



# MATHS

# **BOOKS - VK JAISWAL ENGLISH**

# **SEQUENCE AND SERIES**

**Exercise Single Choice Problems** 

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

A. 1

B. 
$$\frac{2}{3}$$
  
C.  $\frac{8}{27}$   
D.  $\frac{4}{9}$ 

# Answer: C

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

A. 
$$\frac{3}{2}$$
  
B.  $\frac{1}{4}$   
C.  $\frac{3}{4}$   
D.  $\frac{1}{2}$ 

#### Answer: C

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

C. 3 D.  $\frac{1}{2}$ 

#### Answer: B

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4. Let a,b,c,d, e ar non-zero and distinct positive real numbers. If a,b, c are

In a,b,c are in A.P, b,c, dare in G.P. and c,d e are in H.P, the a,c,e are in :

A. A.P.

B. G.P.

C. H.P.

D. Nothing can be said

#### Answer: B

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

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

 $\mathsf{D}.+n$ 

#### Answer: A

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

$$A.-4$$

B. 2

C. 6

D. can not be determined

#### Answer: B

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7. If  $S_1,\,S_2\,\,\,{
m and}\,\,\,S_3$  are the sums of first n natureal numbers, their squares

and their cubes respectively, then 
$$\displaystyle rac{S_1^4S_2^2-S_2^2S_3^2}{S_1^2+S_2^2} =$$

A. 4

B. 2

C. 1

D. 0

#### Answer: D

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

infinite terms is

A. 1 B.  $\frac{2}{3}$ C. *e* D.  $\frac{\pi}{4}$ 

# Answer: A

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

A. 4950

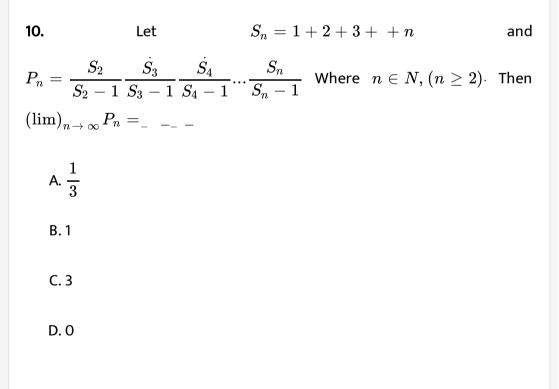
B. 5050

C. 2525

D. 5010

#### Answer: A





#### Answer: C

11. if a,b,c are positive and are the pth qth and rth terms respectively of a

G.P. then  $\Delta = \begin{vmatrix} \log a & p & 1 \\ \log b & q & 1 \\ \log c & r & 1 \end{vmatrix}$  is A. -1B. 2 C. 1 D. 0

# Answer: D



12. The numbers of natural numbers  $\,<\,300$  that are divisible by 6 but not

by 9 :

A. 49

B. 37

C. 33

D. 16

### Answer: D

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

necessarily.

A.  $\geq 8$ 

$$\mathsf{B.} \leq \frac{1}{8}$$

**C**. 1

D. None of these

#### Answer: B

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

A. 0

B. 10

C. 14

D. 18

### Answer: C



15. Let  $x_1, x_2, x_3, \ldots, x_k$  be the divisors of positive integer 'n' (including

$$1$$
 and  $x$ ). If  $x_1+x_2+\ldots\,+x_k=75$ , then  $\sum_{i=1}^krac{1}{x_i}$  is equal to:

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

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

#### Answer: B

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16. If 
$$a_a, a_2, a_3, \dots, a_n$$
 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.

n

C. H.P.

D. None of these

Answer: C

17.	lf	lpha,eta	be	roots	of	the	equation
$375x^2$	-25x -	$-2 = 0   { m an}$	$\operatorname{nd}  s_n = 0$	$lpha^n+eta^n,$			then
$\lim_{x  o \infty}$	$\lim_{x ightarrow\infty}$	$\left(\sum_{r=1}^n S_r\right)$	=				
A	$\frac{1}{12}$						
В	$\frac{1}{4}$						
C	$\frac{1}{3}$						
D. 1	L						

#### Answer: A

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

B. 8

C. 12

D. 24

### Answer: C

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19. Given that x, y, z are positive reals such that xyz=32 . The minimum

value of  $x^2 + 4xy + 4y^2 + 2z^2$  is \_\_\_\_\_.

A. 64

B. 256

C. 96

D. 216

Answer: C

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

A.	25
В.	$\frac{25}{2}$
C.	-25
D.	0

#### Answer: D



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

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

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

#### Answer: B

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

A. 120

B.40

C. 160

D. 80

# Answer: D



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

A. 5

- B. 4
- C. 3
- D. 2

# Answer: D

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

A. 3

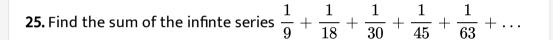
B. 6

C. 2

D. 4

### Answer: A





A. 
$$\frac{1}{3}$$
  
B.  $\frac{1}{4}$   
C.  $\frac{1}{5}$   
D.  $\frac{2}{3}$ 

# Answer: A

26. If  $S_r$  denote the sum of first 'r' terms of a non constaint A.P. and  $\frac{S_a}{a^2} = \frac{S_b}{b^2} = c$ , where a,b,c are distinct then  $S_c =$ A.  $c^2$ B.  $c^3$ C.  $c^4$ D. abc

#### Answer: B

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27. If an infinite G.P. has 2nd term x and its sum is 4, then prove that  $\xi n(-8,1] - \{0\}$ 

A. 
$$(-8, 0)$$
  
B.  $\left[-\frac{1}{8}, \frac{1}{8}\right) - \{0\}$   
C.  $\left[-1, -\frac{1}{8}\right) \cup \left(\frac{1}{8}, 1\right]$ 

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

#### Answer: D



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

A. the number of terms is 17

B. the first term is 3

C. the number of terms is 13

D. the first term is 1

#### Answer: B

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

A. 7 B. 8 C. 9 D. 10

#### Answer: D

30. Let 
$$S_k=\sum_{i=0}^\infty rac{1}{\left(k+1
ight)^t},\,\, ext{then}\,\,\sum_{k=1}^n kS_k\, ext{equal}\,:$$
 A.  $rac{n(n+1)}{2}$  B.  $rac{n(n-1)}{2}$ 

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

### Answer: D



**31.** Find the sum of the series  

$$\frac{2}{1 \times 3} + \frac{5}{2 \times 3} \times 2 + \frac{10}{3 \times 4} \times 2^2 + \frac{17}{4 \times 5} \times 2^3 + \rightarrow n \text{ terms.}$$
A.  $\frac{n2^n}{n+1}$ 
B.  $\left(\frac{n}{n+1}\right)2^n + 1$ 
C.  $\frac{n2^n}{n+1} - 1$ 
D.  $\frac{(n-1)2^2}{n+1}$ 

### Answer: A

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

A. 2k-3B. k+1

$$\mathsf{C.}\,2k+7$$

D. 
$$2k-rac{9}{2}$$

### Answer: D

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33. n aritmetic means are inserted between 7 and 49 and their sum is

found to be 364, then n is :

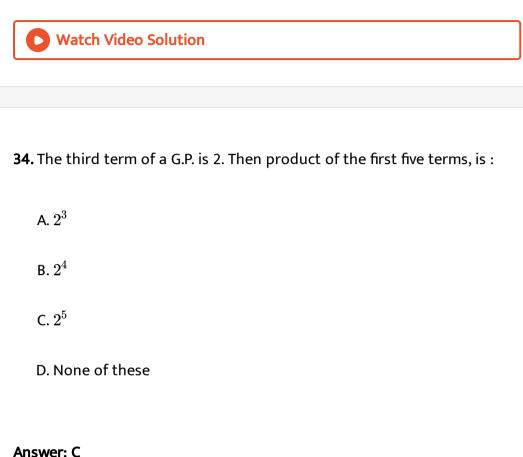
A. 11

B. 12

C. 12

D. 14

# Answer: C





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

is :

n. 5
------

B. 10

C. 3

 $\mathsf{D.}-4$ 

#### Answer: B

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

A. ab

 $\mathsf{B.}\,a^2+b$ 

 $\mathsf{C}.\,a+b^2$ 

D. 
$$rac{3ab-a^3}{2}$$

#### Answer: D

**37.** If  $S_1, S_2, S_3, \ldots, S_n$  are the sum of infinite geometric series whose first terms are  $1, 3, 5, \ldots, (2n - 1)$  and whose common rations are  $\frac{2}{3}, \frac{2}{5}, \ldots, \frac{2}{2n + 1}$  respectively, then  $\left\{\frac{1}{S_1S_2S_3} + \frac{1}{S_2S_3S_4} + \frac{1}{S_3S_4S_5} + \ldots \right\} =$ A.  $\frac{1}{15}$ B.  $\frac{1}{60}$ C.  $\frac{1}{12}$ D.  $\frac{1}{3}$ 

#### Answer: B

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

A.  $10^9$ 

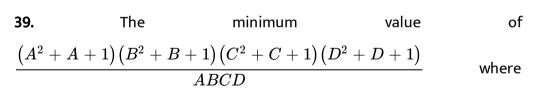
 $B.\,10^{10}$ 

C.  $10^{17/2}$ 

D.  $10^{19/2}$ 

#### Answer: D





A, B, C, D > 0 is :

A. 
$$\frac{1}{3^4}$$
  
B.  $\frac{1}{2^4}$   
C.  $2^4$ 

 $D.3^4$ 

# Answer: D



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

two at a time is :

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

Answer: A



**41.** The sum of first 2n terms of an AP is  $\alpha$  and the sum of next n terms is

 $\beta$ , its common difference is

A. 
$$\frac{x - 2y}{3n^2}$$
  
B. 
$$\frac{2y - x}{3n^2}$$
  
C. 
$$\frac{x - 2y}{3n}$$
  
D. 
$$\frac{2y - x}{3n}$$

#### Answer: B



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

A. 2

B. 3

C. 4

D. Infinite

#### Answer: B

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

A.  $1000\pi$ 

 $\mathsf{B.}\ 5050\pi$ 

 $\mathsf{C.}\,4950\pi$ 

D.  $5151\pi$ 

#### Answer: B

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44. If \log_2 4, \log_{\sqrt{2}} 8 and \log_3 9^{k-1}
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are consecutive terms of GP, then the number of integers that satisfy the system of inequalities  $x^2-x>6$  and  $|x| < k^2$  is

Option a 193 Option b 194 Option c 195 Option d 196 A. 193 B. 194 C. 195

D. 196

# Answer: A

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**45.** Let T, be the  $r^{th}$  term of an A.R. whose fiest term is  $-\frac{1}{2}$  and common diference is 1, then  $\sum_{r=1}^{n} \sqrt{1 + T_r T_{r+1} T_{r+2} T_{r+3}} =$ A.  $\frac{n(n+1)(2n+1)}{6} - \frac{5n}{4}$ 

B. 
$$\frac{n(n+1)(2n+1)}{6} - \frac{5n}{4} + \frac{1}{4}$$
  
C.  $\frac{n(n+1)(2n+1)}{6} - \frac{5n}{4} + \frac{1}{2}$   
D.  $\frac{n(n+1)(2n+1)}{12} - \frac{5n}{8} + 1$ 

# Answer: C



**46.** If 
$$\sum_{r=1}^{n} T_r = \frac{n(n+1)(n+2)}{3}$$
, then  $\lim_{x \to \infty} \sum_{r=1}^{n} \frac{3012}{T_r} =$   
A. 2008  
B. 3012  
C. 4016  
D. 8032

Answer: A

**47.** The sum of the infinite series,  

$$1^2 - \frac{2^2}{5} + \frac{3^2}{5^2} + \frac{4^2}{5^3} + \frac{5^2}{5^4} - \frac{6^2}{5^5} + \dots$$
 is:  
A.  $\frac{1}{2}$   
B.  $\frac{25}{24}$   
C.  $\frac{25}{54}$   
D.  $\frac{125}{252}$ 

# Answer: C

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

infinitity is :

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

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

# Answer: B



**49.** Suppose A, B, C are defined as 
$$A = a^2b + ab^2 - a^2c - ac^2$$
,  $B = b^2c + bc^2 - a^2b - ab^2$ , and  $C = a^2c + ac^2 - b^2c - bc^2$ , where  $a > b > c > 0$  and the equation  $Ax^2 + Bx + C = 0$  has equal roots, then a, b, c are in

A. A.P.

B. G.P.

C. H.P.

D. None of these

# Answer: C



50. It  $T_k$  denotes the  $k^{th}$  term of an H.P. from the bgegining and  $rac{T_2}{T_6}=9,$ then  $rac{T_{10}}{T_4}$  equals : A.  $\frac{17}{5}$  $\mathsf{B.}\,\frac{5}{17}$ C.  $\frac{7}{19}$ D.  $\frac{19}{7}$ Answer: B Watch Video Solution

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

and 16, 21, 26, .., 466.

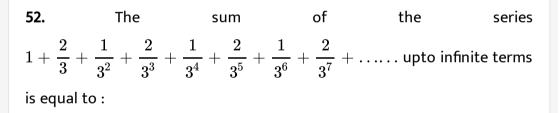
A. 19

C. 21

D. 22

#### Answer: B





A. 
$$\frac{15}{8}$$
  
B.  $\frac{8}{15}$   
C.  $\frac{27}{8}$   
D.  $\frac{21}{8}$ 

#### Answer: A



53. The coefficient of  $x^8$  in the polynomial (x-1)(x-2)(x-3)....(x-10) is : A. 2640

B. 1320

C. 1370

D. 2740

# Answer: B

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54. Let 
$$lpha = \lim_{x o \infty} \; rac{\left(1^3 - 1^2
ight) + \left(2^3 - 2^2
ight) + ... + \left(n^3 - n^2
ight)}{n^4}, \; {
m then} lpha \; {
m is}$$

equal to:

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

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

D. non-exisitent

#### Answer: B

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

A. - 32

 $\mathsf{B.}\,32$ 

C. 49

 $\mathsf{D.}-49$ 

#### Answer: B

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

A.  $\sqrt{3}$ 

B. 1

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

#### Answer: A



57. If  $lpha \,$  and  $\,eta \,$  are the roots of the quadratic equatin  $\,4x^2+2x-1=0$ 

then the value of 
$$\sum_{r=1}^{\infty} \left( lpha^r + eta^r 
ight)$$
 is:

A. 2

B. 3

C. 6

D. 0

Answer: D

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

equal to :

A. 11300

B. 12100

C. 12300

D. 11200

Answer: B

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

A. 
$$\frac{2}{3}$$
  
B.  $\frac{1}{3}$   
C. 1  
D.  $\frac{3}{2}$ 

#### Answer: D

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

A. 1

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

C. 4

D. 2

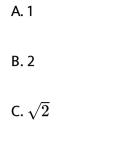
### Answer: C

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61. Let a, b, c be positive numbers, then the minimum value of  $\frac{a^4 + b^4 + c^2}{abc}$ A. 4 B.  $2^{3/4}$ C.  $\sqrt{2}$ D.  $2\sqrt{2}$ 

Answer: D

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



D. 4

## Answer: B



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

A. 2

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

C. 4

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

# Answer: C



64. Evaluate : 
$$\sum_{n=1}^{\infty} \frac{1}{(n+1)(n+2)(n+3)....(n+k)}$$
  
A. 
$$\frac{1}{(k-1)(k-1)!}$$
  
B. 
$$\frac{1}{k \cdot kl}$$
  
C. 
$$\frac{1}{(-1)kl}$$
  
D. 
$$\frac{1}{kl}$$

Answer: C

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

A. 150

B. 153

C. 156

D. 159

## Answer: D



66. Sum of first 10 terms of the series,  

$$S = \frac{7}{2^2 \cdot 5^2} + \frac{13}{5^2 \cdot 8^2} + \frac{19}{8^2 \cdot 11^2} + \dots \text{ is : (a) } \frac{255}{1024} \text{ (b) } \frac{88}{1024} \text{ (c)}$$

$$\frac{264}{1024} \text{ (d) } \frac{85}{1024}$$
A.  $\frac{255}{1024}$ 

B. 
$$\frac{88}{1024}$$
  
C.  $\frac{264}{1024}$   
D.  $\frac{85}{1024}$ 

### Answer: D



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

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

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

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

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

#### Answer: D

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

### Answer: A

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

(ii) to infinity.

A. 
$$\frac{31}{12}$$
  
B.  $\frac{41}{16}$   
C.  $\frac{45}{16}$ 

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

Answer: D



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

A.  $2^3$ 

 $\mathsf{B.}\,2^4$ 

 $\mathsf{C}.\,2^5$ 

D. None of these

Answer: C



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

## Answer: A

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

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

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

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

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

Answer: D

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

A. 2  
B. 
$$\frac{1}{2}$$
  
C.  $\frac{1}{\sqrt{2}}$   
D.  $\sqrt{2}$ 

## Answer: D

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

A. 34 minutes

B. 24 minutes

C. 125 minutes

D. 35 minutes

Answer: A

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

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

B. 
$$\frac{19}{2}$$
  
C.  $\frac{2}{9}$   
D.  $\frac{9}{2}$ 

### Answer: B



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

## Answer: B

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

```
infinite terms:
```

A. 2

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

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

## Answer: C

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

A. 7

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

**C**. 8

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

## Answer: C



**79.** The value of 
$$\sum_{r=1}^{\infty} \frac{(4r+5)5^{-r}}{r(5r+5)}$$
 is :  
A.  $\frac{1}{5}$   
B.  $\frac{2}{5}$   
C.  $\frac{1}{25}$   
D.  $\frac{2}{25}$ 

## Answer: A

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

A. a+c=2bB.  $a\geq b\geq c$ C.  $\displaystyle\frac{2ac}{a+c}=b$ D.  $ac=b^2$ 

#### Answer: B::D

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

- B. 2
- C. 3
- D. 4

### Answer: B::C

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

A. 
$$b>rac{a+c}{2}$$
  
B.  $rac{1}{a-b}-rac{1}{b-c}<0$   
C.  $ac>b^2$ 

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

#### Answer: B::C::D

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

A.  $T_1 = \text{ common difference}$ 

B. 
$$T_{p+q}=rac{1}{pq}$$
  
C.  $T_{pq}=rac{1}{p+q}$   
D.  $T_{p+q}=rac{1}{p^2q^2}$ 

#### Answer: A::B::C

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

A. Sum of the reciprocal of all the n harmonic means inserted between

a and b is equal to n times the harmonic mean between two given

numbers a and b.

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

sum of the first a natural numbers.

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

D. If the first term of the geometric progression  $g_1, g_2, g_3, \ldots, \infty$  is

unity, then the value of the common ratio of the progression such

that  $(4g_2 + 5g_3)$  is minimum equals  $\frac{2}{5}$ .

#### Answer: B::C

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

A. 
$$\frac{b+c-a}{a}$$
,  $\frac{a+b-c}{b}$ ,  $\frac{a+b-c}{c}$  are in AP  
B.  $\frac{b+c}{a}$ ,  $\frac{c+a}{b}$ ,  $\frac{a+b}{c}$  ar in A.P.  
C.  $a^5+c^5 \ge 2b^5$   
D.  $\frac{a-b}{b-c}=\frac{a}{c}$ 

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



7. All roots of equation  $x^5-40x^4+lpha x^3+eta x^2+\gamma x+\delta=0$  are in G.P.

if the sum of their reciprocals is 10, then  $\delta$  can be equal to :

A. 32 B. -32

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

Answer: A::B



**8.** Let  $a_1, a_2, a_3, \ldots$  be a sequence of non-zero rela numbers with are

in A.P. for 
$$k\in N.$$
 Let  $f_k(x)=a_kx^2+2a_{k+1}x+a_{k+2}$ 

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

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

C. Non-common roots of  $f_1(x) = 0, f_2(x) = 0, f_3(x) = 0, \dots$ 

from an A.P.

D. None of these

Answer: A::B

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

A. 9

B.-6

C. 6

 $\mathsf{D.}-9$ 

## Answer: B::C



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

A. 1218

B. 1208

C. 1288

D. 1298

Answer: B::D



$$ig(x^2+x+1ig)+ig(x^2+2x+3ig)+ig(x^2+3x+5ig)+\ldots$$
 .....+ $ig(x^2+20x+3ig)$ then x is equal to :

.

A. 10

B. - 10

 $\mathsf{C.}\,20.5$ 

D.-20.5

Answer: A::D

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

A. a > b > c

 $\mathrm{B.}\, A < B < C$ 

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

D. Triangle ABC is right angled

## Answer: B::C::D



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

of the following is/are correct ?

A. 
$$\cot y = \sqrt{2}$$
  
B.  $\cos(x - y) = \frac{\sqrt{3} - \sqrt{2}}{2\sqrt{2}}$   
C.  $\tan 2y = \frac{2\sqrt{2}}{3}$   
D.  $\sin(x - y) + \sin(y - z) = 0$ 

### Answer: A::B



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

A. 3

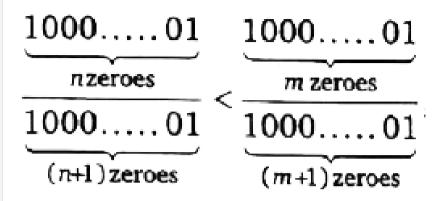
B. 11

C. - 8

D. - 16

Answer: B

**15.** Given



then which of the following true

A. m+1 < n

 $\mathsf{B}.\,m < n$ 

 $\mathsf{C}.\,m < n+1$ 

 $\mathsf{D}.\,m>n+1$ 

#### Answer: B::C

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

following is/are correct.

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

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

C. 
$$\left(2S_{3}-1
ight)^{2},\left(2S_{4}-1
ight)^{2},\left(2S_{2}-1
ight)^{2}$$
 are in A.P.

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

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

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17. Consider the A.P.  $50, 48, 46, 44, \ldots$   $IfS_n$  denotes the sum to n terms

of this A.P. then

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

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

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

D. the maximum value of  $S_n$  is 650

### Answer: A::C::D



**18.** Sum of the n terms of the series  

$$\frac{3}{1^2} + \frac{5}{1^2 + 2^2} + \frac{7}{1^2 + 2^2 + 3^3} + \dots$$
is  
A.  $S_5 = 5$   
B.  $S_{50} = \frac{100}{17}$   
C.  $\left(S_{1001} = \frac{1001}{97}\right)$   
D.  $S_{\infty} = 6$ 

## Answer: A::B::D

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

A. a > b > cB. A < B < CC. Area of  $\Delta ABC = rac{3\sqrt{3}}{8}$ 

D. Triangle ABC is right angled

#### Answer: B::C::D

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**Exercise Comprehension Type Problems** 

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

A. 1 B. 2 C. 5

#### Answer: B

D. 4

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

Β.
----

C. 6

D. 8

#### Answer: A

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

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

A. 51

B. 71

C. 74

D. 86

## Answer: B



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

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

A. 52

B. 54

C. 64

D. 74

Answer: D

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

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

A. (17)(21)(25)

B. (20)(21)(23)

C. (21)(21)(21)

D. (23)(19)(15)

### Answer: C

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

Maximum value of xyz is :

A. 
$$\frac{(355)^3}{3^3.6^2}$$
  
B.  $(355)^3$ 

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

D. None of these

Answer: A

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

Maximum value of xyz is :

A.  $8 imes 10^3$ 

B.  $27 imes 10^3$ 

 ${\rm C.\,64\times10^3}$ 

D.  $125 imes 10^3$ 

Answer: A

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

The removed numbers

A. 48 B. 50 C. 52

D. 49

### Answer: B

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**9.** Two consecutive numbers from 1,2,3 ...., n are removed. The arithmetic

mean of the remaining numbers is 105/4 .

The removed numbers

A. 
$$\sqrt{30}$$

 $\mathsf{B.}\,\sqrt{42}$ 

 $\mathsf{C.}\,\sqrt{56}$ 

D.  $\sqrt{72}$ 

### Answer: C

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10. Two consecutive number from n natural numbers  $1, 2, 3, \ldots$ , n are removed. Arithmetic mean of the remaining numbers is  $\frac{105}{4}$ . Let removed numbers are  $x_1, x_2$  then  $x_1 + x_2 + n =$ 

A. 61

B. 63

C. 65

D. 69

### Answer: C



11. The sequence  $\{a_n\}$  is defined by formula  $a_0 = 4$  and  $a_{m+1} = a_n^2 - 2a_n + 2$  for  $n \ge 0$ . Let the sequence  $\{b_n\}$  is defined by formula  $b_0 = \frac{1}{2}$  and  $b_n = \frac{2a_0a_1a_2....a_{n-1}}{\forall n \ge 1.}$ The value of  $a_{10}$  is equal to :

A.  $1 + 2^{1-24}$ B.  $4^{1024}$ C.  $1 + 3^{1024}$ D.  $6^{1024}$ 

Answer: C

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

defined by formula  $b_0 = \frac{1}{2}$  and  $b_n = \frac{2a_0a_1a_2....a_{n-1}}{\forall n \ge 1}$ . The value of  $a_{10}$  is equal to : A. 2 B. 3 C. 4 D. 5

#### Answer: B

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13. The sequence  $\{a_n\}$  is defined by formula  $a_0 = 4$  and  $a_{m+1} = a_n^2 - 2a_n + 2$  for  $n \ge 0$ . Let the sequence  $\{b_n\}$  is defined by formula  $b_0 = \frac{1}{2}$  and  $b_n = \frac{2a_0a_1a_2....a_{n-1}}{\forall n \ge 1.}$ The value of  $a_{10}$  is equal to :

A. 
$$b_{n+1}=rac{2b_n}{1-b_n^2}$$
B.  $b_{n+1}=rac{2b_n}{1+b_n^2}$ 

$$\mathsf{C}.\, \frac{b_n}{1+b_n^2} \\ \mathsf{D}.\, \frac{b_n}{1-b_n^2}$$

### Answer: B

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14.

$$f(n) = \sum_{r=2}^n rac{r}{^rC_2{^r+1}C_2}, a = \ \lim_{x o \infty} \ f(n) \ ext{and} \ x^2 - igg(2n-rac{1}{2}igg)x + t = 0$$

Let

has two positive roots  $\alpha$  and  $\beta$ .

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

A. 53

B. 55

C. 57

D. 59

### Answer: D



15.

Let

$$f(n) = \sum_{r=2}^n rac{r}{{^rC_2}^{r+1}C_2}, a = \lim_{x o \infty} \; f(n) \; ext{and} \; x^2 - igg(2n - rac{1}{2}igg)x + t = 0$$

has two positive roots  $\alpha$  and  $\beta$ .

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

A. 2

B. 6

C. 3

D. 4

Answer: B

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

 $\frac{a_1}{a_1+1} = \frac{a_2}{a_2+3} = \frac{a_3}{a_3+5} = \dots = \frac{a_{1005}}{a_{1005}+2009}$  $a_1 + a_2 + a_3 \dots a_{1005} = 2010$ 

A. A.P.

B. G.P.

C. A.G.R

D. H.P.

#### Answer: A



17. Given that sequence of number  $a_1, a_2, a_3, \ldots, a_{1005}$  which satisfy  $\frac{a_1}{a_1+1} = \frac{a_2}{a_2+3} = \frac{a_3}{a_3+5} = \ldots = \frac{a_{1005}}{a_{1005}+2009}$   $a_1 + a_2 + a_3 \ldots a_{1005} = 2010$  find the  $21^{st}$  term of the sequence is equal to :

A. 
$$\frac{86}{1065}$$
  
B.  $\frac{83}{1005}$   
C.  $\frac{82}{1005}$   
D.  $\frac{79}{1005}$ 

### Answer: C

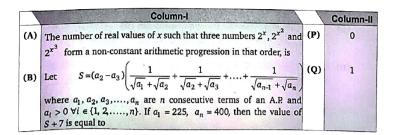
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# Exercise Matching Type Problems

	Column-l	1	Column-II
(A)	The sequence $a$ , $b$ , 10, $c$ , $d$ are in A.P., then $a + b + c + d =$	(P)	6
<b>(B)</b>	Six G.M.'s are inserted between 2 and 5, if their product can be expressed as $(10)^n$ . Then $n =$	(Q)	2
	Let $a_1, a_2, a_3, \ldots, a_{10}$ are in A.P. and $h_1, h_2, h_3, \ldots, h_{10}$ are in H.P. such that $a_1 = h_1 = 1$ and $a_{10} = h_{10} = 6$ , then $a_4h_7 =$	(R)	3
(D)	If $\log_3 2$ , $\log_3 (2^x - 5)$ and $\log_3 \left( 2^x - \frac{7}{2} \right)$ are in A.P., then $x =$	(S)	20
		(T)	40

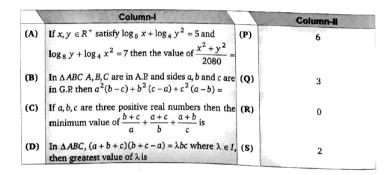
1.





2.

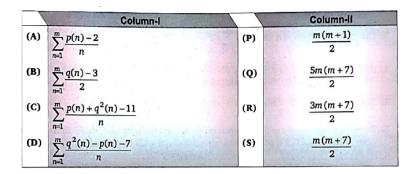
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3.

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

match the following Column-I with Column-II.



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**Exercise Subjective Type Problems** 

1. Let a,b,c,d be four distinct real number in A.P.Then the smallest positive

vlaue of k satisfying

$$2(a-b)+k(b-c)^2+(c-a)^3=2(a-d)+(b-d)^2+(c-d)^3is_-$$

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**2.** The sum of all digits of n for which  $\sum_{r=1}^n r2^r = 2 + 2^{n+10}$  is :



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

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

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5. Three distinct non-zero real numbers form an A.P. and the squares of

these numbers taken in same order form a G.P.If possible common ratio

of G.P. are  $3\pm\sqrt{n}, n\in N$  then n= \_\_\_\_\_.

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

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

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

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

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

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

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**12.** If  $\sum_{k=1}^{\infty} \frac{k^2}{3^k} = \frac{p}{q}$ , where p and q are relatively prime positive integers.

Find the value of (p - q),

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

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

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

(where [.] denotes gratest integer function)

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

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

**18.** Let  $a_1, a_2, a_3, \ldots, a_n$  be real numbers in arithmatic progression

such that  $a_1 = 15$  and  $a_2$  is an integer. Given  $\sum_{r=1}^{10} (a_r)^2 = 1185$ . If

 $S_n = \sum_{r=1}^n a_r \,\, ext{and} \,\,\,\, ext{maximum value of} \,\,n \,\, ext{is} \,\,N \,\, ext{for which} \,\, S_n \geq S_{(n+1)} \,,$ 

then find N - 10.

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

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

21. Let a and b be positive integers. The values. The value of xyz is 55 and

 $\frac{343}{55}$  when a,x,y,z,b are in arithmatic and harmonic progression

respectively. Find the value of (a+b)