**Progressions, Related Inequalities and Series**

**Choose the most appropriate option (a, b, c or d).**

Q 1. If a1, a2, a3,…… are in AP then ap, aq, ar are in AP if p, q, r are in

(a) AP (b) GP (c) HP (d) none of these

Q 2. Let tr denote the rth term of an AP. If tm = and tn = then tmn equals

(a)  (b)  (c) 1 (d) 0

Q 3. If p, q, r, s ∈ N and they are four consecutive terms of an AP then the pth, qth, rth, sth terms of a GP are in

(a) AP (b) GP (c) HP (d) none of these

Q 4. If in a progression a1, a2, a3,…, etc., (ar – ar+1) bears a constant ratio with ar . ar+1 then the terms of the progression are in

(a) AP (b) GP (c) HP (d) none of these

Q 5. If then a1, a2, a3, a4 are in

(a) AP (b) GP (c) HP (d) none of these

Q 6. Let x, y, z be three positive prime numbers. The progression in which can be three terms (not necessarily consecutive) is

(a) AP (b) GP (c) HP (d) none of these

Q 7. Let f(x) = 2x + 1. Then the number of real values of x for which the three unequal number f(x), f(2x), f(4x) are in GP I s

(a) 1 (b) 2 (c) 0 (d) none of these

Q 8. If ar > 0, r ∈ N and a1, a2, a3,……., a2n are in AP then



is equal to

(a) n – 1 (b)  (c)  (d) none of these

Q 9. If a1, a2, a3, ……, a2n+1 are in AP then



is equal to

(a)  (b)  (c)  (d) none of these

Q 10. Let a1, a2, a3,…. be in AP and ap, aq, ar be in GP. Then aq : ap is equal to

(a)  (b)  (c)  (d) none of these

Q 11. If a, b, c are in GP then a + b, 2b, b + c are in

(a) AP (b) GP (c) HP (d) none of these

Q 12. If a,b,c,d are nonzero real numbers such that

(a2 + b2 + c2)(b2 + c2 + d2)≤ (ab + bc + cd)2

Then a, b, c, d are in

(a) AP (b) GP (c) HP (d) none of these

Q 13. If 4a2 + 9b2 + 16c2 = 2(3ab + 6bc + 4ca), where a, b, c are nonzero numbers, then a, b, c are in

(a) AP (b) GP (c) HP (d) none of these

Q 14. If a, b, c are in AP then are in

(a) AP (b) GP (c) HP (d) none of these

Q 15. If in an AP, t1 = log10 a, tn+1 = log10 b and t2n+1 = log10 c then a, b, c are in

(a) AP (b) GP (c) HP (d) none of these

Q 16. If n!, 3 × n! and (n + 1)! are in GP then n!, 5 × n! and (n + 1)! are in

(a) AP (b) GP (c) HP (d) none of these

Q 17. In an AP, the pth term is q and the (p + q)th term is 0. Then the qth term is

(a) –p (b) p (c) p + q (d) p – q

Q 18. In a sequence of (4n + 1) terms the first (2n + 1) terms are in AP whose common difference is 2, and the last (2n + 1) terms are in GP whose common ratio is 0.5. If the middle terms of the AP and GP are equal then the middle term of the sequence is

(a)  (b)  (c) n . 2n (d) none of these

Q 19. If x2 + 9y2 + 25z2 = then x, y, z are in

(a) AP (b) GP (c) HP (d) none of these

Q 20. If a, b, c, d and p are distinct real numbers such that

(a2+ b2 + c2)p2 – 2(ab + bc + cd)p + (b2 + c2 + d2) ≤ 0

then a, b, c, d are in

(a) AP (b) GP (c) HP (d) none of these

Q 21. The largest term common to the sequences 1, 11, 21, 31, …. to 100 terms and 31, 36, 41, 46, …. to 100 terms is

(a) 381 (b) 471 (c) 281 (d) none of these

Q 22. The interior angles of a convex polygon are in AP, the common difference being 5°. If the smallest angle angles is 2π/3 then the number of sides is

(a) 9 (b) 16 (c) 7 (d) none of these

Q 23. The minimum number of terms of 1 + 3 + 5 + 7 + ……. that add up to a number exceeding 1357 is

(a) 15 (b) 37 (c) 35 (d) 17

Q 24. In the value of 100! the number of zeros at the end is

(a) 11 (b) 22 (c) 23 (d) 24

Q 25. The sum of all the proper divisors of 9900 is

(a) 33851 (b) 23952 (c) 23951 (d) none of these

Q 26. The sum of all odd proper divisors of 360 is

(a) 77 (b) 78 (c) 81 (d) none of these

Q 27. In the sequence 1, 2, 2, 3, 3, 3, 4, 4, 4, 4, ……., where n consecutive terms have the value n, the 150th term is

(a) 17 (b) 16 (c) 18 (d) none of these

Q 28. In the sequence 1, 2, 2, 4, 4, 4, 4, 8, 8, 8, 8, 8, 8, 8, 8, ….., where n consecutive terms have the value n, the 1025th term I s

(a) 29 (b) 210 (c) 211 (d) 28

Q 29. Let {tn} be a sequence of integers in GP in which t4 : t6 = 1 : 4 and t2 + t5 = 216. Then t1is

(a) 12 (b) 14 (c) 16 (d) none of these

Q 30. If are in AP, where a, b, c are in GP, then a, b, c are the lengths of sides of

(a) an isosceles triangle (b) an equilateral triangle

(c) a scalene triangle (d) none of these

Q 31. Let S be the sum, P be the product and R be the sum of the reciprocals of n terms of a GP. Then P2Rn : Sn is equal to

(a) 1 : 1 (b) (common ratio)n : 1

(c) (first term)2 : (common ratio)n (d) none of these

Q 32. If the pth, qth and rth terms of an AP are in GP then the common ratio of the GP is

(a)  (b)  (c)  (d) none of these

Q 33. The number of terms common between the series 1 + 2 + 4 + 8 + ….. to 100 terms and 1 + 4 + 7 + 10 + …….. to 100 terms is

(a) 6 (b) 4 (c) 5 (d) none of these

Q 34. The 10th common term between the series 3 + 7 + 11 + …. and 1 + 6 + 11 + …… is

(a) 191 (b) 193 (c) 211 (d) none of these

Q 35. Three consecutive terms of a progression are 30, 24, 20. The next term of the progression is

(a) 18 (b)  (c) 16 (d) none of these

Q 36. If three numbers are in GP then the numbers obtained by adding the middle number to each of the three numbers are in

(a) AP (b) GP (c) HP (d) none of these

Q 37. If a1, a2, a3 are in AP, a2, a3, a4 are in GP and a3, a4, a5 are in HP then a1, a3, a5 are in

(a) AP (b) GP (c) HP (d) none of these

Q 38. If a, b, c, d are four numbers such that the first three are in AP while the last three are in HP then

(a) bc = ad (b) ac = bd (c) ab = cd (d) none of these

Q 39. If the first two terms of an HP be 2/5 and 12/23 then the largest positive term of the progression is the

(a) 6th term (b) 7th term (c) 5th term (d) 8th term

Q 40. If x, 2y, 3z are in AP, where the distinct numbers x, y, z are in GP, then the common ratio of the GP is

(a) 3 (b)  (c) 2 (d) 

Q 41. If x > 1, y > 1, z > 1 are three numbers in GP then



are in

(a) AP (b) HP (c) GP (d) none of these

Q 42. If a, a1, a2, a3,. ….. a2n-1, b are in AP, a, b1, b2, b3,….,b2n-1, b are in GP and a, c1, c2, c3,….., c2n-1, b are in HP, where a, b are positive, then the equation anx2 – bnx + cn = 0 has its roots

(a) real and unequal (b) real and equal (c) imaginary (d) none of these

Q 43. If a, x, b are in AP, a, y, b are in GP and a, z, b are in HP such that x = 9z and a > 0, b > 0 then

(a) |y| = 3z (b) x = 3|y| (c) 2y = x + z (d) none of these

Q 44. If three numbers are in HP then the number obtained by subtracting half of the middle number from each of them are in

(a) AP (b) GP (c) HP (d) none of these

Q 45. a, b, c, d, e are five numbers in which the first three are in AP and the last three are in HP. If the three numbers in the middle are in GP then the numbers in the odd places are in

(a) AP (b) GP (c) HP (d) none of these

Q 46. Let a1, a2, a3,……..,a10 be in AP and h1, h2, h3,………,h10 be in HP. If a1 = h1= 2 and a10 = h10 = 3 then a4h7 is

(a) 2 (b) 3 (c) 5 (d) 6

Q 47. If in an AP, Sn = p. n2 and Sm = p.m2, where Sr denotes the sum of r terms of the AP, then Sp is equal to

(a)  (b) mnp (c) p3 (d) (m + n)p2

Q 48. If Sr denotes the sum of the is equal to

(a) 2r – 1 (b) 2r + 1 (c) 4r + 1 (d) 2r + 3

Q 49. Sr denotes the sum of the first r terms of a GP. Then Sn, S2n – S3n – S2n are in

(a) AP (b) GP (c) HP (d) none of these

Q 50. If (1 – p)(1 + 3x + 9x2 + 27x3 + 81x4 + 243x5) = 1 – p6, p ≠ 1 then the value of is

(a)  ` (b) 3 (c)  (d) 2

Q 51. If the sum of series ∞ is a finite number then

(a) x < 2 (b)  (c) x > -2 (d) x < -2 or x > 2

Q 52. Let Sn denote the sum of the first n terms of an AP. If S2n = 3Sn then S3n : Sn is equal to

(a) 4 (b) 6 (c) 8 (d) 10

Q 53. In a GP of even number of terms, the sum of all terms is 5 times the sum of the odd terms. The common ratio of the GP is

(a)  (b)  (c) 4 (d) none of these

Q 54. In an AP, Sp = q, Sq = p and Sr denote the sum of the first r terms. Then Sp+q is equal to

(a) 0 (b) –(p + q) (c) p + q (d) pq

Q 55. The coefficient of x15 in the product

(1 – x)(1 – 2x)(1 – 22. x)(1 – 23 . x)……(1 – 215 . x)

is equal to

(a) 2105 - 2121 (b) 2121 – 2105 (c) 2120 - 2104 (d) none of these

Q 56. The coefficient of x49 in the product (x – 1)(x – 3) …. (x – 99) is

(a) -992 (b) 1 (c) -2 500 (d) none of these

Q 57. If a, b, c are in AP then are in

(a) AP (b) GP (c) HP (d) none of these

Q 58. The AM of two given positive numbers is 2. If the larger number is increased by 1, the GM of the numbers becomes equal to the AM of the given numbers. Then the HM of the given numbers is

(a)  (b)  (c)  (d) none of these

Q 59. Let a, b are two positive numbers, where a > b and 4 × GM = 5 × HM for the numbers. Then a is

(a) 4b (b) b (c) 2b (d) b

Q 60. If a, a1, a2, a3,…..a2n, b are in AP and a, g1, g2, g3,…..g2n, b are in GP and h is the HM of a and b then



is equal to

(a)  (b) 2nh (c) nh (d) 

Q 61. Let a1= 0 and a1, a2, a3,….,an be real numbers such that |ai| = |ai-1 + 1| for all i then the AM of the numbers a1, a2, a3,……an has the value A where

(a)  (b)  (c) A≥  (d) A = 

Q 62. Let there be a GP whose first term is a and the common ratio is r. If A and H are the arithmetic mean and the harmonic mean respectively for the first n terms of the GP, A . H is equal to

(a) a2rn-1 (b) arn (c) a2rn (d) none of these

Q 63. If the first and the (2n – 1)th terms of an AP, a GP and an HP are equal and their nth terms are a, b and c respectively then

(a) a = b = c (b) a ≥ b ≥ c (c) a + c = b (d) ac - b2 = 0

Q 64. is the HM between a and b if n is

(a) 0 (b)  (c) – (d) 1

Q 65. If the harmonic mean between P and Q be H then is equal to

(a) 2 (b)  (c)  (d) 

Q 66. Let x be the AM and y, z be two GMs between two positive numbers. Then is equal to

(a) 1 (b) 2 (c)  (d) none of these

Q 67. If HM : GM = 4 : 5 for two positive numbers then the ratio of the numbers is

(a) 4 : 1 (b) 3 : 2 (c) 3 : 4 (d) 2 : 3

Q 68. In a GP of alternately positive and negative terms, any term is the AM of the next two terms. Then the common ratio is

(a) -1 (b) -3 (c) -2 (d) 

Q 69. If a, b, c are in AP, and p, p' are the AM and GM respectively between a and b, while q, q' are the AM and GM respectively between b and c, then

(a) p2 + q2 = p'2 + q'2 (b) pq = p'q' (c) p2 – q2 = p'2 – q'2 (d) none of these

Q 70. If then the minimum value of is

(a) 1 (b) 2 (c) 0 (d) none of these

Q 71. If a > 1, b > 1 then the minimum value of logb a + logab I s

(a) 0 (b) 1 (c) 2 (d) none of these

Q 72. The minimum value of 4x + 41-x, x ∈ R, is

(a) 2 (b) 4 (c) 1 (d) none of these

Q 73. If x = log5 3 + log7 5 + log9 7 then

(a)  (b)  (c)  (d) none of these

Q 74. If an > 1 for all n ∈ N then



has the minimum value

(a) 1 (b) 2 (c) 0 (d) none of these

Q 75. The product of n positive numbers is 1. Their sum is

(a) a positive integer (b) divisible by n

(c) equal to  (d) greater than or equal to n

Q 76. If x, y, z are three real numbers of the same sign then the value of lies in the interval

(a) [2, +∞) (b) [3, +∞) (c) (3, +∞) (d) (-∞, 3)

Q 77. The least value of 2log100 a – loga 0.0001, a > 1 is

(a) 2 (b) 3 (c) 4 (d) none of these

Q 78. If 0 < x < π/2 then the minimum value of (sin x + cos x + cosec 2x)3 is

(a) 27 (b) 13.5 (c) 6.75 (d) none of these

Q 79. If x, y, z are positive then the minimum value of

is

(a) 3 (b) 1 (c) 9 (d) 16

Q 80. a, b, c are three positive numbers and abc2 has the greatest value . Then

(a)  (b)  (c)  (d) none of these

Q 81. If a > 0, b > 0, c > 0 and the minimum value of



is λabc then λ is

(a) 2 (b) 1 (c) 6 (d) 3

Q 82. The value of is

(a) an even integer (b) an odd integer (c) a rational number (d) an irrational number

Q 83. The sum of 0.2 + 0.004 + 0.00006 + 0.0000008 + ….. to ∞ is

(a)  (b)  (c)  (d) none of these

Q 84. If (2n + r)r, n ∈ N, r ∈ N is expressed as the sum of k consecutive odd natural numbers then k is equal to

(a) r (b) n (c) r+ 1 (d) n + 1

Q 85. is equal to

(a) 0 (b)  (c)  (d) none of these

Q 86. If (1 + x)(1 + x2)(1 + x4)….(1 + x128) = then n is

(a) 255 (b) 127 (c) 63 (d) none of these

Q 87. The value of (a ≠ 0, 1; b ≠ 0, 1) is

(a)  (b)  (c)  (d) 

Q 88. The sum of the products of the ten numbers ±1, ±2, ±3, ±4, ±5 taking two at a time is

(a) 165 (b) -55 (c) 55 (d) none of these

Q 89. The sum of the series is

(a)  (b)  (c)  (d) none of these

Q 90. If are in GP then the value of n is

(a) 2 (b) 3 (c) 4 (d) nonexistent

Q 91. The value of is equal to

(a)  (b)  (c)  (d) none of these

Q 92. If the sn is equal to

(a) 2n – (n + 1) (b)  (c)  (d) 

Q 93. Let Sn denote the sum of the cubes of the first n natural numbers sn denote the sum of the first n natural numbers. Then is equal to

(a)  (b)  (c)  (d) none of these

Q 94. It is known that . Then is equal to

(a)  (b)  (c)  (d) none of these

Q 95. It is given that is equal to

(a)  (b)  (c)  (d) none of these

Q 96. If in a series then is equal to

(a)  (b)  (c)  (d) none of these

Q 97. If tn denotes the nth term of the series 2 + 3 + 6 + 11 + 18 + …. Then t50 is

(a) 492 -1 (b) 492 + 2 (c) 502 + 1 (d) 492 + 2

Q 98. 21/4 . 41/8 . 81/16 … to ∞ is equal to

(a) 1 (b) 2 (c)  (d) none of these

Q 99. The sum of n terms of the series

12 + 2.22 + 32 + 2.42 + 52 + 2.62 + ……

is when n is even. When n is odd, the sum is

(a)  (b)  (c) 2(n + 1)2. (2n + 1) (d) none of these

Q 100. If n is an odd integer greater than or equal to 1 then the value of n3 – (n – 1)3 + (n – 2)3 - …. + (-1)n-1 . 13 is

(a)  (b)  (c)  (d) none of these

Q 101. Observe that

13 = 1, 23 = 3 + 5, 33 = 7 + 9 + 11, 43 = 13 + 15 + 17 + 19.

Then n3 as a similar series is

(a) 

(b) (n2 + n + 1) + (n2 + n + 3) + (n2 + n + 5) + ….. + (n2 + 3n – 1)

(c) (n2 – n + 1) + (n2 – n + 3) + (n2 – n + 5) + ….. + (n2 + n – 1)

(d) none of these

Q 102. Let tr= 2r/2 + 2-r/2. Then is equal to

(a)  (b)  (c)  (d) none of these

Q 103. Let Sk = . Then equals

(a)  (b)  (c)  (d) 

Q 104. Let tn = n.(n!). then is equal to

(a) 15! – 1 (b) 15! + 1 (c) 16! – 1 (d) none of these

Q 105. The sum of terms is equal to

(a)  (b)  (c)  (d) none of these

Q 106. Let f(n) = where [x] denotes the integral part of x. Then the value of is

(a) 50 (b) 51 (c) 1 (d) none of these

Q 107. Ar; r = 1, 2, 3,….., n are n points on the parabola y2 = 4x in the first quadrant. If Ar = (xr, yr), where x1, x2, x3,…..,xn are in GP and x1 = 1, x2= 2, then yn is equal to

(a)  (b) 2n+1 (c)  (d) 

Q 108. In the given square, a diagonal is drawn, and parallel line the segments joining points on the adjacent sides are drawn on both sides of the diagonal. The length of the diagonal cm. If the distance between consecutive line segment be cm then the sum of the lengths of all possible line segments and the diagonal is

(a) n(n + 1) cm (b)  (c)  (d) 

Q 109. ABCD is a square of length a, a ∈ N, a > 1. Let L1, L2, L3, … be points on BC such that BL1 = L1L2 = L2L3 = …. = 1 and M1, M2, M3,…. be points on CD such that CM1 = M1M2 = M2M3 = ……. = 1. Then is equal to

(a)  (b)  (c)  (d) none of these

Q 110. The sum of infinite terms of a decreasing GP is equal to the greatest value of the function f(x) = x3 + 3x – 9 in the interval [-2, 3] and the difference between the first two terms is f'(0). Then the common ratio of the GP is

(a)  (b)  (c)  (d) 

Q 111. The lengths of three unequal edges of a rectangular solid block are in GP. The volume of the block is 216 cm3 and the total surface area is 252 cm2. The length of the longest edge is

(a) 12 cm (b) 6 cm (c) 18 cm (d) 3 cm

Q 112. ABC is a right-angled triangle in which ∠B = 90° and BC = a. If n points L1, L2,…..,Ln on AB are such that AB is divided in n + 1 equal parts and L1M1, L2M2,…..,LnMn are line segments parallel to BC and M1, M2,….., Mn are on AC then the sum of the lengths of L1M1, L2M2, ….., LnMn is

(a)  (b)  (c) 

(d) impossible to find from the given data

**Choose the correct options. One or more options may be correct.**

Q 113. If AM of the number 51+x and 51-x is 13 then the set of possible real values of x is

(a)  (b) {1, 1} (c) {x | x2 – 1 = 0, x ∈ R} (d) none of these

Q 114. If the AM of two positive numbers be three times their geometric mean then the ratio of the numbers is

(a)  (b)  (c) 17 +  (d) 

Q 115. If a, b, c are in HP then is equal to

(a)  (b)  (c)  (d) none of these

Q 116. Sr denotes the sum of the first r terms of an AP. Then S3n : (S2n – Sn) is

(a) n (b) 3n (c) 3 (d) independent of n

Q 117. If ax = by = cz and x, y, z are in GP then logcb is equal to

(a) logb a (b) loga b (c)  (d) none of these

Q 118. The value of is

(a)  (b)  (c)  (d) none of these

Q 119. Let . Then is equal to

(a) f(2n) – 16f(n) for all n ∈ N (b) f(n) – when n is odd

(c) when n is even (d) none of these

Q 120. If 2.nP1, nP2, nP3 are three consecutive terms of an AP then they are

(a) in GP (b) in HP (c) equal (d) none of these

Q 121. In a GP the product of the first four terms is 4 and the second term is the reciprocal of the fourth term. The sum of the GP up to infinite terms is

(a) 8 (b) -8 (c)  (d) 

Q 122. If = an4 + bn3 + cn2 + dn + e then

(a)  (b)  (c)  (d) e = 0

Q 123. If a, b, c, d are four positive numbers then

(a)  (b) 

(c)  (d) 

Q 124. Let and . Then the constant term in f'(x) × g(x) is equal to

(a) when n is even (b) when n is odd

(c) when n is even (d) when n is odd

Q 125. Let an = product of the first n natural numbers. Then for all n ∈ N

(a) an ≥ an (b)  (c) nn ≥ an+1 (d) none of these

Q 126. Let the sets A = {2, 4, 6, 8,….} and B = {3, 6, 9, 12,….} and n(A) = 200, n(B) = 250. Then

(a) n(A ∩ B) = 67 (b) n(A ∪ B) = 450 (c) n(A ∩ B) = 66 (d) n(A ∪ B) = 384

Q 127. Let a, x, b be in AP; a, y, b be in GP and a, z, b be in HP. If x = y + 2 and a = 5z then

(a) y2 = xz (b) x > y > z (c) a = 9, b = 1 (d) 

Q 128. Let S1, S2, S3,….be squares such that for each n ≥ 1, the length of a side of Sn equals the length of a diagonal of Sn+1. If the length of a side of S1 is 10 cm then for which of the following values of n is the area of Sn less than 1 cm2 ?

(a) 7 (b) 8 (c) 9 (d) 10

Q 129. Three positive numbers from a GP. If the middle number is increased by 8, the three numbers form an AP. If the last number is also increased by 64 along with the previous increase in the middle number, the resulting numbers from a GP again. Then

(a) common ratio = 3 (b) first number =  (c) common ratio = -5 (d) first number = 4

Q 130. If a, b, c are in GP and a, p, q are in AP such that 2a, b + p, c + q are in GP then the common difference of the AP is

(a)  (b)  (c)  (d) 

Q 131. If x, y, z are positive numbers in AP then

(a) y2 ≥ xy (b) y ≥  (c) has the minimum value 2

(d) 

Q 132. Between two unequal numbers, if a1, a2 are two AMs; g1, g2 are two GMs and h1, h2 are two HMs then g1 . g2 is equal to

(a) a1h1 (b) a1h2 (c) a2h2 (d) a2h1

Q 133. The number 1, 4, 16 can be three terms (not necessarily consecutive) of

(a) no AP (b) only one GP

(c) infinite number of APs (d) infinite number of GPs

1a 2c 3b 4c 5c 6d 7c 8b 9a 10c

11c 12b 13c 14d 15b 16a 17b 18a 19c 20b

21d 22a 23b 24d 25c 26a 27a 28b 29a 30d

31a 32b 33c 34a 35b 36c 37b 38a 39c 40b

41b 42c 43b 44b 45b 46d 47c 48b 49b 50b

51d 52b 53c 54b 55a 56c 57a 58a 59a 60a

61c 62a 63d 64a 65a 66b 67a 68c 69c 70b

71c 72b 73c 74d 75d 76b 77c 78b 79a 80b

81c 82c 83b 84a 85c 86a 87c 88b 89d 90c

91b 92c 93a 94c 95a 96b 97d 98a 99a 100a

101c 102b 103d 104c 105a 106b 107c 108d 109b 110c

111a 112c 113bc 114cd 115ac 116cd 117ac 118ab 119a 120abc

121abcd 122ac 123abc 124bc 125ab 126cd 127ac 128bcd 129ad 130bd

131ad 132bd 133cd