



# MATHS

## **BOOKS - CENGAGE**

# PROGRESSIONS

Worked Examples

**1.** Find the nth term and hence the 50th term of the AP 2,5,8,11, ....

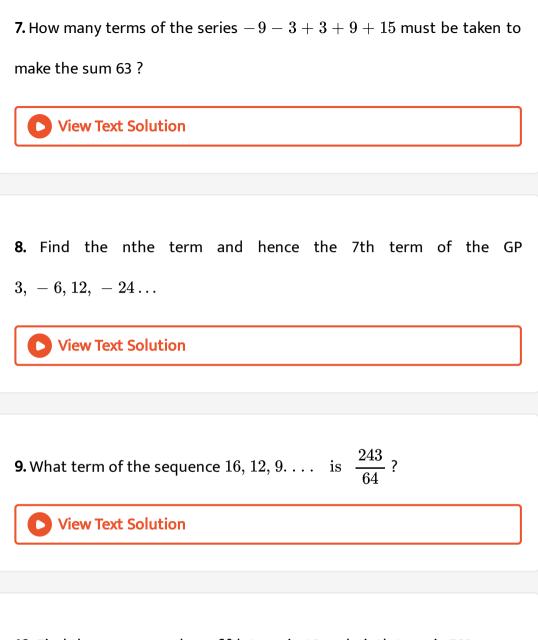
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**2.** Which term of the sequence 37,32,27,22 . . . Is -103 ?

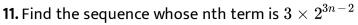
3. If the 5th and 17the terms of an AP are 7 and 25, respectively, find the

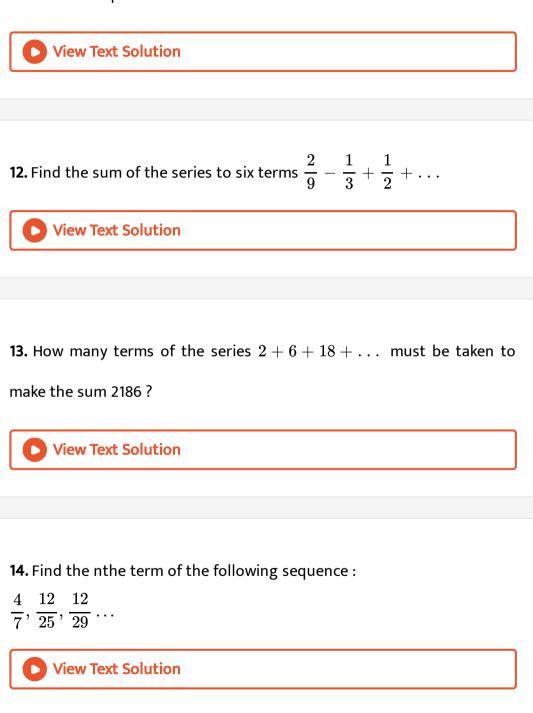
13 the term .

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<b>4.</b> Find the sequence whose nth term is $5n-12$ .
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<b>5.</b> If pth term of an AP is q and qth term is p, find rth term.
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<b>6.</b> The sum the sequence 25,21,17 to 16 terms
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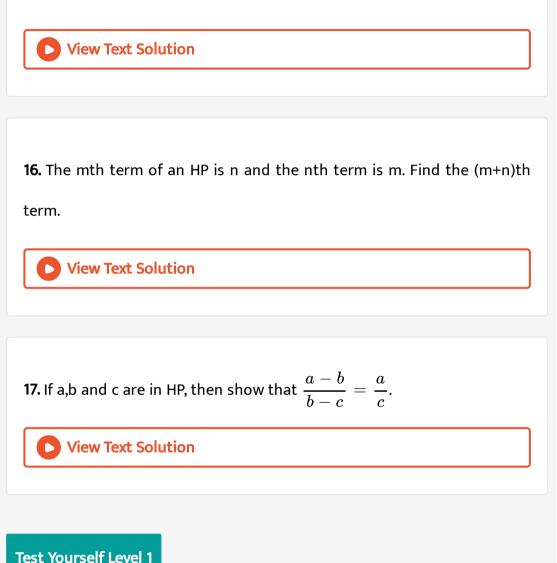
10. Find the sequence whose fifth term is 48 and ninth term is 768.





15. The 6th and 12th terms of a sequence in HP are 12 and 6, respectively.

What is the 18th term ?



1. Find the sum of the following sequences :

2,13/4,9/2,... to 20 terms

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2. Find the sum of the following sequences :

49,44,39, . . . to 17 terms

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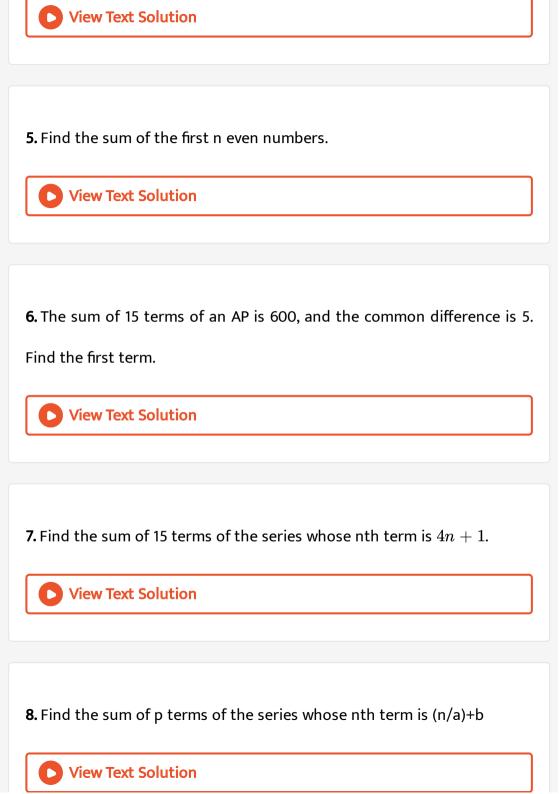
3. Find the sum of the following sequences :

3.75,3.5,3.25, . . . to 16 terms



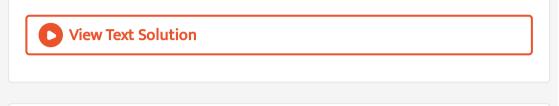
4. In an AP, the first term is 2, the last term is 29, and the sum is 155. Find

the common difference.



9. Find the nth term and the term indicated against each sequence.

a,a+3d,a+6d,  $\ldots$ ,  $t_{15}$ 



**10.** Find the nth term and the term indicated against each sequence.

$$-5, -1, 3, \ldots, t_{31}$$

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**11.** Find the nth term and the term indicated against each sequence.

6, 11,  $\ldots$  ,  $t_{20}$ 



12. How many terms are there in each of the following sequences ?

1,4,7, . . . , 49

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13. How many terms are there in each of the following sequences ?

72,70,68, . . .,40

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14. How many terms are there in each of the following sequences ?

16,11,6, . . ., -19





<b>1.</b> Find the first term and the number of terms in an AP is
the 4th,16th, and last terms are 36,0 and -42, respectively
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<b>2.</b> Find the first term and the number of terms in an AP is
the 7th, 15th, and last terms are $-6,6,$ and 15, respectively
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<b>3.</b> Find the first term and the number of terms in an AP is
the mth, nth, and last terms are n, m, and o, respectively.
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<b>4.</b> Sum the following series :

 $1+4+7+\ldots$  to 40 terms



5. Sum the following series :

 $-4+4+12+\ldots$  to 20 terms

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6. Sum the following series :

$$(a-b)^2, \left(a^2+b^2
ight), \left(a+b
ight)^2 + \dots$$
 to n terms.



7. How many terms of the series  $9+12+15+\ldots$  must be taken to

make the sum 306?



8. Find three numbers in AP whose sum is 15 and the sum of the squares

of the two extremes is 58.



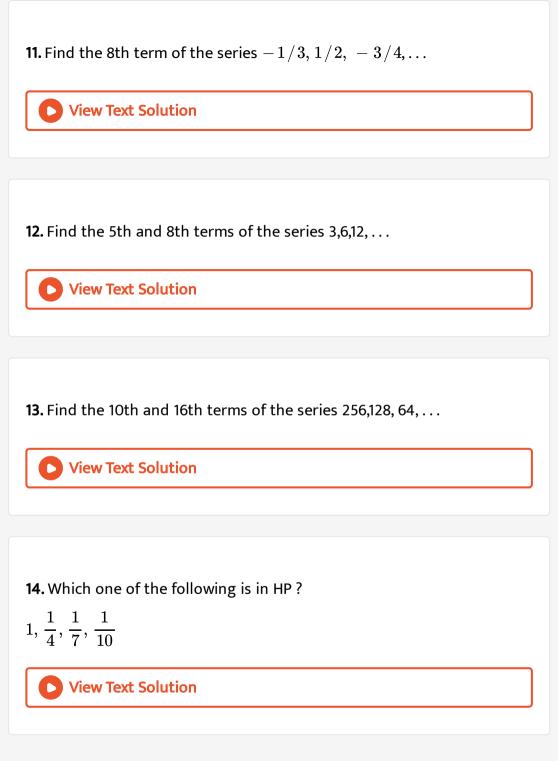
**9.** Examine whether the following form a geometric progression. If so, find their sum.

$$1/\left(1+x^2
ight), 1/\left(1+x^2
ight)^2, \dots, 1/\left(1+x^2
ight)^n$$

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**10.** Examine whether the following form a geometric progression. If so, find their sum.

$$1, x \, / \, ig(1 + x^2ig), x^2 \, / \, ig(1 + x^2ig)^2, \dots, x^n \, / \, ig(1 + x^2ig)^n$$



**15.** Which one of the following is in HP?

 $\frac{1}{3}, \frac{1}{6}, \frac{1}{12}, \frac{1}{24}$ 

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**16.** Which one of the following is in HP?

 $2, \frac{1}{2}, \frac{1}{7}, \frac{1}{5}$ 

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17. Write the nth term and the term indicated against each case :

$$rac{1}{a}, rac{1}{a+3d}, rac{1}{a+6d}, \dots, t_{15}$$

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18. Write the nth term and the term indicated against each case :

$$\frac{4}{7}, \frac{12}{25}, \frac{12}{29}, \dots, t_{31}$$

**19.** Write the nth term and the term indicated against each case :

$$2, 1\frac{3}{4}, 1\frac{5}{9}, \dots, t_{10}$$

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20. Find the nth term and the term indicated against each sequences :

$$\sqrt{2}, \frac{1}{\sqrt{2}}, \frac{1}{2\sqrt{2}}, \dots, t_{10}$$

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**21.** Find the nth term and the term indicated against each sequences :

 $0.3, 0.06, 0.012, \ldots, t_8$ 

22. Find the nth term and the term indicated against each sequences :

4,2,1,  $\ldots$  ,  $t_{10}$ 

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23. Find the nth term and the term indicated against each sequences :

 $1, 0.1, 0.01, 0.001, \ldots, t_{20}$ 

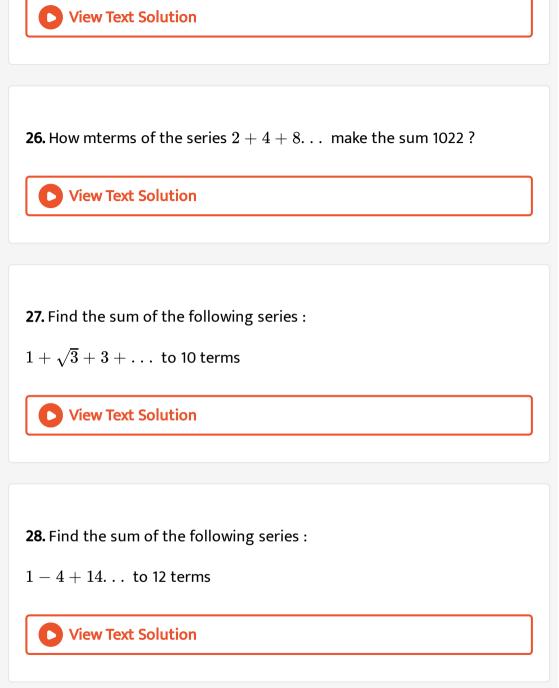
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24. Find the first term and the number of terms in a GP is the third, fifth,

and last terms are  $3\sqrt{3},\,9\sqrt{3}$ , and 729, respectively.

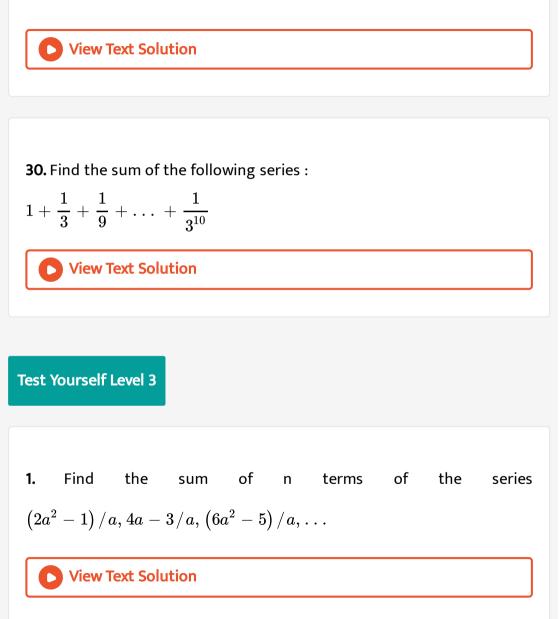


**25.** Find the first term and the number of terms in a GP if the fourth, seventh, and last terms are 10,80, and 2560, respectively.



29. Find the sum of the following series :

 $0.6+0.06+0.006+\ldots$  to 16 terms



2. In a GP, the first term is 7, the last term is 448, and the sum is 889. Find

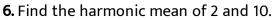
the common ratio.

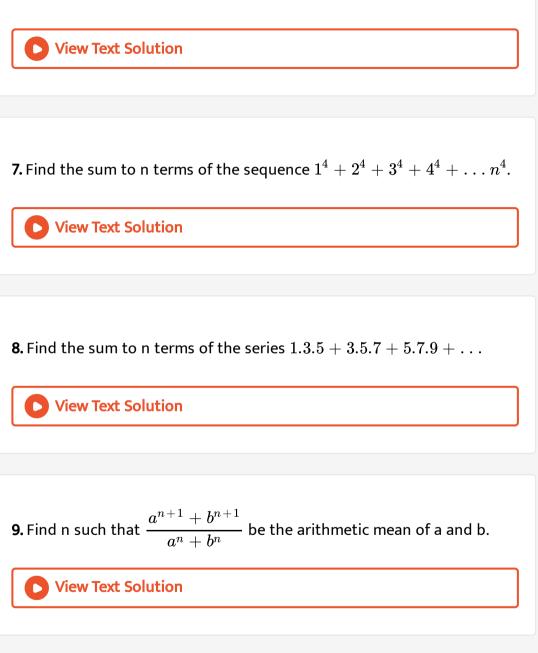
View Text Solution 3. The sum of three numbers in GP is 38, and their product is 1728. Find them. View Text Solution

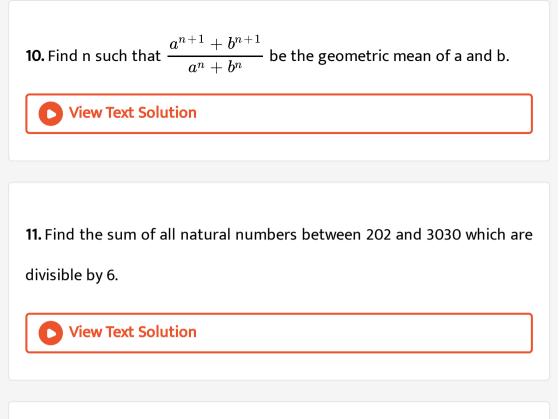
**4.** Sum  $1 + 2a + 3a^2 + 4a^3 + \dots$  to n terms.

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5. Sum  $1 + 3x + 5x^2 + 7x^3 + \dots$  to n terms.







12. Find the geometric mean of the following numbers :

(i) 3 and 12

(ii)  $a^2$  and  $b^2$ 

(iii)  $\sqrt{2}$  and  $16\sqrt{8}$ 

**13.** Find x if

$$rac{1}{a-d}$$
,x, and  $rac{1}{a+d}$  are in HP

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**14.** Find x if

3, x, and 9 are in HP

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**15.** Find x if

2,x, and 6 are in HP

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Test Yourself Level 3 Multiple Choice Questions

1.	The	Fibonacci	sequence	is	defined		by	
$a_1$	$=a_{2}=1,a_{r}$	$a_n = a_{n-1} + a_{n-1}$	$_{-2},n>2.$	Then	the	value	of	
$a_5-a_4-a_3$ is								
	A. 1							
	B. 2							
	C. 0							
	D 1							

## Answer: C

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2. If for a sequence  $\ < a_n > \ , \ S_n = 2n^2 + 9n$  , where  $S_n$  is the sum of n terms, then value of  $a_{20}$  is

A. 65

B.75

C. 87

D. 97

Answer: C

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**3.** The first three terms of a sequence are 3,3,6. Each term after the second term is the sum of two terms preceding it. The  $8^{th}$  term os the sequence is

A. 15

B. 24

C. 39

D. 63

Answer: D

4. The common difference of the AP whose  $n^{th}$  term is given by  $t_n = 5n + 4$  is A. 2 B. 3 C. 5 D. 6

## Answer: C

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5. Which of the following can't be an AP ( $n^{th}$  term is given) ?

A. 3n+2

 $\mathsf{B.}\,3n^2+2$ 

C.4n + 5

 $\mathsf{D.}\,7n+2$ 

Answer: B



**6.** If mth term of an AP is  $\frac{1}{n}$  and nth term is  $\frac{1}{m}$  then mnth term of the AP is

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

B. mn

C. 1

D. none of these

Answer: C

7. The sums of n terms of two AP's are in the ratio (3n-13): (5n+21). Find the ratio of their  $24^{th}$  terms.

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

#### Answer: A

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**8.** How many terms of the series  $20 + 19\frac{1}{3} + 18\frac{2}{3} + \ldots$  must be taken to make 300 ?

A. 25

B.36

C. both (A) and (B)

D. none of these

Answer: C

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**9.** If N be the set of natural numbers is partitioned into groups  $S_1=(1),\,S_2=(2,\,3),\,S_3=(4,\,5,\,6),\,\ldots$  then the sum of the numbers in  $S_{50}$  is

A. 62525

B. 57567

C. 62505

D. none

Answer: A

 $(1 + 3 + 5 + \ldots + p) + (1 + 3 + 5 + \ldots + q) = (1 + 3 + 5 + \ldots + r)$ , where each set of parentheses contains the sum f consecutive odd integers as shown then the smallest possible value of p + q + r(p > 6) is A. 18 B. 19 C. 20 D. 21

#### Answer: D



11. Let lpha, eta be roots of the equations  $x^2-2x+A=0$  and  $\gamma, \delta$  be the roots of the equation  $x^2-18x+B=0$  If  $lpha, eta, \gamma$  and

 $\delta(lpha<eta<\gamma<\delta)$  are in arithmetic progression, then find the values of A and B.

A. A = -2, B = 77

B. A = -3, B = 77

C. A = 77, B = -3

D. none of these

#### Answer: B

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12. If a,b,c and d are distinct integers which form an increasing AP such that  $d = a^2 + b^2 + c^2$  then the value of a + b + c + d is

A. 1

B. 2

C. 3

### Answer: B



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

A. 1

 $\mathsf{B.}-1$ 

C. 0

D. 1/2

Answer: C

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14. Let  $S_n$  denotes the sum of n terms of an AP. If  $S_{2n}=3S_n$ , then the ratio  ${S_{3n}\over S_n}$  is equal to

A. 9

B. 6

C. 16

D. 12

#### Answer: B

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15. If  $a_1, a_2, a_3, \ldots, a_n$  are in AP, where  $a_i > 0$  for all i, then the value of  $\frac{1}{\sqrt{a_1} + \sqrt{a_2}} + \frac{1}{\sqrt{a_2} + \sqrt{a_3}} + \ldots + \frac{1}{\sqrt{a_{n-1}} + \sqrt{a_n}}$  is
A.  $\frac{1}{\sqrt{a_1} + \sqrt{a_n}}$ B.  $\frac{1}{\sqrt{a_1} - \sqrt{a_n}}$ 

C. 
$$\displaystyle rac{n}{\sqrt{a_1}-\sqrt{a_n}}$$
  
D.  $\displaystyle rac{n-1}{\sqrt{a_1}+\sqrt{a_n}}$ 

Answer: D

**D** View Text Solution

**16.** If m+n)th and (m-n)th terms of a GP are p and q, respectively, then the  $m^{th}$  term of the GP is

A. 
$$p\left(rac{q}{p}
ight)^{rac{m}{2n}}$$

B. 
$$\sqrt{pq}$$

C. 
$$\sqrt{p/q}$$

D. none of these

### Answer: B

17. Find the sum up to n terms of the series  $a+aa+aaa+aaaa+\ldots,\ orall a\in N$  and  $1\leq a\leq p.$ 

A. 
$$\frac{a}{9} \left[ \frac{10}{9} (10^n - 1) - n \right]$$
  
B.  $a \left\{ \frac{10}{9} (10^n - 1) - n \right\}$   
C.  $\frac{1}{9} \left\{ \frac{10}{9} (10^n - 1) - n \right\}$   
D.  $\frac{a}{9} \left\{ \frac{(10^n - 1)}{9} - n \right\}$ 

#### Answer: A

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**18.** Find the sum up to n terms of the series  $0. b + 0. + 0. + 0. b + ..., \forall b \in N \text{ and } 1 \leq b \leq 9.$ 

$$\begin{aligned} &\mathsf{A}.\,b\bigg\{n-\frac{1}{9}\bigg(1-\bigg(\frac{1}{10}\bigg)^n\bigg)\bigg\}\\ &\mathsf{B}.\,\frac{b}{9}\bigg[n-\frac{1}{9}\bigg\{1-\bigg(\frac{1}{10}\bigg)^n\bigg\}\bigg]\\ &\mathsf{C}.\,\frac{1}{9}\bigg[n-\frac{1}{9}\bigg\{1-\bigg(\frac{1}{10}\bigg)^n\bigg\}\bigg]\end{aligned}$$

#### D. none of these

#### Answer: B



19. Let  $x_1, x_2$  be the roots of the equation  $x^2 - 3x + A = 0$  and let  $x_3, x_4$  be the roots of the equations  $x^2 - 12x + B = 0$ . If the numbers  $x_1, x_2, x_3, x_4$  (in that order) form an increasing GP, then values of A and B are

A. A = 2, B = 32

B. A = -2, B = 32

C. A = -2, B = -32

D. none of these

Answer: A

20. Let a,b,c be in AP and  $a^2, b^2, c^2$  be in GP. a>b>c and a+b+c=3/2 then find the values of a and c.

A. 
$$a = \frac{\sqrt{2}+2}{2\sqrt{2}}, b = \frac{\sqrt{2}-2}{2\sqrt{2}}$$
  
B.  $a = \frac{2-\sqrt{2}}{2\sqrt{2}}, b = \frac{\sqrt{2}-2}{2\sqrt{2}}$   
C.  $a = \frac{\sqrt{2}+2}{\sqrt{2}-2}, b = 1$   
D.  $a = \frac{2+\sqrt{2}}{2\sqrt{2}}, b = \frac{2+\sqrt{2}}{2\sqrt{2}}$ 

#### Answer: A

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**21.** Let a,b,c,d and e be five real numbers such that a,b,c are in AP, b,c,d are GP, c,d,e are in H.P. If a = 2 and e = 18 then find all possible values of b,c and d.

A. 
$$b = 6, c = 4, d = 3$$

B. 
$$b = 4, c = 6, d = 9$$

 $\mathsf{C}.\,b=\ -\,6,\,c=\ -\,2,\,d=9$ 

D. none of these

#### Answer: B

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22. Find n so that 
$$\frac{a^{n+1} + b^{n+1}}{a^n + b^n}$$
 be the AM be and b. (if  $a \neq b$ )  
A. 1  
B. 2  
C. 0  
D.  $-1$ 

## Answer: C

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23. There are n AM's between 3 and 54 such that  $8^{th}$  mean is to  $(n-2)^{
m th}$  mean is as to 5. Find n.

A. n=12

B. n=13

C. n=16

D. n=15

#### Answer: C

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**24.** Find n, so that 
$$rac{a^{n+1}+b^{n+1}}{a^n+b^n}(a
eq b)$$
 is the GM between a and b.

A. 1/2

B. - 1/2

C. 0

### D. none of these

### Answer: B

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**25.** Find n, so that 
$$\frac{a^{n+1}+b^{n+1}}{a^n+b^n}$$
  $(a \neq b)$  be the HM between a and b.

A. n=0

B. n=13

 $\mathsf{C.}\,n=\,-\,1/\,2$ 

 $\mathsf{D}.\,n=\,-\,1$ 

Answer: D

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26. If a,b and c are in AP then the value of 
$$a^{2}(b+c) + b^{2}(c+a) + c^{2}(a+b)$$
 is  
A.  $(a+b+c)^{3}$   
B.  $4b^{3}$   
C.  $6b^{3}$   
D.  $10b^{3}$ 

### Answer: C

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**27.** 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

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

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

D. none of these

Answer: A

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Olympiad And Ntse Level Exercise

1. If the pth term of an A.P. is q and qth term is p then its rth term will be

A. p-q+r

B. p + q - r

 $\mathsf{C}.\, p+r-q$ 

 $\mathsf{D}.\,p-q-r$ 

Answer: B

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2. The sum of 24 terms of the following series  $\sqrt{2} + \sqrt{8} + \sqrt{18} + \sqrt{32} + \ldots$  is

A. 300

B.  $300\sqrt{2}$ 

C.  $200\sqrt{2}$ 

D. none of these

#### Answer: B

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**3.** If the sum of n terms of an A.P. is  $2n^2+5n$  then the  $n^{th}$  term will be

A. 4n + 3

 $\mathsf{B.}\,4n+5$ 

C.4n + 6

 $\mathsf{D.}\,4n+7$ 

Answer: A

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**4.** The sum of the first five terms of the series  $3 + 4\frac{1}{2} + 6\frac{3}{4} + \ldots$  will

be

A. 
$$39\frac{9}{16}$$
  
B.  $18\frac{3}{16}$   
C.  $39\frac{7}{16}$   
D.  $13\frac{9}{16}$ 

Answer: A

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5. In an AP, of which a is the first term, if the sum of the first p terms is

zero then the sum of the next q terms will be

A.
$$-rac{a(p+q)p}{q+1}$$
  
B. $rac{a(p+q)p}{p+1}$   
C. $-rac{a(p+q)q}{p-1}$ 

D. none of these

#### Answer: C

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

A.  $\log_b a = \log_a c$ 

 $\operatorname{B.} \log_c b = \log_a c$ 

 $\mathsf{C}.\log_b a = \log_c b$ 

D. none of these

### Answer: C



7. The value of 
$$0.2^{\log_{\sqrt{5}}\left(\frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \dots\right)}$$
 is

A. 4

B. log 4

C. log 2

D. none of these

### Answer: A



# 8. Match the following columns :

Column I			Column II	
(a)	If a, b and c are in GP, then $\log_a 10$ , $\log_b 10$ , $\log_c 10$ are in	(p)	АР	
(b)	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 and d are in	(q)	HP	
(c)	If a, b, c are in AP; a, x, b are in GP and b, y, c are in GP, then $x^2$ , $b^2$ , $y^2$ are in	(r)	GP	
(d)	If x, y and z are in GP, such that $a^x = b^y = c^z$ , then log a, log b and log c are in	(s)	None of these	



**9.** Match the following columns and then choose the correct option from amongst the given codes.

Column I		Column II	
(p)	If <i>p</i> th, <i>q</i> th, <i>r</i> th and sth terms of an AP are in GP then $p - q$ , $q - r$ , r - s	(1)	are all equal
(q)	If lnx, lny and lnz $(x, y, z > 1)$ are in GP, then $2x + \ln (\ln x)$ , $3x + \ln(\ln y)$ , and $4x + \ln (\ln z)$	(2)	are in AP
(r)	If $n!$ , $3 \times n!$ , and $(n + 1)^{!}$ are in GP, then $n!$ , $5 \times n!$ and $(n+1)!$	(3)	are in GP
(s)	If the arithmetic mean of $(b-c)^2$ , $(c-a)^2$ and $(a-b)^2$ is the same as that of $(b+c-2a)^2$ , $(c+a-2b)^2$ and $(a+b-2c)^2$ then a, b and c	(4)	are in HP

A.
$$(p)$$
 $(q)$  $(r)$  $(s)$  $(1)$  $(2)$  $(4)$  $(3)$ B. $(p)$  $(q)$  $(r)$  $(s)$  $(2)$  $(1)$  $(3)$  $(4)$ C. $(p)$  $(q)$  $(r)$  $(s)$  $(3)$  $(4)$  $(2)$  $(1)$ D. $(p)$  $(q)$  $(r)$  $(s)$  $(2)$  $(1)$  $(4)$  $(3)$ 

### Answer: C

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10. If a,b,c,d  $\,\in R^{\,+}\,$  such that a,b,c and d are in H.P. then

A. a + d > b + c

 $\mathsf{B.}\,a+b>c+d$ 

C. a + c > b + d

D. none of these

Answer: A

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