



MATHS

BOOKS - CENGAGE

PROGRESSIONS

Worked Examples

1. Find the n th 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 ?

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3. If the 5th and 17th terms of an AP are 7 and 25, respectively, find the 13th term .

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4. Find the sequence whose n th term is $5n - 12$.

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5. If p th term of an AP is q and q th term is p , find r th term.

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6. The sum of the sequence 25, 21, 17 ... to 16 terms

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7. How many terms of the series $-9 - 3 + 3 + 9 + 15$ must be taken to make the sum 63 ?

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8. Find the n th term and hence the 7th term of the GP
 $3, -6, 12, -24, \dots$

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9. What term of the sequence $16, 12, 9, \dots$ is $\frac{243}{64}$?

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10. Find the sequence whose fifth term is 48 and ninth term is 768.

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11. Find the sequence whose n th term is $3 \times 2^{3n-2}$

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12. Find the sum of the series to six terms $\frac{2}{9} - \frac{1}{3} + \frac{1}{2} + \dots$

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13. How many terms of the series $2 + 6 + 18 + \dots$ must be taken to make the sum 2186 ?

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14. Find the n th term of the following sequence :

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

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

What is the 18th term ?



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16. The m th term of an HP is n and the n th term is m . Find the $(m+n)$ th term.



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17. If a, b and c are in HP, then show that $\frac{a-b}{b-c} = \frac{a}{c}$.



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Test Yourself Level 1

1. Find the sum of the following sequences :

$2, 1\frac{13}{4}, 9/2, \dots$ to 20 terms



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2. Find the sum of the following sequences :

$49, 44, 39, \dots$ to 17 terms



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3. Find the sum of the following sequences :

$3.75, 3.5, 3.25, \dots$ to 16 terms



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



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5. Find the sum of the first n even numbers.



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6. The sum of 15 terms of an AP is 600, and the common difference is 5.

Find the first term.



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7. Find the sum of 15 terms of the series whose n th term is $4n + 1$.



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8. Find the sum of p terms of the series whose n th term is $(n/a)+b$



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9. Find the n th term and the term indicated against each sequence.

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



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10. Find the n th term and the term indicated against each sequence.

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



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11. Find the n th term and the term indicated against each sequence.

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



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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



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Test Yourself Level 2

1. 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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2. 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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3. Find the first term and the number of terms in an AP is the m th, n th, and last terms are n , m , and o , respectively.



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4. Sum the following series :

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



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5. Sum the following series :

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



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6. Sum the following series :

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



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7. How many terms of the series $9 + 12 + 15 + \dots$ must be taken to make the sum 306 ?



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8. Find three numbers in AP whose sum is 15 and the sum of the squares of the two extremes is 58.



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

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



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

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



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11. Find the 8th term of the series $-1/3, 1/2, -3/4, \dots$



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12. Find the 5th and 8th terms of the series $3, 6, 12, \dots$



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13. Find the 10th and 16th terms of the series $256, 128, 64, \dots$



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14. Which one of the following is in HP ?

$$1, \frac{1}{4}, \frac{1}{7}, \frac{1}{10}$$



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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 :

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



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

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



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19. Write the n th 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 n th 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 n th term and the term indicated against each sequences :

$$0.3, 0.06, 0.012, \dots, t_8$$



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22. Find the n th term and the term indicated against each sequences :

4,2,1, . . . , t_{10}



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23. Find the n th term and the term indicated against each sequences :

1, 0.1, 0.01, 0.001, . . . , 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.



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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.



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26. How many terms of the series $2 + 4 + 8 \dots$ make the sum 1022 ?



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27. Find the sum of the following series :

$1 + \sqrt{3} + 3 + \dots$ to 10 terms



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28. Find the sum of the following series :

$1 - 4 + 14 \dots$ to 12 terms



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29. Find the sum of the following series :

$$0.6 + 0.06 + 0.006 + \dots \text{ to 16 terms}$$



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30. Find the sum of the following series :

$$1 + \frac{1}{3} + \frac{1}{9} + \dots + \frac{1}{3^{10}}$$



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Test Yourself Level 3

1. Find the sum of n terms of the series

$$(2a^2 - 1)/a, 4a - 3/a, (6a^2 - 5)/a, \dots$$



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



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



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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.



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6. Find the harmonic mean of 2 and 10.

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7. Find the sum to n terms of the sequence $1^4 + 2^4 + 3^4 + 4^4 + \dots n^4$.

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8. Find the sum to n terms of the series $1.3.5 + 3.5.7 + 5.7.9 + \dots$

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9. Find n such that $\frac{a^{n+1} + b^{n+1}}{a^n + b^n}$ be the arithmetic mean of a and b .

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10. Find n such that $\frac{a^{n+1} + b^{n+1}}{a^n + b^n}$ be the geometric mean of a and b .



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11. Find the sum of all natural numbers between 202 and 3030 which are divisible by 6.



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12. Find the geometric mean of the following numbers :

(i) 3 and 12

(ii) a^2 and b^2

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



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13. Find x if

$\frac{1}{a-d}$, x, and $\frac{1}{a+d}$ 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 $a_1 = a_2 = 1, a_n = a_{n-1} + a_{n-2}, n > 2$. 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 $\langle a_n \rangle$, $S_n = 2n^2 + 9n$, 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 8th term of the sequence is

A. 15

B. 24

C. 39

D. 63

Answer: D



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4. The common difference of the AP whose n^{th} term is given by

$$t_n = 5n + 4 \text{ is}$$

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. $3n + 2$

B. $3n^2 + 2$

C. $4n + 5$

D. $7n + 2$

Answer: B



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6. If m th term of an AP is $\frac{1}{n}$ and n th term is $\frac{1}{m}$ then m th term of the AP is

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

B. mn

C. 1

D. none of these

Answer: C



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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 $20 + 19\frac{1}{3} + 18\frac{2}{3} + \dots$ 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 $S_1 = (1)$, $S_2 = (2, 3)$, $S_3 = (4, 5, 6)$, \dots then the sum of the numbers in S_{50} is

A. 62525

B. 57567

C. 62505

D. none

Answer: A



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10. If

$$(1 + 3 + 5 + \dots + p) + (1 + 3 + 5 + \dots + q) = (1 + 3 + 5 + \dots + r)$$

, where each set of parentheses contains the sum of 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



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11. Let α, β be roots of the equations $x^2 - 2x + A = 0$ and γ, δ be the roots of the equation $x^2 - 18x + B = 0$ If α, β, γ and

$\delta(\alpha < \beta < \gamma < \delta)$ 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

D. 0

Answer: B



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13. If the p^{th} , q^{th} and r^{th} terms of an A.P. be a , b , c respectively, then

$$a(q - r) + b(r - p) + c(p - q) =$$

A. 1

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 $\frac{S_{3n}}{S_n}$ is equal to

A. 9

B. 6

C. 16

D. 12

Answer: B



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15. If $a_1, a_2, a_3, \dots, a_n$ are in AP, where $a_i > 0$ for all i , then the value of

$$\frac{1}{\sqrt{a_1} + \sqrt{a_2}} + \frac{1}{\sqrt{a_2} + \sqrt{a_3}} + \dots + \frac{1}{\sqrt{a_{n-1}} + \sqrt{a_n}}$$
 is

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

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

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

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

Answer: D



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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. $p \left(\frac{q}{p} \right)^{\frac{m}{2n}}$

B. \sqrt{pq}

C. $\sqrt{p/q}$

D. none of these

Answer: B



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17. Find the sum up to n terms of the series

$$a + aa + aaa + aaaa + \dots, \forall a \in N \text{ and } 1 \leq a \leq p.$$

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

$$0.b + 0. + 0. + 0.b + \dots, \forall b \in N \text{ and } 1 \leq b \leq 9.$$

A. $b \left\{ n - \frac{1}{9} \left(1 - \left(\frac{1}{10} \right)^n \right) \right\}$

B. $\frac{b}{9} \left[n - \frac{1}{9} \left\{ 1 - \left(\frac{1}{10} \right)^n \right\} \right]$

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

D. none of these

Answer: B



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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



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

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 8th mean is to $(n - 2)$ 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 $\frac{a^{n+1} + b^{n+1}}{a^n + b^n}$ ($a \neq b$) 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. $n=13$

C. $n = -1/2$

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 $\frac{1}{2} + \frac{3}{4} + \frac{7}{8} + \frac{15}{16} + \dots$ is equal to

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

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

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 p th term of an A.P. is q and q th term is p then its r th term will be

A. $p - q + r$

B. $p + q - r$

C. $p + r - q$

D. $p - q - r$

Answer: B



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2. The sum of 24 terms of the following series

$$\sqrt{2} + \sqrt{8} + \sqrt{18} + \sqrt{32} + \dots \text{ is}$$

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. $4n + 3$

B. $4n + 5$

C. $4n + 6$

D. $4n + 7$

Answer: A

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4. The sum of the first five terms of the series $3 + 4\frac{1}{2} + 6\frac{3}{4} + \dots$ 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. $-\frac{a(p+q)p}{q+1}$

B. $\frac{a(p+q)p}{p+1}$

C. $-\frac{a(p+q)q}{p-1}$

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. $\log_b a = \log_a c$

B. $\log_c b = \log_a c$

C. $\log_b a = \log_c b$

D. none of these

Answer: C



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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



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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)	AP
(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



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

Column I		Column II	
(p)	If p th, q th, r th and s th terms of an AP are in GP then $p - q, q - r, r - s$	(1)	are all equal
(q)	If $\ln x, \ln y$ and $\ln z$ ($x, y, z > 1$) 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. $a + d > b + c$

B. $a + b > c + d$

C. $a + c > b + d$

D. none of these

Answer: A



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