MATHS

BOOKS - VK JAISWAL ENGLISH

SEQUENCE AND SERIES

Exercise Single Choice Problems

1. If a,b,c are positive numbers and $a+b+ \ =c1,$ then the maximum value of $(1-a)(1-b)(1-c)$ is :

A. 1

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

C. $\frac{8}{27}$

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

Answer: C

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2. If $xyz = (1-x)(1-y)(1-s)$ where $0 \leq x, y, x \leq 1$, then the minimum value of $x(1-2) + y(1-x) + s(1-y)$ is :

A. $\frac{3}{2}$

B. $\frac{1}{4}$

C. $\frac{3}{4}$

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

Answer: C

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3. If $\sec(\alpha - 2\beta), \sec\alpha, \sec(\alpha + 2\beta)$ are in arithmetical progressin then $\cos^2\alpha = \lambda\cos^2\beta(\beta \neq n\pi, n \in I)$ the value of λ is:

A. 1

B. 2

C. 3

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

Answer: B

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4. Let a,b,c,d, e ar non-zero and distinct positive real numbers. If a,b, c are In a,b,c are in A.P, b,c, dare in G.P. and c,d e are in H.P, the a,c,e are in :

A. A.P.

B. G.P.

C. H.P.

D. Nothing can be said

Answer: B

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

A. $-\frac{n}{2}$

B. $-n$

C. $-2n$

D. $+n$

Answer: A

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6. If the equation $x^4-4x^3+ax^2+bx+1=0$ has four positive roots, then the value of $(a+b)$ is :

A. -4

B. 2

C. 6

D. can not be determined

Answer: B

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7. If S_1, S_2 and S_3 are the sums of first n natureal numbers, their squares and their cubes respectively, then $\frac{S_1^4 S_2^2 - S_2^2 S_3^2}{S_1^2 + S_2^2} =$

A. 4

B. 2

C. 1

D. 0

Answer: D

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8. If $S_n = \frac{1.2}{3!} + \frac{2.2^2}{4!} + \frac{3.2^2}{5!} + ... +$ up to n terms, then sum of infinite terms is

A. 1

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

C. e

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

Answer: A

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9. If $\tan\left(\frac{\pi}{12} - x\right), \tan\frac{\pi}{12}, \tan\left(\frac{x}{12} + x\right)$ in order are three consecutive terms of a G.P. then sum of all the solution in $[0, 314]$ is $k\pi$. The vlaue of k is :

A. 4950

B. 5050

C. 2525

D. 5010

Answer: A

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10. Let $S_n = 1 + 2 + 3 + \quad + n$ and $P_n = \frac{S_2}{S_2 - 1}\frac{\dot{S}_3}{S_3 - 1}\frac{\dot{S}_4}{S_4 - 1}\cdots\frac{S_n}{S_n - 1}$ Where $n \in N, (n \geq 2)\cdot$ Then $(\lim)_{n \to \infty} P_n =_{-} \ -_{-} \ -$

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

B. 1

C. 3

D. 0

Answer: C

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11. if a,b,c are positive and are the pth qth and rth terms respectively of a G.P. then $\Delta = \begin{vmatrix} \log a & p & 1 \\ \log b & q & 1 \\ \log c & r & 1 \end{vmatrix}$ is

A. -1

B. 2

C. 1

D. 0

Answer: D

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12. The numbers of natural numbers < 300 that are divisible by 6 but not by 9 :

A. 49

B. 37

C. 33

D. 16

Answer: D

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13. If $x, y, x > 0$ and $x + y + z = 1$ then $\dfrac{xyz}{(1-x)(1-y)(1-z)}$ is necessarily.

A. ≥ 8

B. $\leq \dfrac{1}{8}$

C. 1

D. None of these

Answer: B

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14. If the roots of the equation $px^2 + qx + r = 0$, where $2p, q, 2r$ are in G.P, are of the form $\alpha^2, 4\alpha - 4$. Then the value of $2p + 4q + 7r$ is :

A. 0

B. 10

C. 14

D. 18

Answer: C

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15. Let $x_1, x_2, x_3, \ldots, x_k$ be the divisors of positive integer 'n' (including 1 and x). If $x_1 + x_2 + \ldots + x_k = 75$, then $\sum_{i=1}^{k} \frac{1}{x_i}$ is equal to:

A. $\frac{75}{k}$

B. $\frac{75}{n}$

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

D. $\frac{1}{75}$

Answer: B

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16. If $a_a, a_2, a_3, \ldots., a_n$ are in H.P. and $f(k) = \sum_{r=1}^{n} a_r - a_k$ then $\frac{a_1}{f(1)}, \frac{a_2}{f(2)}, \frac{a_3}{f(n)}$ are in :

A. A.P.

B. G.P.

C. H.P.

D. None of these

Answer: C

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17. If α, β be roots of the equation $375x^2 - 25x - 2 = 0$ and $s_n = \alpha^n + \beta^n$, then $\lim_{x \to \infty} \lim_{x \to \infty} \left(\sum_{r=1}^{n} S_r \right) =$

A. $\frac{1}{12}$

B. $\frac{1}{4}$

C. $\frac{1}{3}$

D. 1

Answer: A

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18. If $a_i, i = 1, 2, 3, 4$ be four real members of same sign, then the minimum value of $\sum \left(\frac{a_i}{a_j} \right), i, j \in \{1, 2, 3, 4\}, i \neq j$ is : (a) 6 (b) 8 (c) 12 (d) 24

A. 6

B. 8

C. 12

D. 24

Answer: C

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19. Given that x, y, z are positive reals such that $xyz = 32$. The minimum value of $x^2 + 4xy + 4y^2 + 2z^2$ is ________.

A. 64

B. 256

C. 96

D. 216

Answer: C

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20. In an A.P. five times the fifth term is equal tyo eight times thte eight term. Then the sum of the first twenty five terms is equal to :

A. 25

B. $\frac{25}{2}$

C. -25

D. 0

Answer: D

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21. Let α, β be two distinct values of x lying in $(0, \pi)$ for which $\sqrt{5}\sin x, 10\sin x, 10(4\sin^2 x + 1)$ are 3 consecutive terms of a G.P. Then minimum value of $|\alpha - \beta| =$

A. $\frac{\pi}{10}$

B. $\frac{\pi}{5}$

C. $\frac{2\pi}{5}$

D. $\frac{3\pi}{5}$

Answer: B

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22. In an infinite G.P. the sum of first three terms is 70. If the externme terms are multipled by 4 and the middle term is multiplied by 5, the resulting terms form an A.P. then the sum to infinite terms of G.P. is :

A. 120

B. 40

C. 160

D. 80

Answer: D

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23. Find the $\sum_{k=1}^{\infty} \sum_{n=1}^{\infty} \frac{k}{2^{n+k}}$.

A. 5

B. 4

C. 3

D. 2

Answer: D

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24. Let p,q,r are positive real numbers, such that $27pqr \geq (p+q+r)^2$ and $3p+4p+5r=12$, then $p^2+q^4+r^3=$

A. 3

B. 6

C. 2

D. 4

Answer: A

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25. Find the sum of the infinte series $\frac{1}{9}+\frac{1}{18}+\frac{1}{30}+\frac{1}{45}+\frac{1}{63}+\ldots$

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

B. $\frac{1}{4}$

C. $\frac{1}{5}$

D. $\frac{2}{3}$

Answer: A

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26. If S_r denote the sum of first 'r' terms of a non constaint A.P. and $\frac{S_a}{a^2} = \frac{S_b}{b^2} = c,$ where a,b,c are distinct then $S_c =$

A. c^2

B. c^3

C. c^4

D. abc

Answer: B

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27. If an infinite G.P. has 2nd term x and its sum is 4, then prove that

$\xi n(- 8, 1] - \{0\}$

A. $(- 8, 0)$

B. $\left[- \frac{1}{8}, \frac{1}{8}\right) - \{0\}$

C. $\left[- 1, - \frac{1}{8}\right) \cup \left(\frac{1}{8}, 1\right]$

D. $(-8, 1] - \{0\}$

Answer: D

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28. The number of terms of an A.P. is odd. The sum of the odd terms $\left(1^{st}, 3^{rd} etc, \right)$ is 248 and the sum of the even terms is 217. The last term exceeds the first by 56 then :

A. the number of terms is 17

B. the first term is 3

C. the number of terms is 13

D. the first term is 1

Answer: B

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29. Let $A_1, A_2, A_3, \ldots\ldots, A_n$ be squares such that for each $n \geq 1$ the length of a side of A_n equals the length of a diagonal of A_{n+1}. If the side of A_1 be 20 units then the smallest value of 'n' for wheich area of A_n is less than 1.

A. 7

B. 8

C. 9

D. 10

Answer: D

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30. Let $S_k = \sum_{i=0}^{\infty} \frac{1}{(k+1)^t}$, then $\sum_{k=1}^{n} kS_k$ equal :

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

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

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

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

Answer: D

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

A. $\dfrac{n2^n}{n+1}$

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

C. $\dfrac{n2^n}{n+1}-1$

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

Answer: A

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32. If $(1.5)^{30} = k$, then the value of $\sum_{(n=2)}^{29} (1.5)^n$, is :

A. $2k - 3$

B. $k + 1$

C. $2k + 7$

D. $2k - \frac{9}{2}$

Answer: D

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33. n aritmetic means are inserted between 7 and 49 and their sum is found to be 364, then n is :

A. 11

B. 12

C. 12

D. 14

Answer: C

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34. The third term of a G.P. is 2. Then product of the first five terms, is :

A. 2^3

B. 2^4

C. 2^5

D. None of these

Answer: C

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35. The sum of first n terms of an A.P. is $5n^2 + 4n,$ its common difference is :

A. 9

B. 10

C. 3

D. -4

Answer: B

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36. If $x+y=a$ and $x^2+y^2=b$, then the value of (x^3+y^3), is

A. ab

B. a^2+b

C. $a+b^2$

D. $\dfrac{3ab-a^3}{2}$

Answer: D

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37. If $S_1, S_2, S_3, \ldots\ldots, S_n$ are the sum of infinite geometric series whose first terms are $1, 3, 5\ldots, (2n-1)$ and whose common rations are $\frac{2}{3}, \frac{2}{5}, \ldots, \frac{2}{2n+1}$ respectively, then $\left\{\frac{1}{S_1S_2S_3} + \frac{1}{S_2S_3S_4} + \frac{1}{S_3S_4S_5} + \ldots\ldots\ldots\text{upon infinite terms}\right\} =$

A. $\frac{1}{15}$

B. $\frac{1}{60}$

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

D. $\frac{1}{3}$

Answer: B

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38. Sequence $\{t_n\}$ of positive terms is a G.P. If $r_6, 2, 5t_{14}$ form another G.P. in that order, then the prodct $t_1t_2t_3\ldots\ldots T_{18}t_{19}$ is equal to :

A. 10^9

B. 10^{10}

C. $10^{17/2}$

D. $10^{19/2}$

Answer: D

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39. The minimum value of $\frac{(A^2+A+1)(B^2+B+1)(C^2+C+1)(D^2+D+1)}{ABCD}$ where $A, B, C, D > 0$ is :

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

B. $\frac{1}{2^4}$

C. 2^4

D. 3^4

Answer: D

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40. if $\sum_{1}^{20} r^3 = a, \sum_{1}^{20} r^2 = b$ then sum of products of 1,2,3,4,....20 taking two at a time is :

A. $\frac{a-b}{2}$

B. $\frac{a^2-b^2}{2}$

C. $a-b$

D. a^2-b^2

Answer: A

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41. The sum of first 2n terms of an AP is α and the sum of next n terms is β, its common difference is

A. $\dfrac{x-2y}{3n^2}$

B. $\dfrac{2y-x}{3n^2}$

C. $\dfrac{x-2y}{3n}$

D. $\dfrac{2y-x}{3n}$

Answer: B

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42. The number of non-negative integers 'n' satisfying $n^2 = p + q$ and $n^3 = p^2 + q^2$ where p and q are integers

A. 2

B. 3

C. 4

D. Infinite

Answer: B

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43. 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

A. 1000π

B. 5050π

C. 4950π

D. 5151π

Answer: B

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44. If $\log_2 4$, $\log_{\sqrt{2}} 8$ and` $\log_3 9^{k-1}$`

are consecutive terms of GP, then the number of integers that satisfy the system of inequalities x^2-x>6 and |x| < k^2 is

Option a 193

Option b 194

Option c 195

Option d 196

A. 193

B. 194

C. 195

D. 196

Answer: A

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45. Let T, be the r^{th} term of an A.R. whose fiest term is $-\frac{1}{2}$ and common diference is 1, then $\sum_{r=1}^{n}\sqrt{1+T_rT_{r+1}T_{r+2}T_{r+3}}=$

A. $\frac{n(n+1)(2n+1)}{6}-\frac{5n}{4}$

B. $\dfrac{n(n+1)(2n+1)}{6} - \dfrac{5n}{4} + \dfrac{1}{4}$

C. $\dfrac{n(n+1)(2n+1)}{6} - \dfrac{5n}{4} + \dfrac{1}{2}$

D. $\dfrac{n(n+1)(2n+1)}{12} - \dfrac{5n}{8} + 1$

Answer: C

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46. If $\sum_{r-1}^{n} T_r = \dfrac{n(n+1)(n+2)}{3}, \textit{then} \lim_{x \to \infty} \sum_{r=1}^{n} \dfrac{3012}{T_r} =$

A. 2008

B. 3012

C. 4016

D. 8032

Answer: A

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47. The sum of the infinite series, $1^2 - \frac{2^2}{5} + \frac{3^2}{5^2} + \frac{4^2}{5^3} + \frac{5^2}{5^4} - \frac{6^2}{5^5} + \dots.$ is:

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

B. $\frac{25}{24}$

C. $\frac{25}{54}$

D. $\frac{125}{252}$

Answer: C

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48. The absolute term in $P(x) = \sum_{r=1}^{n} \left(x - \frac{1}{r}\right)\left(x - \frac{1}{r+1}\right)\left(x - \frac{1}{r+2}\right)$ as n approaches to infinitity is :

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

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

C. $\frac{1}{4}$

D. $\frac{-1}{4}$

Answer: B

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49. Suppose A, B, C are defined as $A = a^2b + ab^2 - a^2c - ac^2$, $B = b^2c + bc^2 - a^2b - ab^2$, and $C = a^2c + ac^2 - b^2c - bc^2$, where $a > b > c > 0$ and the equation $Ax^2 + Bx + C = 0$ has equal roots, 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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50. It T_k denotes the k^{th} term of an H.P. from the bgegining and $\frac{T_2}{T_6} = 9$, then $\frac{T_{10}}{T_4}$ equals :

A. $\frac{17}{5}$

B. $\frac{5}{17}$

C. $\frac{7}{19}$

D. $\frac{19}{7}$

Answer: B

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

A. 19

B. 20

C. 21

D. 22

Answer: B

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52. The sum of the series $1+\frac{2}{3}+\frac{1}{3^2}+\frac{2}{3^3}+\frac{1}{3^4}+\frac{2}{3^5}+\frac{1}{3^6}+\frac{2}{3^7}+\ldots\ldots$ upto infinite terms is equal to :

A. $\frac{15}{8}$

B. $\frac{8}{15}$

C. $\frac{27}{8}$

D. $\frac{21}{8}$

Answer: A

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53. The coefficient of x^8 in the polynomial $(x-1)(x-2)(x-3)\ldots.(x-10)$ is :

A. 2640

B. 1320

C. 1370

D. 2740

Answer: B

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54. Let $\alpha = \lim_{x \to \infty} \frac{(1^3 - 1^2) + (2^3 - 2^2) + \ldots + (n^3 - n^2)}{n^4}$, then$\alpha$ is equal to:

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

B. $\frac{1}{4}$

C. $\frac{1}{2}$

D. non-exisitent

Answer: B

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55. If $16x^4 - 32x^3 + ax^2 + bx + 1 = 0, a, b, \in R$has positive real roots only, then $|b - a|$ is equal to :

A. -32

B. 32

C. 49

D. -49

Answer: B

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56. If in the triangle ABC, $\tan\frac{A}{2}$, $\tan\frac{B}{2}$ and $\tan\frac{C}{2}$ are in harmonic progression then the least value of $\cot^2\frac{B}{2}$ is equal to :

A. $\sqrt{3}$

B. 1

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

D. $\frac{1}{\sqrt{3}}$

Answer: A

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57. If α and β are the roots of the quadratic equatin $4x^2 + 2x - 1 = 0$ then the value of $\sum_{r=1}^{\infty}(\alpha^r + \beta^r)$ is:

A. 2

B. 3

C. 6

D. 0

Answer: D

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58. The sum of the series $2^2 + 2(4)^2 + 3(6)^2 + \ldots\ldots$ upto 10 terms is equal to :

A. 11300

B. 12100

C. 12300

D. 11200

Answer: B

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59. If a and b are positive real numbers such that $a+b=c$, then the minimum value of $\left(\frac{4}{a}+\frac{1}{b}\right)$ is equal to :

A. $\frac{2}{3}$

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

C. 1

D. $\frac{3}{2}$

Answer: D

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60. The first term of an infinite G.R is the value of satisfying the equation $\log_4(4^x-15)+x-2=0$ and the common ratio is $\cos\left(2011\frac{\pi}{3}\right)$ The sum of G.P is ?

A. 1

B. $\frac{4}{3}$

C. 4

D. 2

Answer: C

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61. Let a, b, c be positive numbers, then the minimum value of $\dfrac{a^4+b^4+c^2}{abc}$

A. 4

B. $2^{3/4}$

C. $\sqrt{2}$

D. $2\sqrt{2}$

Answer: D

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62. If $xy = 1$, then minimum value of $x^2 + y^2$ is :

A. 1

B. 2

C. $\sqrt{2}$

D. 4

Answer: B

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63. Find the value of $\frac{2}{1^3} + \frac{6}{1^3 + 2^3} + \frac{12}{1^3 + 2^3 + 3^3} + \frac{20}{1^3 + 2^3 + 3^2 + 4^3} + \ldots.$ upto 60 terms :

A. 2

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

C. 4

D. $\frac{1}{4}$

Answer: C

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64. Evaluate : $\sum_{n=1}^{\infty} \frac{1}{(n+1)(n+2)(n+3)....(n+k)}$

A. $\frac{1}{(k-1)(k-1)!}$

B. $\frac{1}{k \cdot kl}$

C. $\frac{1}{(-1)kl}$

D. $\frac{1}{kl}$

Answer: C

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65. Consider two positive numbers a and b. If arithmetic mean of a and b exceeds their geometric mean by 3/2, and geometric mean of aand b exceeds their harmonic mean by 6/5 then the value of $a^2 + b^2$ will be

A. 150

B. 153

C. 156

D. 159

Answer: D

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66. Sum of first 10 terms of the series, $S = \frac{7}{2^2 \cdot 5^2} + \frac{13}{5^2 \cdot 8^2} + \frac{19}{8^2 \cdot 11^2} + \ldots\ldots$ is : (a) $\frac{255}{1024}$ (b) $\frac{88}{1024}$ (c) $\frac{264}{1024}$ (d) $\frac{85}{1024}$

A. $\frac{255}{1024}$

B. $\frac{88}{1024}$

C. $\frac{264}{1024}$

D. $\frac{85}{1024}$

Answer: D

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67. $\sum_{r=1}^{10} \frac{r}{1-3r^2+r^4} =$

A. $-\frac{50}{109}$

B. $-\frac{54}{109}$

C. $-\frac{55}{111}$

D. $-\frac{55}{109}$

Answer: D

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68. Let r^{th} term t_r of a series if given by $t_c = \frac{r}{1+r^2+r^4}$. Then $\lim_{n \to \infty} \sum_{r=1}^{n} t_r$ is equal to :

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

B. 1

C. 2

D. $\frac{1}{4}$

Answer: A

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69. Find the sum of the series $1 + \frac{4}{5} + \frac{7}{5^2} + \frac{10}{5^3} + \dots..$

(ii) to infinity.

A. $\frac{31}{12}$

B. $\frac{41}{16}$

C. $\frac{45}{16}$

D. $\frac{35}{16}$

Answer: D

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70. The third term of a G.P. is 2. Then product of the first five terms, is :

A. 2^3

B. 2^4

C. 2^5

D. None of these

Answer: C

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71. If $x_1, x_2, x_3, \ldots\ldots x_{2n}$ are in $A.P$, then $\sum_{r=1}^{2n}(-1)^{r+1}x_r^2$ is equal to (a) $\frac{n}{(2n-1)}\left(x_1^2 - x_{2n}^2\right)$ (b) $\frac{2n}{(2n-1)}\left(x_1^2 - x_{2n}^2\right)$ (c) $\frac{n}{(n-1)}\left(x_1^2 - x_{2n}^2\right)$
(d) $\frac{n}{(2n+1)}\left(x_1^2 - x_{2n}^2\right)$

A. $\frac{n}{(2n-1)}\left(x_1^2 - x_{2n}^2\right)$

B. $\frac{2n}{(2n-1)}\left(x_1^2 - x_{2n}^2\right)$

C. $\frac{n}{(n-1)}\left(x_1^2 - x_{2n}^2\right)$

D. $\frac{n}{(2n+1)}\left(x_1^2 - x_{2n}^2\right)$

Answer: A

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72. Let two humbers have arithmatic mean 9 and geometric mean 4. Then these numbers are roots of the equation :

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

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

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

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

Answer: D

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73. If p and q are positive real numbers such that $p^2 + q^2 = 1$, then the maximum value of $(p + q)$ is :

A. 2

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

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

D. $\sqrt{2}$

Answer: D

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74. A person is to count 4500 currency notes. Let a_n denote the number of notes he counts is the n^{th} minute .If $a_1 = a_2$ =...... $= a_{10}$= 150 and $a_{10}, a_{11}. . ,$ are in A.P with common difference -2, then the time to count all notes

A. 34 minutes

B. 24 minutes

C. 125 minutes

D. 35 minutes

Answer: A

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75. A non constant arithmatic progression has common difference d and first term is $(1 - ad)$ If the sum of the first 20 term is 20, then the value of a is equal to :

A. $\frac{2}{19}$

B. $\frac{19}{2}$

C. $\frac{2}{9}$

D. $\frac{9}{2}$

Answer: B

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76. The value of $\sum_{n=3}^{\infty} \frac{1}{n^5 - 5n^3 + 4n}$ is equal to - (a) $\frac{1}{120}$ (b) $\frac{1}{96}$ (c) $\frac{1}{24}$ (d) $\frac{1}{144}$

A. $\frac{1}{120}$

B. $\frac{1}{96}$

C. $\frac{1}{24}$

D. $\frac{1}{144}$

Answer: B

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77. Find the value of $\frac{2}{1^3}+\frac{6}{1^3+2^3}+\frac{12}{1^3+2^3+3^3}+\frac{20}{1^3+3^3+3^3+4^3}+\ldots.$ up to infinite terms:

A. 2

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

C. 4

D. $\frac{1}{4}$

Answer: C

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78. The minimum value of the expression $2^x+2^{2x+1}+\frac{5}{2^x}, x \in R$ is :

A. 7

B. $(7.2)^{1/7}$

C. 8

D. $(3.10)^{1/3}$

Answer: C

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79. The value of $\sum_{r=1}^{\infty} \frac{(4r+5)5^{-r}}{r(5r+5)}$ is :

A. $\frac{1}{5}$

B. $\frac{2}{5}$

C. $\frac{1}{25}$

D. $\frac{2}{25}$

Answer: A

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Exercise One Or More Than One Answer Is Are Correct

1. It the first and $(2n-1)^{th}$ terms of an A.P.,a G.P. and an H.P. of positive terms are equal and their $(n+1)^{th}$ terms are a, b, and c respectively then

A. $a+c=2b$

B. $a \geq b \geq c$

C. $\frac{2ac}{a+c}=b$

D. $ac=b^2$

Answer: B::D

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2. If a, b, c are distinct positive real numbers such that the quadratic expression $Q_1(x)=ax^2+bx+c$, $Q_2(x)=bx^2+cx+a$, $Q_3(x)=cx^2+ax+b$ are always non-negative, then possible integer in the range of the expression $y=\frac{a^2+b^2+c^2}{ab+bc+ca}$ is

A. 1

B. 2

C. 3

D. 4

Answer: B::C

Watch Video Solution

3. If a,b,c are in H.P, where $a > c > 0$, then :

A. $b > \frac{a+c}{2}$

B. $\frac{1}{a-b} - \frac{1}{b-c} < 0$

C. $ac > b^2$

D. $bc(1-a), ac(1-b), ab(1-c)$ are in A.P.

Answer: B::C::D

Watch Video Solution

4. In an A.P. let T_r denote r^{th} term from beginning, $T_p - \frac{1}{q(p+q)}, T_q - \frac{1}{p(p+q)}$, then :

A. $T_1 =$ common difference

B. $T_{p+q} = \frac{1}{pq}$

C. $T_{pq} = \frac{1}{p+q}$

D. $T_{p+q} = \frac{1}{p^2q^2}$

Answer: A::B::C

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5. Which of the following statement (s) is (are) correct ?

A. Sum of the reciprocal of all the n harmonic means inserted between a and b is equal to n times the harmonic mean between two given numbers a and b.

B. Sum of the cubes of first n natural number is equal to square of the sum of the first a natural numbers.

C. If $a, A_1, A_2, A_3, \ldots\ldots, A_{2n}, b$ are in A.P. then $\sum_{I=1}^{2n} A_l = n(a+b)$.

D. If the first term of the geometric progression $g_1, g_2, g_3, \ldots\ldots, \infty$ is unity, then the value of the common ratio of the progression such that $(4g_2 + 5g_3)$ is minimum equals $\frac{2}{5}$.

Answer: B::C

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6. If a,b,c are in 3 distinct numbers in H.P. $a, b, c > 0$, then :

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

B. $\frac{b+c}{a}, \frac{c+a}{b}, \frac{a+b}{c}$ ar in A.P.

C. $a^5 + c^5 \geq 2b^5$

D. $\frac{a-b}{b-c} = \frac{a}{c}$

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

Watch Video Solution

7. All roots of equation $x^5 - 40x^4 + \alpha x^3 + \beta x^2 + \gamma x + \delta = 0$ are in G.P. if the sum of their reciprocals is 10, then δ can be equal to :

A. 32

B. -32

C. $\frac{1}{32}$

D. $-\frac{1}{32}$

Answer: A::B

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8. Let $a_1, a_2, a_3.......$ be a sequence of non-zero rela numbers with are in A.P. for $k \in N$. Let $f_k(x) = a_k x^2 + 2a_{k+1}x + a_{k+2}$

A. $f_k(x) = 0$ has real roots for each $k \in N$.

B. Each of $f_k(x) = 0$ has one root in common.

C. Non-common roots of $f_1(x) = 0, f_2(x) = 0, f_3(x) = 0, \ldots\ldots$ from an A.P.

D. None of these

Answer: A::B

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9. Given a,b,c are in A.P. b,c,d are in G.P. and c,d,e are in H.P. if $a = 2 \text{ and } e = 18,$ then the possible value of 'c' can be :

A. 9

B. -6

C. 6

D. -9

Answer: B::C

Watch Video Solution

10. The numbers a, b, c are in $A.P.$ and $a+b+c=60$. The numbers $(a-2), b, (c+3)$ are in $G.P.$ Then which of the following is not the possible value of $a^2+b^2+c^2$?

A. 1218

B. 1208

C. 1288

D. 1298

Answer: B::D

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11. If

$(x^2 + x + 1) + (x^2 + 2x + 3) + (x^2 + 3x + 5) + \ldots\ldots + (x^2 + 20x + 39$

then x is equal to :

A. 10

B. -10

C. 20.5

D. -20.5

Answer: A::D

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12. For ΔABC, if $81 + 144a^4 + 16b^4 + 9c^4 = 144$ abc, (where notations have their usual meaning), then :

A. $a > b > c$

B. $A < B < C$

C. Area of $\Delta ABC = \frac{3\sqrt{3}}{8}$

D. Triangle ABC is right angled

Answer: B::C::D

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13. Let $x, y, z \in \left(0, \frac{\pi}{2}\right)$ are first three consecutive terms of an arithmatic progression such that $\cos x + \cos y + \cos z = 1$ and $\sin x + \sin y + \sin z = \frac{1}{\sqrt{2}}$, then which of the following is/are correct ?

A. $\cot y = \sqrt{2}$

B. $\cos(x - y) = \frac{\sqrt{3} - \sqrt{2}}{2\sqrt{2}}$

C. $\tan 2y = \frac{2\sqrt{2}}{3}$

D. $\sin(x - y) + \sin(y - z) = 0$

Answer: A::B

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14. If the number $16, 20, 16, d$ form a A.G.P. then d can be equal to :

A. 3

B. 11

C. -8

D. -16

Answer: B

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15. Given

$$\frac{\underbrace{1000.....01}_{n \text{ zeroes}}}{\underbrace{1000.....01}_{(n+1) \text{ zeroes}}} < \frac{\underbrace{1000.....01}_{m \text{ zeroes}}}{\underbrace{1000.....01}_{(m+1) \text{ zeroes}}}$$

then which of the following true

A. $m+1<n$

B. $m<n$

C. $m<n+1$

D. $m>n+1$

Answer: B::C

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16. If $S_r = \sqrt{r + \sqrt{r + \sqrt{r + \sqrt{r + \ldots . \infty}}}}, r > 0,$ then which of the following is/are correct.

A. S_2, S_6, S_{13}, S_{20} are in A.P.

B. S_4, S_9, S_{16} are irrational

C. $(2S_3 - 1)^2, (2S_4 - 1)^2, (2S_2 - 1)^2$ are in A.P.

D. S_2, S_{12}, S_{36} are in G.P.

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

Watch Video Solution

17. Consider the A.P. $50, 48, 46, 44. \ldots \ldots . If S_n$ denotes the sum to n terms of this A.P. then

A. S_n is maximum for $\pi = 25$

B. the first negative terms is 26^{th} term

C. the first negative term is 27^{th} term

D. the maximum value of S_n is 650

Answer: A::C::D

Watch Video Solution

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

A. $S_5 = 5$

B. $S_{50} = \frac{100}{17}$

C. $\left(S_{1001} = \frac{1001}{97}\right.$

D. $S_\infty = 6$

Answer: A::B::D

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19. For ΔABC, if $81+144a^4+16b^4+9c^4=144$ abc, (where notations have their usual meaning), then :

A. $a > b > c$

B. $A < B < C$

C. Area of $\Delta ABC = \dfrac{3\sqrt{3}}{8}$

D. Triangle ABC is right angled

Answer: B::C::D

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Exercise Comprehension Type Problems

1. The first four terms of a sequence are given by $T_1=0, T_2=1, T_3=1, T_4=2. The \geq \neq raltermsisgivenby$ T_(n)=Aalpha ^(n -1) +B beta ^(n-1)$where A, B$ alpha, beta

$are \in dependentofa$ and $Aispositive. Thevalueof$5 (A^(2) + B ^(2)` is equal to :

A. 1

B. 2

C. 5

D. 4

Answer: B

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2. The first four terms of a sequence are given by $T_1 = 0, T_2 = 1, T_3 = 1, T_4 = 2. The \geq \neq raltermsisgivenby$ T_(n)=Aalpha ^(n -1) +B beta ^(n-1)$whereA, B$ alpha, beta $are \in dependentofa$ and $Aispositive. Thevalueof$5 (A^(2) + B ^(2)` is equal to :

A. 2

B. 4

C. 6

D. 8

Answer: A

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3. There are two sets A and B each of which consists of three numbers in A.P. whose sum is 15. D and d are their respective common difference such that $D-d=1, D>0. If \dfrac{p}{q}=\dfrac{7}{8}$ where p and q are the product of the number in those sets A and B respectively.

Sum of the product of the numbers in set B taken two at a time is :

A. 51

B. 71

C. 74

D. 86

Answer: B

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4. There are two sets A and B each of which consists of three numbers in A.P. whose sum is 15. D and d are their respective common difference such that $D - d = 1, D > 0. If \frac{p}{q} = \frac{7}{8}$ where p and q are the product of the number in those sets A and B respectively.

Sum of the product of the numbers in set B taken two at a time is :

A. 52

B. 54

C. 64

D. 74

Answer: D

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5. Let x, y, z are positive reals and $x + y + z = 60$ and $x > 3$.

Maximum value of $(x - 3)(y + 1)(z + 5)$ is : (a) $(17)(21)(25)$ (b) $(20)(21)(23)$ (c) $(21)(21)(21)$ (d) $(23)(19)(15)$

A. $(17)(21)(25)$

B. $(20)(21)(23)$

C. $(21)(21)(21)$

D. $(23)(19)(15)$

Answer: C

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6. Let x, y, z are positive reals and $x + y + z = 60$ and $x > 3$.

Maximum value of xyz is :

A. $\frac{(355)^3}{3^3 . 6^2}$

B. $(355)^3$

C. $\frac{(355)^3}{3^2 \cdot 6^3}$

D. None of these

Answer: A

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7. Let x, y, z are positive reals and $x + y + z = 60$ and $x > 3$.

Maximum value of xyz is :

A. 8×10^3

B. 27×10^3

C. 64×10^3

D. 125×10^3

Answer: A

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8. Two consecutive numbers from 1,2,3 ...., n are removed.The arithmetic mean of the remaining numbers is 105/4 .

The removed numbers

A. 48

B. 50

C. 52

D. 49

Answer: B

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9. Two consecutive numbers from 1,2,3 ...., n are removed.The arithmetic mean of the remaining numbers is 105/4 .

The removed numbers

A. $\sqrt{30}$

B. $\sqrt{42}$

C. $\sqrt{56}$

D. $\sqrt{72}$

Answer: C

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10. Two consecutive number from n natural numbers $1, 2, 3, \ldots\ldots,$ n are removed. Arithmetic mean of the remaining numbers is $\frac{105}{4}$.

Let removed numbers are x_1, x_2 then $x_1 + x_2 + n =$

A. 61

B. 63

C. 65

D. 69

Answer: C

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11. The sequence $\{a_n\}$ is defined by formula $a_0 = 4$ and $a_{m+1} = a_n^2 - 2a_n + 2$ for $n \geq 0$. Let the sequence $\{b_n\}$ is defined by formula $b_0 = \frac{1}{2}$ and $b_n = \frac{2a_0a_1a_2.....a_{n-1}}{\forall n \geq 1.}$

The value of a_{10} is equal to :

A. $1 + 2^{1-24}$

B. 4^{1024}

C. $1 + 3^{1024}$

D. 6^{1024}

Answer: C

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12. The sequence $\{a_n\}$ is defined by formula $a_0 = 4$ and $a_{m+1} = a_n^2 - 2a_n + 2$ for $n \geq 0$. Let the sequence $\{b_n\}$ is

defined by formula $b_0 = \frac{1}{2}$ and $b_n = \frac{2a_0 a_1 a_2 \ldots\ldots a_{n-1}}{\forall n \geq 1.}$

The value of a_{10} is equal to :

A. 2

B. 3

C. 4

D. 5

Answer: B

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13. The sequence $\{a_n\}$ is defined by formula $a_0 = 4$ and $a_{m+1} = a_n^2 - 2a_n + 2$ for $n \geq 0$. Let the sequence $\{b_n\}$ is defined by formula $b_0 = \frac{1}{2}$ and $b_n = \frac{2a_0 a_1 a_2 \ldots\ldots a_{n-1}}{\forall n \geq 1.}$

The value of a_{10} is equal to :

A. $b_{n+1} = \frac{2b_n}{1 - b_n^2}$

B. $b_{n+1} = \frac{2b_n}{1 + b_n^2}$

C. $\frac{b_n}{1+b_n^2}$

D. $\frac{b_n}{1-b_n^2}$

Answer: B

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14. Let

$$f(n)=\sum_{r=2}^{n}\frac{r}{{}^{r}C_2{}^{r+1}C_2}, a=\lim_{x\to\infty} f(n) \text{ and } x^2-\left(2n-\frac{1}{2}\right)x+t=0$$

has two positive roots α and β.

If value of $f(7)+f(8) is \frac{p}{q}$ where p and q are relatively prime, then $(p-q)$ is :

A. 53

B. 55

C. 57

D. 59

Answer: D

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15. Let

$$f(n)=\sum_{r=2}^{n}\frac{r}{{}^{r}C_2\,{}^{r+1}C_2},\ a=\lim_{x\to\infty} f(n) \text{ and } x^2-\left(2n-\frac{1}{2}\right)x+t=0$$

has two positive roots α and β.

If value of $f(7)+f(8)is\frac{p}{q}$ where p and q are relatively prime, then $(p-q)$ is :

A. 2

B. 6

C. 3

D. 4

Answer: B

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16. Given that sequence of number $a_1, a_2, a_3, \ldots\ldots, a_{1005}$ which satisfy

$$\frac{a_1}{a_1+1} = \frac{a_2}{a_2+3} = \frac{a_3}{a_3+5} = \ldots\ldots = \frac{a_{1005}}{a_{1005}+2009}$$

$a_1 + a_2 + a_3 \ldots\ldots a_{1005} = 2010$

A. A.P.

B. G.P.

C. A.G.R

D. H.P.

Answer: A

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17. Given that sequence of number $a_1, a_2, a_3, \ldots\ldots, a_{1005}$ which satisfy

$$\frac{a_1}{a_1+1} = \frac{a_2}{a_2+3} = \frac{a_3}{a_3+5} = \ldots\ldots = \frac{a_{1005}}{a_{1005}+2009}$$

$a_1 + a_2 + a_3 \ldots\ldots a_{1005} = 2010$ find the 21^{st} term of the sequence is equal to :

A. $\frac{86}{1065}$

B. $\frac{83}{1005}$

C. $\frac{82}{1005}$

D. $\frac{79}{1005}$

Answer: C

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Exercise Matching Type Problems

1.

	Column-I		Column-II
(A)	The sequence a, b, 10, c, d are in A.P., then $a+b+c+d=$	(P)	6
(B)	Six G.M.'s are inserted between 2 and 5, if their product can be expressed as $(10)^n$. Then $n=$	(Q)	2
(C)	Let $a_1, a_2, a_3, \ldots, a_{10}$ are in A.P. and $h_1, h_2, h_3, \ldots, h_{10}$ are in H.P. such that $a_1 = h_1 = 1$ and $a_{10} = h_{10} = 6$, then $a_4 h_7 =$	(R)	3
(D)	If $\log_3 2$, $\log_3(2^x - 5)$ and $\log_3\left(2^x - \frac{7}{2}\right)$ are in A.P., then $x=$	(S)	20
		(T)	40

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	Column-I		Column-II
(A)	The number of real values of x such that three numbers $2^x, 2^{x^2}$ and 2^{x^3} form a non-constant arithmetic progression in that order, is	(P)	0
(B)	Let $S=(a_2-a_3)\left(\frac{1}{\sqrt{a_1}+\sqrt{a_2}}+\frac{1}{\sqrt{a_2}+\sqrt{a_3}}+....+\frac{1}{\sqrt{a_{n-1}}+\sqrt{a_n}}\right)$ where $a_1, a_2, a_3, ..., a_n$ are n consecutive terms of an A.P. and $a_i > 0\ \forall i \in \{1, 2, ..., n\}$. If $a_1 = 225$, $a_n = 400$, then the value of $S+7$ is equal to	(Q)	1

2.

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	Column-I		Column-II
(A)	If $x, y \in R^+$ satisfy $\log_8 x + \log_4 y^2 = 5$ and $\log_8 y + \log_4 x^2 = 7$ then the value of $\frac{x^2+y^2}{2080} =$	(P)	6
(B)	In ΔABC A, B, C are in A.P. and sides a, b and c are in G.P. then $a^2(b-c)+b^2(c-a)+c^2(a-b) =$	(Q)	3
(C)	If a, b, c are three positive real numbers then the minimum value of $\frac{b+c}{a}+\frac{a+c}{b}+\frac{a+b}{c}$ is	(R)	0
(D)	In ΔABC, $(a+b+c)(b+c-a) = \lambda bc$ where $\lambda \in I$, then greatest value of λ is	(S)	2

3.

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4. Let $f(x) = 1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + ... + \frac{1}{n}$ such that $P(n)f(n+2) = P(n)f(n) + q(n)$. Where $P(n)Q(n)$ are polynomials of least possible degree and $P(n)$ has leading coefficient unity. Then

match the following Column-I with Column-II.

	Column-I		Column-II
(A)	$\sum_{n=1}^{m} \frac{p(n)-2}{n}$	(P)	$\frac{m(m+1)}{2}$
(B)	$\sum_{n=1}^{m} \frac{q(n)-3}{2}$	(Q)	$\frac{5m(m+7)}{2}$
(C)	$\sum_{n=1}^{m} \frac{p(n)+q^2(n)-11}{n}$	(R)	$\frac{3m(m+7)}{2}$
(D)	$\sum_{n=1}^{m} \frac{q^2(n)-p(n)-7}{n}$	(S)	$\frac{m(m+7)}{2}$

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Exercise Subjective Type Problems

1. Let a,b,c,d be four distinct real number in A.P.Then the smallest positive vlaue of 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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2. The sum of all digits of n for which $\sum_{r=1}^{n} r2^r = 2+2^{n+10}$ is :

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3. If $\lim_{x \to \infty} \frac{r+2}{2^{r+1} r(r+1)} = \frac{1}{k}$, then k =

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4. The value of $\sum_{r=1}^{\infty} \frac{8r}{4r^4+1}$ is equal to :

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5. Three distinct non-zero real numbers form an A.P. and the squares of these numbers taken in same order form a G.P.If possible common ratio of G.P. are $3 \pm \sqrt{n}, n \in N$ then $n =$ __________.

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6. which term of an AP is zero -48,-46,-44.......?

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7. In an increasing sequence of four positive integers, the first 3 terms are in A.P., the last 3 terms are in G.P. and the fourth term exceed the first term by 30, then the common difference of A.P. lying in interval $[1, 9]$ is:

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8. The limit of $\frac{1}{n^4}\sum_{k=1}^{n} k(k+2)(k+4) as n \rightarrow \infty$ is equal to $\frac{1}{\lambda}$, then $\lambda =$

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9. Which is the last digit of $1+2+3+\ldots\ldots+$ n if the last digit of $1^3+2^3+\ldots\ldots+n^3$ is 1 ?

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10. There distinct positive numbers, a,b,c are in G.P. while $\log_c a, \log_b c, \log_a b$ are in A.P. with non-zero common difference d, then $2d =$

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11. The numbers $\frac{1}{3}, \frac{1}{3}\log_x y, \frac{1}{3}\log_y z, \frac{1}{7}\log_x x$ are in H.P. If $y = x^{®}$ and $z = x^s$, then $4(r+s) =$

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12. If $\sum_{k=1}^{\infty} \frac{k^2}{3^k} = \frac{p}{q}$, where p and q are relatively prime positive integers. Find the value of $(p-q)$,

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13. The sum of the terms of an infinitely decreassing Geometric Progression (GP) is equal to the greatest value of the function $f(x) = x^3 + 3x - 9$ where $x \in [-4, 3]$ and the difference between the first and second term is $f'(0)$. The common ratio $r = \frac{p}{q}$ where p and q are relatively prime positive integers. Find $(p + q)$.

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14. A cricketer has to score 4500 runs. Let a_n denotes the number of runs he scores in the n^{th} match. If $a_1 = a_2 = \ldots . a_{10} = 150$ and $a_{10}, a_{11}, a_{12} \ldots .$ are in A.P. with common difference (-2). If N be the total number of matches played by him to scoere 4500 runs. Find the sum of the digits of N.

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15. If $x = 10\sum_{r=3}^{100} \frac{1}{(r^2 - 4)}$, then $[x] =$

(where [.] denotes gratest integer function)

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16. Let $f(n) = \frac{4n + \sqrt{4n^2 - 1}}{\sqrt{2n+1} + \sqrt{2n-1}}$, $n \in N$ then the remainder when $f(1) + f(2) + f(3) + \ldots. + f(60)$ is divided by 9 is.

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17. Find the sum of series $1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{6} + \frac{1}{8} + \frac{1}{9} + \frac{1}{12} + \ldots\ldots\infty$, where the term are the reciprocals of the positive integers whose only prime factors are two's and three's :

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18. Let $a_1, a_2, a_3, \dots\dots\dots, a_n$ be real numbers in arithmatic progression such that $a_1 = 15$ and a_2 is an integer. Given $\sum_{r=1}^{10} (a_r)^2 = 1185$. If $S_n = \sum_{r=1}^{n} a_r$ and maximum value of n is N for which $S_n \geq S_{(n+1)}$, then find $N - 10$.

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19. Let the roots of the equation $24x^3 - 14x^2 + kx + 3 = 0$ form a geometric sequence of real numbers. If absolute value of k lies between the roots of the equation $x^2 + \alpha^2 x - 122 = 0,$ then the largest integral value of α is :

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20. How many ordered pair (s) satisfy $\log\left(x^3 + \frac{1}{3}y^3 + \frac{1}{9}\right) = \log x + \log y$

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21. Let a and b be positive integers. The values. The value of xyz is 55 and $\frac{343}{55}$ when a,x,y,z,b are in arithmatic and harmonic progression respectively. Find the value of $(a+b)$

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