. $p^2 a$ c. pa^2 d. a^3

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275. If $a_1, a_2, a_3,$ be terms of an A.P. if $\frac{a_1 + a_2 + \ + a_p}{a_1 + a_2 + \ + a_q} = \frac{p^2}{q^2}, p \neq q, then \frac{a_6}{a_{21}}$ equals 41/11 b. 7/2 c. 2/7 d. 11/41

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276. Consider an A.P. $a_1, a_2, a_3,$ such that $a_3 + a_5 + a_8 = 11 and a_4 + a_2 + \ = -2,$ then the value of $a_1 + a + 6 + a + 7$ is -8 b. 5 c. 7 d. 9

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277. 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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278. If $|a| < 1$ and $|b| < 1$, then the sum of the series $1 + (1+a)b + (1+a+a^2)b^2 + (1+a+a^2+a^3)b^3 + \ldots$ is (a) $\dfrac{1}{(1-a)(1-b)}$ (b). $\dfrac{1}{(1-a)(1-ab)}$ (c.) $\dfrac{1}{(1-b)(1-ab)}$ (d.) $\dfrac{1}{(1-a)(1-b)(1-ab)}$

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279. Let $n \in N, n > 25$. Let A, G, H deonote te arithmetic mean, geometric man, and harmonic mean of 25 and n. 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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280. 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. $1 < r < \rightarrow 3$ b. $-3 < r < -1$ c. $r > 3$ or $r < 1$ d. none of these

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281. 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) $2-\sqrt{3}$ (B) $2+\sqrt{3}$ (C) $\sqrt{3}-2$ (D) $3+\sqrt{2}$

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282. If S_1, S_2, S_3, S_m are the sums of n terms of m A.P. $'s$ whose first terms are $1, 2, 3, , m$ and common differences are $1, 3, 5, , (2m-1)$ respectively. Show that $S_1 + S_2, + S_m = \frac{mn}{2}(mn+1)$

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283. If $S_1, S_2 and S_3$ be respectively the sum of n, 2n and 3n terms of a G.P., prove that $S_1(S_3 - S_2) = (S_2 - S_1)^2$

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284. 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 a.$\frac{n.2n+1}{2^{2n}-1}$ b. $\frac{n.2n+1}{2^{n}-1}$ c. $n.2^n$ d. none of these

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285. If $(p+q)th$ term of a G.P. is $aand$ its $(p-q)th$ term is $bwherea, b \in R^+$, then its pth term is $\sqrt{\frac{a^3}{b}}$ b. $\sqrt{\frac{b^3}{a}}$ c. $\sqrt{ab}$ d. none of these

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286. 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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287. $\sum_{i=0}^{\infty}\sum_{j=0}^{\infty}\sum_{k=0}^{\infty}\frac{1}{3^i 3^i 3^k}$

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288. Let $a_1, a_2, ... a_n$ be real numbers such that $\sqrt{a_1}+\sqrt{a_2-1}+\sqrt{a_3-2}+ + \sqrt{a_n-(n-1)}=\frac{1}{2}(a_1+a_2+.......+$

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

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289. If $\log_2(5.2^x+1), \log_4(2^{1-x}+1)$ and 1 are in A.P,then x equals

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290. 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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291. If

`x=sum_(n=0)^oocos^(2n)theta,y=sum_(n=0)^oosin^(2n)varphi,z=sum_(n=0)^oo

h e r e0

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

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293. Let a, b, c, d be real numbers in $G.P.$ If u, v, w satisfy the system of equations $u+2y+3w=6, 4u+5v+6w=12 \text{ and } 6u+9v=4$ then show that the roots of the equation

$$\left(\frac{1}{u}+\frac{1}{v}\frac{+}{w}\right)x^2+\left[(b-c)^2+(c-a)^2+(d-b)^2\right]x+u+v+w=0$$

and 20x^2+10(a-d)^2 x-9=0` are reciprocals of each other.

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294. The sum of the first three terms of a strictly increasing G.P. is αs and sum of their squares is s^2

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295. 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.

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296. 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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297. If $S_1, S_2, S_3, ...S_n, ...$ are the sums of infinite geometric series whose first terms are $1, 2, 3..........n, ...$ and whose common ratio $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, ..., \frac{1}{n+1}, ...$ respectively, then find the value of $\sum_{r=1}^{2n-1} S_1^2$.

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298. 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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299. If $a_1, a_2, a_3, , a_n$ are in A.P., where $a_i > 0$ for all i , show that $\frac{1}{\sqrt{a_1} + \sqrt{a_2}} + \frac{1}{\sqrt{a_2} + \sqrt{a_3}} + + \frac{1}{\sqrt{a_{n-1}} + \sqrt{a_n}} = \frac{n-1}{\sqrt{a_1} + \sqrt{a_n}}$.

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300. How many geometric progressions are possible containing 27, 8 and 12 as three of its/their terms

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301. 9. 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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302. The sum of 50 terms of the series $1+2\left(1+\frac{1}{50}\right)+3\left(1+\frac{1}{50}\right)^2+$ is given by (A) 2500 (B) 2550 (C) 2450 (D) none of these

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303. The sum of 50 terms of the series $\frac{3}{1^2}+\frac{5}{1^2+2^2}+\frac{7}{1^2+2^2+3^2}+$ is $\frac{100}{17}$ b. $\frac{150}{17}$ c. $\frac{200}{51}$ d. $\frac{50}{17}$

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304. 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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305. 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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306. If $a, b, and c$ are in G.P. 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 1 b. 2 c. $1/2$ d. none of these

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307. If $a, b and c$ are in A.P., and $p and p'$ are respectively, 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 $p^2 + q^2 = p'^2 + q'^2$ b. $pq = p'q'$ c. $p^2 - q^2 = p'^2 - q'^2$ d. none of these

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308. 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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309. Find the sum of series upto n terms $\left(\frac{2n+1}{2n-1}\right)+3\left(\frac{2n+1}{2n-1}\right)^2+5\left(\frac{2n+1}{2n-1}\right)^3+\ldots$

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310. 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 $x andy\cdot$

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311. If the first and the nth terms of a G.P., are $a and b,$ respectively, and if P is hte product of the first n terms prove that $P^2=(ab)^n\cdot$

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312. Along a road lie an odd number of stones placed at intervals of 10 metres. These stones have to be assembled around the middle stone. A person can carry only one stone at a time. A man carried the job with one of the end stones by carrying them in succession. In carrying all the stones he covered a distance of 3 km. Find the number of stones.

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

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315. For $a, x, > 0$ prove tht at most one term of the G.P. $\sqrt{a-x}, \sqrt{x}, \sqrt{a+x}$ can be rational.

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316. If $\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}+ \rightarrow \infty = \frac{\pi^2}{6}, then \frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+$ equals $\pi^2/8$ b. $\pi^2/12$ c. $\pi^2/3$ d. $\pi^2/2$

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317. Coefficient of $x^{18} \in \left(1+x+2x^2+3x^3+ \ + 18x^{18}\right)^2$ equal to 995 b. 1005 c. 1235 d. none of these

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318. Let $\alpha and \beta$ be the roots of $x^2-x+p=0 and \gamma and \delta$ be the root of $x^2-4x+q=0.$ If $\alpha, \beta, and \gamma, \delta$ are in G.P., then the integral values of

$pandq$, respectively, are $-2, \ -32$ b. $-2, 3$ c. $-6, 3$ d. $-6, \ -32$

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319. 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 10 b. 12 c. 11 d. 13

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320. 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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321. Let the positive numbers $a, b, cadnd$ be in the A.P. Then $abc, abd, acd, andbcd$ are a. not in A.P. /G.P./H.P. b. in A.P. c. in G.P. d. in H.P.

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322. If three positive real numbers $a, , b, c$ are in A.P. sich that $abc = 4$, then the minimum value of b is a.$2^{1/3}$ b. $2^{2/3}$ c. $2^{1/2}$ d. $2^{3/23}$

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323. 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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324. 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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325. 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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326. Let $a_1, a_2, a_3, \ldots$ be in harmonic progression with $a_1 = 5 and a_{20} = 25.$ The least positive integer n for which $a_n < 0$ a.22 b. 23 c. 24 d. 25

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

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328. Let $S \subset (0, \pi)$ denote the set of values of x satisfying the equation $8^{1} + |\cos x| + \cos^{2} x + \mid \cos^{3x \mid \to \infty} = 4^{3}$. 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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329. The value of $\sum_{r=0}^{n} (a + r + ar)(-a)^{r}$ is equal to $(-1)^{n}\left[(n+1)a^{n+1} - a\right]$ b. $(-1)^{n}(n+1)a^{n+1}$ c. $(-1)^{n}\dfrac{(n+2)a^{n+1}}{2}$ d. $(-1)^{n}\dfrac{na^{n}}{2}$

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330. If x_1, x_2, x_{20} are in H.P. and $x_1, 2, x_{20}$ are in G.P., then $\sum_{r=1}^{19} x_r x_{r+1} =$ 76 b. 80 c. 84 d. none of these

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331. 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 $\frac{x}{1-x}$ b. $\frac{1}{1-x}$ c. $\frac{1+x}{1-x}$ d. 1

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332. If

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

ab b. nab c. $(n+1)ab$ d. nab

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333. 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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334. $(\lim)_{n \overrightarrow{\infty}} \sum_{r=1}^{n} \frac{r}{1 \times 3 \times 5 \times 7 \times 9 \times \ \times (2r+1)}$ is equal to $\frac{1}{3}$ b. $\frac{3}{2}$ c. $\frac{1}{2}$ d. none of these

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335. 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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336. If $\sum_{r=1}^{n} r^4 = I(n), then \sum_{r=1}^{n} (2r-1)^4$ is equal to $I(2n) - I(n)$ b. $I(2n) - 16I(n)$ c. $I(2n) - 8I(n)$ d. $I(2n) - 4I(n)$

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337. If sum of an infinite G.P. $p, 1, 1/p, 1/p^2, is 9/2$ then value of p is a. 3

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

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

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339. If $a_1, a_2, a_3, , a_{2n+1}$ are in A.P., then $\frac{a_{2n+1}-a_1}{a_{2n+1}+a_1}+\frac{a_{2n}-a_2}{a_{2n}+a_2}++\frac{a_{n+2}-a_n}{a_{n+2}+a_n}$ is equal to $\frac{n(n+1)}{2}\times\frac{a_2-a_1}{a_{n+1}}$ b. $\frac{n(n+1)}{2}$ c. $(n+1)(a_2-a_1)$ d. none of these

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340. If the sides of a triangle are in G.P., and its largest angle is twice the smallest, then the common ratio r satisfies the inequality `0

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341. For the series, $S = 1 + \frac{1}{(1+3)}(1+2)^2 + \frac{1}{(1+3+5)}(1+2+3)^2 + \frac{1}{(1+3+5+7)}($

+... 7th term is 16 7th term is 18 Sum of first 10 terms is $\frac{505}{4}$ Sum of first 10 terms is $\frac{45}{4}$

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342. 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 (a) a=b=c (b)a+c=b (c) a>b>c and $ac - b^2 = 0$ (d) none of these

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343. Let $a_1, a_2, , a_{10}$ be in A.P. and h_1, h_2, h_{10} be in H.P. If $a_1 = h_1 = 2anda_{10} = h_{10} = 3, thena_4h_7$ is 2 b. 3 c. 5 d. 6

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344. The harmonic mean of the roots of the equation $(5+\sqrt{2})x^2-(4+\sqrt{5})x+8+2\sqrt{5}=0$ is 2 b. 4 c. 6 d. 8

A. 2

B. 4

C. 6

D. 8

Answer: B

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345. Find the sum $(x+2)^{n-1}+(x+2)^{n-2}(x+1)^+(x+2)^{n-3}(x+1)^2++(x+1)^{n-1}$ $(x+2)^{n-2}-(x+1)^n$ b. $(x+2)^{n-2}-(x+1)^{n-1}$ c. $(x+2)^n-(x+1)^n$ d. none of these

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346. If $ln(a+c), ln(a-c)andln(a-2b+c)$ 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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347. If $a, b, andc$ are in G.P., then the equations $ax^2+2bx+c=0anddx^2+2ex+f=0$ have a common root if $\frac{d}{c}, \frac{e}{b}, \frac{f}{c}$ are in a. A.P. b. G.P. c. H.P. d. none of these

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348. Sum of the first n terms of the series $\frac{1}{2}+\frac{3}{4}+\frac{7}{8}+\frac{15}{16}+$ is equal to 2^n-n-1 b. $1-2^{-n}$ c. $n+2^{-n}-1$ d. 2^n+1

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349. The third term of a geometric progression is 4. The production of the first five terms is 4^3 b. 4^5 c. 4^4 d. none of these

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350. 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 triangle ABC is equal to a. $\frac{25}{8}$ b. $\frac{25}{3}$ c. $\frac{25}{18}$ d. $\frac{10}{3}$

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351. Suppose $a, b, \text{ and } c$ are in A.P. and $a^2, b^2 \text{ and } c^2$ are in G.P. If \`a

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352. If $x, y, andz$ are pth, qth, and rth terms, respectively, of an A.P. nd also of a G.P., then $x^{y-z}y^{z-x}z^{x-y}$ is equal to a.xyz b.0 c. 1d. none of these

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353. Sum of $\frac{1}{\sqrt{2}+\sqrt{5}}+\frac{1}{\sqrt{5}+\sqrt{8}}+\frac{1}{\sqrt{8}+\sqrt{11}}+\frac{1}{\sqrt{11}+\sqrt{14}}+\ldots \rightarrow n$ terms= (A) $\frac{n}{\sqrt{3n+2}-\sqrt{2}}$ (B) $\frac{1}{3}\left(\sqrt{2}-\sqrt{3n+2}\right.$ (C) n/(sqrt(3n+2)+sqrt(2))` (D) none of these

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354. 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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355. If a_1, a_2, a_3, a_n are in H.P. and $f(k) = \left(\sum_{r=1}^{n} a_r\right) - a_k, then$ $\frac{a_1}{f(1)}, \frac{a_2}{f(2)}, \frac{a_3}{f(3)}, , \frac{a_n}{f(n)}$, are in a. A.P b. G.P. c. H.P. d. none of these

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356. 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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357. Let $a + ar_1 + ar12 + \quad + \infty anda + ar_2 + ar22 + \quad + \infty$ be two infinite series of positive numbers with the same first term. The sum of the first series is r_1 and the sum of the second series r_2. Then the value of $(r_1 + r_2)$ is _______.

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358. 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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359. 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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360. 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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361. Given a, b, c are in A.P. b, c, d are in G.P. and c, d, e are in H.P. If $a = 2ad \neq \; = 18,$ then the sum of all possible value of c is _______.

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362. 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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363. 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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364. Concentric circles of radii $1, 2, 3, \ldots, 100cm$ are drawn. The interior of the smallest circle is colored red and the angular regions are colored alternately green and red, so that no two adjacent regions are of the same color. Then, the total area of the green regions in sq. cm is equal to 1000π b. 5050π c. 4950π d. 5151π

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365. 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 $t_1 is$ 12 b. 14 c. 16 d. none of these

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366. If $x, 2y, 3z$ are in A.P., where the distinct numbers x, y, z are in G.P, then te common ratio of the G.P. is 3 b. $\frac{1}{3}$ c. 2 d. $\frac{1}{2}$

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367. If S_p denotes the sum of the series $1 + r^p + r^{2p} + \rightarrow \infty and s_p$ the sum of the series $1 - r^{2p} r^{3p} + \rightarrow \infty, |r| < 1, then S_p + s_p$ in term of S_{2p} is $2S_{2p}$ b. 0 c. $\frac{1}{2}S_{2p}$ d. $-\frac{1}{2}S_{2p}$

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

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369. If $a_1, a_2, , a_n$ are in H.P., then $\frac{a_1}{a_2 + a_3 + \ + a_n}, \frac{a_2}{a_1 + a_3 + \ + a_n}, , \frac{a_n}{a_1 + a_2 + \ + a_{n-1}}$ are in a. A.P b. G.P. c. H.P. d. none of these

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370. 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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371. 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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372. 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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373. 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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374. Let T_r be the rth term of an A.P., for $r = 1, 2, 3, \ldots$. If for some positive integers m, n, we have $T_m = \frac{1}{n} and T_n = \frac{1}{m}, then T_{mn}$ equals

a. $\frac{1}{mn}$ b. $\frac{1}{m} + \frac{1}{n}$ c. 1 d. 0

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375. If $a_n = \frac{3}{4} - \left(\frac{3}{4}\right)^2 + \left(\frac{3}{4}\right)^3 + \ldots(-1)^{n-1}\left(\frac{3}{4}\right)^n$ and $b_n = 1 - a_n$, then find the minimum natural number n, such that $b_n > a_n$

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

Then

a. $a(100) \leq 100$

b. $a(100) > 100$

c. $a(200) \leq 100$

d. $a(200) > 100$

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377. If $x > 1, y > 1, and z > 1$ are in G.P., then $\frac{1}{1 + \ln x}, \frac{1}{1 + lny} and \frac{1}{1 + lnz}$ are in $A\dot{P}$. b. $H\dot{P}$. c. $G\dot{P}$. d. none of these

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378. .Let $a_1, a_2, \ldots\ldots\ldots$ 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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379. The fourth power of common difference of an arithmetic progression 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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380. If a, b, c are in A.P. and a^2, b^2, c^2 are in H.P., then prove that either $a = b = c$ or $a, b, -\frac{c}{2}$ form a G.P.

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381. Let a, b be positive real numbers. If a, A_1, A_2, b be are in arithmetic progression a, G_1, G_2, b are in geometric progression, and a, H_1, H_2, b

are in harmonic progression, show that $\dfrac{G_1G_2}{H_1H_2} = \dfrac{A_1 + A_2}{H_1 + H_2}$

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382. 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 $1/2$ b. $2/3$ c. $1/6$ d. none of these

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383. If $a^2 + b^2, ab + bc, and b^2 + c^2$ are in G.P., then a, b, c are in a. A.P. b. G.P. c. H.P. d. none of these

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384. If x, y, z are in G.P. nad $a^x = b^y = c^z$, 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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385. The geometric mean between -9 and -16 is 12 b. -12 c. -13 d. none of these

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386. The value of $0.\ 2^{\log \sqrt{5}\frac{1}{4}+\frac{1}{8}+\frac{1}{16}+}$ is 4 b. $\log 4$ c. $\log 2$ d. none of these

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387. If $(1+a)\left(1+a^{2}\right)\left(1+a^{4}\right)\ldots.\left(1+a^{128}\right)=\sum_{r=0}^{n} a^{r}$, then n is equal to

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388. The number of terms common between the series $1+2+4+8+\ldots\ldots$ to 100 terms and $1+4+7+10+\ldots\ldots$ to 100 terms is a.6

b. 4

c. 5

d. none of these

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389. After striking a floor a certain ball rebounds $\left(\frac{4}{5}\right)^{th}$ of the height from which it has fallen. Find the total distance that it travels before coming to rest, if it is gently dropped from a height of $120 metres\cdot$

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390. If S denotes the sum to infinity and S_n the sum of n terms of the series $1+\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+,$ such that $S-S_n<\frac{1}{1000},$ then the least value of n is 8 b. 9 c. 10 d. 11

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391. 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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392. 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. Then G.M. of $a and b$ is 3 One possible value of $a + 2b$ is 11 A.M. of $a and b$ is 6 Greatest value of $a - b$ is 8

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393. Let $a_1, a_2, a_3, , a_n$ be in G.P. such that $3a_1 + 7a_2 + 3a_3 - 4a_5 = 0.$ Then common ratio of G.P. can be 2 b. $\frac{3}{2}$ c. $\frac{5}{2}$ d. $-\frac{1}{2}$

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394. 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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395. If $S_n = 1^2 - 2^2 + 3^2 - 4^2 + 5^2 - 6^2 +, then \quad S_{40} = -820$ b. $S_{2n} > S_{2n+2}$ c. $S_{51} = 1326$ d. $S_{2n+1} > S_{2n-1}$

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

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

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399. 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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400. If in a progression $a_1, a_2, a_3, \ldots\ldots\ldots etc; (a_r-a_{r+1})$ bears a constant ratio with $a_r \times a_{r+1}$, then the terms of the progression are in

a. A.P b. G.P. c. H.P. d. none of these

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401. $a, b, cx \in R^+$ 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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402. Let $\alpha, \beta \in R$. If α, β^2 are the roots of quadratic equation $x^2 - px + 1 = 0 and \alpha^2, \beta$ is the roots of quadratic equation $x^2 - qx + 8 = 0$, then the value of r if $\frac{r}{8}$ is the arithmetic mean of $pandq,$ is $\frac{83}{2}$ b. 83 c. $\frac{83}{8}$ d. $\frac{83}{4}$

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403. Let $a \in (0, 1]$ satisfies the equation $a^{2008} - 2a + 1 = 0$ and $S = 1 + a + a^2 + \ldots. + a^{2007}$ Then sum of all possible values of S is a.

2010 b. 2009 c. 2008 d. 2

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404. If $a, b, andc$ are in A.P. and $b-a, c-banda$ are in G.P., then $a:b:c$ is $1:2:3$ b.1:3:5 c. $2:3:4$ d. $1:2:4$

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405. If $a, b, andc$ are in A.P. $p, q, andr$ are in H.P., and $ap, bq, andcr$ are in G.P., then $\frac{p}{r}+\frac{r}{p}$ is equal to $\frac{a}{c}-\frac{c}{a}$ b. $\frac{a}{c}+\frac{c}{a}$ c. $\frac{b}{q}+\frac{q}{b}$ d. $\frac{b}{q}-\frac{q}{b}$

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406. The sum of three numbers in G.P. is 14. If one is added to the first and second numbers and 1 is subtracted from the third, the new numbers are in ;A.P. The smallest of them is a. 2 b. 4 c. 6 d. 10

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407. If $x, 2x+2, and 3x+3$ are the first three terms of a G.P., then the fourth term is a. 27 b. -27 c. 13.5 d. -13.5

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408. 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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