

MATHS

BOOKS - PATHFINDER MATHS (BENGALI ENGLISH)

PROGRESSION AND SERIES

Question Bank

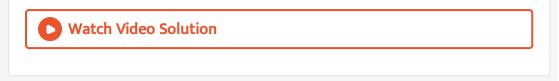
1. A sequence of no. a_1, a_2, a_3 satisfies the relation $a_n = a_{n-1} + a_{n-2}$

for $n\geq 2$. Find a_4 if $a_1=a_2=1$.

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

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



4. If the sum of n terms of an A.P. is $nP + rac{1}{2}n(n-1)$ Q, where P and Q

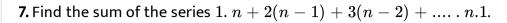
are constants , find the common difference.

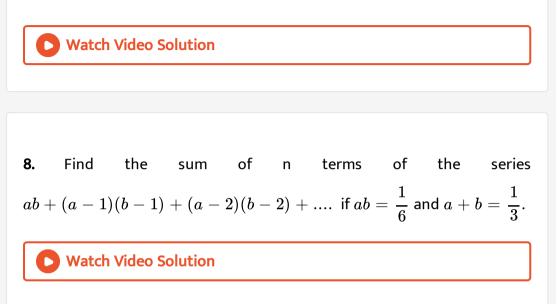
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5. The sum of n terms of two arithmetic progressions are in the ratio (3n+8):(7n+15). Find the ratio of their $12^{t}h$ terms.

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





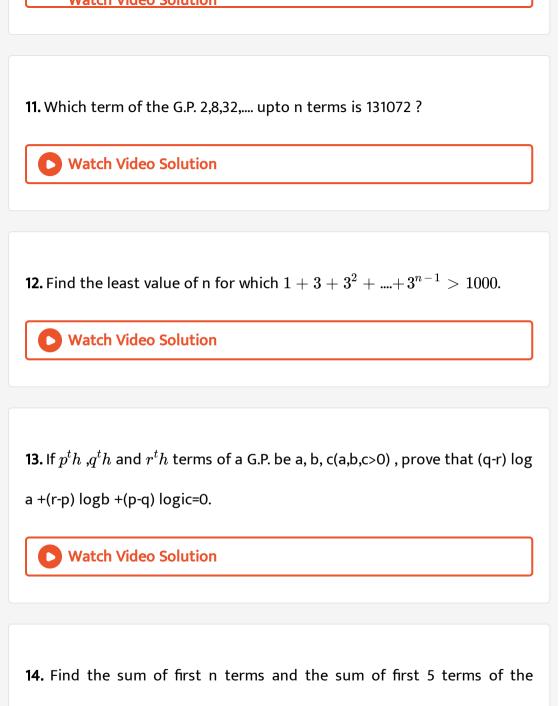
9. Insert 6 no. between 3 and 24 such that the resulting sequence is an

A.P.



10. Between two no. whose sum is 13/6, an even no. of A.M's are inserted .

If the sum of means exceeds their no. by unity find the no. of means.



geometric series 1+2/3+4/9+

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

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

interval.

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

Find the common ratio and the terms.

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



19. Find the natural no. a for which $\sum_{k=1}^n f(a+k) = 16(2^n-1)$ where

the function f satisfies f(x+y)=f(x)f(y) for all natural no. x,y, and further f(1)=2.

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

and Oltblt1.

21. If
$$\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \dots$$
 up to $\infty = \frac{\pi^2}{6}$, then, find
 $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots$ up to ∞
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22. If $\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \dots$ up to $\infty = \frac{\pi^2}{6}$, then, find
 $1 - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots$ up to ∞ .
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23. Find the sum of the series upto n terms
$$\left(\frac{2n+1}{2n-1}\right) + 3\left(\frac{2n+1}{2n-1}\right)^2 + 5\left(\frac{2n+1}{2n-1}\right)^3 + \dots$$

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

to infinite.

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

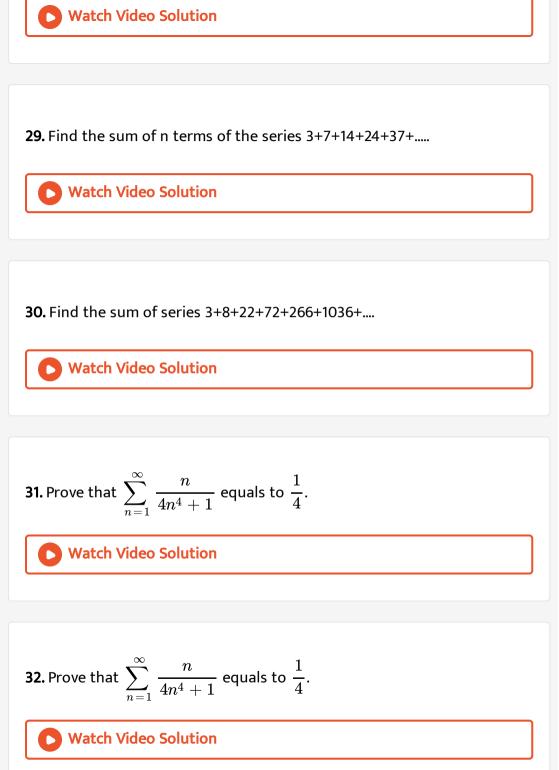
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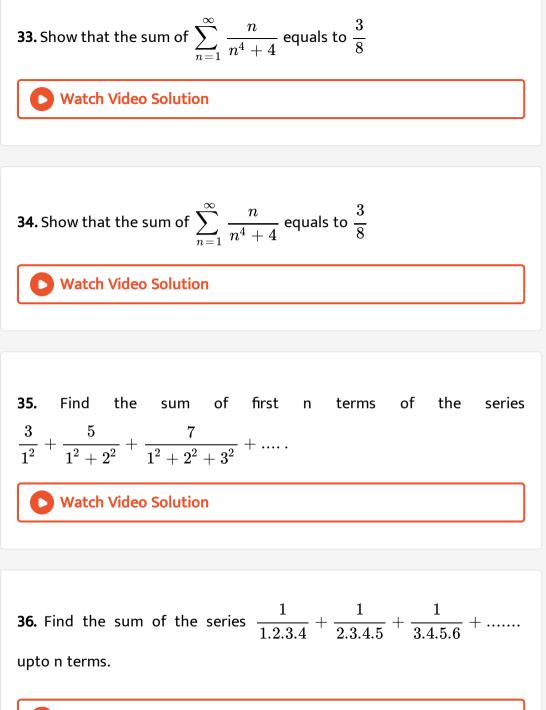
27. Prove that the sum of n arithmatic means between two numbers is n

times the single A.M between them.



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





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



$$\left[(1+a)(1+b)(1+c)
ight]^7>7^7a^4b^4c^4.$$

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

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

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



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

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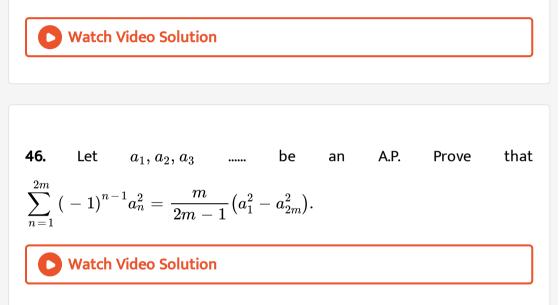
43. N arithmetic means are inserted in between x and 2y and then between 2x and y. In case the rth means in each case be equal, then find the ratio x/y.



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

45. If s_1, s_2 and s_3 are the sum of first n,2n,3n terms respectively of an

arithmetic progression, then show that $s_3 = 3(s_2 - s_1)$.



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



48. If G_1, G_2 are geometric means , and A is the arithmetic mean between

two positive no. then show that
$$rac{G_1^2}{G_2}+rac{G_2^2}{G_1}=2A.$$

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49. Show that
$$\begin{vmatrix} a & b & a\alpha + b \\ b & c & b\alpha + c \\ a\alpha + b & b\alpha + c & 0 \end{vmatrix}$$
 =0 if α is not the root of the

equation $\left(ax^2+2bx+c
ight)=0$ then a,b,c are in G.P.

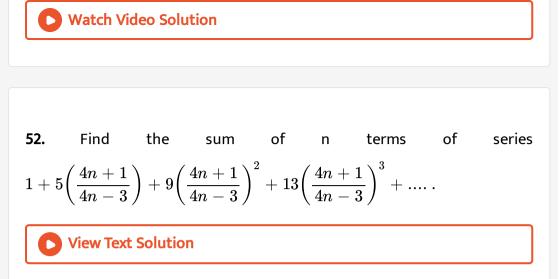
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50. If
$$S_n=1+rac{1}{2}+rac{1}{2^2}+....$$
 $+rac{1}{2^{n-1}}$. Calculate the least value of n such that $S_n=2-S_n<rac{1}{100}.$

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51. Prove that the number of the sequence 121,12321,1234321,..... are each a

perfect square of odd integer.



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

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

55. Find
$$1 + 2^2x + 3^2x^2 + 4^2x^3 + \dots$$
 to $\infty |x| < 1$.
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56. Find the sum of 1st n terms of the sequence 3,6,15,42,123,...
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57. Let S_n denote the sum of first n terms of the sequence 1,5,14,30,55,....

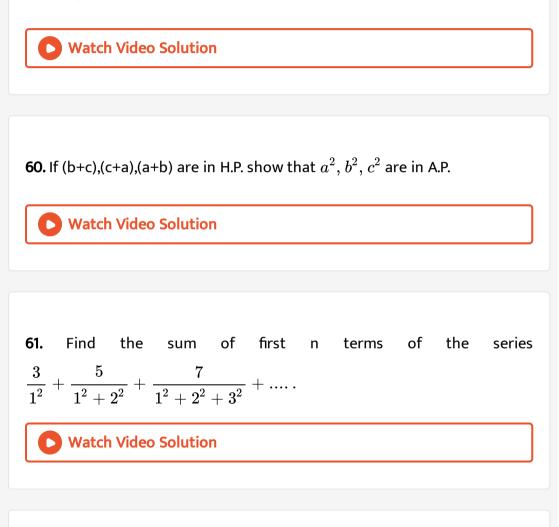
then prove that $S_n-S_{n-1}=\sum n^2.$

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

59. How many terms of the series 54+51+48+45+ ... must be taken to make

513 ? Explain the double answer.



62. If
$$0 < heta < rac{\pi}{2}$$
 then find the least value of $an heta + \cot heta$

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

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

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

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

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

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

A. 44318

 $B. \log_2 5$

 $C. \log_3 5$

D. 44257

Answer: B



69. If the ratiio of the sum of n terms ofd two AP's is (3n+1):(2n+3) then

find the ratio of their 11th term

A. (45:64)

B. 3:4

C. (64:45)

D. 4:3

Answer: C

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

Answer: D

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

A.
$$rac{1}{2}np(np+1)$$

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

 $\mathsf{C.}\,np(n+1)$

D. none of these

Answer: A

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72. 戻

Answer the following question based on above passage:

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

A. 100

B. -5050

C. 5050

D. -100

Answer: B

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

A. AP

B. GP

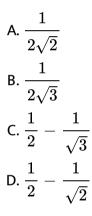
C. HP

D. none of these

Answer: B



74. Suppose a,b,c are in A.P and a^2, b^2, c^2 are in G.P. If a < b < c and $a + b + c = rac{3}{2}$ then the value of a is



Answer: D



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

A. 2		
B. 3		
C. 4		
D. 9		

Answer: A



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

A. 5

B. 3/5

C. 8/5

D. 1/5

Answer: C

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

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

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

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

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

Answer: C

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

real number, then a,b,c are in

A. A.P

B. G.P.

C. H.P.

D. none of these

Answer: C

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

A. AP

B. GP

C. HP

D. None of these

Answer: C

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

A. AP

B. GP

C. HP

D. None of these

Answer: A

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

A. a positive integer

B. divisible by n

C. equal to n+1/m

D. never less than n

Answer: D



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

A. 50

- $B.(50)^2$
- $C.(50)^3$
- $D.(50)^4$

Answer: A



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

(c+d) satisfies the relation:

 $egin{aligned} \mathsf{A}.\,0&\leq M\leq 1\ \mathsf{B}.\,1&\leq M\leq 2\ \mathsf{C}.\,2&\leq M\leq 3\ \mathsf{D}.\,3&\leq M\leq 4 \end{aligned}$

Answer: A

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

A. $n(c)^{rac{1}{n}}$ B. $(n+1)c^{rac{1}{n}}$ C. $2nc^{rac{1}{n}}$ D. $(n+1)(2c)^{rac{1}{n}}$

Answer: A

85. The greatest value x^2y^3 is, where x > 0 and y > 0 are connected by

the relation 3x+4y=5



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

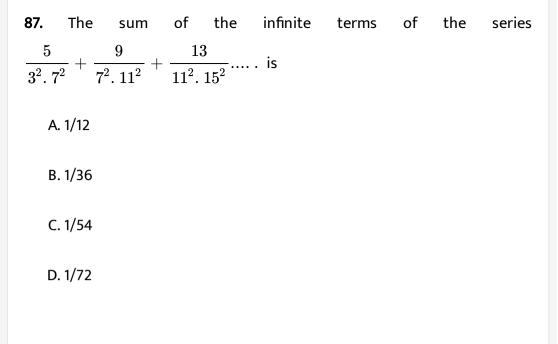
A. S=1088/545

B. S=545/1088

C. S=1056/545

D. S=545/1056

Answer: A



Answer: D

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

A. 2

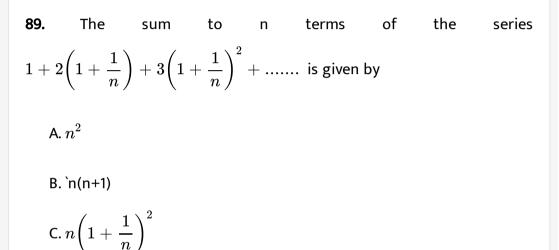
B. 3

C. 4

D. 6

Answer: B



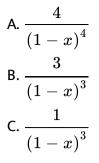


D. none of these

Answer: A



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



D. none of these

Answer: C



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

A. 0

B. 1

C. 2

D. none of these

Answer: B

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

A. 9

B. 3

C. 44472

D. none of these

Answer: A

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

A. $x\,\leq\,10$

 ${\sf B.} - 10 < x < 0$

 ${\sf C}.\,0 < x < 10$

 $\mathsf{D.}\,x<10$

Answer: C



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

A. 1

B. 2

C. 44257

D. 44318

Answer: A

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

A. -2,-32

B. -2,3

C. -6,3

D. -6,-32

Answer: A

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96. If f(x) is a function satisfying f(x+y)=f(x)f(y) for all $x,y \in N$ such that f(1)

=3 and $\sum_{x=1}^n f(x) = 120$, then the value of n is

A. 4

B. 5

C. 6

D. none of these

Answer: A

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

A.
$$rac{8}{81} ig[10^{n+1} - 9n - 10 ig]$$

B. $rac{8}{81} ig[10^n - 9n - 10 ig]$
C. $rac{8}{81} ig[10^{n+1} - 9n + 10 ig]$

D. none of these

Answer: A

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

When n is odd the sum is

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

B. $rac{n(n-1)(2n-1)}{6}$
C. $rac{n(n+1)^2}{2}$
D. $rac{n^2(n+1)}{2}$

Answer: A

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

A. 3100

B. 3600

C. 3050

D. 3500

Answer: C

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100.
$$\frac{1}{2} + \frac{3}{4} + \frac{7}{8} + \frac{15}{16} + \dots \cdot to$$
 n terms =
A. $2^n - 1$

B. 2n - n - 1

$$\mathsf{C.}\, 2^{-\,n}+n-1$$

D. none of these

Answer: C



101.

$$0< heta<rac{\pi}{2}, \hspace{0.3cm} ext{if}\hspace{0.3cm} x=\sum_{n=0}^{\infty}\cos^{2n} heta, y=\sum_{n=0}^{\infty}\sin^{2n} heta, z=\sum_{n=0}^{\infty}\cos^{2n} heta\sin^{2n} heta$$

B. xyz=xy+z

C. xyz=yz+x

D. none of these

Answer: B

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

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

 $\mathsf{B.}\, f_n^2(1)$

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

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

Answer: C



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

A. 2,4

B. 4,6

C. 6,8

D. 8,10

Answer: 2

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

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

B. $rac{2}{3}n(n+1)(2n-1)-n$
C. $rac{2}{3}n(n-1)(2n-1)-n$

D. none of these

Answer: 2

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105. If the sum of an infinitely decreasing GP is 3, and the sum of the

squares of its items is 9/2, the sum of the cubes of the terms is.

A. 105/13

B. 108/13

C. 729/8

D. none of these

Answer: 2



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

A. 99.2^{100}

 $B.\,100.2^{100}$

 $C.1 + 99.2^{100}$

D. none of these

Answer: 3

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107. If A_1,A_2 be two AM's and G_1,G_2 be the two GM's between two number a and b , then ${A_1+A_2\over G_1G_2}$ is equal to

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

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

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

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

Answer: 3

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108. If H_1 , H_2 , H_3 , H_n be n harmonic means between a and b then $\frac{H_1 + a}{H_1 - a} + \frac{H_n + b}{H_n - b} =$ A. 0 B. n C. 2n D. 1

Answer: 3

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

A. a=b+c

B. b=c+a

C. c=a+b

D. a=b=c

Answer: 4

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110. If between 1 and 1/31 there are n H.M's and ratio of 7th and $\left(n-1
ight)^th$

harmonic means is 9:5, then values of n is

A. 12

B. 13

C. 5

D. 14

Answer: 4

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

A. -1,-1/2,0

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

C. 0,-1/2,-1

D. none of these

Answer: 3

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

A. 33/4

B. 44504

C. 44/9

D. 44/8

Answer: 3

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

A. (0,1)

 $B.(1,\infty)$

 $\mathsf{C}.(0,\infty)$

D. none of these

Answer: 1&2



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

are also in AP, then

A. $b^2 = ac$ B. $a^2 + b^2 + c^2 = ab + bc + ca$ C. $a^3 + b^3 + c^3 = 3abc$ D. $\sin^{-1}a, \sin^{-1}b, \sin^{-1}c$

Answer: 1,2,3&4



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

A.
$$ad < bc$$

B. $a + c < b + d$
C. $a + d = b + c$
D. $(a + 1)(d + 1) < (b + 1)(cx + 1)$

Answer: 1,3&4

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

A. a=1/2

B. b=8/3

C. c=9/2

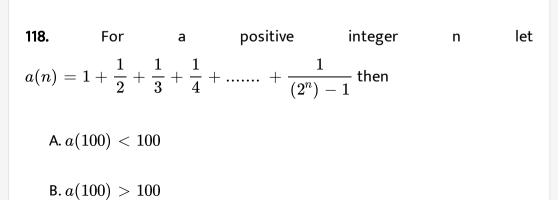
D. e=0

Answer: 1,2,3&4

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

A. $T_{p+q}=pq$ B. $T_{pq}=p+q$ C. $T_{p+q}>T_{pq}$ D. $T_{pq}>T_{p+q}$

Answer: 1,2&3



C.a(200) < 100

D.a(200) > 100

Answer: 1&4

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

- A. two such GP are possible
- B. it must be a decreasing GP
- C. the common ratio is always rational
- D. the first term is always an even integer

Answer: 1,3&4

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

A. a=b=c B. $a \ge b \ge c$ C. a+c=b D. $ac - b^2 = 0$

Answer: 1,2&4

121. If a,b,c be in H.P prove that

$$\left(\frac{1}{a} + \frac{1}{b} - \frac{1}{c}\right) \left(\frac{1}{b} + \frac{1}{c} - \frac{1}{a}\right) = \frac{4}{ac} - \frac{3}{b^2}$$

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

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

D. none of these

Answer: 1,2&3

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122. Which one of the following statements is correct ?

- A. $G_1 > G_2 > G_3 > \dots$
- B. $G_1 < G_2 < G_3 < ...$
- $\mathsf{C}.\,G_1 = G_2 = G_3 =$
- D. $G_1 < G_3 < G_5 < ...$ and $G_2 > G_4 > G_8 > ...$

Answer: C

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

A.
$$A_1 > A_2...$$
 .
B. $A_1 > A_2 > A_3 > ...$
C. $A_1 > A_3 > A_5 > ...$ and $A_2 < A_4 < A_6 < ...$.
D. $A_1 < A_3 < A_5 < ...$ and $A_2 > A_4 > A_6 > ...$

Answer: A

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124. Which one of the following statements is correct ?

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

B. H_1ltH_2ltH_3lt....

 $\mathsf{C}.\, H_1 > H_3 > H_5 > \dots$ 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



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

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

B. $rac{1}{12}n(n+1)\left(3n^2+n+1
ight)$
C. $rac{1}{2}n\left(2n^2-n+1
ight)$
D. $rac{1}{3}n\left(2n^3-2n+3
ight)$

Answer: B



126. T_r is always

A. an odd number

B. an even number

C. a prime number

D. a composite number

Answer: D

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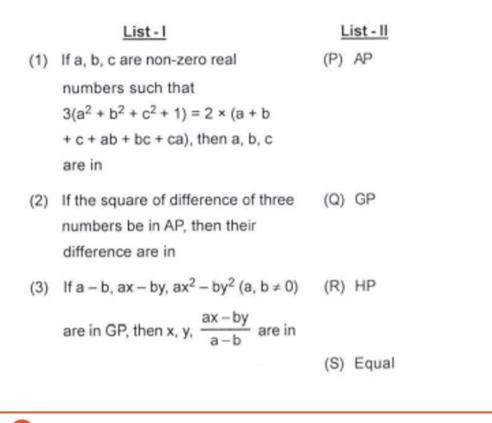
127. Which one of the following statements is correct?

- A. $Q_1, Q_2, Q_3...$ are in AP with common differences 5
- B. $Q_1, Q_2, Q_3...$ are in AP with common differences 6
- C. $Q_1, Q_2, Q_3...$ are in AP with common differences 11

D.
$$Q_1 = Q_2 = Q_3 = ...$$

Answer: B

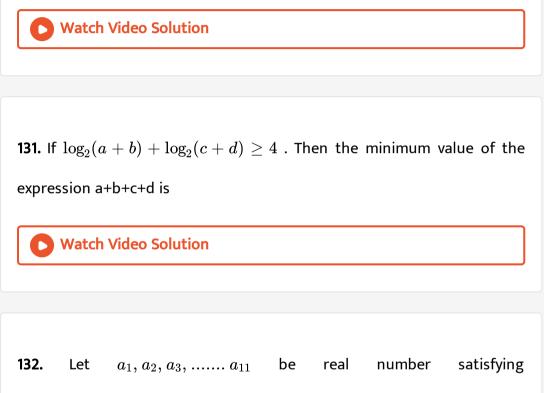
128. Match List-I with List-II



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129. The roots of equation $x^2 + 2(a-3)x + 9 = 0$ lie between -6 and 1 and 2 , h_1, h_2, \ldots, h_{20} [a] are in HP where [a] denotes the integral part of a and 2, a_1, a_2, \ldots, a_{20} ,[a] are in AP, then $\left(\frac{a_3h_{18}}{3}\right)$ is equal to

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



 $a_1 = 15, 27 - 2a_2 > 0$ and $a_k = 2a_{k-1} - a_{k-2}$ for k=3,4,....11. If $\frac{a_1^2 + a_2^2 + \dots + a_{11}^2}{11} = 90$, then the value of $\frac{a_1 + a_2 + \dots + a_{11}}{11}$ is equal

to

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



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

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

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136. Does there exist a GP containing 27,8 and 12 as three of its terms ? If

it exists, how many such progressions are possible ?

137. The sum of the squares of three distinct real numbers, which are in

GP is $S^2.$ If their sum is lpha S , show that $lpha^2 \in \left(rac{1}{3},1
ight) \cup (1,3).$

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138. Prove that the three successive terms of a GP will form the sides of a

triangle if the common ratio satisfies the inequality $rac{1}{2}ig(\sqrt{5}-1ig) < t < rac{1}{2}ig(\sqrt{5}+1ig).$

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139. If $(m+1)^t h$, $(n+1)^t h$ and $(r+1)^t h$ terms in AP are in GP m,n,r are

in HP ,show that the ratio of the common difference to the first term of

the AP is
$$\left(-\frac{2}{n}\right)$$
.

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

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141. Show that $\frac{1^4}{13} + \frac{2^4}{3.5} + \frac{3^4}{5.7} + \dots + \frac{n^4}{(2n-1)(2n+1)} = \frac{n(4n^2 + 6n + 5)}{48} + \frac{1}{160}$. Watch Video Solution

142. Solve the following equations for x and y

$$\log_{10} \times + \frac{1}{2}\log_{10} \times + \frac{1}{4}\log_{10} \times + \dots = y$$
 and $\frac{1+3+5+\dots+(2y+10)}{4+7+10+\dots+(3y+10)}$
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143. Find the sum of the series $rac{1}{1.3}+rac{2}{1.3.5}+rac{3}{1.3.5.7}$... up to infinity

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144. If
$$\sum\limits_{r=1}^n T_r = rac{n}{8}(n+1)(n+2)(n+3)$$
 then find $\sum\limits_{r=1}^n rac{1}{T_r}$

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

A. \log_4^3

 $B. \log_3 4$

 $\mathsf{C.1} - \log_3 4$

 $D. \log_3 0.25$

Answer: C

146. If the sum of the first 2n terms of the AP 2,5,8.....is equal to the sum of

the first n terms of the AP 57,59,61,then n equals

A. 10

B. 12

C. 11

D. 13

Answer: C

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

A. [1,5]

B. [2,5]

C. [5,12]

D. $[12,\infty]$

Answer: D



148. If an AP $a_7=9$ and $a_1a_2a_7$ is least , then common difference is

A. 13/20

B. 23/20

C. 33/20

D. 43/20

Answer: C



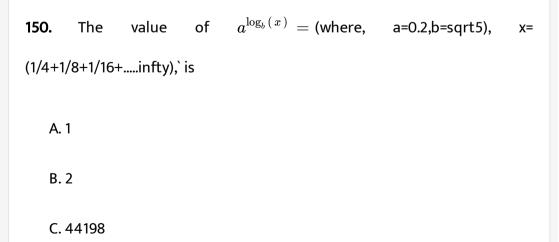
149. Consider an infinite geometric series with first term a and common ratio r, if its sum is 4 and the second term is 3/4 then

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

B. $a = 2, r = \frac{3}{8}$
C. $a = \frac{3}{2}, r = \frac{1}{2}$
D. $a = 3, r = \frac{1}{4}$

Answer: D





Answer: D



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

A. is positive

B. is zero

C. is negative

D. has no fixed sign

Answer: A



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

A. Not in AP/GP/HP

B. in AP

C. in GP

D. in HP

Answer: D

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

A. 0

B. 1

C. 2

D. 3

Answer: C

154. If $x_1 > 0, i = 1, 2.....50$ and $x_1 + x_2 +x_{50} = 50$ then the minimum value of $\frac{1}{x_1} + \frac{1}{x_2} +\frac{1}{x_{50}}$ equals to. A. 150 B. 100 C. 50 D. $(50)^2$

Answer: C

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

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

B. 3

C. 2

D. 44198

Answer: A

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

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

D. none of these

Answer: B

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

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

B. $n(8n^3 + 11n^2 - n - 3)$
C. $n(2n^3 + 8n^2 + 7n - 2)$

D. none of these

Answer: C

158. Find the sum of first n terms of the series

$$\frac{3}{1^2} + \frac{5}{1^2 + 2^2} + \frac{7}{1^2 + 2^2 + 3^2} + \dots$$
A. $\frac{6n}{n+1}$
B. $\frac{9n}{n+1}$
C. $\frac{12n}{n+1}$

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

Answer: A



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

A. 44201

B. 19/7

C. 44396

D. none of these

Answer: B

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

A. a=d/2

B. a=d

C. a=2d

D. none of these

Answer: C

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

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

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

C. all p and r

D. no p and r

Answer: A

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

 $A. \pm \frac{\pi}{3}, \pm \frac{\pi}{6}$ $B. \pm \frac{\pi}{3}, \pm \pi$ $C. \pm \frac{\pi}{3}, \pm \frac{2\pi}{3}$

D. none of these

Answer: A

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

A. 255

B. 127

C. 60

D. none of these

Answer: A

C. 0

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164.If $a_n > 1$ forall $n \in N$,then $\log_{a_2} a_1 + \log_{a3} a_2 + \dots + \log_{an} a_{n-1} + \log_{a1} a_n$ hastheminimumvalueA. NB. 2

D. none of these

Answer: A

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165. Let
$$S_k = \lim_{n \to \infty} \sum_{i=0}^n \frac{1}{(k+1)^i}$$
. Then $\sum_{k=1}^n kS_k$ equals
A. $\frac{n(n+1)}{2}$
B. $\frac{n(n-1)}{2}$
C. $\frac{n(n+2)}{2}$
D. $\frac{n(n+3)}{2}$

Answer: C

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

C. HP

D. none of these

Answer: A

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

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

D. none of these

Answer: A



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

A. 2489

B. 4735

C. 2317

D. 2632

Answer: D



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

of a+b+c is

A. 1

B. 3

C. 5

D. 9

Answer: C

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

A. 99

B. 50

C. 199

D. 100

Answer: C

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

A.
$$rac{nig(n^2+2ig)(3n+1)}{24}$$

B. $rac{nig(n^2-2ig)(3n+1)}{24}$
C. $rac{nig(n^2-1ig)(3n+4)}{24}$

D. none of these

Answer: D

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

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

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

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Answer: B

173. The sum of 10 terms of the series

$$\left(x + \frac{1}{x}\right)^{2} + \left(x^{2} + \frac{1}{x^{2}}\right)^{2} + \left(x^{3} + \frac{1}{x^{3}}\right)^{2} + \dots \text{ is}$$
A. $\left(\frac{x^{20} - 1}{x^{2} - 1}\right) \left(\frac{x^{22} + 1}{x^{20}}\right) + 20$
B. $\left(\frac{x^{18} - 1}{x^{2} - 1}\right) \left(\frac{x^{11} + 1}{x^{9}}\right) + 20$

$$\mathsf{C}.\, \bigg(\frac{x^{18}-1}{x^2-1}\bigg)\bigg(\frac{x^{11}-1}{x^9}\bigg)+20$$

D. none of these

Answer: C

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

A. 2⁹
B. 2¹⁰
C. 2¹¹

 $D. 2^8$

Answer: B

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

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

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

D. none of these

Answer: A



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

A.
$$rac{1}{8}n^3ig(n^2+1ig)ig(n^2+3ig)$$

B. $rac{1}{16}n^3ig(n^2+16ig)ig(n^2+12ig)$
C. $rac{n^3}{12}ig(n^2+2ig)ig(n^2+4ig)$

D. none of these

Answer: A



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

A. 50

B. 51

C. 1

D. none of these

Answer: B



178. ABC is a right angled triangle in which $\angle B = 90^{\circ}$ and BC=a. If n points $L_1, L_2, ..., L_n$ on AB are such that AB is divided in n+1 equal parts

and $L_1M_1, L_2M_2, ...L_nM_n$ are line segments parallel to BC and $M_1, M_2, ...M - n$ are on AC. Then the sum og the lengths of L_1M_1, L_2M_2,L_nM_n is

A.
$$\left(rac{a(n+1)}{2}
ight)$$

B. $rac{a(n-1)}{2}$
C. $rac{an}{2}$

D. impossible to find from the given data

Answer: A



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

A. less than 1

B. equal to 1

C. greater than 1

D. any real number

Answer: A

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180. The sum of the series $1^3-2^3+3^3+9^3$ =	
A. 300	
B. 125	
C. 425	
D. 0	
Answer: B	

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

A. are vertices of a triangle

B. lie on a straight line

C. lie on an ellipse

D. lie on a circle

Answer: B

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

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

 $\mathsf{B}.\,x^2 - 18x + 16 = 0$

 $\mathsf{C}.\,x^2 + 18x - 16 = 0$

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

Answer: C



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

When n is odd the sum is

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

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

Answer: A

184.	Let	a_1,a_2,a_3	ι_3,\ldots	be	terms	of	an	A.P.	if
$rac{a_1+}{a_1+}$	$a_2 +$ - $a_2 +$	${+a_p\over +a_q} =$	${p^2\over q^2}.p eq$	q then	$rac{a_6}{a_{21}}$ equa	ls			
A.	44379								
В.	44234								
C.	11/41								
D.	41/11								

Answer: C

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

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

B. na_1a_n

 $\mathsf{C}.\,(n-1)a_1a_n$

$$\mathsf{D}.\,n(a_1-a_n)$$

Answer: C



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

A. 5 B. 6 C. 7

D. 8

Answer: C

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

A. A.P.

B. G.P.

C. H.P.

D. None of these

Answer: C

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188. If x be the AM and yz be two GM's between two positive numbers,

then
$$rac{y^3+z^3}{xyz}$$
 is equal to

A. 1

B. 2

C. 3

Answer: B



189. If In (a + c), In(c - a) , In(a - 2b + c) are in A.P., then

A. a,b,c are in A.P.

B. a^2, b^2, c^2 are in A.P.

C. a, b , c are in G.P.

D. a , b, c are in H.P

Answer: D



190. The sum of the numerical series

$$\frac{1}{\sqrt{3} + \sqrt{7}} + \frac{1}{\sqrt{7} + \sqrt{11}} + \frac{1}{\sqrt{11} + \sqrt{15}} + \dots \text{ upto n terms is}$$
A. $\frac{\sqrt{3 + 4n} - \sqrt{3}}{4}$
B. $\frac{n}{\sqrt{3 + 4n} + \sqrt{3}}$
C. less than n
D. greater than $\frac{\sqrt{n}}{2}$

Answer: A::B::C

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

A. > 50

B. 52

C. 54

Answer: A::B



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

)

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

B. B. n^3-3n^2+3n-1
C. C . $n^3+(n-1)^3$
D. D. $rac{n^3+n}{2}$

Answer: A::C

193. $\sum_{i=1}^{n} \sum_{j=1}^{i} \sum_{k=1}^{j} 1$ is equal to A. $\frac{n(n+1)(n+2)}{6}$ B. $\sum n^2$ C. $\hat{n}C_3$ D. $\hat{(n+2)}C_3$

Answer: A::D

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

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

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

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

Answer:



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

A. a = b = cB. $a \ge b \ge c$ C. a + c = 2bD. $ac = b^2$

Answer: A::B::D

196. If the arithmetic mean of two positive numbers a & b (a > b) is twice

their geometric mean , then a : b is

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

B. $4 + 4\sqrt{3}: 1$
C. $1: 7 - 4\sqrt{3}$
D. $2: \sqrt{3}$

Answer: A::B::C

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197. If S_n denotes the sum to n terms of the series $(1 \leq n \leq 9)$ 1 + 22 +

333 + + 999999999 then for $n\geq 2$

A.
$$S_n-s_{n-1}=rac{1}{9}ig(10^n-n^2+n$$

B. $S_n=rac{1}{9}ig(10^n-n^2+2n-2ig)$
C. $9(S_n-S_{n-1})=n(10^n-1)$

D. $S_3=356$

Answer: C::D



A.
$$\displaystyle rac{a}{b+c-a}, \displaystyle rac{b}{c+a-b}, \displaystyle rac{c}{a+b-c}$$
 are in H.P.
B. $\displaystyle rac{2}{b} = \displaystyle rac{1}{b-a} + \displaystyle rac{1}{b-c}$

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

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

199. Let $S_1, S_2, ...$ be squares such that for each $n \ge 1$ the length of a side of S_n equals the length of a diagonal of S_{n+1} . If the length of a sides of S_1 is 10 cm, then for which of the following values of n in the ares of S_n less than 1 sq. cm ?

A. 7 B. 8

C. 9

D. 10

Answer: B::C::D

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200. Given a sequence t_1, t_2, \ldots if its possible to find a function f(r)

such that $t_r = f(r+1) - f(r)$

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

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

A. 1

B. 44198

C. 44200

D. 44204

Answer: C

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201. Given a sequence t_1, t_2, \ldots . if its possible to find a function f(r) such

that
$$t_r=f(r+1)-f(r)$$

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

 $\mathsf{B.}\,n^4+7n^2+20n$

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

D. None of these

Answer: D

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202. Let $a_1, a_2, a_3, \ldots, a_m$ be the arithmetic means between -2 and 1027 and let $g_1, g_2, g_3, \ldots, g_n$ be the geometric mean between 1 and 1024. $g_1g_2, \ldots, g_n = 2^{45}$ and $a_1 + a_2 + a_3 + \ldots + a_m = 1025 \times 171$ The value of n is :

A. 5

B. 9

C. 11

D. None of these

Answer: B



203. Let $a_1, a_2, a_3, \ldots, a_m$ be the arithmetic means between -2 and 1027 and let $g_1, g_2, g_3, \ldots, g_n$ be the geometric mean between 1 and 1024. $g_1g_2, \ldots, g_n = 2^{45}$ and $a_1 + a_2 + a_3 + \ldots + a_m = 1025 \times 171$ The value of m is :

A. 339

B. 342

C. 345

D. None of these

Answer: B

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

$$egin{array}{ll} A=rac{a+b}{2}\Rightarrow a+b=2A, G=\sqrt{a}b\Rightarrow ab=G^2 & ext{ and } \ H=rac{2ab}{a+b}\Rightarrow G^2=AH. \end{array}$$

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

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

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

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

A. -2

B. -1

C. 2

D. 1

Answer: C

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

$$egin{array}{ll} A=rac{a+b}{2}\Rightarrow a+b=2A, G=\sqrt{a}b\Rightarrow ab=G^2 & ext{ and } \ H=rac{2ab}{a+b}\Rightarrow G^2=AH. \end{array}$$

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

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

A. 2

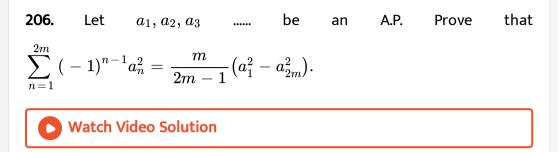
B. 3

C. 5

D. 6

Answer: B





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

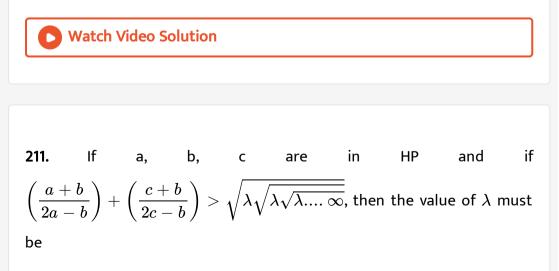


208. If a_n denotes the coefficient of x^n in P(x) = $(1 + x + 2x^2 + 3x^3 + ... + nx^n)^2$. then the last digit of a_{24} must be

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

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



A. `

n	
к	
	٠

C		
C.		

D.

Answer:

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

that

```
\sin d [\sec lpha_1 \sec lpha_2 + \sec lpha_2 \sec lpha_3 + ..... + \sec lpha_{n-1} \sec lpha_n] = \tan lpha_n - 	an
```

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



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

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

prove

that

$$\left(a_{1}+a_{2}+....+a_{n}
ight)^{n}\geq\left(n^{2}-n
ight)^{n}(s-a_{1})(s-a_{2})......\left(s-a_{n}
ight)$$

216. Find the sum to n terms of the series

$$rac{1}{1+1^2+1^4}+rac{2}{1+2^2+2^4}+rac{3}{1+3^2+3^4}+...$$

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

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

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

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

<code>B_n = 1 - A_n</code> . Find a least odd natural number n_0 , so that $B_n > A_n \, orall n \ge n_0.$

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

A. 1

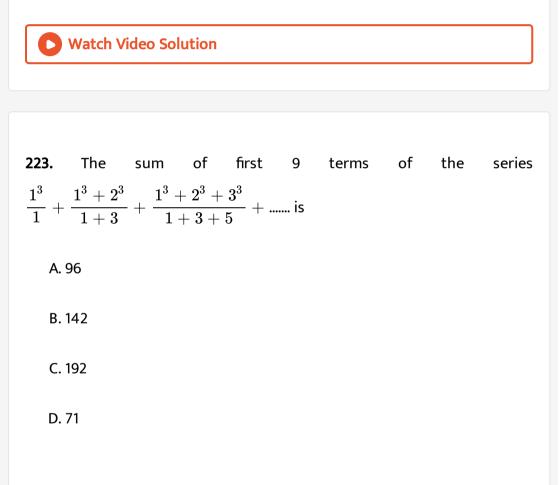
B. 2

C. 3

D. 5

Answer: B::D

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



Answer: A

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

A. $4lm^2n$

 $B.4lmn^2$

 $\mathsf{C}.\,4l^2m^2n^2$

 $\mathsf{D}.\,4l^2mn$

Answer: A



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

value of x is

A. 44230

B. 44257

C. 2/3

D. -3/2

Answer: A

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226. Let d(n) denotes the number of divisors of n including 1 and itself.

Then d(225), d(1125) and d(640) are

A. in AP

B. in HP

C. in GP

D. consecutive integers

Answer: C

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

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228. If
$$(10)^9 + 2(11)^1(10)^8 + 3(11)^2(10)^7 + ... + 10(11)^9 = k(10)^9$$

then k is equal to :

A. 100

B. 110

C. 121/10

D. 441/100

Answer: A

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

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

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

Answer: B

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

A. 1

B. 0

C. 3

D. 2

Answer: A

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

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

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

C. 1 and $(\log_e c)$

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

Answer: C

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

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

D. 2

Answer: A

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

A. 2x = 3y = 6z

B. 6x = 3y = 2z

C. 6x = 4y = 3z

D. x= y = z

Answer: D



 ${\bf 234.}$ The sum of first 20 terms of the sequence 0.7 , 0.77 , 0.777,... is

A.
$$rac{7}{9} (99 - 10^{-20})$$

B. $rac{7}{9} (99 + 10^{-20})$
C. $rac{7}{81} (179 + 10^{-20})$
D. $rac{7}{81} (179 - 10^{-20})$

Answer: C

235. The value of
$$1000\left[\frac{1}{1\times2} + \frac{1}{2\times3} + \dots + \frac{1}{999\times1000}\right]$$
 is equal to

A. 1000

B. 999

C. 1001

D. 1/999

Answer: B

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236. Let $f: R \rightarrow R$ be such that f is is injective and f(x) f(y) = f(x + y) for all

x, y $\in R$. If f(x), f(y), f(z) are in G.P. then x, y, z are in

A. A.P always

B. G.P always

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

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

Answer: A

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

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

B. 5
C. 2
D. $\frac{14}{3}$

Answer: A



238. If a, b ,c are in A.P ., then the straight line ax + 2by + c=0 will always

pass through a fixed point whose coordinates are

A. (1, -1)

B. (-1, 1)

C. (1, -2)

D. (-2, 1)

Answer: A

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239. Six possible number are in G.P. such that their product is 1000. If the

fourth term is 1, then the last term is

A. 1000

B. 100

C. 1/100

D. 1/1000

Answer: C

240. Five number are in A.P. with common difference \neq 0. If the 1 st , 3 rd

, and 4 th terms are in G.P., then

A. the 5th term is always 0

B. the 1st term is always 0

C. the middle term is always 0

D. the middle term is always -2

Answer: A

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241. Let f(x) =
$$xigg(rac{1}{x-1}+rac{1}{x}+rac{1}{x+1}igg), x>1$$
 , Then

A. $f(x) \leq 1$

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

 $\mathsf{C.}\, 2 < f(x) \leq 3$

D. f(x) > 3

Answer: D

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242. Let $a_1, a_2, ...$ be in harmonic progression with $a_1 = 5$ and $a_{20} = 25$.

The least positive integer n for which $a_n < 0$

A. 22

B. 23

C. 24

D. 25

Answer: D

243. Statement 1: The sum of the series

1 + (1 + 2 + 4)+(4 + 6 + 9) + (9 + 12 + 16)+....+(361 + 380 + 400) is 8000 . Statement 2 : $\sum_{k=1}^{n} \left(k^3 (k-1)^3 \right) = n^3$ for any natural number n .

A. Statement 1 is false , statement 2 is true

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

explanation for statement 1.

C. Statement 1 is true, statement 2 is true , statement 2 is a not

correct explanation for statement 1.

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

Answer: B

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

A. -150

B. 150 times its 50 th term

C. 150

D. zero

Answer: D

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

A. -15

В. -3

C. 9

D. -4

Answer: D

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

equal to

A. R

B. 2R

C. 3R

D. 4R

Answer: C

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247. Let a, b , c, p , q , r be positive real numbers such that a , b , c are in

G.P. and $a^p = b^q = c^r$. Then

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

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

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

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

Answer: C

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248. Let S_k be the sum of an infinite G.P. series whose first term is k and

common ratio is
$$\displaystyle rac{k}{k+1}(k>0).$$
 Then the value of $\displaystyle \sum_{k=1}^{\infty} \displaystyle rac{(-1)^k}{s_k}$ is equal

to

A. $\log_e 4$

 $\mathsf{B.}\log_e 2 - 1$

 $\mathsf{C.1} - \log_e 2$

 $\mathsf{D.}\,1-\log_e 4$

Answer: D

249. Let $a_1, a_2, \ldots, a_{100}$ be an arithmetic progression with $a_1 = 3$ and

$$S_p = \sum_{j=1}^{P} a_j, 1 \leq p \leq 100. \ F \ ext{or} \ any {\int\!\!e \geq rnwith}$$
1 le n le 20

 $, \ \leq tm = 5n, \ \ ext{if} \ \ ext{S_m/S_n} does \
eg n, then a 2` is$

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

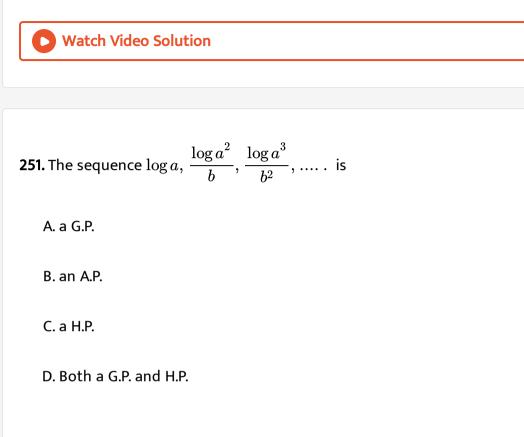
A. 19 months

B. 20 months

C. 21 months

D. 18 months

Answer: C



Answer: B



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

