MATHS

BOOKS - ML KHANNA

PROGRESSIONS

PROBLEM SET - 1 (MULTIPLE CHOICE QUESTIONS)

1. In an A.P., the sum of terms equidistant from the beginning and end is equal to

A. first term

B. second term

C. sum of first and last term

D. last term

Answer: C

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2. If in A.P., 3rd term is 18 and 7th term is 30, the sum of its 17 terms is

A. 600

B. 612

C. 624

D. none of these

Answer: B

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3. In an A.P., $T_3 = 7 \text{ and } T_7 = 2 + 3T_3$, then sum of its first 20 terms is :

A. 74

B. 228

C. 740

D. 1090

Answer: C

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4. The m^{th} term of an A.P. is n and its n^{th} term is m. Its p^{th} term is

A. m + n + p

B. m + n - p

C. m - n + p

D. none

Answer: B

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5. In an A.P. if $T_p = q \text{ and } T_{p+q} = 0$, then T_q is

A. p

B. $-p$

C. p + q

D. p - q

Answer: A

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6. Let T_r be the rth term of an A.P., for $r = 1, 2, 3,$ If for some positive integers $m, n,$ we have $T_m = \frac{1}{n} and T_n = \frac{1}{m}, then T_{mn}$ equals $\frac{1}{mn}$ b. $\frac{1}{m} + \frac{1}{n}$ c. 1 d. 0

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

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

C. 1

D. 0

Answer: C

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7. In an A.P., $T_m = \frac{1}{n}, T_n = \frac{1}{m}$, then a - d is equal to

A. 0

B. 1

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

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

Answer: A

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8. The sum of n terms of an A.P. is $3n^2 + 5$. If T_n of the series is 159, then n equals

A. 13

B. 21

C. 27

D. none of these

Answer: C

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9. The sum of all two-digit numbers which when divided by 4 leaves 1 as remainder is

A. 1210

B. 1200

C. 1100

D. none

Answer: A

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10. The sum of n terms of an A.P. is 4n(n - 1), then the sum of their squares is

A. n^3

B. $\frac{32}{3}n(n-1)(2n-1)$

C. $\frac{16}{3}n(n-1)(2n-1)$

D. $4n(n-1)(2n-1)$

Answer: B

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11. If a, b, c, d, e, f are in A.P. then e - c is equal to

A. $2(c-a)$

B. $2(d-c)$

C. $2(f - d)$

D. $(d - c)$

Answer: B

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12. If a, b, c, d, e are in A.P. then the value of a - 4b + 6c - 4d + e is

A. 0

B. 1

C. 2

D. none

Answer: A

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13. In an A.P. if $t_7 = 15$ then the value of common difference d that would make $t_2 t_7 t_{12}$ greatest is

A. 9

B. 18

C. 0

D. $9/4$

Answer: C

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14. If the p^{th}, q^{th} and r^{th} terms of an A.P. be a, b, c respectively, then $a(q-r)+b(r-p)+c(p-q)=$

A. 0

B. 2

C. p + q + r

D. pqr

Answer: A

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15. The fifth term of an AP of n terms, whose sum is $n^2 - 2n$, is:

A. 5

B. 7

C. 8

D. 16

Answer: B

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16. If the sum of n terms of an A.P. is $3n^2 + 5n$ and its mth term is 164, find the value of m.

A. 26

B. 27

C. 28

D. none of these

Answer: B

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17. If the roots of the equation $x^3 - 12x^2 + 39x - 28 = 0$ are in A.P. then common difference will be ± 1 b. ± 2 c.± 3 d. ± 4

A. ± 1

B. ± 2

C. ± 3

D. ± 4

Answer: C

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18. Sum of three terms of an A.P. is 33 and their product is 792. The least of them is

A. 7

B. 11

C. 18

D. none of these

Answer: D

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

A. 10

B. 11

C. 12

D. none of these

Answer: B

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

A. 352

B. 652

C. 852

D. none

Answer: C

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21. If the length of perpendicular from (0,0,0) to the plane ax+by+cz+d=0 where a,b,c,d are in A.P.and $0 < a < d$ is 1 units then the value of $\frac{c-a}{b}$ is

A. $\sqrt{8}-2$

B. $\sqrt{8}+2$

C. $-\sqrt{8}-2$

D. none

Answer: A::C

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22. In an arithmetic sequence $a_1, a_2, a_3, \ldots\ldots, a_n,$

$$\Delta = \begin{vmatrix} a_m & a_n & a_p \\ m & n & p \\ 1 & 1 & 1 \end{vmatrix}$$ equals

A. 1

B. -1

C. 0

D. none of these

Answer: C

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23. The numbers $3^{2\sin 2\theta - 1}, 14, 3^{4 - 2\sin 2\theta}$ form first three terms of an A.P. Its fifth term is equal to

A. -25

B. -12

C. 40

D. 53

Answer: D

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24. The numbers $t(t^2+1), -\frac{1}{2}t^2$ and 6 are three consecutive terms of an A.P. If t be real, then the next two terms of A.P. are

A. $-2, -10$

B. 14, 6

C. 14, 22

D. none

Answer: C

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25. The sides of a triangle are in A.P. and the greatest angle is double of smallest angle. The ratio of its sides is

A. $3:4:5$

B. $4:5:6$

C. $5:6:7$

D. $7:8:9$

Answer: B

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26. If the sides of a right angled triangle are in A.P. then the sines of the acute angles are

A. $\frac{3}{5}, \frac{4}{5}$

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

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

D. none

Answer: A

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27. If $\log_{10} 2, \log_{10}(2^x - 1)$ and $\log_{10}(2^x + 3)$ are three consecutive terms of an AP, then the value of x is

A. x = 0

B. x = 1

C. $x = \log_2 5$

D. $x = \log_{10} 2$

Answer: C

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28. If $5^{1+x}+5^{1-x}, \frac{a}{2}, 25^{x}+25^{-x}$ are three consecutive terms of an A.P., then which of the following is true ?

A. $a \leq 12$

B. $a < 12$

C. $a \geq 12$

D. $a > 12$

Answer: C

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

A. $\log_2 5$

B. $1-\log_2 5$

C. $\log_5 2$

D. none of these

Answer: B

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

A. a = b = c

B. $b^2 = ac$

C. $a^2 = bc$

D. $c^2 = ab$

Answer: A::B

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31. The consecutive terms $\dfrac{1}{1+\sqrt{x}}, \dfrac{1}{1-x}, \dfrac{1}{1-\sqrt{x}}$ of a series are in

A. H.P.

B. G.P.

C. A.P.

D. none of these

Answer: B

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32. Let f(x) be a polynomial function of second degree such that f(1) = f(-1).

If a, b, c are in A.P., then f'(a), f'(b) and f'(c) are in :

A. A.P.

B. G.P.

C. H.P.

D. A.G.P.

Answer: A

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

A. 1, 4, 7, 10

B. 2, 4, 6, 8

C. 3, 5, 7, 9

D. none

Answer: B

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34. The value of the common difference of an A.P. which makes $T_1T_2T_7$ least, given that $T_7 = 9$, is

A. $d = \frac{33}{2}$

B. $d = \frac{5}{4}$

C. $d = \frac{33}{20}$

D. none of these

Answer: C

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35. In an A.P. with $d > 1, t_6 = 2$. If product $t_1 t_4 t_5$ be greatest, then the value of d is

A. $5/8$

B. $8/5$

C. $2/3$

D. $3/2$

Answer: B

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36. The numbers of terms of the series 54, 51, 48,...so that their sum is 513

A. 18, 19

B. 16, 22

C. 25, 36

D. none

Answer: A

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37. The sum of 40 terms of an AP whose first term is 2 and common difference is 4, will be

A. 3200

B. 1600

C. 200

D. 2800

Answer: B

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38. The sum of the series $\frac{1}{2}+\frac{1}{3}+\frac{1}{6}+\ldots\ldots$ to 9 terms is

A. $-5/6$

B. $-1/2$

C. 1

D. $-3/2$

Answer: D

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39. If the pth term of the series $25, 22\frac{3}{4}, 20\frac{1}{2}, 18\frac{1}{4}, \ldots\ldots$ is numerically the smallest, then p =

A. 11

B. 12

C. 13

D. 14

Answer: B

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40. The least value of n such that 1 + 3 + 5 + 7 + ... N terms $\geq$ 500 is

A. 18

B. 19

C. 22

D. 23

Answer: D

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41. The maximum value of the sum of the series $20 + 19\frac{1}{3} + 18\frac{2}{3} + \ldots\ldots$ is

A. 300

B. 310

C. 320

D. none

Answer: B

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42. If $\frac{3 + 5 + 7 + \ldots + n}{5 + 8 + 11 + \ldots. + 10 \text{ terms}} = 7$, the value of n is

A. 35

B. 36

C. 37

D. 40

Answer: A

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43. If the sum of the series 2, 5, 8, 11,... is 60100, then n is

A. 100

B. 200

C. 150

D. 250

Answer: B

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44. Let S_n denote the sum of the first n terms of an AP

$S_{2n} = 3S_n$ Then the ratio $\frac{S_{3n}}{S_n}$ is equal to

A. 4

B. 6

C. 8

D. 10

Answer: B

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

A. 10

B. 12

C. 11

D. 13

Answer: C

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

A. 7

B. 9

C. 11

D. 16

Answer: B

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47. If $S_n = nP + \frac{n(n-1)Q}{2}$, where S_n denotes the sum of the first terms of an AP, then the common difference is:

A. P + Q

B. 2P + 3Q

C. 2Q

D. Q

Answer: D

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48. The sum of n terms of a series is $3n^2 + 4n$. Then the series is

A. A.P.

B. G.P.

C. H.P.

D. A.G.S.

Answer: A

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49. In an A.P., a = 3, l = 39 and S = 525, then the value of common difference d =

A. $1/2$

B. 1

C. $3/2$

D. none

Answer: C

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50. The sum of eleven terms of an A.P. whose middle terms is 30 is

A. 320

B. 330

C. 340

D. 350

Answer: B

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51. If the ratio of the sums of m and n terms of A.P. is $m^2 : n^2$, then the ratio of its m^{th} and n^{th} terms is given by

A. $2m - 1 : 2n - 1$

B. $m : n$

C. $2m + 1 : 2n + 1$

D. none

Answer: A

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52. If in an A.P. the ratio of the sum of m terms and n terms is $m^2 : n^2$ then if a is first term and d the common difference, then

A. a = 2d

B. a = d

C. d = 2a

D. none of these

Answer: C

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53. If S_n be the sum of first n terms of an A.P. and if $\frac{S_{pn}}{S_n}$ is independent of n then $\frac{a}{d}$ is equal to

A. 2

B. $1/2$

C. 3

D. none

Answer: B

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54. The ratio between the sum of n terms of two A.P.'s is 3n + 8 : 7n + 15. Then the ratio between their 12^{th} terms is

A. $5:7$

B. $7:16$

C. $12:11$

D. none

Answer: B

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55. The sum of all odd numbers between 1 to 1000 which are divisible by 3 is

A. 83667

B. 56128

C. 90000

D. none

Answer: A

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56. If repetition of digits is allowed, then the number of even natural numbers having three digits is

A. 250

B. 350

C. 450

D. 550

Answer: C

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57. Given two A.P.'s $2, 5, 8, 11, \ldots\ldots, T_{60}$ and $3, 5, 7, 9, \ldots\ldots, T_{50}$. Then the number of terms which are identical is

A. 15

B. 17

C. 19

D. none

Answer: B

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58. The number of numbers lying between 100 and 500 which are divisible by 7 but not by 21 is

A. 19

B. 38

C. 57

D. none

Answer: B

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59. The sum of all two digit numbers which are odd is

A. 2475

B. 2530

C. 4905

D. 5049

Answer: A

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60. The sum of integers from 1 to 100 that are divisible by 2 or 5 is

A. 3000

B. 3050

C. 3200

D. 3250

Answer: B

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61. The sum of first p- terms terms of an A.P. is q and the sum of first q terms is p, find the sum of first (p + q)

A. p + q

B. 0

C. $-(p+q)$

D. $-2(p+q)$

Answer: C

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62. If $S_n=n^2p$ and $S_m=m^2p, m\neq n$, in A.P., then S_p is

A. p^2

B. p^3

C. p^4

D. none

Answer: B

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63. In an A.P., $\frac{S_p}{S_q} = \frac{p^2}{q^2}, p \neq q$, then $\frac{T_6}{T_{21}}$ is equal to

A. $7/2$

B. $2/7$

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

D. $41/11$

Answer: C

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64. If $\log_{\sqrt{5}} x + \log_{5^{1/3}} x + \log_{5^{1/4}} x + \ldots$ up to 7 terms = 35, then the value of x is equal to

A. 5

B. 5^2

C. 5^3

D. $\sqrt{5}$

Answer: A

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65. If a_1, a_2, a_3 , ... is an A.P. such that

$a_1, a_5, a_{10}, a_{15}, a_{20}, a_{24} = 225$

then $a_1 + a_2 + a_3 + \ldots + a_{23} + a_{24}$ is equal to :

A. 909

B. 75

C. 750

D. 900

Answer: D

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66. A person is to count 4500 notes. Let a_n denote the number of notes the counts in the nth minute. If $a_1 = a_2 = a_3 = \_ = a_{10} = 150$, and $a_{10}, a_{11}, a_{12}, \ldots$ are in AP with the common difference -2, then the time taken by him to count all the notes is:

A. 34 minutes

B. 125 minutes

C. 135 minutes

D. 24 minutes

Answer: A

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67. The sum of nineteen terms of an A.P. $a_1, a_2, \ldots a_{19}$ given that $a_4 + a_8 + a_{12} + a_{16} = 224$ is

A. 1200

B. 1140

C. 1064

D. none

Answer: C

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68. If $S_1 = a_2 + a_4 + a_6 + \ldots$ up to 100 terms and $S_2 = a_1 + a_3 + a_5 + \ldots.$ upto 100 terms of a certain A.P. then its common difference d is

A. $S_1 - S_2$

B. $S_2 - S_1$

C. $\dfrac{S_1 - S_2}{2}$

D. none of these

Answer: D

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69. In an A.P. if $S_1 = T_1 + T_2 + T_3 + \ldots + T_n$ (n odd) $S_2 = T_1 + T_3 + T_5 + \ldots + T_n$, then S_1 / S_2 =

A. $\dfrac{2n}{n+1}$

B. $\dfrac{n}{n+1}$

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

D. $\dfrac{n+1}{n}$

Answer: A

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70. The value of $\sum_{r=1}^{n} \log\left(\frac{a^r}{b^{r-1}}\right)$, is

A. $\frac{n}{2}\log\left(\frac{a^n}{b^n}\right)$

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

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

D. $\frac{n}{2}\log\left(\frac{a^{n+1}}{b^{n+1}}\right)$

Answer: C

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71. The coefficient of x^{99} in $(x+1)(x+3)(x+5)\ldots(x+199)$ is

A. $1+2+3+\ldots+99$

B. $1+3+5+\ldots+199$

C. $1.3.5..199$

D. none of these

Answer: B

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72. If S_1, S_2, S_3 be the sum of n, 2n, 3n terms respectively of an A.P., then

A. $S_3 = S_1 + S_2$

B. $S_3 = 2(S_1 + S_2)$

C. $S_3 = 3(S_2 - S_1)$

D. none of these

Answer: C

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73. If the sum of first p terms, first q terms and first r terms of an A.P. be a, b and c respectively, then $\frac{a}{p}(q-r) + \frac{b}{q}(r-p) + \frac{c}{r}(p-q)$ is equal to

A. 0

B. 2

C. pqr

D. $\frac{8abc}{pqr}$

Answer: A

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74. The first and last terms of an A.P. are a and l respectively. If S be the sum of all the terms of the A.P., then the common difference is

A. $\frac{l^2 - a^2}{2S - (l + a)}$

B. $\frac{l^2 - a^2}{2S - (l - a)}$

C. $\frac{l^2 + a^2}{2S + (l + a)}$

D. $\frac{l^2 + a^2}{2S - (l + a)}$

Answer: A

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

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

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

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

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

Answer: D

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76. If $a_1, a_2, \ldots, a_n$ be an A.P. of positive terms, then $\frac{a_1+a_{2n}}{\sqrt{a_1}+\sqrt{a_2}}+\frac{a_2+a_{2n-1}}{\sqrt{a_2}+\sqrt{a_3}}+\ldots+\frac{a_n+a_{n+1}}{\sqrt{a_n}+\sqrt{a_{n+1}}}$ is equal to

A. $\frac{n(a_1+a_{2n})}{\sqrt{a_1}+\sqrt{a_{n+1}}}$

B. n - 1

C. $\dfrac{n-1}{\sqrt{a_1}+\sqrt{a_{n+1}}}$

D. none

Answer: A

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77. In an arithmetical progression $a_1, a_2, a_3, \ldots, S = a_1^2 - a_2^2 + a_3^2 - a_4^2 + \ldots. - a_{2k}^2 =$

A. $\dfrac{k}{2k-1}\left(a_1^2 - a_{2k}^2\right)$

B. $\dfrac{2k}{k-1}\left(a_{2k}^2 - a_1^2\right)$

C. $\dfrac{k}{k+1}\left(a_1^2 + a_{2k}^2\right)$

D. none

Answer: A

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78. If $a_1, a_2, a_3, \ldots, a_n$ be an A.P. of non-zero terms, then $\frac{1}{a_1 a_2} + \frac{1}{a_2 a_3} + \ldots + \frac{1}{a_{n-1} a_n} =$

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

B. $\frac{n}{a_1 a_n}$

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

D. none

Answer: C

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79. If $\frac{a^{n+1} + b^{n+1}}{a^n + b^n}$ is arithmetic mean of a and b, then n is equal to

A. 1

B. 0

C. -1

D. none

Answer: B

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80. There are m A.M.s' between 1 and 31 . If the ratio of the 7^{th} and $(m-1)^{th}$ means is 5:9 then m=

A. 12

B. 13

C. 14

D. 15

Answer: C

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81. There are n A.M.'s between 3 and 29 such that 6th mean : (n - 1)th mean : : 3 : 5 then the value of n is

A. 10

B. 11

C. 12

D. none

Answer: C

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82. Sum of n A.M.'s between a and b is

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

B. n(a + b)

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

D. none of these

Answer: A

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83. If a, b, c, d, e, f are A.M's between 2 and 12, then a + b + c + d + e + f is equal to

A. 14

B. 42

C. 84

D. none of these

Answer: B

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84. Given two numbers a and b. Let A denote the single A.M. and S denote the sum of n A.M.'s between a and b, then S/A depends on

A. n, a, b

B. n, b

C. n, a

D. n

Answer: D

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85. If x, y, z are in A.P., then the value of $(x+y-z)(y+z-x)$ is

A. $8yz-3y^2-4z^2$

B. $4xz-3y^2$

C. $8xy-4x^2-3y^2$

D. $\frac{1}{4}(10xz-3x^2-3z^2)$

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

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86. The series of natural numbers is divided into groups :

1, (2, 3, 4), (5, 6, 7, 8, 9),...... and so on. Then the sum of the numbers in the nth group is

A. $n^3 - 3n^2 + 3n - 1$

B. $(2n - 1)(n^2 - n + 1)$

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

D. $n^3 + (n + 1)^3$

Answer: B::C

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87. If $1, \log_y x, \log_z y, -15\log_x$ z are in A.P., then

A. $z^3 = x$

B. $x = y^{-1}$

C. $z^{-3} = y$

D. all of these

Answer: D

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88. In the arithmetic progression whose common difference is non-zero, the sum of first 3n terms is equal to the sum of the next n terms. Then the ratio of the sum of the first 2n terms to the next 2n terms is

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

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

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

D. none of these

Answer: A

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89. If $a_1, a_2, \ldots\ldots\ldots a_n$ are in A.P. with common difference d, then the sum of these series

$\sin d[\text{cosec } a_1 \text{cosec } a_2 + \text{cosec } a_2 \text{cosec } a_3 + \ldots\ldots + \ldots\ldots\ldots + \text{cosec } a_{n-1} - \cos$

A. $\sec a_1 - \sec a_n$

B. $\text{cosec } a_1 - \text{cosec } a_n$

C. $\cot a_1 - \cot a_n$

D. $\tan a_1 - \tan a_n$

Answer: D

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90. $1/(q+r), 1/(r+p), 1/(p+q)$ are in A.P., then

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

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

C. 1/p, 1/q, 1/r are in A.P.

D. none

Answer: B

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91. Let t_n be the nth term of an A.P. If $\sum_{r=1}^{10^{99}} a_{2r} = 10^{100}$ and $\sum_{r=1}^{10^{99}} a_{2r-1} = 10^{99}$, then the common difference of A.P. is

A. 1

B. 10

C. 9

D. 10^{99}

Answer: C

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PROBLEM SET - 1 (TRUE AND FALSE)

1. The p^{th} term of an A.P. is $a and q^{th}$ term is b. Prove that the sum of its $(p+q)$ terms is $\frac{p+q}{2}\left\{a+b+\frac{a-b}{p-q}\right\}$.

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2. The angles of a triangle are in A.P. and tangent of smallest angle is 1, then the angles are $45^\circ, 60^\circ, 75^\circ$. T or F ?

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3. The sums of n terms of three arithmetical progressions are S_1, S_2 and S_3. The first term of each is unity and the common differences are 1, 2 and 3 respectively. Then $S_1 + S_3 = 3S_2$

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4. If a, b, c are in A.P., then the following are also in A.P.

(i) $a^2(b+c), b^2(c+a), c^2(a+b)$

(ii) $a\left(\frac{1}{b}+\frac{1}{c}\right), b\left(\frac{1}{c}+\frac{1}{a}\right), c\left(\frac{1}{a}+\frac{1}{b}\right)$

(iii) $\frac{1}{\sqrt{b}+\sqrt{c}}, \frac{1}{\sqrt{c}+\sqrt{a}}, \frac{1}{\sqrt{a}+\sqrt{b}}$

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5. If a^2, b^2, c^2 are in A.P., then prove that the following are also in A.P. $\frac{1}{b+c}, \frac{1}{c+a}, \frac{1}{a+b}$, (ii) $\frac{a}{b+c}, \frac{b}{c+a}, \frac{c}{a+b}$,

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6. If (b+c-a)/a,(c+a-b)/b,(a+b-c)/c are in A.P. Prove that 1/a,1/b,1/c are also inA.P

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

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8. If a, b, c are in A.P., then $\frac{a}{bc}, \frac{1}{c}, \frac{2}{b}$ are also in A.P.

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9. if a,b,c are in AP, prove that $(a-c)^2 = 4(b^2 - ac)$

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10. If x, y, z are in A.P., then $x^3 + z^3 - 8y^3 = 4xyz$

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PROBLEM SET - 1 (FILL IN THE BLANKS)

1. The sum of three numbers in A.P. is 15 whereas sum of their squares is 83. The numbers are.........................

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

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3. The sum of all two digit numbers which when divided by 4 , yield unity as remainder is

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4. If $x, |x+1|, |x-1|$ are the three terms of an A.P., its sum upto 20 terms is.........................

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PROBLEM SET - 2 (MULTIPLE CHOICE QUESTIONS)

1. In a G.P. if the $(m+n)^{th}$ term be p and (m - n)th term be q, then its m^{th} term is

A. $\sqrt{pq}$

B. $\sqrt{p/q}$

C. $\sqrt{q/p}$

D. p/q

Answer: A

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2. In a G.P., $T_2+T_5=216$ and $T_4:T_6=1:4$ and all terms are integers, then its first term is

A. 16

B. 14

C. 12

D. none

Answer: C

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3. In a geometric progression consisting of positive terms, each term equals the sum of the next two terms. Then the common ratio of this progression equals (1) $\frac{1}{2}(1-\sqrt{5})$ (2) $\frac{1}{2}\sqrt{5}$ (3) $\sqrt{5}$ (4) $\frac{1}{2}(\sqrt{5}-1)$

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

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

C. $\sqrt{5}$

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

Answer: D

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4. The first two terms of a geometric progression add up to 12. The sum of the third and the fourth terms is 48. If the terms of the geometric progression are alternately positive and negative, then the first term is (1) 4 (2) 12 (3) 12 (4) 4

A. -4

B. -12

C. 12

D. 4

Answer: B

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5. The third term of a G.P. is 4. The product of the first five terms is

A. 4^3

B. 4^5

C. 4^4

D. none of these

Answer: B

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6. If x, 2x + 2, 3x + 3,....are in G.P., then the fourth term is

A. 27

B. -27

C. 135

D. -13.5

Answer: D

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7. The condition that the roots of $ax^3 + bx^2 + cx + d = 0$ may be in G.P is

A. $a^3b = c^3d$

B. $ab^3 = cd^3$

C. $c^3a = b^3d$

D. $ca^3 = bd^3$

Answer: C

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8. If $a, a^2 + 2, a^3 + 10$ be three consecutive terms of G.P., then the fourth term is

A. 0

B. 6

C. $\frac{729}{16}$

D. 54

Answer: C::D

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9. 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 $A(x_1, y_1), B(x_2, y_2), C(x_3, y_3)$:

A. lie on a st. line

B. lie on a circle

C. lie on an ellipse

D. vertices of a Δ

Answer: A

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10. If a, b, c be three successive terms of a G.P. with common ratio r and $a > 0$ satifying the relation $c > 4b - 3a$, then

A. $1 < r < 3$

B. $-3 < r < -1$

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

D. none

Answer: C

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11. If $(1-k)(1+2x+4x^2+8x^3+16x^4+32x^5)=1-k^6$, where $k \ne 1$ then the value of $\frac{k}{x}$ is

A. 2

B. 4

C. $1/2$

D. $1/4$

Answer: A

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12. The nth term of the series $3, \sqrt{3}, 1, \ldots$ is $\frac{1}{243}$, then n is

A. 12

B. 13

C. 14

D. 15

Answer: B

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13. The first term of a G.P. whose second term is 2 and sum to infinity is 8 will be

A. 6

B. 3

C. 4

D. 1

Answer: C

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14. The first and second terms of a G.P. are x^{-4} and x^n respectively. If x^{52} is the 8th term of the same progression, then n is equal to

A. 13

B. 4

C. 5

D. 3

Answer: B

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15. If the pth, qth and rth terms of a G.P. be respectively , a,b and c then the value of $a^{q-r}. b^{r-p}. c^{p-q}$ is :

A. 0

B. 1

C. -1

D. none of these

Answer: B

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16. The fourth, seventh and tenth terms of a G.P. are p,q,r respectively, then

A. $p^2 = q^2 + r^2$

B. $q^2 = pr$

C. $p^2 = qr$

D. $pqr + pq + 1 = 0$

Answer: B

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17. In a G.P., $T_{10} = 9$ and $T_4 = 4$, then $T_7 =$

A. $4/9$

B. $9/4$

C. 6

D. 36

Answer: C

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18. If $(a^2+b^2+c^2)(b^2+c^2+d^2) \leq (ab+bc+cd)^2$ where a, b, c, d are non-zero real numbers, then they are in

A. A.P.

B. G.P.

C. H.P.

D. none

Answer: B

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19. If $a^2+9b^2+25c^2 = abc\left(\frac{15}{a}+\frac{5}{b}+\frac{3}{c}\right)$, then a, b, c are in

A. A.P.

B. G.P.

C. H.P.

D. none

Answer: C

Watch Video Solution

20. If $a_1, a_2, a_3, \ldots, a_n$ are non-zero real numbers such that

$\left(a_1^2 + a_2^2 + \ldots + a_{n-1}.^2\right)\left(a_2^2 + a_3^2 + \ldots + a_n^2\right) \leq \left(a_1 a_2 + a_2 a_3 + \ldots +\right.$

are in

A. A.P.

B. G.P.

C. H.P.

D. none of these

Answer: B

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21. α, β be the roots of the equation $x^2 - 3x + a = 0$ and γ, δ the roots of $x^2 - 12x + b = 0$ and numbers $\alpha, \beta, \gamma, \delta$ (in this order) form an increasing G.P., then

A. a = 3, b = 12

B. a = 12, b = 3

C. a = 2, b = 32

D. a = 4, b = 16

Answer: C

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22. If x, y, z be respectively the pthh, and rth terms of a G.P., then $(q-r)\log x+(r-p)\log y+(p-q)\log z=$

A. 0

B. 1

C. -1

D. none

Answer: A

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23. If p, q, r are in A.P. and x, y, z in G.P., then $x^{q-r}y^{r-p}z^{p-q}=$

A. -1

B. 1

C. 2

D. none

Answer: B

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24. The sum of first three terms of a G.P. is to the sum of the first six terms as 125 : 152. The common ratio of the G.P. is

A. $1/5$

B. $2/5$

C. $3/5$

D. $4/5$

Answer: C

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25. A. G.P. consists of an even number of terms. If the sum of all the terms is 5 times the sum of the terms occupying he odd places. Find the common ratio of the G.P.

A. 2

B. 3

C. 4

D. 5

Answer: C

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

A. $\frac{S_2}{S_1}$

B. $\frac{S_1}{S_2}$

C. $S_1 + S_2$

D. $S_1 - S_2$

Answer: A

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

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

B. $\dfrac{n.2^{n+1}}{2^{2n} - 1}$

C. $n.2^n$

D. none

Answer: A

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

A. $\frac{3}{16}$

B. $\frac{3}{256}$

C. $\frac{39}{256}$

D. none of these

Answer: A

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

A. $2-\sqrt{3}$

B. $2+\sqrt{3}$

C. $\sqrt{3}-2$

D. none of these

Answer: B

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

A. 1

B. 2

C. 0

D. none

Answer: C

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31. If a, b and c be three distinct real number in G.P. and $a+b+c=xb$, then x cannot be

A. $0 < x < 1$

B. $-1 < x < 3$

C. $x < -1 \text{ or } x > 3$

D. $-1 < x < 2$

Answer: C

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32. If a, b, c be in G.P., then the expression $a^2b^2c^2\left(\frac{1}{a^3}+\frac{1}{b^3}+\frac{1}{c^3}\right)=$

A. a + b + c

B. $a^3+b^3+c^3$

C. ab + bc + ca

D. none

Answer: B

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33. How many terms of the series 1, 4, 16,... must be taken to have their sum equal to 341 ?

A. 8

B. 6

C. 4

D. 5

Answer: D

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34. The sum of n terms of the series $1+\frac{1}{2}+\frac{1}{2^2}+\ldots$ is less than 1999. The greatest value of n is

A. 10

B. 11

C. 9

D. none of these

Answer: B

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35. The minimum value of n such that $1 + 3 + 3^2 + \dots + 3^n > 1000$ is

A. 7

B. 8

C. 9

D. none of these

Answer: A

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

A. 8

B. 9

C. 10

D. 11

Answer: D

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37. Let S_1, S_2 , ... Be squares such that for each $n \geq 1$ the length of a side of S_n equals the lengths 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 is the area of S_n less than 1 square cm ?

A. 7

B. 8

C. 9

D. 10

Answer: B

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38. If A and G be the A .M and G.M between two positive numbers, then the numbers are

A. $A \pm \sqrt{G^2 - A^2}$

B. $A \pm \sqrt{A^2 - G^2}$

C. $A \pm \sqrt{A^2 + G^2}$

D. $G \pm \sqrt{A^2 - G^2}$

Answer: B

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39. If the A.M. and G.M. between two numbers are in the ratio m.n., then what is the ratio between the two numbers ?

A. $m+\sqrt{n^2-m^2}:m-\sqrt{n^2-m^2}$

B. $m+\sqrt{m^2+n^2}:m-\sqrt{m^2+n^2}$

C. $m+\sqrt{m^2-n^2}:m-\sqrt{m^2-n^2}$

D. none of these

Answer: C

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40. If $S=\frac{2}{3}+\frac{8}{9}+\frac{26}{27}+\frac{30}{81}+\ldots.+n$ terms, then the value of S is equal to

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

B. $1 - \frac{1}{3^n}$

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

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

Answer: D

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41. Sum of n terms of the series $\frac{1}{3} + \frac{5}{9} + \frac{19}{27} + \frac{65}{81} + \ldots$ is

A. $2^n - 1$

B. $3^n - 1$

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

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

Answer: D

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42. 8 + 88 + 888 +...n terms =

A. $\frac{80}{81}(10^n - 1) - \frac{8n}{9}$

B. $\frac{10}{81}(10^n - 1)$

C. $\frac{80}{81}(10^n - 1) + \frac{8n}{9}$

D. none of these

Answer: A

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43. $\underbrace{(666...6)}_{\text{n digits}}^2 + \underbrace{(888...8)}_{\text{n digits}}$ is equal to

A. $\frac{4}{9}(10^n - 1)$

B. $\frac{4}{9}(10^{2n} - 1)$

C. $\frac{4}{9}(10^n - 1)^2$

D. none of these

Answer: B

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44. The value of sum $\sum_{n=1}^{13}\left(i^n + i^{n+1}\right)$ where $i = \sqrt{-1}$, is equal to

A. i

B. i - 1

C. $-i$

D. 0

Answer: B

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45. If $|a| < 1$ and |b| $<$ 1, then the sum of the series

$a(a+b) + a^2\left(a^2 + b^2\right) + a^3\left(a^3 + b^3\right)$+... upto ∞ is :

A. $\dfrac{a}{1-a}+\dfrac{ab}{1-ab}$

B. $\dfrac{a^2}{1-a^2}+\dfrac{ab}{1-ab}$

C. $\dfrac{b}{1-b}+\dfrac{a}{1-a}$

D. $\dfrac{b^2}{1-b^2}+\dfrac{ab}{1-ab}$

Answer: B

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46. If S be the sum, P the product and R the sum of the reciprocals of n terms of a G.P., then $\left(\dfrac{S}{R}\right)^n=$

A. P

B. P^2

C. P^3

D. $\sqrt{P}$

Answer: B

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47. If

$x = 1 + a + a^2 + a^3 + \ldots \text{to} \infty (|a| < 1)$ and $y = 1b + b^2 + b^3 + \ldots \text{to} \infty (|$

, then $1 + ab + a^2b^2 + a^3b^3 + \ldots \infty$ is equal to

A. $\dfrac{xy}{x + y - 1}$

B. $\dfrac{x + y}{x + y + 1}$

C. $\dfrac{x - y}{x - y + 1}$

D. none

Answer: A

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48. If x is the first term of a G.P. with infinite number of terms and $S_\infty = 5$, then x is

A. $0 < x < 10$

B. $x \geq 10$

C. $x < -10$

D. $-10 < x < 0$

Answer: A

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

A. A.P.

B. G.P.

C. H.P.

D. none of these

Answer: C

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50. Given that

$0 < x < \frac{\pi}{4}$ and $\frac{\pi}{4} < y < \frac{\pi}{2}$ and $\sum_{k=0}^{\infty} (-1)^k \tan^{2k} x = p, \sum_{k=0}^{\infty} (-1)^k \text{co}$

, then $\sum_{k=0}^{\infty} \tan^{2k} x \cot^{2k} y$ is

A. $\frac{1}{p} + \frac{1}{q} - \frac{1}{pq}$

B. $\frac{1}{\left\{\frac{1}{p} + \frac{1}{q} - \frac{1}{pq}\right\}}$

C. p + q - pq

D. p + q + pq

Answer: B

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51. If $x = 1 + y + y^2 + y^3 + \ldots \text{to} \infty$, then y is

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

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

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

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

Answer: C

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52. $\dfrac{3}{4}-\dfrac{5}{4^2}+\dfrac{3}{4^3}-\dfrac{5}{4^4}+\dfrac{3}{4^5}-\dfrac{5}{4^6}+\ldots.\infty=?$

A. $1/3$

B. $1/5$

C. $7/15$

D. none

Answer: C

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53. If $\begin{aligned} x &= a + a/r + a/r^2 + \ldots\ldots\infty \\ y &= b - b/r + b/r^2 - \ldots\ldots.\ \infty \\ z &= c + c/r^2 + c/r^4 + \ldots\ldots\infty \end{aligned}$

Then the value of xy/z is equal to

A. $\frac{ab}{a}$

B. $\frac{bc}{a}$

C. $\frac{ca}{b}$

D. none

Answer: A

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54. If $S_1, S_2, \ldots S_\lambda$ are the sums of infinite G.P.'s whose first terms are respectively 1, 2, 3,....λ and common ratios are $\frac{1}{2}, \frac{1}{3}, \ldots \frac{1}{\lambda + 1}$ respectively, then $S_1 + S_2 + S_3 + \ldots + S_\lambda =$

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

B. $\frac{\lambda(\lambda+2)}{2}$

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

D. none

Answer: C

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55. The vlaue of $9^{1/3}\times9^{1/9}\times9^{1/27}\times\ldots\ldots\ldots\infty$ is :

A. 9

B. 1

C. 3

D. none of these

Answer: C

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56. Find the value of $\left(320(32)^{1/6}(32)^{1/36}\infty\right.$.

A. 16

B. 32

C. 64

D. none

Answer: C

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57. The value of $2.\overline{357}$, is

A. $\frac{2355}{1001}$

B. $\frac{2370}{997}$

C. $\frac{2355}{999}$

D. none of these

Answer: C

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58. The value of $0.4\overline{23}$ is

A. $\frac{419}{999}$

B. $\frac{419}{990}$

C. $\frac{423}{1000}$

D. none of these

Answer: C

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59. An equilateral triangle is drawn by joining the mid-points of a given equilateral triangle, A third equilateral triangle is drawn inside the second in the same manner and the process is continued indefinitely. If the side of the first equilateral triangle is $3^{1/4}$ inch, then the sum of the areas in sq. inch of all these triangles is

A. $\sqrt{3}$

B. 3

C. $3\sqrt{3}$

D. 1

Answer: D

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60. If the expression

exp $\{1 + |\cos x| + \cos^3 x \mid \ + \cos^4 x + \dots . \infty) \log_e 4\}$

satisfies the equation $y^2 - 20y + 64 = 0$ for $0 < x < \pi$, then the set of value of x is

A. $\left\{\frac{\pi}{2}, 0, \frac{2\pi}{3}\right\}$

B. $\left\{\frac{\pi}{3}, \frac{\pi}{2}, \frac{2\pi}{3}\right\}$

C. $\left\{\frac{\pi}{3}, \frac{2\pi}{3}\right\}$

D. $\left\{\frac{\pi}{2}, \frac{\pi}{3}\right\}$

Answer: B

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61. Find the values of $x \in (-\pi, \pi)$ which satisfy the equation $8^{1 + |\cos x| + |\cos^2 x| + |\cos^{2x}| +} = 4^3$

A. $\left\{\frac{\pi}{3}\right\}$

B. $\left(-\frac{\pi}{3}, -\frac{2\pi}{3}\right)$

C. $\left(-\frac{\pi}{3}, \frac{2\pi}{3}\right)$

D. $\left(\frac{\pi}{3}, \frac{2\pi}{3}\right)$

Answer: B::D

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62. In an A.P., $\frac{S_p}{S_q} = \frac{p^2}{q^2}, p \neq q$, then $\frac{T_6}{T_{21}}$ is equal to

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

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

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

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

Answer: C

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63. If $||a| < 1 \text{and } |b| < 1$ then the sum of the series $1 + (1+a)b + (1+a+a^2)b^2 + (1+a+a^2+a^3)b^3 + \ldots .. is$

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

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

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

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

Answer: C

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64. If exp. $\{(\sin^2 x + \sin^4 x + \sin^6 x + \ldots \in f.)In2\}$ satisfies the equation $x^2 - 9x + 8 = 0$ find the value off $\frac{\cos x}{\cos x + \sin x}, 0 < x < \frac{\pi}{2}$

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

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

C. 0

D. none of these

Answer: B

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

A. 4

B. log 4

C. log 2

D. none of these

Answer: A

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66. The value of $(0 \cdot 16)^{\log_{2 \cdot 5}\left(\frac{1}{3} + \frac{1}{3^2} + \frac{1}{3^3} + \dots . \infty\right)}$ is

A. 2

B. 3

C. 4

D. none of these

Answer: C

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67. If the sum of an infinitely decreasing G.P. is 3, and the sum of the squares of its terms is $9/2$, the sum of the subes of the terms is

A. $\frac{105}{13}$

B. $\frac{108}{13}$

C. $\frac{729}{8}$

D. none of these

Answer: B

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68. The sum of an infinite geometric progression (G.P.) is 2 and the sum of the G.P. made from the cubes of the terms of this infinite series is 24. The values a nad r respectively (where is the first term and r denote common ratio of the series)

A. 2, 1/3

B. 3, -1/2

C. 4, 1/2

D. none

Answer: B

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69. Consider an infinite geometric series with first term a and common ratio r. if the sum is 4 and the sencond 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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70. If $S_\lambda = \sum_{r=0}^{\infty} \frac{1}{\lambda^r}$, then $\sum_{\lambda=1}^{n} (\lambda - 1) S_\lambda =$

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

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

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

D. none

Answer: B

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71. If a,b,c are in A.P., then $2^{ax+1}, 2^{bx+1}, 2^{cx+1}, x \in R$, are in

A. A.P.

B. G.P. only when $x > 0$

C. G.P. if $x < 0$

D. G.P. $\forall x \neq 0$

Answer: D

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72. If a,b,c are in A.P. as well as in G.P. then

A. $a = b \neq c$

B. $a \neq b = c$

C. $a \neq b \neq c$

D. a = b = c

Answer: D

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73. If a,b,c are in G.P., then show that : $a(b^2 + c^2) = c(a^2 + b^2)$

A. $a(b^2 + a^2) = c(b^2 + c^2)$

B. $a(b^2 + c^2) = c(a^2 + b^2)$

C. $a^2(b + c) = c^2(a + b)$

D.

Answer: B

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

A. $\log_c b = \log_b c$

B. $\log_a c = \log_b a$

C. $\log_a b = \log_c b$

D. $\log_b a = \log_c b$

Answer: D

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

A. A.P.

B. G.P.

C. H.P.

D. none

Answer: C

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76. If a, b, c are in G.P., then $\log_a 10, \log_b 10, \log_c 10$ are in

A. A.P.

B. G.P.

C. H.P.

D. none

Answer: C

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77. If $\frac{a+be^x}{a-be^x}=\frac{b+ce^x}{b-ce^x}=\frac{c+de^x}{c-de^x}$ then a, b, c, d are in

A. A.P.

B. G.P.

C. H.P.

D. none

Answer: B

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78. If a,b,c are in A.P., a,x,b are in G.P. and b,y,c are in G.P. then a^2, b^2, y^2 are in

A. H.P.

B. G.P.

C. A.P.

D. none of these

Answer: C

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

A. x = y = z or y $\neq$ 1

B. $z = \frac{1}{x}$

C. x = y = z, but their common value is not necessarily zero

D. x = y = z = 0

Answer: C

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80. If a, b, c are in A.P. and b-a, c-b, a are in G.P. then a:b:c=?

A. $1:2:3$

B. $1:3:5$

C. $2:3:4$

D. $1:2:4$

Answer: A

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81. The sides a, b, c of a triangle ABC are in G.P. such that $\log a - \log 2b, \log 2b - \log 3c, \log 3c - \log a$ are in A.P. then the triangle ABC is

A. right angled

B. acute angled

C. obtuse angled

D. none

Answer: C

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82. If a, b, c are in G.P. where a, b, c are all (+) ive and $\log\frac{5c}{a}, \log\frac{3b}{5c}$ and $\log\frac{a}{3b}$ are in A.P. then a, b, c are the sides of a triangle which is

A. right angled

B. acute angled

C. obtuse angled

D. none

Answer: D

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83. If A and G between two + ive numbers a and b are connected by the relation A + G = a - b, then the numbers are in the ratio

A. $1:3$

B. $1:6$

C. $1:9$

D. $1:12$

Answer: C

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84. The product of n geometric means between two given numbers a and b is :

A. $(ab)^n$

B. $(ab)^{n/2}$

C. $(ab)^{2n}$

D. none of these

Answer: B

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85. Find the value of n so that $\frac{a^{n+1}+b^{n+1}}{a^n+b^n}$ may be the geometric mean between a and b.

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86. (2n+1) G.M.s are inserted between 4 and 2916 .Then the $(n+1)^{th}$ G.M.is equal to

A. 36

B. 54

C. 108

D. 324

Answer: C

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87. Area of the triangle with vertces (a,b),(x_1, y_1) and (x_2, y_2) where a, x_1, x_2 are in G.P with common ratio r and b, y_1, y_2 are in G.P with common ratio s is

A. $\frac{1}{2}ab(r+1)(s+2)(s+r)$

B. $\frac{1}{2}ab(r-1)(s-1)(s-r)$

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

D. $\frac{1}{2}ab(r+1)(s+1)(s-r)$

Answer: B

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88. If $\log_t a, a^{t/2}$ and $\log_b t$ are in G.P., then t is equal to

A. $\log_a(\log_b a)$

B. $\log_a(\log a) - \log_a(\log b)$

C. $-\log_a(\log_a b)$

D. $\log_a(\log b) - \log_a(\log a)$

Answer: A::B::C

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89. Sum of the series $(\sqrt{3}-1)+2(2-\sqrt{3})+2(3\sqrt{3}-5)+\ldots\infty$ is

A. $\sqrt{3}+1$

B. $\sqrt{3}-1$

C. $2-\sqrt{3}$

D. none of these

Answer: A

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90. Let $n > 1$, be a positive integer. Then the largest integer m, such that $(n^m + 1)$ divides $\left(1 + n + n^2 + n^3 + \ldots.. + n^{127}\right)$ is:

A. 127

B. 63

C. 64

D. 32

Answer: C

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91. Let$a_1, a_2, \ldots.$ be in AP and $q_1, q_2, \ldots.$ be in GP. If $a_1 = q_1 = 2$ and $a_{10} = q_{10} = 3$, then

A. $a_7 q_{19}$ is not an integer

B. $a_{19} q_7$ is an integer

C. $a_7 q_{19} = a_{19} q_{10}$

D. none

Answer: C

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92. Let

$$A_n = \frac{3}{4} - \left(\frac{3}{4}\right)^2 + \left(\frac{3}{4}\right)^3 - \dots + (-1)^{n-1}\left(\frac{3}{4}\right)^n \text{ and } B_n = 1 - A_n$$

, then find the least value of $n_0, n_0 \in N$ such that $B_n > A_n, \forall n \geq n_0$.

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PROBLEM SET - 2 (TRUE AND FALSE)

1. Given that $\log_x y, \log_z x, \log_y z$ are in GP, $xyz = 64$ and x^3, y^3, z^3 are in A.P.

Which one of the following is correct ?

x,y and z are

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2. If a,b,c and d are in G.P , then show that $ax^2 + c$ divides $ax^3 + bx^2 + cx + d$

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PROBLEM SET - 2 (FILL IN THE BLANKS)

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

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2. Five geometric means between 486 and 2/3 are..................

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3. The sum of first ten terms of an A.P. is 155 and the sum of first two terms of a G.P. 9. The first term of the A.P. is equal to the common ratio of the G.P. and the first term of the G.P. is equal to the common difference of the A.P. which can be the A.P. as per the given conditions?

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PROBLEM SET - 3 (MULTIPLE CHOICE QUESTIONS)

1. If p^{th} term of an H.P. is qr and q^{th} is rp, then the r^{th} term is

A. pqr

B. pq/r

C. pq

D. $-pqr$

Answer: C

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2. If the m^{th} term of an H.P. is n and n^{th} term be m, then $(m+n)^{th}$ term is

A. $\dfrac{mn}{m+n}$

B. $\dfrac{m}{m+n}$

C. $\dfrac{n}{m+n}$

D. $\dfrac{m-n}{m+n}$

Answer: A

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3. If the 7th term of a H.P. is 8 and the 8th term is 7, then its 15th term is

A. 16

B. 14

C. 27/14

D. 56/15

Answer: D

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4. In a H.P., $T_7 = \frac{1}{10}$ and $T_{12} = \frac{1}{25}$ then T_{20} is

A. $\frac{1}{37}$

B. $\frac{1}{40}$

C. $\frac{1}{49}$

D. $\frac{1}{45}$

Answer: C

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5. If $a_1, a_2, a_3, \ldots\ldots, a_n$ are in HP, than prove that $a_1a_2 + a_2a_3 + a_3a_4 + \ldots\ldots + a_{n-1}a_n = (n-1)a_1a_n$

A. $(n-1)a_1a_n$

B. na_1a_n

C. $n(a_1 + a_n)$

D. none

Answer: A

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6. If a, b, c be respectively the pth, qth and rth terms of an H.P., then $bc(q-r) + ca(r-p) + ab(p-q) =$

A. 0

B. 1

C. -1

D. none

Answer: A

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7. If a,b,c are in H.P., then the value of

$$\left(\frac{1}{b}+\frac{1}{c}-\frac{1}{a}\right)\left(\frac{1}{c}+\frac{1}{a}-\frac{1}{b}\right)$$ is

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

D. noe of these

Answer: A::B::C

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8. If a,b,c,d are in H.P., then ab+bc+cd is equal to

A. 3 ad

B. (a + b) (c + d)

C. 3 ac

D. none of these

Answer: A

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

A. 2

B. $PQ/(P+Q)$

C. $(P+Q)/PQ$

D. none of these

Answer: A

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10. The harmonic mean of $\frac{a}{1-ab}$ and $\frac{a}{1+ab}$ is

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

B. $\frac{a}{1-a^2b^2}$

C. a

D. $\frac{1}{1-a^2b^2}$

Answer: C

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

A. 2

B. 4

C. 6

D. 8

Answer: B

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12. Consider the series 21, 22, 23, ..., k - 1, k where k is a three-digit number. If the A.M. and G.M. of the first and last numbers exist in the given series, then the number of values k can attain is

A. 5

B. 6

C. 2

D. 4

Answer: C

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13. If a, b, c are respectively the T_p, T_{2q} and T_{3r} terms of an H.P., then

$$\Delta = \begin{vmatrix} bc & ca & ab \\ p & 2q & 3r \\ 1 & 1 & 1 \end{vmatrix} =$$

A. 1

B. 0

C. $-p$

D. q

Answer: B

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14. In an H.P., $T_p = q(p+q), T_q = p(p+q)$, then p and q are the roots of

A. $x^2 - T_{p+q}x + T_{pq} = 0$

B. $x^2 - T_{pq}x + T_{p+q} = 0$

C. $x^2 - 2T_{p+q}x + T_{pq} = 0$

D. $x^2 - T_{pq}x + 2T_{p+q} = 0$

Answer: B

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15. If x, y, z are in $G.P.$ $(x, y, z > 1)$, then $\frac{1}{2x + \log_e x}, \frac{1}{4x + \log_e y}, \frac{1}{6x + \log_{ez} z}$ are in

A. A.P.

B. G.P.

C. H.P.

D. none

Answer: C

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PROBLEM SET - 3 (TRUE AND FALSE)

1. If $\frac{1}{a(b+c)}, \frac{1}{b(c+a)}, \frac{1}{c(a+b)}$ be in H.P., then a, b, c are also in H.P.

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2. If a, b, c be in H.P., then

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

(ii) $\frac{1}{a}+\frac{1}{b+c}, \frac{1}{b}+\frac{1}{c+a}, \frac{1}{c}+\frac{1}{a+b}$ are in H.P.

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3. If $I_n = \int_0^{\pi/4} \tan^n x dx$, then

$\frac{1}{I_2+I_4}, \frac{1}{I_3+I_5}, \frac{1}{I_4+I_6}, \ldots$ from

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PROBLEM SET - 3 (FILL IN THE BLANKS)

1. If $\cos(x-y), \cos x and \cos(x+y)$ are in H.P., then $\cos x \sec\left(\frac{y}{2}\right) =$

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PROBLEM SET - 4 (MULTIPLE CHOICE QUESTIONS)

1. Find the sum of the series :

$1 \cdot 3^2 + 2 \cdot 5^2 + 3 \cdot 7^2 + \ldots$ to 20 terms :

A. 100000

B. 143215

C. 188090

D. none

Answer: C

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2. Sum up to 16 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. 346

B. 446

C. 546

D. none

Answer: B

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3. Sum of n terms of the series $1 + (1 + 3) + (1 + 3 + 5) + \ldots$ is

A. n^2

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

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

D. none

Answer: B

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4. 1.2.3 + 2.3.4 + 3.4.5 +...n terms is $\frac{n(n+1)(n+2)(n+3)}{P}$ where P =

A. 4

B. 6

C. 8

D. 12

Answer: A

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5. Find the sum of all the numbers of the form n^3 which lie between 100 and 10000.

A. 53214

B. 53321

C. 53261

D. 53361

Answer: C

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6. If the sum of n natural numbers is one-third the sum of their cubes then the value of n is equal to

A. 3

B. 5

C. 2

D. 4

Answer: C

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7. If the sum of first n natural numbers is one-fifth of the sum of their squares, then n is

A. 5

B. 6

C. 7

D. 8

Answer: C

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8. If $\sum$ n = 210, then $\sum n^2 =$

A. 2100

B. 2870

C. 2970

D. none

Answer: B

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9. If $f: R \to R$ satisfies $f(x+y) = f(x) + f(y)x, y \in R$ and f(1) = 7, then $\sum_{r=1}^{n} f(r) =$

A. $\frac{7n}{2}$

B. $\frac{7(n+1)}{2}$

C. $7n(n+1)$

D. $\frac{7n(n+1)}{2}$

Answer: D

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10. If the sum of n terms of an A.P. is an(n - 1), then sum of squares of these n terms is

A. $\frac{2a^2}{3}n(n-1)(2n-1)$

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

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

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

Answer: A

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11. Balls are arranged in rows to form an equilateral triangle. The first row consists of ome ball, the second row of two balls and so on. If 669 more balls are added,then all the balls can be arranged in the shape of a square and each of the sides, then contains 8 balls less than each side of the triangle. Determine the initial number of balls.

A. 1600

B. 1500

C. 1540

D. 1690

Answer: C

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

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

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

C. $-n(n+1)$

D. none of these

Answer: A::B

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13. The sum of the series: $\frac{1}{(\log)_2 4} + \frac{1}{(\log)_4 4} + \frac{1}{(\log)_8 4} + + \frac{1}{(\log)_{2n} 4}$ is $\frac{n(n+1)}{2}$ (b) $\frac{n(n+1)(2n+1)}{12}$ (c) $\frac{n(n+1)}{4}$ (d) none of these

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

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

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

D. $\frac{n(n+1)}{4}$

Answer: D

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14. The sum of the series $\frac{1}{3\times 7}+\frac{1}{7\times 11}+\frac{1}{11\times 15}+\ldots$ to ∞ is

A. $1/3$

B. $1/6$

C. $1/9$

D. $1/12$

Answer: D

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

A. $n/2$

B. n - 1

C. n + 1

D. n

Answer: D

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16. The sum of n terms of the series $1^2 + 2.2^2 + 3^2 + 2.4^2 + 5^2 + 2.6^2 + \dots$ 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. $\frac{n(n^2-1)}{2}$

C. $2(n+1)^2(2n+1)$

D. none

Answer: A

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

A. $a^2n^2(n+1)^2$

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

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

D. none

Answer: C

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18. The sum of all the products of the first n(+) ive integers taken two at a time is

A. $\frac{1}{48}(n-2)(n-1)n^2$

B. $\frac{1}{6}(n-1)n(n+1)(3n+2)$

C. $\frac{1}{6}n(n+1)(n+2)(n+5)$

D. none

Answer: B

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19. The value of the expression $\left(1+\frac{1}{\omega}\right)\left(1+\frac{1}{\omega^2}\right)+\left(2+\frac{1}{\omega}\right)\left(2+\frac{1}{\omega^2}\right)+\left(3+\frac{1}{\omega^2}\right)+\dots\dots\dots\dots$, where ω is an imaginary cube root of unity, is

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

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

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

D. none of these

Answer: C

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20. The value of the expression

$2(1+\omega)(1+\omega^2)+3(2\omega+1)(2\omega^2+1)+4(3\omega+1)(3\omega^2+1)+$

$...+(n+1)(n\omega+1)(n\omega^2+1)$ is

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

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

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

D. none of these

Answer: B

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21. The value of the expression

$1.(2-\omega).(2-\omega^2)+2.(3-\omega)(3-\omega^2)+.+(n-1)(n-\omega)(n-\omega^2),$

where omega is an imaginary cube root of unity, is.........

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

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

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

D. none

Answer: B

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22. For and odd integer $n \geq 1, n^3 - (n-1)^3 + \ldots\ldots$

$+(-1)^{n-1}1^3$

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

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

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

D. none

Answer: B

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23. The sum of the series $\frac{1}{3.5}+\frac{1}{5.7}+\frac{1}{7.9}+\ldots.$ ad infinity is equal to

A. $1/6$

B. $1/3$

C. $1/2$

D. $5/6$

Answer: A

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24. If $\Sigma_{r=1}^{n} t_r = \frac{1}{6}n(n+1)(n+2), \forall n \geq 1,$ then the value of $\lim_{n \to \infty} \Sigma_{r=1}^{n} \frac{1}{t_r}$ is equal to

A. 2

B. $3/2$

C. 3

D. 6

Answer: A

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25. The sum of the infinite series $1+(1+a)x+\left(1+a+a^2\right)x^2+\left(1+a+a^2+a^3\right)x^3+\ldots$ where $0<a, x<1$, is

A. $1/(1-x)(1-a)$

B. $1/(1-x)(1-ax)$

C. $1/(1-a)(1-ax)$

D. $1/(1-x)(1+a)$

Answer: B

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26. Sum of the series $1 + 2 + 4 + 7 + \ldots + 67$ is equal to

A. 150

B. 230

C. 298

D. 340

Answer: C

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27. 99^{th} term of the series $2 + 7 + 14 + 23 + 34 + \ldots$ is

A. 9998

B. 9999

C. 10000

D. none of these

Answer: A

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28. Find the 50th term of the series $2 + 3 + 6 + 11 + 18 + \dots.$

A. $49^2 - 1$

B. 49^2

C. $50^2 + 1$

D. $49^2 + 2$

Answer: D

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29. Let $P = 3^{1/3}.\ 3^{2/9}.\ 3^{3/27}\dots\infty$, then $P^{1/3}$ is equal to

A. $3^{2/3}$

B. $\sqrt{3}$

C. $3^{1/3}$

D. $3^{1/4}$

Answer: D

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30. $2^{1/4}.4^{1/8}.8^{1/16}.16^{1/32}....$ is equal to

A. 2

B. 2^2

C. $\sqrt{2}$

D. $2^{1/4}$

Answer: A

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31. If $3+\frac{1}{4}(3+d)+\frac{1}{4^2}(3+2d)+\ldots\infty=8$, then the value of d is

A. 1

B. 5

C. 9

D. none

Answer: C

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32. The sum to infinity of the series

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

A. n^2

B. $n(n+1)$

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

D. none

Answer: A

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33. The sum to infinite terms of the arithmetic - gemoetric progression $3, 4, 4, \frac{32}{9}, \ldots\ldots$ is equal to

A. 16

B. 18

C. 24

D. 27

Answer: D

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

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

B. $\frac{11}{8}$

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

D. $\frac{7}{16}$

Answer: C

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

A. 6

B. 2

C. 3

D. 4

Answer: C

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36. The sum of $0.2 + 0004 + 0.00006 + 0.0000008 + \ldots$ to ∞ is $\frac{200}{891}$ b. $\frac{2000}{9801}$ c. $\frac{1000}{9801}$ d. none of these

A. $\frac{200}{891}$

B. $\frac{2000}{9801}$

C. $\frac{1000}{9801}$

D. none

Answer: B

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

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38. Sum of the series $1 + 3 + 7 + 15 + 31 + \ldots$to n terms is

A. $2^n - 2 - n$

B. $2^{n+1} + 2 + n$

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

D. none

Answer: C

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39. Sum of the series $1 + 2.2 + 3.2^2 + 4.2^3 + \ldots + 100.2^{99}$ is

A. $100.2^{100}+1$

B. $99.2^{100}+1$

C. $99.2^{99}-1$

D. $100.2^{100}-1$

Answer: B

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40. The positive numbers are written in a triangular array as shown.

$$\begin{array}{ccccccc} & & & 1 & & & \\ & & 2 & & 3 & & \\ & 4 & & 5 & & 6 & \\ 7 & & 8 & & 9 & & 10 \end{array}$$

The row in which number 2005 will be is

A. 58

B. 61

C. 63

D. 65

Answer: C

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PROBLEM SET - 4 (TRUE AND FALSE)

1. The sum of the series $\frac{5}{1^2.4^2}+\frac{11}{4^2.\,7^2}+\frac{17}{7^2.\,10^2}+\,..$ ad inf. is $\frac{1}{3}$.

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PROBLEM SET - 4 (FILL IN THE BLANKS)

1. If 1.3+2.$3^2+3.3^3+\ldots\;=n3^n=\frac{(2n-1)3+b}{4}$, then a and b are respectively:

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2. The value of $\frac{3}{1!} + \frac{5}{2!} + \frac{9}{3!} + \frac{15}{4!} + \frac{23}{4!} + \ldots\ldots\infty$,

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3. $2 + 4 + 7 + 11 + 16 +$ .... to n term =

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

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5. Sum of the series $n.1 + (n-1).2 + (n-2).3 + \ldots\ldots 1$ is....................

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6. The natural numbers are written as follows :

1

2 3

4 5 6

7 8 9 10

... ...

... ...

The sum of numbers in the nth row is :

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

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PROBLEM SET - 5 (MULTIPLE CHOICE QUESTIONS)

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

A. 6, 3

B. 5, 4

C. 5, -2.5

D. $-3, 1$

Answer: A

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2. The A.M. of two numbers exceeds their G.M. by 15 and H.M. by 27. The numbers are

A. 100, 50

B. 120, 30

C. 90, 60

D. none

Answer: B

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3. If the harmonic mean between two positive numbers is to their G.M. as 12 : 13, the numbers are in the ratio

A. $12 : 13$

B. $\frac{1}{12} : \frac{1}{13}$

C. $4:9$

D. $\frac{1}{4}:\frac{1}{9}$

Answer: C::D

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4. If the arithmetic means of two positive number a and b $(a > b)$ is twice their geometric mean, then find the ratio a: b

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

B. $7+4\sqrt{3}:7-4\sqrt{3}$

C. $2:7+4\sqrt{3}$

D. $2:\sqrt{3}$

Answer: A

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5. If first and (2n−1)^(th) terms of an A.P., G.P. and H.P. are equal and their n^(th) terms are a, b, c respectively, then

A. a = b = c

B. a + c = b

C. $a \geq b \geq c$

D. $ac - b^2 = 0$

Answer: C::D

Watch Video Solution

6. If $a, a_1, a_2, a_3, a_{2n}, b$ are in A.P. and $a, g_1, g_2, g_3, , g_{2n}, b$. are in G.P. and h s the H.M. of $aandb,$ then prove that

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

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

B. 2nH

C. nH

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

Answer: A

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7. Given that n arithmetic means are inserted between two sets of numbers a,2b, and 2a,b,2a,b where a,b, $\in R$. Suppose further that m^{th} mean between these two sets of numbers is same, then the ratio a:b equals

A. $n-m+1:m$

B. $n-m+1:n$

C. $m:n-m+1$

D. $n:n-m+1$

Answer: C

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Watch Video Solution

8. If A_1, A_2 are between two numbers, then $\frac{A_1 + A_2}{H_1 + H_2}$ is equal to

A. $\frac{H_1 H_2}{G_1 G_2}$

B. $\frac{G_1 G_2}{H_1 H_2}$

C. $\frac{H_1 H_2}{A_1 A_2}$

D. $\frac{A_1 A_2}{H_1 H_2}$

Answer: B

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9. Two A.M.'s A_1 and A_2, two G.M.'s G_1 and G_2 and two H.M's H_1 and H_2 are inserted between any two numbers, then $H_1^{-1} + H_2^{-1}$ equals

A. $A_1^{-1} + A_2^{-1}$

B. $G_1^{-1} + G_2^{-1}$

C. $\dfrac{G_1 G_2}{A_1 + A_2}$

D. $\dfrac{A_1 + A_2}{G_1 G_2}$

Answer: D

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10. If A is the arithmetic mean and p and q be two geometric means between two numbers a and b, then prove that :

$p^3 + q^3 = 2pq \text{ A}$

A. $\dfrac{2pq}{A}$

B. 2Apq

C. $2Ap^2q^2$

D. none of these

Answer: B

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11. If one G.M., G and two A.M.\'s p and q be inserted between two given quantities, show that $G^2 = (2p - q)(2q - p)$.

A. $(3p - q)(3q - p)$

B. $(2p - q)(2q - p)$

C. $(4p - q)(4q - p)$

D. none

Answer: B

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12. If a is the A.M. of $bandc$ and the two geometric mean are $G_1 and G_2$, then prove that $G13 + G23 = 2ab \cdot$

A. 1

B. 2

C. 3

D. 4

Answer: B

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13. If p, q, r are + ive, then the minimum value of $p^{\log q - \log r} + q^{\log r - \log p} + r^{\log p - \log q}$ is

A. 1

B. 3

C. 9

D. 16

Answer: B

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14. (i) The value of $x + y + z$ is 15. If a, x, y, z, b are in AP while the value of $\frac{1}{x} + \frac{1}{y} + \frac{1}{z}$ is $\frac{5}{3}$. If a, x, y, z b are in HP, then find a and b

(ii) If x,y,z are in HP, then show that

log $(x + z) + \log(x + z - 2y) = 2\log(x - z)$.

A. 1, 9

B. 3, 7

C. 7, 3

D. 9, 1

Answer: A::D

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15. If a,b,c,d are in H.P., then ab+bc+cd is equal to

A. 3ac

B. 3ad

C. (a + b) (c + d)

D. none

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

Answer: C

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17. If A, G & H are respectively te A.M., G.M. & H.M. of three positive numbers a, b, & c then the equation whose roots are a, b & c is given by

A. $x^3 - 3Ax^2 + G^3(3x - 1) = 0$

B. $x^3 - 3Ax^2 + 3\left(G^3 / H\right)x - G^3 = 0$

C. $x^3 + 3Ax^2 + 3\left(G^3 / H\right)x - G^3 = 0$

D. $x^3 - 3Ax^2 - 3\left(G^3 / H\right)x + G^3 = 0$

Answer: B

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18. In an H.P., $T_p = q(p+q)$, $T_q = p(p+q)$, then p and q are the roots of

A. $x^2 - T_{p+q}x + T_{pq} = 0$

B. $x^2 - T_{pq}x + T_{p+q} = 0$

C. $x^2 - 2T_{p+q}x + T_{pq} = 0$

D. $x^2 - T_{pq}x + 2T_{p+q} = 0$

Answer: B

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19. If four positive numbers a, b, c, d are in H.P. then which one of the following is true.

A. $a^n + c^n > 2b^n$

B. $a + d > b + c$

C. $(a/b) > (c/d)$

D. $b^n + d^n > 2c^n$

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

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20. The A.M., G.M. and H.M. between two positive numbers a and b are equal, then

A. a = b

B. ab = 1

C. $a > b$

D. $a < b$

Answer: A

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21. The AM, HM and GM between two numbers are (144)/(15), 15 and 12, but not necessarily in this order then, HM, GM and AM respectively are :

A. $15, 12, \frac{144}{15}$

B. $12, 15, \frac{144}{15}$

C. $\frac{144}{15}, 12, 15$

D. $\frac{144}{15}, 15, 12$

Answer: C

Watch Video Solution

22. If $2(y-a)$ is the harmonic mean between $y-x$ and $y-z$ then $x-a, y—a$ and $z-a$ are in

A. A.P.

B. G.P.

C. H.P.

D. none of these

Answer: B

Watch Video Solution

23. IF $a_1, a_2, a_3, \ldots . a_{10}$ be in AP and $h_1, h_2, h_3, \ldots . h_{10}$ be in HP. If $a_1 = h_1 = 2$ and $a_{10} = h_{10} = 3$, then find value of $a_4 h_7$.

A. 2

B. 3

C. 5

D. 6

Answer: D

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24. If a_1, a_2, a_3 and h_1, h_2, h_3 are the A.M.'s and H.M.'s between 2 and 3, then $a_2 h_2$ is equal to

A. 1

B. 4

C. 6

D. 8

Answer: C

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25. If $H_1, H_2, \ldots .., H_n$ be n harmonic means between a and b then $\frac{H_1 + a}{H_1 - a} + \frac{H_n + b}{H_n - b}$ is equal to

A. n

B. 2n

C. 3n

D. 4n

Answer: B

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26. If n is a root of the equation $(1-ab)x^2-\left(a^2+b^2\right)x-(1-ab)=0$ and n hormonic means are inserted between a and b, then the difference between the last and the first of the means equals

A. b - a

B. ab(b - a)

C. a(b - a)

D. ab(a - b)

Answer: B

Watch Video Solution

27. If $\frac{1}{b+c}, \frac{1}{c+a}$ and $\frac{1}{a+b}$ are in AP, then a^2, b^2 and c^2 are in

A. A.P.

B. G.P.

C. H.P.

D. none

Answer: A

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28. If three numbers are in G.P., then the numbers obtained by adding the middle number to each of these numbers are in

A. A.P.

B. G.P.

C. H.P.

D. none

Answer: C

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29. If three numbers are in H.P., then the numbers obtained by subtracting half of the middle number from each of them are in

A. A.P.

B. G.P.

C. H.P.

D. none

Answer: B

Watch Video Solution

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

A. A.P.

B. G.P.

C. H.P.

D. none

Answer: B

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31. If a, b, c, d be four numbers of which the first three are in AP and the last three are in HP then prove that ad=bc.

A. bc = ad

B. ac = bd

C. ab = cd

D. none

Answer: A

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32. If S_k denotes the sum of first k terms of a G.P. Then, $S_n, S_{2n} - S_n, S_{3n} - S_n$ are in

A. A.P.

B. G.P.

C. H.P.

D. none

Answer: B

Watch Video Solution

33. If x, y, z be in A.P., then $x + \frac{1}{yz}, y + \frac{1}{zx}, z + \frac{1}{xy}$ are in

A. A.P.

B. G.P.

C. H.P.

D. none

Answer: C

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34. Let the positive numebrs a,b,c,d be in A.P. Then abc, abd, acd, bcd re

(A) not in A.P., G.P., H.P. (B) in A.P. (C) in G.P. (D) in H.P.

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

B. in A.P.

C. in G.P.

D. in H.P.

Answer: D

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35. $\frac{1}{b-a}+\frac{1}{b-c}=\frac{1}{a}+\frac{1}{c}$ then a,b,c are in:

A. A.P.

B. G.P.

C. H.P.

D. H.P. and G.P. both

Answer: C

Watch Video Solution

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

A. A.P.

B. G.P.

C. H.P.

D. ab = cd

Answer: B

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

A. $-\frac{25}{109}$

B. $-\frac{35}{109}$

C. $-\frac{45}{109}$

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

Answer: C

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38. If $21\left(a^2+b^2+c^2\right)=(a+2b+4c)^2$ then a, b, c are in

A. A.P.

B. G.P.

C. H.P.

D. none of these

Answer: B

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

A. A.P.

B. G.P.

C. H.P.

D. none

Answer: C

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40. α, β, γ are the geometric means between ca, ab, ab, bc, bc, ca respectively. If a, b, c are in A.P. then $\alpha^2, \beta^2, \gamma^2$ are in

A. A.P.

B. G.P.

C. H.P.

D. none

Answer: B

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

A. A.P.

B. G.P.

C. H.P.

D. none of these

Answer: B

Watch Video Solution

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

A. A.P.

B. G.P.

C. H.P.

D. none of these

Answer: C

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43. If $a^x = b^y = c^z = d^u$ and a, b, c, d are in G.P. then x, y, z, u are in

A. A.P.

B. G.P.

C. H.P.

D. none of these

Answer: C

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44. If for an exponential function $y = a^x (a > 0, \neq 1) x_1, x_2, \ldots x_n$ form an A.P., then $y_1, y_2, \ldots y_n$ form a

A. A.P.

B. G.P.

C. H.P.

D. A.G.P.

Answer: B

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45. If a,b,c, are in A.P., b,c,d are in G.P. and c,d,e, are in H.P., then a,c,e are in

A. A.P.

B. G.P.

C. H.P.

D. none of these

Answer: B

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46. If x,1,z are in A.P. and x,2,z are in G.P., then x,4,z are in

A. A.P.

B. G.P.

C. H.P.

D. none of these

Answer: C

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47. If a,b,c are in A.P., a,x,b are in G.P. and b,y,c are in G.P. then a^2, b^2, y^2 are in

A. H.P.

B. G.P.

C. A.P.

D. none of these

Answer: C

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48. If a,b,c are in H.P., then $\frac{a}{a+c}, \frac{b}{c+a}, \frac{c}{a+b}$ will be in

A. A.P.

B. G.P.

C. H.P.

D. none of these

Answer: C

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

A. A.P.

B. G.P.

C. H.P.

D. none

Answer: C

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50. If $x > 1, y > 1, z > 1$ are in G.P. then $\frac{1}{a + Inx}, \frac{1}{1 + Iny}, \frac{1}{1 + Inz}$ are in (A) A.P. (B) H.P. (C) G.P. (D) none of these

A. A.P.

B. H.P.

C. G.P.

D. none of the above

Answer: B

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51. If x, y, z are in $G.P.$ $(x, y, z > 1)$, then $\frac{1}{2x + \log_e x}, \frac{1}{4x + \log_e y}, \frac{1}{6x + \log_{ez} z}$ are in

A. A.P.

B. G.P.

C. H.P.

D. none

Answer: C

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52. In an A.P., $T_1 = \log a, T_{n+1} = \log b, T_{2n+1} = \log c$, then a, b, c are in

A. A.P.

B. G.P.

C. H.P.

D. none

Answer: B

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53. If in a G.P. of 3n terms S_1, S_2, S_3 denote the sum of first n, sum of middle n terms and sum of last n terms respectively, then S_1, S_2, S_3 are in

A. A.P.

B. G.P.

C. H.P.

D. none

Answer: B

Watch Video Solution

54. If $\log(x+z)+\log(x-2y+z)=2\log(x-z), \quad \text{then} \quad x, y, z$ are in

A. H.P.

B. G.P.

C. A.P.

D. none of these

Answer: A

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55. If a, b, c are in H.P., then $a^2(b-c)^2, \frac{b^2}{4}(c-a)^2, c^2(a-b)^2$ are in

A. H.P.

B. G.P.

C. A.P.

D. none of these

Answer: C

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56. If $I_n = \int_0^{\pi} \frac{1 - \sin 2nx}{1 - \cos 2x} dx$ then $I_1, I_2, I_3, \ldots..$ are in

A. A.P.

B. G.P.

C. H.P.

D. none of these

Answer: A

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57. If $I_n = \int_0^{\pi/2} \frac{\sin^2 nx}{\sin^2 x} dx$ then $I_1, I_2, I_3, \ldots$ are in

A. A.P.

B. G.P.

C. H.P.

D. none of these

Answer: A

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58. If $I_n = \int_0^{\pi/4} \tan^n x \sec^2 x$ dx, then $I_1, I_2, I_3, \ldots.$ are in

A. A.P.

B. G.P.

C. H.P.

D. none of these

Answer: C

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59. Let the roots α, β of the equation $ax^2 + bx + c = 0$ satisfy $(\alpha + \beta)\alpha^2\beta^2 = \alpha^2 + \beta^2$, then (i) ab^2, ca^2, bc^2 and (ii) $\frac{a}{c}, \frac{b}{a}, \frac{c}{b}$ are in

A. A.P.

B. G.P.

C. H.P.

D. none of these

Answer: A

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60. If a, b, c be in A.P and a^2, b^2, c^2 in H.P., then

A. $-\frac{a}{2}$, b, c are in G.P.

B. a = b = c

C. a + b + c = 0

D. none

Answer: A::B

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61. If a, b, c are in H.P. then the value of $\left(\frac{1}{b}+\frac{1}{c}-\frac{1}{a}\right)\left(\frac{1}{c}+\frac{1}{a}-\frac{1}{b}\right)$ is

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

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

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

D. none

Answer: A::B::C

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62. The next term of the sequence 1,5,14,30,55,... is

A. 95

B. 90

C. 85

D. 91

Answer: D

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

A. -3

B. 0

C. 3

D. none of these

Answer: B

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64. If a,b, and c are in G.P then a+b,2b and b+ c are in

A. A.P.

B. G.P.

C. H.P.

D. none

Answer: C

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

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

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

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

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

Answer: B

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66. The sum of first n terms of the series $3.1 + 2^2 + 3.3^2 + 4^2 + \dots$ is $\dfrac{n(n+1)(4n-1)}{6}$ when n is even. The sum of first n terms when n is odd is

A. $\dfrac{1}{6}n(n+1)(4n+1)$

B. $\dfrac{1}{6}n(n+1)(4n+3)$

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

D. none

Answer: C

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67. We know that, if $a_1, a_2, \ldots, a_n$ are in H.P., then $\frac{1}{a_1}, \frac{1}{a_2}, \ldots, \frac{1}{a_n}$ are in A.P. and vice versa. If $a_1, a_2, \ldots, a_n$ are in A.P. with common difference d, then for any b (>0), the numbers $b^{a_1}, b^{a_2}, b^{a_3}, \ldots, b^{a_n}$ are in G.P. with common ratio b^d. If $a_1, a_2, \ldots, a_n$ are positive and in G.P. with common ratio r, then for any base b $(b > 0)$, $\log_b a_1, \log_b a_2, \ldots, \log_b a_n$ are in A.P. with common difference $\log_b r$.

1. If x, y and z are respectively the p_{th}, q_{th}, and r_{th} terms, respectively, of an A.P. and also of a G.P., then $x^{y-z} y^{z-x} z^{x-y}$ is equal to

a. p

b. q

c. r

d. 1

2. If a,b,c,d are in GP and $a^x = b^x = c^z = d^u$, then x, y, z, u are in

a. A.P.

b. G.P.

c. H.P.

d. none of these

Watch Video Solution

68. A.G.P. and H.P. have the same pth, qth and rth terms as a, b, c respectively, then the value of $a(b-c)\log a + b(c-a)\log b + c(a-b)\log c$ is equal to

A. pqr

B. abc

C. a + b + c

D. 0

Answer: D

View Text Solution

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

A. $\frac{a}{c} - \frac{c}{a}$

B. $\frac{a}{c}+\frac{c}{a}$

C. $\frac{b}{q}+\frac{q}{b}$

D. $\frac{b}{q}-\frac{q}{b}$

Answer: B

Watch Video Solution

70. 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

Watch Video Solution

71. If x, y, z are in A.P. then xth, yth and zth terms of any G.P. are in

A. A.P.

B. G.P.

C. reciprocals of these terms are in A.P.

D. none of these

Answer: B

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72. If T_p, T_q, T_r of an A.P. (G.P. or H.P.) are in A.P. (G.P. or H.P.) then p, q, r are in

A. A.P.

B. G.P.

C. H.P.

D. none

Answer: A

Watch Video Solution

73. If x, y, z, w $\in$ N be four consecutive terms of an A.P., then T_x, T_y, T_z and T_w of a G.P. are in

A. A.P.

B. G.P.

C. H.P.

D. none

Answer: B

Watch Video Solution

74. If in any progressin the difference of any two consecutive terms bears a consant ratio to their product, then the given progression is in

A. A.P.

B. G.P.

C. H.P.

D. none

Answer: C

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75. In any progression, if $\frac{t_2 t_3}{t_1 t_4} = \frac{t_2 + t_3}{t_1 + t_4} = 3\left(\frac{t_2 - t_3}{t_1 - t_4}\right)$, then t_1, t_2, t_3, t_4 are in

A. A.P.

B. G.P.

C. H.P.

D. none

Answer: C

Watch Video Solution

76. In a certain progression, three consecutive terms are 30, 24, 20. Then the next term of the progression is

A. 16

B. $17\frac{1}{7}$

C. 18

D. none

Answer: C

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77. If (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 the ratio of the first term and common difference of this A.P. is

A. $n/2$

B. $-n/2$

C. $n/3$

D. $-n/3$

Answer: B

Watch Video Solution

78. If $\cos(\theta-\alpha), \cos\theta, \cos(\theta+\alpha)$ are in H.P. then $\cos 2\theta$ is equal to

A. $1-\cos\alpha$

B. $1+\cos\alpha$

C. $1-2\cos\alpha$

D. $1+2\cos\alpha$

Answer: D

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79. If $A=\lim_{n\to\infty}\sum_{r=1}^{n}\tan^{-1}\left(\frac{1}{2r^2}\right)$, then A is equal to

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

B. 1

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

D. <1

Answer: A::D

Watch Video Solution

80. If $S_n=\sum_{r=1}^{n}\frac{2r+1}{r^4+2r^3+r^2}$, then $S_{20}=$

A. $\frac{220}{221}$

B. $\frac{420}{441}$

C. $\frac{439}{221}$

D. $\frac{440}{441}$

Answer: B

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

A. $-\frac{25}{109}$

B. $-\frac{35}{109}$

C. $-\frac{45}{109}$

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

Answer: D

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82. If $A = \underset{n \to \infty}{\text{Lt}} \sum_{r=1}^{n} \tan^{-1}\left(\frac{2r}{2 + r^2 + r^4}\right)$ then A is equal to

A. $\pi / 3$

B. $\pi / 4$

C. $\pi / 6$

D. none

Answer: B

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83. $\sum_{r=1}^{50} \left[\frac{1}{49 + r} - \frac{1}{2r(2r-1)}\right] =$

A. $\frac{1}{50}$

B. $\frac{1}{99}$

C. $\frac{1}{100}$

D. $\frac{1}{101}$

Answer: C

View Text Solution

84. if the equation $x^4 - 4x^3 + ax^2 + bx + 1 = 0$ has four positive roots, then find a.

A. (1, 3)

B. (6, -4)

C. (4, 2)

D. none of these

Answer: B

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85. Let Vr denote the sum of first r terms of an arithmetic progression (A.P.) whose first term is r and the common difference is (2r – 1).

Let $T_r = V_{r+1} - V_r - 2$ and $Q_{r+1} - T_r$ for $r = 1, 2.\ldots\ldots$

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

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

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

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

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

Answer: B

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86. Let V_r denote the sum of the first r terms of an arithmetic progression (AP) whose first term is r and the common difference is $(2r - 1). Let$ T_r=V_(r+1)-V_r-2 is always (A) an odd number (B) an even number (C) a prime number (D) a composite number

A. an odd number

B. an even number

C. a prime number

D. a composite number

Answer: D

Watch Video Solution

87. Let V_r denote the sum of the first r terms of an arithmetic progression (A.P.) whose first term is r and the common difference is (2r - 1). Let $T_r = V_{r+1} - V_r - 2$ and $Q_r = T_{r+1} - T_r$ for r = 1, 2, ...

Which one of the following is a correct statement ?

A. $Q_1, Q_2, Q_3, \dots$ are in A.P. with common difference 5

B. $Q_1, Q_2, Q_3, \dots$ are in A.P. with common difference 6

C. $Q_1, Q_2, Q_3, \dots$ are in A.P. with common difference 11

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

Answer: B

View Text Solution

88. Let A_1, G_1, H_1 denote the arithmetic, geometric and harmonic means, respectively, of two distinct positive numbers. For $n \geq 2$, let A_{n-1} and H_{n-1} has arithmetic, geometric and harmonic means as A_n, G_n, H_n respectively.

1. Which of the following statements is correct ?

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

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

C. $G_1 = G_2 = G_3 = \ldots..$

D. $G_1 < G_3 < G_5 < \ldots.$ and $G_2 > G_4 > G_6 > \ldots.$

2. Which one of the following statements is correct?

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

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

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

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

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89. Let A_1, G_1, H_1 denote the arithmetic, geometric and harmonic means, respectively, of two distinct positive numbers. For $n \geq 2$, let A_{n-1} and H_{n-1} has arithmetic, geometric and harmonic means as A_n, G_n, H_n respectively.

Which of the following statements is correct?

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

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

C. $A_1 = A_2 = A_3 = \ldots$ 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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90. Let A_1, G_1, H_1 denote the arithmetic, geometric and harmonic means, respectively, of two distinct positive numbers. For $n \geq 2$, let A_{n-1} and H_{n-1} has arithmetic, geometric and harmonic means as A_n, G_n, H_n respectively.

Which of the following statements is correct?

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

B. $H_1 < H_2 < H_3 < \dots$

C. $H_1 = H_2 = H_3 = \dots.$ and $H_2 < H_4 < H_6 < \dots.$

D. $H_1 < H_3 < H_5 < \dots.$ and $H_2 > H_4 > H_6 > \dots.$

Answer: B

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91. Let a_n denote the number of all n-digit numbers formed by the digits 0,1 or both such that no consecutive digits in them are 0. Let b_n be the number of such n-digit integers ending with digit 1 and let c_n be the number of such n-digit integers ending with digit 0. Which of the following is correct ?

A. $a_{17} = a_{16} + a_{15}$

B. $c_{17} \neq c_{16} + c_{15}$

C. $b_{17} \neq b_{16} + c_{16}$

D. $a_{17} = c_{17} + b_{16}$

Answer: A

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92. Let a_n denote the number of all n-digit positive integers formed by the digits 0, 1, or both such that no consecutive digits in them are 0. Let $b_n =$ The number of such n-digit integers ending with digit 1 and $c_n =$ Then number of such n-digit integers with digit 0.

The value of b_6 is

A. 7

B. 8

C. 9

D. 11

Answer: B

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PROBLEM SET - 5 (Assertion/Reason)

1. Suppose four distinct positive numbers a_1, a_2, a_3, a_4 are in G.P. Let $b_1 = a_1 + , a_b = b_1 + a_2, b_3 = b_2 + a_3$ and $b_4 = b_3 + a_4$.

Statement -1 : The numbers b_1, b_2, b_3, b_4 are neither in A.P. nor in G.P.

Statement -2: The numbers b_1, b_2, b_3, b_4 are in H.P.

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PROBLEM SET - 5 (TRUE AND FALSE)

1. In a set of four number, the first three are in GP & the last three are in A.P. with common difference 6. If the first number is the same as the fourth, find the four numbers.

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2. If one G.M., G and two A.M.\'s p and q be inserted between two given quantities, show that $G^2 = (2p - q)(2q - p)$.

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3. a, b, c are in A.P., G.P. or H.P. according as the value of $\frac{a-b}{b-c}$ is equal to $\frac{a}{a}, \frac{a}{b}, \frac{a}{c}$ respectively.

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4. First three of four numbers are in A.P., the last three in H.P. The four numbers are proportional.

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

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PROBLEM SET - 5 (FILL IN THE BLANKS)

1. The sum of three numbers in G.P. is 14. If the first to terms are each increased by 1 and the third term decreased by 1, the resulting numbers are in A.P. find the numbers.

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2. a, b, c are the first three terms of a geometric series. If the harmonic mean of a and b is 12 and that of b and c is 36, then the first five terms of the series are....................

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SELF ASSESSMENT TEST

1. Let T_r be the rth term of an AP, for r=1,2,... If for some positive integers m and n, we have $T_m = \frac{1}{n}$ and $T_n = \frac{1}{m}$, the T_{m+n} equals

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

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

C. 1

D. 0

Answer: C

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

A. 300

B. 200

C. 100

D. 150

Answer: B

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3. If the numbers a, b, c, d, e form an A.P. , then find the value of $a - 4b + 6c - 4d + e$.

A. 2

B. 1

C. 0

D. 4

Answer: C

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4. If $a_1, a_2, \ldots, a_{n+1}$ are in A.P., then $\frac{1}{a_1a_2} + \frac{1}{a_2a_3} + \ldots + \frac{1}{a_na_{n+1}}$ is

A. $\frac{n-1}{a_1a_{n+1}}$

B. $\frac{n+1}{a_1a_{n+1}}$

C. $\frac{1}{a_1a_{n+1}}$

D. $\frac{n}{a_1a_{n+1}}$

Answer: D

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

A. $\log_3 5$

B. $\log_2 5$

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

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

Answer: B

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6. In a G.P. if the $(m+n)^{th}$ term be p and (m - n)th term be q, then its m^{th} term is

A. mn

B. $\sqrt{mn}$

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

D. 0

Answer: B

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7. If the fifth term of a G.P. is 2, then write the product of its 9 terms.

A. 1024

B. 512

C. 256

D. 400

Answer: B

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8. If $1 + \sin x + \sin^2 x + \ldots\ldots + \infty = 4 + 2\sqrt{3}, 0 < x < \pi \text{ and } x \neq \frac{\pi}{2}$, then x =

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

B. $\frac{\pi}{6}, \frac{\pi}{3}$

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

D. $\frac{\pi}{3}, \frac{5\pi}{6}$

Answer: A

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9. If x,y,z are in HP, then $\log(x+5)+\log(x-2y+z)$ is equal to

A. $3\log(x-z)$

B. $2\log(x-z)$

C. $\log(x-z)$

D. $4\log(x-z)$

Answer: B

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10. If H be the harmonic mean between x and y, then show that

$$\frac{H+x}{H-x}+\frac{H+y}{H-y}=2$$

A. 1

B. 2

C. 4

D. a + b

Answer: B

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11. In a H.P., p^{th} term is q and q^{th} term is p then pq^{th} term is

A. p

B. 1

C. pq

D. q

Answer: B

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12. The harmonic mean of $\frac{a}{1-ab}$ and $\frac{a}{1+ab}$ is

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

B. $\frac{a}{\sqrt{1-a^2b^2}}$

C. a

D. b

Answer: C

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13. If b^2, a^2, c^2 are in A.P., then $a+b, b+c, c+a$ will be in

A. G.P.

B. A.P.

C. H.P.

D. none of these

Answer: C

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14. If $\frac{x+y}{2}, y, \frac{y+z}{2}$ are in H.P., then x, y, z are in

A. H.P.

B. G.P.

C. A.P.

D. none of these

Answer: B

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15. If a,b,c are in A.P., then $2^{ax+1}, 2^{bx+1}, 2^{cx+1}, x \in R$, are in

A. A.P.

B. G.P. if $x < 0$

C. G.P. if $x > 0$

D. G.P. for all $x \neq 0$

Answer: D

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16. If a, ,b c, are in G.P., then $\log_a n, \log_b n, \log_c n$are in

A. G.P.

B. A.P.

C. H.P.

D. none of these

Answer: C

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17. For all $n \geq 1,$ prove that

$$\frac{1}{1.\ 2}+\frac{1}{2.\ 3}+\frac{1}{3.\ 4}+\vdots+\frac{1}{n(n+1)}=\frac{n}{n+1}$$

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

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

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

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

Answer: A

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18. The value of $\sum_{i=1}^{n} \sum_{j=1}^{i} \sum_{k=1}^{j} 1$ is

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

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

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

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

Answer: D

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19. $11^3 + 12^3 + 13^3 + \ldots\ldots\ldots\ldots + 20^3$ is

A. divisible by 5

B. an odd integer divisible by 5

C. an even integer not divisible by 5

D. an odd integer which is not divisible by 5

Answer: B

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20. For any integer $n \geq 1$, the sum $\sum_{k=1}^{n} k(k+2)$ is equal to

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

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

C. $\frac{n(n+1)(2n+7)}{6}$

D. none of these

Answer: C

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21. Find the sum of first n terms of the series $1^3 + 3^3 + 5^3 + \dots$

A. $n^2(2n^2 - 1)$

B. $2n^4 + 3n$

C. $n(n-1)$

D. none of these

Answer: A

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

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

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

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

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

Answer: C

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

A. 18 months

B. 19 months

C. 20 months

D. 21 months

Answer: D

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

A. -150

B. 150 times the 50th term

C. 150

D. 0

Answer: D

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

A. 22

B. 23

C. 24

D. 25

Answer: D

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

A. 9

B. 0

C. 1

D. 18

Answer: A

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27. Let S_k, where $k = 1, 2$,....,100, denotes the sum of the infinite geometric series whose first term is k. $\frac{k-1}{k!}$ and the common ratio is $\frac{1}{k}$

. Then, the value of $\frac{100^2}{100!} + \sum_{k=2}^{100} \left| \left(k^2 - 3k + 1\right) S_k \right|$ is....

A. 3

B. 2

C. 1

D. 0

Answer: A

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

A. 0

B. 1

C. 11

D. 100

Answer: A

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

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

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

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

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

Answer: C

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MISCELLANEOUS EXERCISE (MATCHING ENTRIES)

1. If $\dfrac{a^{n+1}+b^{n+1}}{a^n+b^n}$ is ,Match A to B

	List A		List B
(a)	A.M. of a and b	1.	-1
(b)	G.M. of a and b	2.	0
(c)	H.M. of a and b, then n $=$	3.	$-1/2$

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2.

List A

(a) In an A.P.,S_p = a, S_q = b, S_r = c, then $\frac{a}{q}(q-r)+\frac{b}{q}(r-p)+\frac{c}{r}(p-$

(b) In a G.P.,T_r = R, T_s = S, T_t = T, then $R^{s-t}.\ S^{t-r}.\ T^{r-s}=$

(c) In an H.P.T_p = a, T_p = b, T_r = c, then $bc(q-r)+ca(r-p)+ab(p$

(d) If both in A.P. and G.P.,T_m = x, T_n = y, T_p = z then $x^{y-z}.\ y^{z-x}.\ z^x$

(e) If both in G.P. and H.P.,T_p = a, T_q = b, T_r = c, then
$a(b-c)\log a+b(c-a)\log b+c(a-b)\log c=$

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3. $a, b, c \in R$ and a, b, c are in A.P. match the entries of column-I with those of column-II.

	Column-I		Column-II
(a)	a^2, b^2, c^2 are in A.P.	(p)	$a = b = c$
(b)	a^2, b^2, c^2 are in G.P.	(q)	$-\frac{1}{2}$a, b, c are in G.P
(c)	a^2, b^2, c^2 are in H.P.	(r)	a, b, $-\frac{1}{2}$c are in G.P.
(d)	$a + b + c = 3/2$	(s)	$b = 1/2$

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4. For $0 < \theta < \frac{\pi}{4}$, let $x = \sum_{n=0}^{\infty} \sin^{2n}\theta$, $y = \sum_{n=0}^{\infty} \cos^{2n}\theta$, then match the entries of column-I with column-II

	Column-I		Column-II
(a)	$\sum_0^{\infty} \sin^{2n}\theta \cos^{2n}\theta$	(p)	$\frac{xy^2}{xy^2 - 1}$
(b)	$\sum_0^{\infty} \tan^{2n}\theta$	(q)	$\frac{y}{y - x}$
(c)	$\sum_0^{\infty} \sin^{2n}\theta \cos^{4n}\theta$	(r)	$\frac{xy}{xy - 1}$
(d)	$\sum_0^{\infty} \cos^{2n}\theta \sin^{4n}\theta$	(s)	$\frac{x^2y}{x^2y - 1}$

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MISCELLANEOUS EXERCISE (ASSERTION/REASON)

1. Suppose four distinct positive numbers a_1, a_2, a_3, a_4 are in G.P. Let $b_1 = a_1 + , a_b = b_1 + a_2, b_3 = b_2 + a_3$ and $b_4 = b_3 + a_4$.

Statement -1 : The numbers b_1, b_2, b_3, b_4 are neither in A.P. nor in G.P.

Statement -2: The numbers b_1, b_2, b_3, b_4 are in H.P.

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