MATHS

BOOKS - PATHFINDER MATHS (BENGALI ENGLISH)

PROGRESSION AND SERIES

Question Bank

1. A sequence of no. a_1, a_2, a_3..... satisfies the relation $a_n = a_{n-1} + a_{n-2}$ for $n \geq 2$. Find a_4 if $a_1 = a_2 = 1$.

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2. Find the sum to n terms of the series whose $n^t h$ term is n(n+3).

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3. Find the first negative term of the series 2000, 1995, 1990,1985...

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

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

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6. The sum of four integar in A.P is 24 and their product is 945. Find the numbers.

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

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8. Find the sum of n terms of the series $ab + (a-1)(b-1) + (a-2)(b-2) + \ldots$ if $ab = \frac{1}{6}$ and $a + b = \frac{1}{3}$.

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9. Insert 6 no. between 3 and 24 such that the resulting sequence is an A.P.

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10. Between two no. whose sum is 13/6, an even no. of A.M's are inserted . If the sum of means exceeds their no. by unity find the no. of means.

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11. Which term of the G.P. 2,8,32,.... upto n terms is 131072 ?

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12. Find the least value of n for which $1 + 3 + 3^2 + ...+ 3^{n-1} > 1000.$

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13. If $p^t h$,$q^t h$ and $r^t h$ terms of a G.P. be a, b, c(a,b,c>0) , prove that (q-r) log a +(r-p) logb +(p-q) logic=0.

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14. Find the sum of first n terms and the sum of first 5 terms of the geometric series 1+2/3+4/9+......

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15. How many terms of the G.P 3,3/2,3/4 ...... are needed to give the sum 3069/512 ?

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16. If $a_1, a_2, a_3(a_1 > 0)$ are in G.P with common ratio r, then the value of r , for which the inequality 9 $a_1 + 5a_3 \leq 14a_2$ holds, can not lie in the interval.

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17. The sum of first three terms of a G.P is 13/12 and their products is -1. Find the common ratio and the terms.

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

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19. Find the natural no. a for which $\sum_{k=1}^{n} f(a+k) = 16(2^n - 1)$ where the function f satisfies f(x+y)=f(x)f(y) for all natural no. x,y, and further f(1)=2.

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20. If $x = 1 + a + a^2 + a^3 + \ldots\ldots\infty$ and $y = 1 + b + b^2 + b^3 + \ldots\ldots\infty$ show that $1 + ab + a^2b^2 + a^3b^3 + \ldots.\infty = \frac{xy}{x+y-1}$ where 0 lt alt1 and 0ltblt1.

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21. If $\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}+....$ upto $\infty=\frac{\pi^2}{6}$, then, find $\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+......upto\infty$

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22. If $\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}+....$ upto $\infty=\frac{\pi^2}{6}$, then, find $1-\frac{1}{2^2}+\frac{1}{3^2}-\frac{1}{4^2}+....\ upto\infty.$

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

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24. Find the sum of series $4-9x+16x^2-25x^3+36x^4-49x^5+.....$ to infinite.

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25. If a,b,c be in H.P prove that $\left(\frac{1}{a}+\frac{1}{b}-\frac{1}{c}\right)\left(\frac{1}{b}+\frac{1}{c}-\frac{1}{a}\right)=\frac{4}{ac}-\frac{3}{b^2}$

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26. If a,b,c are in H.P. show that $\frac{a}{b+c}, \frac{b}{c+a}, \frac{c}{a+b}$ are also in H.P.

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27. Prove that the sum of n arithmatic means between two numbers is n times the single A.M between them.

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28. Find the sum to n terms of the series: 5+11+19+29+41.....

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29. Find the sum of n terms of the series 3+7+14+24+37+.....

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30. Find the sum of series 3+8+22+72+266+1036+....

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31. Prove that $\sum_{n=1}^{\infty} \frac{n}{4n^4+1}$ equals to $\frac{1}{4}$.

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32. Prove that $\sum_{n=1}^{\infty} \frac{n}{4n^4+1}$ equals to $\frac{1}{4}$.

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33. Show that the sum of $\sum_{n=1}^{\infty} \frac{n}{n^4+4}$ equals to $\frac{3}{8}$

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34. Show that the sum of $\sum_{n=1}^{\infty} \frac{n}{n^4+4}$ equals to $\frac{3}{8}$

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35. Find the sum of first n terms of the series $\frac{3}{1^2} + \frac{5}{1^2+2^2} + \frac{7}{1^2+2^2+3^2} + \dots .$

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36. Find the sum of the series $\frac{1}{1.2.3.4} + \frac{1}{2.3.4.5} + \frac{1}{3.4.5.6} + \dots\dots$ upto n terms.

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37. Find the sum of 2.3+3.4+4.5+......to n terms.

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38. If a,b,c are positive real no., then prove that $[(1+a)(1+b)(1+c)]^7 > 7^7 a^4 b^4 c^4$.

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39. If a,b,c are the sides of a triangle and $s = \frac{a+b+c}{2}$, prove that $8(s-a)(s-b)(s-c) \leq abc$.

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40. Prove that $a^4 + b^4 + c^4 > abc(a+b+c)$. [a,b,c are distinct positive real number]..

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41. Show that the greatest value of $xyz(d - ax - by - cz) is \frac{d^4}{4^4 abc}$.

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42. Prove that $\left(\frac{a+b}{2}\right)^{a+b} \leq a^a. b^b. [a, b \in N]$.

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43. N arithmetic means are inserted in between x and 2y and then between 2x and y. In case the rth means in each case be equal, then find the ratio x/y.

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44. Let S_n denote the sum upto n terms of an AP . If $S_n = n^2 P$ and $S_m = m^2 P$ where m,n,p are positive integers and m $\neq$ n , then find S_p.

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45. If s_1, s_2 and s_3 are the sum of first n,2n,3n terms respectively of an arithmetic progression, then show that $s_3 = 3(s_2 - s_1)$.

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46. Let a_1, a_2, a_3 ...... be an A.P. Prove that $\sum_{n=1}^{2m} (-1)^{n-1} a_n^2 = \frac{m}{2m-1}(a_1^2 - a_{2m}^2)$.

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47. A G.P. consists of 2n terms . If the sum of the terms occupying the odd places in S_1 and that of the terms in the even places is S_2 then find the common ratio in progression.

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48. If G_1, G_2 are geometric means , and A is the arithmetic mean between two positive no. then show that $\frac{G_1^2}{G_2} + \frac{G_2^2}{G_1} = 2A$.

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49. Show that $\begin{vmatrix} a & b & a\alpha + b \\ b & c & b\alpha + c \\ a\alpha + b & b\alpha + c & 0 \end{vmatrix}$=0 if α is not the root of the equation $(ax^2 + 2bx + c) = 0$ then a,b,c are in G.P.

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50. If $S_n = 1 + \frac{1}{2} + \frac{1}{2^2} + \ldots\ldots. + \frac{1}{2^{n-1}}$. Calculate the least value of n such that $S_n = 2 - S_n < \frac{1}{100}$.

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51. Prove that the number of the sequence 121,12321,1234321,...... are each a perfect square of odd integer.

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52. Find the sum of n terms of series $1+5\left(\frac{4n+1}{4n-3}\right)+9\left(\frac{4n+1}{4n-3}\right)^2+13\left(\frac{4n+1}{4n-3}\right)^3+\ldots.$

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53. Find the sum of the products of the integers 1,2,3,....n taken two at a time and show that it equal to half the excess of the sum of the cubes of the given integers over the sum of their squares.

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54. Sum the series $n+(n-1)x+(n-2)x^2+\ldots\ldots+2x^{n-2}+x^{n-1}$.

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55. Find $1 + 2^2x + 3^2x^2 + 4^2x^3 + \dots$ to $\infty |x| < 1$.

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56. Find the sum of 1st n terms of the sequence 3,6,15,42,123,...

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57. Let S_n denote the sum of first n terms of the sequence 1,5,14,30,55,..... then prove that $S_n - S_{n-1} = \sum n^2$.

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58. Finds the sum of first n terms of the series $\frac{3}{1^2 \times 2^2} + \frac{5}{2^2 \times 3^2} + \frac{7}{3^2 \times 4^2} + \dots\dots$ and hence deduce the sum of infinity.

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59. How many terms of the series 54+51+48+45+ ... must be taken to make 513 ? Explain the double answer.

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60. If (b+c),(c+a),(a+b) are in H.P. show that a^2, b^2, c^2 are in A.P.

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

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62. If $0<\theta<\frac{\pi}{2}$ then find the least value of $\tan\theta+\cot\theta$

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63. If x and y are positive quantities whose sum is 4, show that $\left(x+\frac{1}{x}\right)^2+\left(y+\frac{1}{y}\right)^2 \geq 12\frac{1}{2}$.

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64. If $a, b, c > 0$ show that $\frac{bc}{b+c}+\frac{ca}{c+a}+\frac{ab}{a+b} \leq \frac{a+b+c}{2}$.

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65. Show that $a^2(1+b^2)+b^2(1+c^2)+c^2(1+a^2) \geq 6abc$.

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66. If m, n are positive quantities, prove that $\left(\frac{mn+1}{m+1}\right)^{m+1} \geq n^m$.

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67. Prove that $\left(\frac{bc+ac+ab}{a+b+c}\right)^{a+b+c} \geq (b)^a (c)^b (a)^c$ [where $a, b, c > 0$].

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68. If $\log 2, \log(2^n - 1)$ and $\log(2^n + 3)$ are in A.P. then n =

A. 44318

B. $\log_2 5$

C. $\log_3 5$

D. 44257

Answer: B

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69. If the ratiio of the sum of n terms ofd two AP's is (3n+1):(2n+3) then find the ratio of their 11th term

A. (45:64)

B. 3:4

C. (64:45)

D. 4:3

Answer: C

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70. If $a_1, a_2, a_3, ... a_n$ are in AP where $a_1 > 0 \forall i$ then the value of $\frac{1}{\sqrt{a_1}+\sqrt{a_2}}+\frac{1}{\sqrt{a_2}+\sqrt{a_3}}+\dots\frac{.1}{\sqrt{a_{n-1}}+\sqrt{a_n}}=$

A. $\frac{1}{\sqrt{a_1}-\sqrt{a_n}}$

B. $\frac{1}{\sqrt{a_1}-\sqrt{a_n}}$

C. $\frac{n-1}{\sqrt{a_1}+\sqrt{a_n}}$

D. $\frac{n}{\sqrt{a_1}-\sqrt{a_n}}$

Answer: D

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71. Given p no. of A.P. each of which consists of an n terms. If their first terms are 1,2,3.... p are in common differences are 1,3,5...2p-1 respectively, then the sum of the terms of all progressions is

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

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

C. $np(n+1)$

D. none of these

Answer: A

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72.

Answer the following question based on above passage:

The coefficient of x^{99} in the expansion of (x-1)(x-2)......(x-99)(x-100) is

A. 100

B. -5050

C. 5050

D. -100

Answer: B

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73. If a,b,c ,d and p are distinct real number such that $(a^2+b^2+c^2)p^2-2(ab+bc+cd)p+(b^2+c^2+d^2)\leq 0$ then a,b,c,d are in

A. AP

B. GP

C. HP

D. none of these

Answer: B

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74. 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

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

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

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

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

Answer: D

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75. The value of $4^{\frac{1}{3}}.4^{\frac{1}{9}}.4^{\frac{1}{27}}.... \infty$ is.

A. 2

B. 3

C. 4

D. 9

Answer: A

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76. If the sum of an infinite GP is 20 and sum of their square is 100 then common ratio will be=

A. 5

B. 3/5

C. 8/5

D. 1/5

Answer: C

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77. If $S = 1 + a + a^2 + \ldots\ldots. to\infty$, then a=

A. $\dfrac{S}{S-1}$

B. $\dfrac{S}{1-S}$

C. $\dfrac{S-1}{S}$

D. $\dfrac{1-S}{S}$

Answer: C

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78. If $4a^2 + 9b^2 + 16c^2 = 2(3ab + 6bc + 4ca)$ where a,b,c are non zero real number, then a,b,c are in

A. A.P

B. G.P.

C. H.P.

D. none of these

Answer: C

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79. If a,b,c in AP and $x=\sum_{n=0}^{\infty} a^n, y=\sum_{n-0}^{\infty} b^n, z=\sum_{n-0}^{\infty} c^n$ then x,y,z are in

A. AP

B. GP

C. HP

D. None of these

Answer: C

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80. If a,b,c are in G.P., then the equations $ax^2+2bx+c=0$ and $dx^2+2ex+f=0$ have a common root if d/a,e/b,f/c are in

A. AP

B. GP

C. HP

D. None of these

Answer: A

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81. If the product of n positive number is unity, then their sum is

A. a positive integer

B. divisible by n

C. equal to n+1/m

D. never less than n

Answer: D

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82. If $x_1 > 0, i = 1, 2.... .50$ and$x_1 + x_2 + ... x_{50} = 50$ then the minimum value of $\frac{1}{x_1} + \frac{1}{x_2} + ...\frac{1}{x_{50}}$ equals to.

A. 50

B. $(50)^2$

C. $(50)^3$

D. $(50)^4$

Answer: A

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83. If a,b,c,d are positive real number such that a+b+c+d=2 , then M=(a+b)(c+d) satisfies the relation:

A. $0 \leq M \leq 1$

B. $1 \leq M \leq 2$

C. $2 \leq M \leq 3$

D. $3 \leq M \leq 4$

Answer: A

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84. If $a_1, a_2, \ldots. a_n$ are positive real number whose product is a fixed number c, then the minimum value of $a_1 + a_2 + \ldots\ldots + a_{n-1} + a_n$ is

A. $n(c)^{\frac{1}{n}}$

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

C. $2nc^{\frac{1}{n}}$

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

Answer: A

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85. The greatest value x^2y^3 is, where $x > 0$ and $y > 0$ are connected by the relation 3x+4y=5

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86. Let $S = \frac{8}{5} + \frac{16}{65} + \ldots\ldots \frac{128}{2^{18} + 1}$ then

A. S=1088/545

B. S=545/1088

C. S=1056/545

D. S=545/1056

Answer: A

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87. The sum of the infinite terms of the series $\frac{5}{3^2.\ 7^2}+\frac{9}{7^2.\ 11^2}+\frac{13}{11^2.\ 15^2}.....$ is

A. 1/12

B. 1/36

C. 1/54

D. 1/72

Answer: D

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88. The sum to infinity of the series $1+\frac{2}{3}+\frac{6}{3^2}+\frac{10}{3^3}+\frac{14}{3^4}+....$

A. 2

B. 3

C. 4

D. 6

Answer: B

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89. The sum to n terms of the series $1+2\left(1+\frac{1}{n}\right)+3\left(1+\frac{1}{n}\right)^2+\ldots\ldots$ is given by

A. n^2

B. `n(n+1)

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

D. none of these

Answer: A

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90. For $|x|<1$ the value of $1+3x+6x^2+10x^3+\ldots.\,to\infty$ is

A. $\dfrac{4}{(1-x)^4}$

B. $\dfrac{3}{(1-x)^3}$

C. $\dfrac{1}{(1-x)^3}$

D. none of these

Answer: C

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91. If pth, qth, and rth term of an AP are equal to corresponding terms of a GP and these terms are respectively x,y,z, then $x^{y-z}y^{z-x}z^{x-y}$ equals

A. 0

B. 1

C. 2

D. none of these

Answer: B

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92. If a,b,c are positive real number, then the least value of $(a+b+c)\left(\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right)$ is

A. 9

B. 3

C. 44472

D. none of these

Answer: A

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93. An infinite GP has first term x and sum 5, then x belongs to

A. $x \leq 10$

B. $-10 < x < 0$

C. $0 < x < 10$

D. $x < 10$

Answer: C

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94. $2^{\frac{1}{4}}, 2^{\frac{2}{8}}, 2^{\frac{3}{16}}, 2^{\frac{4}{32}}......\infty$ is equal to

A. 1

B. 2

C. 44257

D. 44318

Answer: A

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95. Let α , β be the roots of $x^2 - x + p = 0$ and γ, δ be the roots of $x^2 - 4x + q = 0$. If α, β, γ are in GP , then the integer values of p and q respectively are:

A. -2,-32

B. -2,3

C. -6,3

D. -6,-32

Answer: A

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

A. 4

B. 5

C. 6

D. none of these

Answer: A

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97. Sum of n terms of the series 8+88+888+....equals

A. $\frac{8}{81}\left[10^{n+1}-9n-10\right]$

B. $\frac{8}{81}[10^{n}-9n-10]$

C. $\frac{8}{81}\left[10^{n+1}-9n+10\right]$

D. none of these

Answer: A

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98. The sum of the first n terms of the series $1^2 + 2.2^2 + 3^2 + 2.4^2 + 5^2 + 2.6^2 + ... is \frac{n(n+1)^2}{2}$ when n is even.

When n is odd the sum is

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

B. $\frac{n(n-1)(2n-1)}{6}$

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

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

Answer: A

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99. The sum of integer in between 1 to 100 which is divisible by 2 or 5 is

A. 3100

B. 3600

C. 3050

D. 3500

Answer: C

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100. $\frac{1}{2}+\frac{3}{4}+\frac{7}{8}+\frac{15}{16}+\ldots..to$ n terms =

A. $2^{n}-1$

B. $2n-n-1$

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

D. none of these

Answer: C

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101.

$0<\theta<\frac{\pi}{2}, \quad \text{if} \quad x=\sum_{n=0}^{\infty}\cos^{2n}\theta, y=\sum_{n=0}^{\infty}\sin^{2n}\theta, z=\sum_{n=0}^{\infty}\cos^{2n}\theta\sin^{2n}\theta$

A. xyz=xz+y

B. xyz=xy+z

C. xyz=yz+x

D. none of these

Answer: B

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102. If $x \in \{1, 2, 3......9\}$ and $f_n(x)=xxx...x$ (n digits), then $f_n^2(3)+f_n(2)$ is equal to

A. $2f_{2n}(1)$

B. $f_n^2(1)$

C. $f_{2n}(1)$

D. $-f_{2n}(4)$

Answer: C

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103. Four no. are in AP . If their sum is 20 and the sum of their squares is 120, then the middle terms are

A. 2,4

B. 4,6

C. 6,8

D. 8,10

Answer: 2

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104. Sum of n terms of series 1.3+3.5+5.7+....is

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

B. $\frac{2}{3}n(n+1)(2n-1)-n$

C. $\frac{2}{3}n(n-1)(2n-1)-n$

D. none of these

Answer: 2

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105. If the sum of an infinitely decreasing GP is 3, and the sum of the squares of its items is 9/2, the sum of the cubes of the terms is.

A. 105/13

B. 108/13

C. 729/8

D. none of these

Answer: 2

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106. $1 + 2.2 + 3.2^2 + 4.2^3 + \ldots .100.2^{99}$ equals

A. 99.2^{100}

B. 100.2^{100}

C. $1 + 99.2^{100}$

D. none of these

Answer: 3

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107. If A_1, A_2 be two AM's and G_1, G_2 be the two GM's between two number a and b , then $\dfrac{A_1 + A_2}{G_1 G_2}$ is equal to

A. $\frac{a+b}{2ab}$

B. $\frac{2ab}{a+b}$

C. $\frac{a+b}{ab}$

D. $\frac{ab}{a+b}$

Answer: 3

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108. If $H_1, H_2, H_3, \ldots\ldots. H_n$ be n harmonic means between a and b then
$\frac{H_1+a}{H_1-a}+\frac{H_n+b}{H_n-b}=$

A. 0

B. n

C. 2n

D. 1

Answer: 3

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109. If a,b,c are in AP and a^2, b^2, c^2 are in HP, then

A. a=b+c

B. b=c+a

C. c=a+b

D. a=b=c

Answer: 4

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110. If between 1 and 1/31 there are n H.M's and ratio of 7th and $(n-1)^t h$ harmonic means is 9:5, then values of n is

A. 12

B. 13

C. 5

D. 14

Answer: 4

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111. $\frac{a^{n+1}+b^{n+1}}{a^n+b^n}$ is AM/GM/HM, between a and b if n is equal to respectively

A. -1,-1/2,0

B. 0,1/2,-1/2

C. 0,-1/2,-1

D. none of these

Answer: 3

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112. Sum of infinite terms of series $3 + 5.\frac{1}{4} + 7.\frac{1}{4^2} + \ldots..$ is

A. 33/4

B. 44504

C. 44/9

D. 44/8

Answer: 3

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113. The value of x for which $\frac{1}{1+\sqrt{x}}, \frac{1}{1-x}, \frac{1}{1-\sqrt{x}}$ are in AP lie in

A. (0,1)

B. $(1, \infty)$

C. $(0, \infty)$

D. none of these

Answer: 1&2

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114. If the non-zero numbers a,b,c are in AP and $\tan^{-1}a, \tan^{-1}b, \tan^{-1}c$ are also in AP, then

A. $b^2 = ac$

B. $a^2 + b^2 + c^2 = ab + bc + ca$

C. $a^3 + b^3 + c^3 = 3abc$

D. $\sin^{-1}a, \sin^{-1}b, \sin^{-1}c$

Answer: 1,2,3&4

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115. If a,b,c,d are distinct positive numbers in AP, then

A. $ad < bc$

B. $a + c < b + d$

C. $a + d = b + c$

D. $(a + 1)(d + 1) < (b + 1)(cx + 1)$

Answer: 1,3&4

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116. If $\sum_{r=1}^{n} r(r+1)(2r+3) = an^4 + bn^3 + cn^2 + dn + e,$ then

A. a=1/2

B. b=8/3

C. c=9/2

D. e=0

Answer: 1,2,3&4

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117. The pth term T_p of HP is q(p+q) and qth term T_q is $p(p+q)$ when $p > 1, q > 1$, them

A. $T_{p+q} = pq$

B. $T_{pq} = p+q$

C. $T_{p+q} > T_{pq}$

D. $T_{pq} > T_{p+q}$

Answer: 1,2&3

Watch Video Solution

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

A. $a(100) < 100$

B. $a(100) > 100$

C. $a(200) < 100$

D. $a(200) > 100$

Answer: 1&4

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119. A geometric progression of real number is such that the sum of its first four terms is equal to 30 and the sum of teh square of the first four terms is 340. then

A. two such GP are possible

B. it must be a decreasing GP

C. the common ratio is always rational

D. the first term is always an even integer

Answer: 1,3&4

Watch Video Solution

120. If the first and the $(2n-1)^th$ term of an A.P,G.P anf H.P are equal and their nth term are a,b,c respectively,then

A. a=b=c

B. $a \geq b \geq c$

C. a+c=b

D. $ac-b^2=0$

Answer: 1,2&4

Watch Video Solution

121. If a,b,c be in H.P prove that $\left(\frac{1}{a}+\frac{1}{b}-\frac{1}{c}\right)\left(\frac{1}{b}+\frac{1}{c}-\frac{1}{a}\right)=\frac{4}{ac}-\frac{3}{b^2}$

A. $\frac{2}{bc}-\frac{1}{b^2}$

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

C. $\frac{3}{b^2} - \frac{2}{ab}$

D. none of these

Answer: 1,2&3

Watch Video Solution

122. Which one of the following statements is correct ?

A. $G_1 > G_2 > G_3 > \ldots$

B. $G_1 < G_2 < G_3 < \ldots$

C. $G_1 = G_2 = G_3 =$

D. $G_1 < G_3 < G_5 < \ldots$and $G_2 > G_4 > G_8 > . .$

Answer: C

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123. Let $\sin\alpha$, $\cos\alpha$, be the roots of the equation $x^2 - bx + c = 0$. Then which of the following statements is/are correct ?

A. $A_1 > A_2 \ldots .$

B. $A_1 > A_2 > A_3 > \ldots$

C. $A_1 > A_3 > A_5 > \ldots$ and $A_2 < A_4 < A_6 < \ldots .$

D. $A_1 < A_3 < A_5 < \ldots$ and $A_2 > A_4 > A_6 > \ldots .$

Answer: A

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124. Which one of the following statements is correct ?

A. $H_1 > H_2 > H_3 > \ldots .$

B. H_1ltH_2ltH_3lt.....

C. $H_1 > H_3 > H_5 > \ldots . \text{ and } H_2 < H_4 < H_6 < \ldots$

D. $H_1 < H_3 < H_5 < \ldots . \text{ and } H_2 > H_4 > H_6 > \ldots$

Answer: B

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125. The sum $V_1 + V_2 + \ldots . V_n$ is

A. $\frac{1}{12}n(n+1)\left(3n^2 - n + 1\right)$

B. $\frac{1}{12}n(n+1)\left(3n^2 + n + 1\right)$

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

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

Answer: B

Watch Video Solution

126. T_r is always

A. an odd number

B. an even number

C. a prime number

D. a composite number

Answer: D

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127. Which one of the following statements is correct ?

A. $Q_1, Q_2, Q_3 \ldots .$ are in AP with common differences 5

B. $Q_1, Q_2, Q_3 \ldots .$ are in AP with common differences 6

C. $Q_1, Q_2, Q_3 \ldots .$ are in AP with common differences 11

D. $Q_1 = Q_2 = Q_3 = \ldots$

Answer: B

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128. Match List-I with List-II

List - I	List - II
(1) If a, b, c are non-zero real numbers such that $3(a^2 + b^2 + c^2 + 1) = 2 \times (a + b + c + ab + bc + ca)$, then a, b, c are in	(P) AP
(2) If the square of difference of three numbers be in AP, then their difference are in	(Q) GP
(3) If $a - b$, $ax - by$, $ax^2 - by^2$ $(a, b \neq 0)$ are in GP, then x, y, $\frac{ax - by}{a - b}$ are in	(R) HP
	(S) Equal

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129. The roots of equation $x^2 + 2(a-3)x + 9 = 0$ lie between -6 and 1 and 2 ,$h_1, h_2, \ldots . h_{20}$ [a] are in HP where [a] denotes the integral part of a and 2,$a_1, a_2, \ldots\ldots a_{20}$,[a] are in AP, then $\left(\frac{a_3 h_{18}}{3}\right)$ is equal to

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130. If a,b,c ,d are distinct integer in AP such that $d = a^2 + b^2 + c^2$, then a+b+c+d is

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131. If $\log_2(a+b) + \log_2(c+d) \geq 4$. Then the minimum value of the expression a+b+c+d is

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132. Let $a_1, a_2, a_3, \ldots\ldots. a_{11}$ be real number satisfying $a_1 = 15, 27 - 2a_2 > 0$ and $a_k = 2a_{k-1} - a_{k-2}$ for k=3,4,.....11. If $\frac{a_1^2 + a_2^2 + \ldots\ldots a_{11}^2}{11} = 90$, then the value of $\frac{a_1 + a_2 + \ldots.\,. a_{11}}{11}$ is equal to

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133. 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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134. Find the sum of the first n terms of the series $1^3 + 3.2^2 + 3^3 + 3.4^2 + 5^2 + 3.6^2 + ...$ when n is even

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135. Find the sum of the first n terms of the series $1^3 + 3.2^2 + 3^3 + 3.4^2 + 5^2 + 3.6^2 + ...$ when n is odd

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

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137. The sum of the squares of three distinct real numbers, which are in GP is S^2. If their sum is αS, show that $\alpha^2 \in \left(\frac{1}{3}, 1\right) \cup (1, 3)$.

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138. Prove that the three successive terms of a GP will form the sides of a triangle if the common ratio satisfies the inequality $\frac{1}{2}\left(\sqrt{5}-1\right) < t < \frac{1}{2}\left(\sqrt{5}+1\right)$.

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139. If $(m+1)^t h$,$(n+1)^t h$ and $(r+1)^t h$ terms in AP are in GP m,n,r are in HP ,show that the ratio of the common difference to the first term of the AP is $\left(-\frac{2}{n}\right)$.

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140. If p be the first of n arithmetic means between two numbers and q be the first of n harmonic means between the same two numbers , then prove that the value of q can not lie between p and $\left(\frac{n+1}{n-1}\right)^2 p$.

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141. Show that $\frac{1^4}{13} + \frac{2^4}{3.5} + \frac{3^4}{5.7} + \ldots . + \frac{n^4}{(2n-1)(2n+1)} = \frac{n(4n^2+6n+5)}{48} + \frac{}{16(}$

.

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142. Solve the following equations for x and y $\log_{10} \times + \frac{1}{2}\log_{10} \times + \frac{1}{4}\log_{10} \times + \ldots = y$ and $\frac{1+3+5+\ldots+(2y}{4+7+10+\ldots+(3y}$

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143. Find the sum of the series $\frac{1}{1.3}+\frac{2}{1.3.5}+\frac{3}{1.3.5.7}$...upto infinity

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144. 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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145. If 1,$\log_9\left(3^{1-x}+2\right)$ and $\log_3\left(4.3^x-1\right)$ are in AP , then x is equal to

A. $\log_4^3$

B. $\log_3 4$

C. $1-\log_3 4$

D. $\log_3 0.25$

Answer: C

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146. If the sum of the first 2n terms of the AP 2,5,8.....is equal to the sum of the first n terms of the AP 57,59,61, ...then n equals

A. 10

B. 12

C. 11

D. 13

Answer: C

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147. If x $\in$ R , the number $5^{1+x}+5^{1-x}, \frac{a}{2}, 25^{x}+25^{-x}$ form an AP , then a must lie in the interval

A. [1,5]

B. [2,5]

C. [5,12]

D. $[12, \infty]$

Answer: D

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148. If an AP $a_7 = 9$ and $a_1 a_2 a_7$ is least , then common difference is

A. 13/20

B. 23/20

C. 33/20

D. 43/20

Answer: C

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

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

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

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

Answer: D

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150. The value of $a^{\log_b(x)}$ = (where, a=0.2,b=sqrt5), x= (1/4+1/8+1/16+.....infty),` is

A. 1

B. 2

C. 44198

D. 4

Answer: D

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151. If a,b,c are in HP and $a > c > 0, then \frac{1}{b-c} - \frac{1}{a-b}$.

A. is positive

B. is zero

C. is negative

D. has no fixed sign

Answer: A

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

A. Not in AP/GP/HP

B. in AP

C. in GP

D. in HP

Answer: D

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153. If a,b,c are in HP , thn the value of $\frac{b+a}{b-a}+\frac{b+c}{b-c}$ is

A. 0

B. 1

C. 2

D. 3

Answer: C

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154. If $x_1 > 0, i = 1, 2.... .50$ and$x_1 + x_2 + ... x_{50} = 50$ then the minimum value of $\frac{1}{x_1} + \frac{1}{x_2} + ...\frac{1}{x_{50}}$ equals to.

A. 150

B. 100

C. 50

D. $(50)^2$

Answer: C

Watch Video Solution

155. If three positive real number a,b,c are in AP with abc =4 , then the minimum value of b is

A. $4^{\frac{1}{3}}$

B. 3

C. 2

D. 44198

Answer: A

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156. The sum of 10 terms of the series 0.7+.77+.777+.... is

A. $\frac{7}{9}.\left(89+\frac{1}{10^{10}}\right)$

B. $\frac{7}{81}.\left(89+\frac{1}{10^{10}}\right)$

C. $\frac{7}{81}.\left(89+\frac{1}{10^{9}}\right)$

D. none of these

Answer: B

Watch Video Solution

157. Find the sum of the series upto n terms 1.3.5+3.5.7+5.7.9+....

A. $8n^2 + 12n^2 - 2n - 3$

B. $n(8n^3 + 11n^2 - n - 3)$

C. $n(2n^3 + 8n^2 + 7n - 2)$

D. none of these

Answer: C

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158. Find the sum of first n terms of the series $\frac{3}{1^2} + \frac{5}{1^2 + 2^2} + \frac{7}{1^2 + 2^2 + 3^2} + \dots .$

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

B. $\frac{9n}{n+1}$

C. $\frac{12n}{n+1}$

D. $\frac{15n}{n+1}$

Answer: A

Watch Video Solution

159. If the sum to infinity to the series $1 + 4x + 7x^2 + 10x^3 + \ldots.$ is 35/16 the value of x is

A. 44201

B. 19/7

C. 44396

D. none of these

Answer: B

Watch Video Solution

160. Consider an AP with first term a and the common difference 'd' Let S_k denote the sum of its first k terms. If $\frac{S_{kx}}{S_x}$ is independent of x then

A. a=d/2

B. a=d

C. a=2d

D. none of these

Answer: C

Watch Video Solution

161. If p,q,r are three positive real number are in AP , then the roots of the quadratic equation $px^2 + qx + r = 0$ are all real for

A. $\left|\frac{r}{p} - 7\right| \geq 4\sqrt{3}$

B. $\left|\frac{p}{r} - 7\right| < 4\sqrt{3}$

C. all p and r

D. no p and r

Answer: A

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162. The solution of the equation $(8)^{(1+[\cos x| \div |\cos^2 x| \div |\cos^3 x] \div \ldots . = 4^3}$ in thge interval $(-\pi, \pi)$ are

A. $\pm\frac{\pi}{3}, \pm\frac{\pi}{6}$

B. $\pm\frac{\pi}{3}, \pm\pi$

C. $\pm\frac{\pi}{3}, \pm\frac{2\pi}{3}$

D. none of these

Answer: A

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163. If $(1+x)(1+x^2)(1+x^4)\dots.(1+x^{128})=\sum_{r=0}^{n}x^r$ then n is

A. 255

B. 127

C. 60

D. none of these

Answer: A

Watch Video Solution

164. If $a_n > 1$ for all $n \in N$,then $\log_{a_2} a_1 + \log_{a3} a_2 + \dots . + \log_{an} a_{n-1} + \log_{a1} a_n$ has the minimum value

A. N

B. 2

C. 0

D. none of these

Answer: A

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165. Let $S_k = \lim_{n \to \infty} \sum_{i=0}^{n} \frac{1}{(k+1)^i}$. Then $\sum_{k=1}^{n} kS_k$ equals

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

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

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

D. $\frac{n(n+3)}{2}$

Answer: C

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166. If $a_1, a_2, a_3 \ldots a_n$ are in HP and $f(k) = \sum_{r=1}^{n} a_r - a_k$, then $\frac{a_1}{f(1)}, \frac{a_2}{f(2)}, \frac{a_3}{f(3)}, \ldots\ldots \frac{a_n}{f(n)}$ are in

A. AP

B. GP

C. HP

D. none of these

Answer: A

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167. $\sum_{r=1}^{n} r^2 - \sum_{m=1}^{n} \sum_{r=1}^{m} r$ is equal to

A. 0

B. $\frac{1}{2}\left(\sum_{r=1}^{n} r^2 + \sum_{r=1}^{n}\right)$

C. $\frac{1}{2}\left(\sum_{r=1}^{n} r^2 - \sum_{r=1}^{n} r\right)$

D. none of these

Answer: A

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168. The sum of the integer from 1 to 100 which is not divisible by 3 or 5 is

A. 2489

B. 4735

C. 2317

D. 2632

Answer: D

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169. If $ab^2c^3, a^2b^3c^4, a^3b^4c^5$ are in AP (a,b,cgt0) thgen the minimum value of a+b+c is

A. 1

B. 3

C. 5

D. 9

Answer: C

Watch Video Solution

170. If the sum of n terms of the series $\frac{1}{1^3}+\frac{1+2}{1^3+2^3}+\frac{1+2+3}{1^3+2^3+3^3}+\ldots.$ is S_n , then S_n exceeds 1.99 for all n greater than

A. 99

B. 50

C. 199

D. 100

Answer: C

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171. The coefficient of x^{n-2} in the polynomial (x-1)(x-2)(x-3)....(x-n) is

A. $\dfrac{n(n^2+2)(3n+1)}{24}$

B. $\dfrac{n(n^2-2)(3n+1)}{24}$

C. $\dfrac{n(n^2-1)(3n+4)}{24}$

D. none of these

Answer: D

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172. The series of natural number is divided into groups as follows , (1), (2,3),(4,5,6),(7,8,9,10) and so on. Find the sum of the number in the nth group is

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

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

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

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

Answer: B

Watch Video Solution

173. The sum of 10 terms of the series $\left(x+\frac{1}{x}\right)^2+\left(x^2+\frac{1}{x^2}\right)^2+\left(x^3+\frac{1}{x^3}\right)^2+....$ is

A. $\left(\frac{x^{20}-1}{x^2-1}\right)\left(\frac{x^{22}+1}{x^{20}}\right)+20$

B. $\left(\frac{x^{18}-1}{x^2-1}\right)\left(\frac{x^{11}+1}{x^9}\right)+20$

C. $\left(\frac{x^{18}-1}{x^2-1}\right)\left(\frac{x^{11}-1}{x^9}\right)+20$

D. none of these

Answer: C

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174. If the sequence 1,2,2,4,4,4,4,,8,8,8,8,8,8,8,8,.... where n consecutive terms has value n then 1025th term is

A. 2^9

B. 2^{10}

C. 2^{11}

D. 2^8

Answer: B

Watch Video Solution

175. Sum of n terms of the series (2n-1)+2(2n-3)+3(2n-5)+.... is

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

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

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

D. none of these

Answer: A

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176. The cubes of the natural numbers are grouped as $1^3, (2^3, 3^3), (4^3, 5^3, 6^3)$.... then sum of the number in the nth group is

A. $\frac{1}{8}n^3(n^2+1)(n^2+3)$

B. $\frac{1}{16}n^3(n^2+16)(n^2+12)$

C. $\frac{n^3}{12}(n^2+2)(n^2+4)$

D. none of these

Answer: A

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177. Let $f(n)=\left[\frac{1}{2}+\frac{n}{100}\right]$ where [x] denote the integral part of x. Then the value of $\sum_{n=1}^{100} f(n)$ is

A. 50

B. 51

C. 1

D. none of these

Answer: B

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178. ABC is a right angled triangle in which $\angle B=90^{\circ}$ and BC=a. If n points $L_1, L_2, \ldots. L_n$ on AB are such that 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 og the lengths of $L_1M_1, L_2M_2, ... L_nM_n$ is

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

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

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

D. impossible to find from the given data

Answer: A

Watch Video Solution

179. If a,b,c are three distinct positive real number such that $a^2 + b^2 + c^2 = 1$, then ab+bc+ca=1 is

A. less than 1

B. equal to 1

C. greater than 1

D. any real number

Answer: A

Watch Video Solution

180. The sum of the series $1^3 - 2^3 + 3^3 - .... + 9^3$=

A. 300

B. 125

C. 425

D. 0

Answer: B

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181. If x_1, x_2, x_3 and y_1, y_2, y_3 are both in G.P. with the same common ratio, then the points $(x_1, y_1), (x_2, y_2)$ and (x_3, y_3)

A. are vertices of a triangle

B. lie on a straight line

C. lie on an ellipse

D. lie on a circle

Answer: B

Watch Video Solution

182. Let two numbers have arithmetic mean 9 and geometric mean 4. Then these numbers are the roots of the quadratic equation

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

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

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

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

Answer: C

Watch Video Solution

183. The sum of the first n terms of the series $1^2 + 2.2^2 + 3^2 + 2.4^2 + 5^2 + 2.6^2 + \ldots\ldots. is \frac{n(n+1)^2}{2}$ when n is even. When n is odd the sum is

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

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

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

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

Answer: A

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184. Let $a_1, a_2, a_3, \ldots.$ be terms of an A.P. if $\frac{a_1 + a_2 + \ldots. + a_p}{a_1 + a_2 + \ldots + a_q} = \frac{p^2}{q^2}. p \neq q$ then $\frac{a_6}{a_{21}}$ equals

A. 44379

B. 44234

C. 11/41

D. 41/11

Answer: C

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185. If $a_1, a_2, \ldots. . a_n$ are in H.P., then the expression $a_1a_2 + a_2a_3 + \ldots + a_{n-1}a_n$ is equal to

A. $(n-1)(a_1 - a_n)$

B. na_1a_n

C. $(n-1)a_1a_n$

D. $n(a_1 - a_n)$

Answer: C

Watch Video Solution

186. If the sum of first n natural numbers is 1/5 times the sum of their squares , then the value of n is

A. 5

B. 6

C. 7

D. 8

Answer: C

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187. $\log_3 2, \log_6 2$and $\log_{12} 2$ are in

A. A.P.

B. G.P.

C. H.P.

D. None of these

Answer: C

Watch Video Solution

188. If x be the AM and y,z be two GM's between two positive numbers, then $\frac{y^3+z^3}{xyz}$ is equal to

A. 1

B. 2

C. 3

D. 4

Answer: B

Watch Video Solution

189. If In (a + c), In(c - a) , In(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. a , b, c are in H.P

Answer: D

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190. The sum of the numerical series $\frac{1}{\sqrt{3}+\sqrt{7}}+\frac{1}{\sqrt{7}+\sqrt{11}}+\frac{1}{\sqrt{11}+\sqrt{15}}+\ldots$ upto n terms is

A. $\frac{\sqrt{3+4n}-\sqrt{3}}{4}$

B. $\frac{n}{\sqrt{3+4n}+\sqrt{3}}$

C. less than n

D. greater than $\frac{\sqrt{n}}{2}$

Answer: A::B::C

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

A. >50

B. 52

C. 54

D. 60

Answer: A::B

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192. The series of natural number is divided into groups 1 , 2, 3, 4,...... and so on. Then the sum of the numbers in the nth group is

A. A.$(2n-1)\left(n^2-n+1\right)$

B. B.n^3-3n^2+3n-1

C. C .$n^3+(n-1)^3$

D. D. $\dfrac{n^3+n}{2}$

Answer: A::C

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193. $\sum_{i=1}^{n} \sum_{j=1}^{i} \sum_{k=1}^{j} 1$ is equal to

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

B. $\sum n^2$

C. $\hat{} \ nC_3$

D. $\hat{} \ (n+2)C_3$

Answer: A::D

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194. The sides of a right angle triangle from a G.P. the tangent of the smallest angle is

A. $\sqrt{\frac{\sqrt{5}+1}{2}}$

B. $\sqrt{\frac{\sqrt{5}-1}{2}}$

C. $\sqrt{\frac{2}{\sqrt{5}+1}}$

D. $\sqrt{\frac{2}{\sqrt{5}-2}}$

Answer:

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195. If the first & the (2n + 1)th terms of an A.P. , a G.P & an H.P. of positive terms are equal and their (n + 1)th terms are a, b & c respectively , then

A. a = b = c

B. $a \geq b \geq c$

C. a + c = 2b

D. $ac = b^2$

Answer: A::B::D

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196. If the arithmetic mean of two positive numbers a & b $(a > b)$ is twice their geometric mean , then a : b is

A. $2+\sqrt{3}:2-\sqrt{3}$

B. $4+4\sqrt{3}:1$

C. $1:7-4\sqrt{3}$

D. $2:\sqrt{3}$

Answer: A::B::C

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197. If S_n denotes the sum to n terms of the series $(1 \leq n \leq 9)$ 1 + 22 + 333 + ... + 999999999 then for $n \geq 2$

A. $S_n - s_{n-1} = \frac{1}{9}(10^n - n^2 + n)$

B. $S_n = \frac{1}{9}(10^n - n^2 + 2n - 2)$

C. $9(S_n - S_{n-1}) = n(10^n - 1)$

D. $S_3 = 356$

Answer: C::D

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198. If a , b , c are in H.P. , then

A. $\frac{a}{b+c-a}, \frac{b}{c+a-b}, \frac{c}{a+b-c}$ are in H.P.

B. $\frac{2}{b} = \frac{1}{b-a} + \frac{1}{b-c}$

C. a - b/2 , b/2 , c-b/2 are in G.P.

D. $\frac{a}{b+c}, \frac{b}{c+a}, \frac{c}{a+b}$ are in H.P

Answer: A::B::C::D

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199. 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 sides of S_1 is 10 cm, then for which of the following values of n in the ares of S_n less than 1 sq. cm ?

A. 7

B. 8

C. 9

D. 10

Answer: B::C::D

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200. Given a sequence $t_1, t_2, \ldots .$ if its possible to find a function f(r) such that $t_r = f(r+1) - f(r)$

then $\sum_{r=1}^{n} t_r = f(n+1) - f(1)$

Sum of the $\sum_{r=1}^{\infty} \frac{1}{r(r+1)(r+2)}$ is

A. 1

B. 44198

C. 44200

D. 44204

Answer: C

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201. Given a sequence $t_1, t_2, \ldots.$ if its possible to find a function f(r) such that $t_r = f(r+1) - f(r)$

then $\sum_{r=1}^{n} t_r = f(n+1) - f(1)$

Sum of the $\sum_{r=1}^{n} r(r+3)(r+6)$ is

A. 1/3 n(n + 3)(n + 9)

B. $n^4 + 7n^2 + 20n$

C. 1/4 n(n+3)(n+5)(n+9)

D. None of these

Answer: D

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202. Let $a_1, a_2, a_3, \ldots, a_m$ be the arithmetic means between -2 and 1027 and let $g_1, g_2, g_3 \ldots\ldots, g_n$ be the geometric mean between 1 and 1024. $g_1 g_2 \ldots\ldots g_n = 2^{45}$ and $a_1 + a_2 + a_3 + \ldots + a_m = 1025 \times 171$

The value of n is :

A. 5

B. 9

C. 11

D. None of these

Answer: B

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203. Let $a_1, a_2, a_3, \ldots., a_m$ be the arithmetic means between -2 and 1027 and let $g_1, g_2, g_3 \ldots \ldots .., g_n$ be the geometric mean between 1 and 1024.

$g_1 g_2 \ldots \ldots g_n = 2^{45}$ and $a_1 + a_2 + a_3 + \ldots . + a_m = 1025 \times 171$

The value of m is :

A. 339

B. 342

C. 345

D. None of these

Answer: B

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204. If A, G and H are respectively arithmetic , geometric and harmonic means between a and b both being unequal and positive, then

$A = \frac{a+b}{2} \Rightarrow a+b = 2A, G = \sqrt{a}b \Rightarrow ab = G^2$ and

$H = \frac{2ab}{a+b} \Rightarrow G^2 = AH.$

From above discussion we can say that a , b are the roots of the equation

$x^2 - 2Ax + G^2 = 0$

Now, quadratic equation $x^2 - Px + Q = 0$ and quadratic equation $a(b-c)x^2 + b(c-a)x + c(a-b) = 0$ have a root common and satisfy the relation b = $\frac{2ac}{a+c}$, where a, b, c are real numbers.

The value of [P] is (where [.] denotes the greatest integer function)

A. -2

B. -1

C. 2

D. 1

Answer: C

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205. If A, G and H are respectively arithmetic , geometric and harmonic means between a and b both being unequal and positive, then $A = \frac{a+b}{2} \Rightarrow a+b = 2A, G = \sqrt{a}b \Rightarrow ab = G^2$ and $H = \frac{2ab}{a+b} \Rightarrow G^2 = AH.$

From above discussion we can say that a , b are the roots of the equation $x^2 - 2Ax + G^2 = 0$

Now, quadratic equation $x^2 - Px + Q = 0$ and quadratic equation $a(b-c)x^2 + b(c-a)x + c(a-b) = 0$ have a root common and satisfy the relation b =$\frac{2ac}{a+c}$, where a, b, c are real numbers.

The value of [2P - Q] is (where [.] denotes the greatest integer function)

A. 2

B. 3

C. 5

D. 6

Answer: B

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206. Let a_1, a_2, a_3 ...... be an A.P. Prove that

$$\sum_{n=1}^{2m} (-1)^{n-1} a_n^2 = \frac{m}{2m-1}\left(a_1^2 - a_{2m}^2\right).$$

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207. A three digit number whose consecutive digits from a G.P. If we subtract 792 from this number , we get a number consisting of the same digits written in the reverse order . Now if we increase the second digit of the required number by 2 , the resulting digits will from an A.P. find the number in the tenth place

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208. If a_n denotes the coefficient of x^n in P(x) = $\left(1 + x + 2x^2 + 3x^3 + \dots + nx^n\right)^2$. then the last digit of a_{24} must be

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209. Two consecutive numbers from 1,2,3,.....,n are removed, then arithmetic mean of the remaining numbers is 105/4, then n/10 must be equal to

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210. The value of xyz is 55 or 343/55 according as the sequence a, x, y, z, b is an A.P. or H.P. Find the sum (a + b) given that a and b are positive integers

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211. If a, b, c are in HP and if $\left(\frac{a+b}{2a-b}\right)+\left(\frac{c+b}{2c-b}\right)>\sqrt{\lambda\sqrt{\lambda\sqrt{\lambda\ldots\infty}}}$, then the value of λ must be

A. `

B.

C.

D.

Answer:

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212. If $\alpha_1, \alpha_2, \ldots\ldots, \alpha_n$ are in A.P, whose common difference is d , show that

$\sin d[\sec\alpha_1\sec\alpha_2 + \sec\alpha_2\sec\alpha_3 + \ldots\ldots. + \sec\alpha_{n-1}\sec\alpha_n] = \tan\alpha_n - \tan$

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213. 25 trees are plants in a straight line 5 metre apart from each other. To water them the gardener must bring water for each tree separately from a well 10 metre from the first tree in line with the trees. How far will he move in order to water all the trees beginning with the first if he starts from the well.

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214. The nth term of a series is given by $t_n = \frac{n^5 + n^5}{n^4 + n^2 + 1}$ and if sum of its n terms can be expressed as $s_n = a_n^2 + a + \frac{1}{b_n^2 + b}$, where a_n and b_n are the nth terms of some arithmetic progression and a, b are some constants , then prove that $\frac{b_n}{a_n}$ is a constant.

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215. If $a_1 .\ a_2 .... a_n$ are positive and (n - 1) s = $a_1 + a_2 + ... + a_n$ then prove that

$(a_1 + a_2 + ... + a_n)^n \geq (n^2 - n)^n (s - a_1)(s - a_2) .... (s - a_n)$

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216. Find the sum to n terms of the series

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

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217. Evaluate , S = $\sum_{n=0}^{\infty}\frac{2^n}{a^{2^n}+1}$ (where $a>1$)

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218. Evaluate, $\sum_{i=0}^{i}\infty\sum_{j=0}^{\infty}\sum_{k=0}^{\infty}\frac{1}{3^i\cdot 3^j\cdot 3^k}(i\neq j\neq k)$

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219. If a, b, c, d are four distinct numbers in A.P. , show that $\frac{1}{a}+\frac{1}{d}>\frac{1}{b}+\frac{1}{c}>\frac{4}{a+d}$

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

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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221. Let the harmonic mean of two positive real numbers a and b be 4. If q is a positive real number such that a,5,q,b is an arithmetic progression , then the value (s) of $|q - a|$ is (are)

A. 1

B. 2

C. 3

D. 5

Answer: B::D

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222. 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 terms lies in between 130 and 140, then the common difference of this A.P, is

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

A. 96

B. 142

C. 192

D. 71

Answer: A

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224. If m is the A.M. of two distinct real number l and n(l , n $>$ 1) and G_1, G_2 and G_3 are three geometric means between l and n , then $G_1^4 + 2G_2^4 + G_3^4$ equals.

A. $4lm^2n$

B. $4lmn^2$

C. $4l^2m^2n^2$

D. $4l^2mn$

Answer: A

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225. If $\sin^{-1}\left(x - \frac{x^2}{2} + \frac{x^3}{4} - \frac{x^4}{8} + ...\right) = \frac{\pi}{6}$ where $|x| < 2$ then the value of x is

A. 44230

B. 44257

C. 2/3

D. -3/2

Answer: A

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226. Let d(n) denotes the number of divisors of n including 1 and itself. Then d(225), d(1125) and d(640) are

A. in AP

B. in HP

C. in GP

D. consecutive integers

Answer: C

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227. Let a, b , c be positive integers such that b/a is an integer. if a, b , c are in geometric progression 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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228. If $(10)^9 + 2(11)^1(10)^8 + 3(11)^2(10)^7 + .. + 10(11)^9 = k(10)^9$ then k is equal to :

A. 100

B. 110

C. 121/10

D. 441/100

Answer: A

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229. Three positive numbers from an increasing G.P. If the middle term in this G.P is double , the new numbers are in A.P then the common ratio of the G.P. is :

A. $2-\sqrt{3}$

B. $2+\sqrt{3}$

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

D. $3+\sqrt{2}$

Answer: B

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230. Let f(x) = x + 1/2 , then the number of real values of x for which the three unequal terms f(x), f(2x), f(4x) are in H.P. is

A. 1

B. 0

C. 3

D. 2

Answer: A

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231. If a, b and c are positive numbers in a G.P., then the roots of the quadratic equation $(\log_e a)x^2 - (2\log_e b)x. + (\log_e c) = 0$ are

A. -1 and $\frac{\log_e c}{\log_e a}$

B. 1 and $\frac{\log_e c}{\log_e a}$

C. 1 and $(\log_e c)$

D. -1 and $(\log_e a)$

Answer: C

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232. The minimum value of $2^{\sin x} + 2^{\cos x}$ is

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

B. $2^{1+\frac{1}{\sqrt{2}}}$

C. $2\sqrt{2}$

D. 2

Answer: A

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233. If x, y , z are in A.P and $\tan^{-1} x$, $\tan^{-1} y$ and $\tan^{-1} z$ are also in A.P.,then

A. 2x = 3y = 6z

B. 6x = 3y = 2z

C. 6x = 4y = 3z

D. x= y = z

Answer: D

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234. The sum of first 20 terms of the sequence 0.7 , 0.77 , 0.777,... is

A. $\frac{7}{9}\left(99-10^{-20}\right)$

B. $\frac{7}{9}\left(99+10^{-20}\right)$

C. $\frac{7}{81}\left(179+10^{-20}\right)$

D. $\frac{7}{81}\left(179-10^{-20}\right)$

Answer: C

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235. The value of $1000\left[\frac{1}{1\times 2}+\frac{1}{2\times 3}+\ldots\ldots\ldots+\frac{1}{999\times 1000}\right]$ is equal to

A. 1000

B. 999

C. 1001

D. 1/999

Answer: B

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236. Let $f : R \rightarrow R$ be such that f is is injective and f(x) f(y) = f(x + y) for all $x, y \in R$. If f(x), f(y), f(z) are in G.P. then x , y , z are in

A. A.P always

B. G.P always

C. A.P depending on the values of x,y,z

D. G.P depending on the values of x,y,z

Answer: A

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237. Five number are in H.P. The middle term is 1 and the ratio of the second and the fourth terms is 2 : 1 . Then the sum of the first three terms is

A. $\frac{11}{2}$

B. 5

C. 2

D. $\frac{14}{3}$

Answer: A

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238. If a, b ,c are in A.P ., then the straight line ax + 2by + c=0 will always pass through a fixed point whose coordinates are

A. (1, -1)

B. (-1 , 1)

C. (1 , -2)

D. (-2 , 1)

Answer: A

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239. Six possible number are in G.P . such that their product is 1000. If the fourth term is 1, then the last term is

A. 1000

B. 100

C. 1/100

D. 1/1000

Answer: C

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240. Five number are in A.P. with common difference $\neq$ 0. If the 1 st , 3 rd , and 4 th terms are in G.P. , then

A. the 5th term is always 0

B. the 1st term is always 0

C. the middle term is always 0

D. the middle term is always -2

Answer: A

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241. Let f(x) = $x\left(\frac{1}{x-1}+\frac{1}{x}+\frac{1}{x+1}\right), x > 1$, Then

A. $f(x) \leq 1$

B. $1 < f(x) \leq 2$

C. $2 < f(x) \leq 3$

D. $f(x) > 3$

Answer: D

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242. Let $a_1, a_2, \ldots$ 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

Answer: D

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243. Statement 1 : The sum of the series

1 + (1 + 2 + 4)+(4 + 6 + 9) + (9 + 12 + 16)+....+(361 + 380 + 400) is 8000 .

Statement 2 : $\sum_{k=1}^{n}\left(k^3(k-1)^3\right) = n^3$ for any natural number n .

A. Statement 1 is false , statement 2 is true

B. Statement 1 is true , statement 2 is true , statement 2 is a correct explanation for statement 1.

C. Statement 1 is true, statement 2 is true , statement 2 is a not correct explanation for statement 1.

D. Statement 1 is true , statement 2 is false.

Answer: B

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244. If 100 times the 100 th term of an AP with non zero common different equals the 50 times its 50th term, then the 150th term of this AP is

A. -150

B. 150 times its 50 th term

C. 150

D. zero

Answer: D

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245. Six number are in A.P. such that their sum in 3 . The first term is 4 times the third term. Then the fifth term is

A. -15

B. -3

C. 9

D. -4

Answer: D

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246. If 64, 27 , 36 are the Pth , Qth and Rth terms of a G.P., then P + 2Q is equal to

A. R

B. 2R

C. 3R

D. 4R

Answer: C

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247. Let a, b , c, p , q , r be positive real numbers such that a , b , c are in G.P. and $a^p = b^q = c^r$. Then

A. p,q,r are in G.P

B. p,q,r are in A.P

C. p,q,r are in H.P

D. p^2, q^2, r^2 are in A.P.

Answer: C

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248. Let S_k be the sum of an infinite G.P. series whose first term is k and common ratio is $\frac{k}{k+1}(k > 0)$. Then the value of $\sum_{k=1}^{\infty} \frac{(-1)^k}{s_k}$ is equal to

A. $\log_e 4$

B. $\log_e 2 - 1$

C. $1 - \log_e 2$

D. $1 - \log_e 4$

Answer: D

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249. Let $a_1, a_2, \ldots., a_{100}$ be an arithmetic progression with $a_1 = 3$ and $S_p = \sum_{j=1}^{p} a_j, 1 \leq p \leq 100. F$ or $any \int e \geq rnwith1$ le n le 20 $, \leq tm = 5n,$ if S_m / S_n$does \neg n, then$a_2` is

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250. A man saved Rs. 200 in each of the first three months of his service. In each of the subsequent months his saving increase by Rs. 40 more than the saving of immediately previous month . His total saving from the start of service will be Rs. 11,040 after

A. 19 months

B. 20 months

C. 21 months

D. 18 months

Answer: C

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251. The sequence $\log a, \frac{\log a^2}{b}, \frac{\log a^3}{b^2}, \ldots.$ is

A. a G.P.

B. an A.P.

C. a H.P.

D. Both a G.P. and H.P.

Answer: B

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

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