MATHS

BOOKS - MARVEL MATHS (HINGLISH)

SEQUENCES AND SERIES

Illustrative Examples

1. Find the 24^{th} term of the H.P $\frac{2}{7}, \frac{1}{5}, \frac{2}{13}, \frac{1}{8}, \cdots$

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2. If the 11^{th} and 21^{st} terms of an H.P are 1/16 and 1/29 respectively find the 31^{st} term of the H.P.

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3. The p^{th} term T_p of H.P is $q(p+q)$ and q^{th} term T_q is $p(p+q)$. Prove that $T_{p+q} = pq$

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4. If the m^{th} term of an H.P. is n and the n^{th} term is m, show that its $(mm)^{th}$ term is 1.

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5. If for a G.P. $\{t_n\}$, t_2=-6 and t_5 =48 find S_7.

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6. If for a G.P. $\{t_n\}$, $t_7 : t_4$ =27 and S_5 =242, and t_3.

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7. If for a G.P. $\{t_n\}$, S_2=15 and S_4=255, find a and r.

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8. If a=3, r=3 and S_n=255 find n.

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9. If the sum of the first n terms of a sequence is $2(7^n - 1)/3$ show that it is a G.P. Also , find its first term and common ratio.

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10. Find three numbers in a G.P. such that their sum is 31 and their product is 125.

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11. The sum of three numbers in G.P. is 21 and the sum of their squares is 189. Find the numbers.

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12. Find five numbers in a G.P. such that their product is 1, and the sum of the middle three is 13/3.

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13. Find four positive in a G.P. such that their product is 1 and the sum of the extremes is 65/8.

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14. The three numbers are in A.P and their sum is 21. If the first and second are decrease by 1 each and third is increased by 7, they form a G.P Find the numbers of A.P.

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15. if α, β be roots of $x^2 - 3x + a = 0$ and γ, δ are roots of $x^2 - 12x + b = 0$ and $\alpha, \beta, \gamma, \delta$(in order) form a increasing GP then find the value of $a\&b$

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16. If the A.M. and G.M. of two numbers are 16 and 12 respectively find their H.M.

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17. If the A.M. of two numbers exceeds their G.M. by 10 and their H.M. by 16 , then the numbers are.

A. 5,45

B. 10,40

C. 5,40

D. 15,25

Answer: A

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18. If the G.M. of two numbers is 24 and their H.M. is 72/5, find the numbers.

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

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20. Find the sum to n terms of the series

$4+41+401+4001+\cdots$

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21. Find the sum to n terms of the series

$4+44+444+4444+\cdots$

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22. Sum the series $.4 + .44 + .444 + \ldots$ to n terms.

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23. Find the sum to n terms of the series $3.4+5.04+7.004+9.0004+\cdots$

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24. Find the sum to n terms of the series $(1)+(1+a)+(1+a+a^2)\cdots$.

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25. Find the sum to n terms of the series :

$1 + 2x + 3x^2 + 4x^3 + \ldots\ldots$

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26. Find $\sum_{r=1}^{10}$ (r+2)(3r+1).

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27. Evaluate the sum: $4^3 + 5^3 + 6^3 + \cdots + 20^3$

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28. Evaluate

$50^2 - 49^2 + 48^2 - 47^2 + \cdots + 2^2 - 1^2.$

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29. If $\frac{1.2 + 2.3 + 3.4 + \cdots \text{to n terms}}{1 + 2 + 3 + \cdots \text{to n terms}}$ =6 find n.

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30. Find the sum to n terms of the series

2.5+5.9+8.13+11.17+ $\cdots$

where the point represents multiplication.

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31. Find the sum to n terms of the series

$$\frac{1^2}{1} + \frac{1^2+2^2}{1+2} + \frac{1^2+2^2+3^2}{1+2+3} + \cdots$$

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Multiple Choice Questions

1. If for a G.P., a=8 and t_4=64 then : r =

A. 1

B. 2

C. 3

D. 4

Answer: B

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2. If for a G.P., r=2 and t_9=128, then : a =

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

B. 2

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

D. 3

Answer: A

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3. If, for a G.P., t_3 =0.08 and t_7 =0.000128, then : (a,r)

A. (1,2)

B. $\left(2, \frac{1}{2}\right)$

C. (2,0.2)

D. $\left(\frac{1}{2}, 0.002\right)$

Answer: C

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4. If for a G.P., S_2 =8 and S_4=80 , then : (a,r) $\equiv$

A. (2,4)

B. (2,3)

C. (3,4)

D. none of these

Answer: B

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5. If for a G.P., r=2 and S_8=510, then : t_3 =

A. 2

B. 15

C. 8

D. 18

Answer: C

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6. If for a G.P., $t_3 = 36$ and t_6=972, then : t_8 =

A. $4\left(3^7\right)$

B. $3\left(4^7\right)$

C. $2\left(3^7\right)$

D. $3\left(2^7\right)$

Answer: A

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7. If for a G.P. , $t_8 : t_3$ =32 and S_9=255, then : t_1=

A. 2

B. 3

C. 5

D. none of these

Answer: C

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8. If for a G.P., $S_3 : S_6$ =125 : 152 then : r =

A. 3

B. $\frac{3}{5}$

C. 5

D. $\frac{5}{3}$

Answer: B

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9. If for a G.P., a=5, r=2 and S_n =635 then : n =

A. 5

B. 8

C. 7

D. none of these

Answer: C

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10. If the n^{th} term of a G.P. is $3\left(4^{n+1}\right)$ then its first term and common ratio are respectively

A. 3,n

B. n,4

C. 3,4

D. 4,3

Answer: C

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11. If 2+x, 3+x, 9+x are in a G.P., then : x =

A. $-\frac{9}{5}$

B. $\frac{9}{5}$

C. $-\frac{5}{9}$

D. $\frac{5}{9}$

Answer: A

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12. If the positive numbers 3,x,5,y are in a G.P., then :

$(x, y) =$

A. $\left(3\sqrt{15}, 2\sqrt{5}\right)$

B. $\left(3\sqrt{5}, 15\sqrt{5}\right)$

C. $\left(2\sqrt{15}, 3\sqrt{5}\right)$

D. none of these

Answer: D

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13. Four number in G.P. such that the product of their extremes is 108 and the sum of the middle two is 24 are

A. 9,10,11,12

B. 2,18,6,54

C. 2,6,8,54

D. none of these

Answer: C

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14. Three given numbers whose sum is 24 are in an A.P. If the first is decreased by 1 the second is decreased by 2 and the third is left unchanged the resulting numbers are in a G.P. Then the given numbers are

A. 3,13,8

B. 4,8,12

C. 13,3,8

D. none of these

Answer: B

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15. Three numbers whose sum is 18 are in AP if 2,4, 11 are added to them respective the resulting numbers are in GP. Find the numbers.

A. 9,6,3

B. 3,9,6

C. 3,6,9

D. none of these

Answer: C

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16. If the 5^{th} and 8^{th} terms of a G.P. are 32 and 256 respectively . Then its 4^{th} term is

A. 8

B. 12

C. 16

D. 20

Answer: C

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17. If 5^{th} , 8^{th} and 11^{th} terms of a G.P. are p,q and s respectively then

A. p+r=2q

B. q+r=2p

C. p+q=2r

D. pr=q^2

Answer: D

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18. If x,y,z are in G.P. then log x , log y, logz, are in

A. A.P.

B. G.P.

C. both

D. none of these

Answer: A

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19. If the third term of G.P.is 4, then find the product of first five terms

A. 4^3

B. 4^4

C. 4^5

D. 4^6

Answer: C

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

A. 27

B. -27

C. 13.5

D. -13.5

Answer: D

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21. A man borrows Rs. 8190 without interset and repays the loan in 12 monthly instalments. If each instalment is double the preceding one then the first and last instalments are (in rupees)

A. 5 and 1200

B. 2 and 4096

C. 3 and 7200

D. none of these

Answer: B

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22. If a,b,c are unequal numbers in A.P. such that a,b-c,c-a are in G.P. then

A. $\frac{a}{1} = \frac{b}{2} = \frac{c}{3}$

B. $\frac{a}{3} = \frac{b}{5} = \frac{c}{7}$

C. $\frac{a}{1} = \frac{b}{3} = \frac{c}{5}$

D. none of these

Answer: C

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23. If a, b, c are in A.P. and x, y, z are in G.P., then prove that :

$x^{b-c}.\, y^{c-a}.\, z^{a-b} = 1$

A. -1

B. 0

C. 1

D. none of these

Answer: C

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24. If a,b,c are simultaneously in an A.P. and a G.P. , then : $a^b . b^c . c^a =$

A. -1

B. 0

C. 1

D. none of these

Answer: A

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25. if S is the sum , P the product and R the sum of reciprocals of n terms in $G.P.$ prove that $P^2R^n = S^n$

A. P

B. P^2

C. P^3

D. P^n

Answer: B

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26. The A.M. of a and c is b. If b is also the G.M. of a and c+1 then : $(b-c)^2$=

A. a

B. b

C. c

D. a-b

Answer: A

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27. If the A.M. and G.M. of the roots of a quadratic equation in x are P and q respectively then the equation is

A. $x^2 - 2px + q^2$=0

B. $x^2 + 2px + q^2$=0

C. x^2-px+q=0

D. $x^2 - 2px + q$=0

Answer: A

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28. If the A.M. of the roots of a quadratic equation is $\frac{8}{5}$ and the A.M. of their reciprocals is $\frac{8}{7}$ then the equation is

A. $5x^2 - 8x + 7$=0

B. $5x^2 - 16x + 7$=0

C. $7x^2 - 16x + 5$=0

D. $7x^2 - 16x - 5$=0

Answer: B

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29. $8^2 + 9^2 + 10^2 + \cdots + 22^2$=

A. 3656

B. 3655

C. 3654

D. none of these

Answer: B

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30. $60^2 - 59^2 + 58^2 - 57^2 + \cdots + 2^2 - 1^2$ =

A. 1830

B. 3180

C. 1380

D. none of these

Answer: A

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31. $40^3 - 38^3 + 36^3 - 34^3 + \cdots + 4^3 - 2^3 =$

A. 34200

B. 34300

C. 34400

D. 34500

Answer: C

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32. If $\sum_{r=1}^{n}$ r=210, then : $\sum_{r=1}^{n} r^2$=

A. 2870

B. 2160

C. 2970

D. 2960

Answer: A

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33. $\sum_{r=1}^{20}$ r (2r+1)=

A. 5550

B. 5950

C. 5590

D. none of these

Answer: B

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34. $\sum_{r=1}^{10} (4r-3)^2 =$

A. 4930

B. 3490

C. 9430

D. none of these

Answer: A

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35. Find the sum of the following series:

$5 + 55 + 555 + \rightarrow n\ terms.$

A. $\frac{5}{9}\left[\frac{10}{9}(1-10^n)-1\right]$

B. $\frac{5}{9}\left[\frac{10}{9}(10^n-1)-n\right]$

C. $\frac{5}{9}\left[\frac{1}{9}(1-10^n)-10_n\right]$

D. none of these

Answer: B

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36. 1.2+3.02+5.002+7.0002+ $\cdots$ to n terms =

A. $n^2 + \frac{2}{9}\left(1 + \frac{1}{10^n}\right)$

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

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

D. none of these

Answer: C

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37. $1^3 + 2^3 + 3^3 + \cdots + 20^3$=

A. 14400

B. 44100

C. 41400

D. none of these

Answer: B

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38. $7^2 + 8^2 + 9^2 + \ldots + 20^2 =$

A. 2779

B. 7279

C. 7729

D. none of these

Answer: A

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39. $11^2 + 12^2 + 13^2 + \cdots + 32^2 =$

A. 11550

B. 11055

C. 55011

D. none of these

Answer: B

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40. Suppose that $F(n+1) = \frac{2f(n)+1}{2}$ for n = 1, 2, 3,.....and f(1)= 2 Then F(101) equals = ?

A. 50

B. 52

C. 54

D. none of these

Answer: B

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

A. 2(c-a)

B. 2(d-b)

C. 2(f-d)

D. 2(d-c)

Answer: D

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42. If the middle term amongst any odd number (n) consecutive terms of an A.P, is m, then their sum is (a) $2m^2n$ (b) $\frac{mn}{2}$ (c)mn (d)mn^2

A. 2mmn

B. mn/2

C. mn

D. mn^2

Answer: C

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43. The sum of all 2 digit odd numbers is

A. 2475

B. 2530

C. 4905

D. 5049

Answer: A

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44. The middle term of the progression $20, 16, 12, \cdots, -176, -180$ is (a)-46 (b)-76 (c)-80 (d) None of these

A. -46

B. -76

C. -80

D. none of these

Answer: C

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45. If the first and the last terms of an A.P. are -4 and 146 respectively and the sum of this A.P. is 7171 then its common difference is

A. 2

B. $-3/2$

C. $3/2$

D. -2

Answer: C

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46. The sum of an A.P. is 525. If its first term is 3 and the last term is 39 then its common difference is

A. $3/2$

B. 1

C. $1/2$

D. none of these

Answer: A

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47. If the first term of an A.P. is 100 and the sum of its first 6 terms is five times the sum of the next 6 terms then its common difference is

A. 10

B. -10

C. 5

D. -5

Answer: B

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48. Sum of all two digit numbers which when divided by 4 yield unity as remainder is.

A. 1100

B. 1200

C. 1210

D. none of these

Answer: C

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49. If the sum of any number of consecutive terms of a sequence is always nine times the squared number of these terms then the sequence is a/an

A. A.P.

B. G.P.

C. H.P.

D. none of these

Answer: A

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50. If the sum of the first n terms of an A.P. is pn+ qn^2 then its common difference is

A. p-q

B. p+q

C. 2q

D. 2p

Answer: C

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51. The sum of the series $a-(a+d)+(a+2d)-(a+3d)+$ up to $(2n+1)$ terms is $-nd$ b. $a+2nd$ c. $a+nd$ d. $2nd$

A. $-nd$

B. a+2nd

C. a+nd

D. 2nd

Answer: C

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52. If $S_n = nP + \frac{n(n-1)}{2}Q, where S_n$ denotes the sum of the first n terms of an A.P., then find the common difference.

A. p+q

B. 2p+3q

C. 2q

D. q

Answer: D

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53. Four different integers form an increasing A.P .One of these numbers is equal to the sum of the squares of the other three numbers. Then the product of all numbers is ?

A. $-2, \ -1, 0, 1$

B. 0,1,2,3,

C. $-1, 0, 1, 2,$

D. none of these

Answer: C

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54. If in an A.P. $\{t_n\}$, it is given that t_p=q and t_q=p then : $t_{p+q} = \cdots$

A. 0

B. p-q

C. p+q

D. $-(p+q)$

Answer: A

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55. If in an A.P. $\{t_n\}$, it is given that p.$t_p = q.\, t_q$ then : $t_{p+q} = \cdots$

A. -1

B. 1

C. 0

D. $-(p+q)$

Answer: C

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56. If $a, \frac{1}{b}, and \frac{1}{p}, q, \frac{1}{r}$ from two arithmetic progressions of the common difference, then a, q, c are in A.P. if p, b, r are in A.P. b. $\frac{1}{p}, \frac{1}{b}, \frac{1}{r}$ are in A.P. c. p, b, r are in G.P. d. none of these

A. p,b,r, in A.P.

B. $\frac{1}{p}, \frac{1}{b}, \frac{1}{r}$ in A.P.

C. p,b,r in G.P.

D. none of these

Answer: B

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57. If S_n is the sum of the first n terms of an A.P. then : (a) $S_{3n} = 3(S_{2n} - S_n)$ (b) $S_{3n} = S_n + S_{2n}$ (c) $S_{3n} = 2(S_{2n} - S_n$ (d) none of these

A. $S_{3n} = 3(S_{2n} - S_n)$

B. 2. $S_{3n} = S_n + S_{2n}$

C. $S_{3n} = 2(S_{2n} - S_n)$

D. none of these

Answer: A

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58. If in an A.P., $S_{2n} = 3.\ S_n$ then $S_{3n} : S_n$= (a)5 (b) 6 (c)7 (d)8

A. 5

B. 6

C. 7

D. 8

Answer: B

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59. If S_n denotes the sum of first n terms of an A.P., then $\frac{S_{3n} - S_{n-1}}{S_{2n} - S_{n-1}}$ is equal to

A. 21

B. 15

C. 16

D. 19

Answer: B

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60. If in an A.P. $\{a_n\}$,

$a_1 + a_5 + a_{10} + a_{15} + _{20} + a_{24} = 225$ then :

$S_{24} = \cdots$

A. 550

B. 900

C. 1150

D. 1400

Answer: B

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61. IF in an A.P. $\{a_n\} a_1 + a_4 + a_7 + \cdots + a_{16} = 147,$ then : $a_1 + a_6 + a_{11} + a_{16} = \cdots$. (a) 49 (b) 98 (c)147 (d) 196

A. 49

B. 98

C. 147

D. 196

Answer: B

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62. let $a_1, a_2, a_3, \ldots\ldots\ldots\ldots$, be an AP such that

$$\frac{a_1 + a_2 + a_3 + \ldots\ldots\ldots\ldots + a_p}{a_1 + a_2 + a_3 + \ldots\ldots\ldots\ldots + a_q} = \frac{p^3}{q^3}, (p \neq q)$$

then find $\frac{a_6}{a_{21}} = ?$

A. $7/2$

B. $2/7$

C. $11/41$

D. $41/11$

Answer: C

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

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

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

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

D. $n.\sqrt{(a_1.a_n)}$

Answer: C

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64. If $a_1, a_2, a_3, , a_n$ are an A.P. of non-zero terms, prove that

$$\frac{1}{a_1 + a_2} + \frac{1}{a_1 + a_3} + + \frac{1}{a_{n-1} + a_n} = \frac{n-1}{a_1 + a_n}.$$

A. $\frac{a_1 . a_n}{2}$

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

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

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

Answer: C

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65. If a,b,c are in both : A.P. and G.P. then (A) $a = b \neq c$ (B)$a \neq b = c$ (C) $a \neq b \neq c$ (D) $a = b = c$

A. a=b $\neq$ c

B. a $\neq$ b=c

C. a $\neq$ b $\neq$ c

D. a=b=c

Answer: D

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66. If x,y,z are in A.P. then : e^{-x}, e^{-y}, e^{-z} are in (a) A.P (b) G.P (c) H.P (d) no definite sequence

A. A.P.

B. G.P.

C. H.P.

D. no definite sequence

Answer: B

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67. If x,y,z are in A.P. then : yz,zx,xy are in

A. A.P.

B. G.P.

C. H.P.

D. no definite sequence

Answer: C

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68. If in a G.P., $\{a_n\}$ it given that (a) 120 (b)124 (c) 128 (d) 132

A. 120

B. 124

C. 128

D. 132

Answer: C

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69. Every term of a G.P. is positive and also every term is the sum of preceding. Then, the common ratio of the G.P. is

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

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

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

D. 1

Answer: B

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70. If in a g.P. $\{t_n)$ it is given that t_{p+q} =a and t_{p-q} = b then : t_p= (A) $(ab)^{\frac{1}{2}}$ (B)$(ab)^{\frac{1}{3}}$ (C)$(ab)^{\frac{1}{4}}$ (D) none of these

A. $(ab)^{1/2}$

B. $(ab)^{1/3}$

C. $(ab)^{1/4}$

D. none of these

Answer: A

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71. If , in a G.P. $\{a_n\}$ it is given that

$a_1 + a_2 + a_3 + a_4$= 30

and $a_1^2 + a_2^2 + a_3^2 + a_4^2$=340,

then : $(a_1, r) \equiv$

A. (2,2)

B. (3,3)

C. (16,1/3)

D. (16,1/2)

Answer: A

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72. If $\{a_n\}$ is a G.P. of positive terms then :

$$\frac{\sqrt{a_1a_2}+\sqrt{a_3a_4}+\cdots+\sqrt{a_{2n-1}.a_{2n}}}{\sqrt{a_2a_3}+\sqrt{a_4a_5}+\cdots+\sqrt{a_{2n}.a_{2n-1}}}=$$

A. $a_1+a_3+\cdots+a_{2n-1}$

B. $a_2 + a_4 + \cdots + a_{2n}$

C. $\dfrac{a_2 + a_4 + \cdots + a_{2n}}{a_1 + a_3 + \cdots + a_{2n-1}}$

D. $\dfrac{a_1 + a_3 + \cdots + a_{2n-1}}{a_2 + a_4 + \cdots + a_{2n}}$

Answer: D

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73. The sides of a right angled triangle arein $A.\ P.$

, then they are in the ratio

A. $2:3:4$

B. $3:4:5$

C. $4:5:6$

D. none of these

Answer: B

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

A. $\log_b$ a =$\log_a$c

B. $\log_c$ a =$\log_a$c

C. $\log_b$ a =$\log_c$b

D. none of these

Answer: C

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75. If p^{th}, q^{th} and r^{th} terms of an A.P. are in G.P., then the common ratio of G.P. is-

A. $\frac{pr}{q^2}$

B. $\frac{r}{p}$

C. $\frac{p-q}{r-q}$

D. $\frac{q-r}{p-q}$

Answer: D

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76. IF x,2y,3z are in A.P. where x,y,z are unequal number in a G.P., then the common ratio of this G.P. is (a) 3 (b) $\frac{1}{3}$ (c) 2 (d) $\frac{1}{2}$

A. 3

B. $1/3$

C. 2

D. $1/2$

Answer: B

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77. If $x, 2x + 2, 3x + 3$ are the first three terms of a GP, then what is its fourth term?

A. 27

B. -27

C. 13.5

D. -13.5

Answer: D

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78. If a,b,c,d are positive numbers such that a,b,c are in A.P. and b,c,d are in H.P., then : (A) ab=cd (B) ac=bd (C) ad=bc (D)none of these

A. ab=cd

B. ac=bd

C. ad=bc

D. none of these

Answer: C

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

A. A.P.

B. G.P.

C. H.P.

D. none of these

Answer: C

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80. If a,x,b are in A.P.,a,y,b are in G.P. and a,z,b are in H.P. such that x=9z and $> 0, b > 0$, then

A. $|y| = 4z$

B. x=4 |y|

C. 2y=x+z

D. none of these

Answer: B

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81. If a,b,c, are in G.P. , a.x.b in A.P. and b,y,c in A.P., then : $\frac{a}{x}+\frac{c}{y}$= (A) $\frac{1}{2}$ (B) 1 (C) 2 (D) none of these

A. $1/2$

B. 1

C. 2

D. none of these

Answer: C

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