Assignment

General term of an Arithmetic progression

Basic Level

1. The sequence $\frac{5}{\sqrt{7}}, \frac{6}{\sqrt{7}}, \sqrt{7}........$ is

(a) H.P. (b) G.P. (c) A.P. (d) None of these

2. p^{th} term of the series $\left(3-\frac{1}{n}\right)+\left(3-\frac{2}{n}\right)+\left(3-\frac{3}{n}\right)+.....$ will be

(a) $\left(3+\frac{p}{n}\right)$ (b) $\left(3-\frac{p}{n}\right)$ (c) $\left(3+\frac{n}{p}\right)$ (d) $\left(3-\frac{n}{p}\right)$

3. If the 9^{th} term of an A.P. be zero, then the ratio of its 29^{th} and 19^{th} term is

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

4. Which of the following sequence is an arithmetic sequence

(a) $f(n) = an + b; n \in N$ (b) $f(n) = kr^n; n \in N$ (c) $f(n) = (an+b)kr^n; n \in N$ (d) $f(n) = \frac{1}{a\left(n+\frac{b}{n}\right)}; n \in N$

5. If the p^{th} term of an A.P. be q and q^{th} term be p, then its r^{th} term will be **[Rajasthan PET 1999]**

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

6. If the 9^{th} term of an A.P. is 35 and 19^{th} is 75, then its 20^{th} term will be **[Rajasthan PET 1989]**

(a) 78 (b) 79 (c) 80 (d) 81

7. If $(a+1), 3a, (4a+2)$ are in A.P. then 7^{th} term of the series is

(a) $10a+4$ (b) – 33 (c) 33 (d) 10 a – 4

8. It x, y, z are in A.P., then its common difference is

(a) $\sqrt{x^2-yz}$ (b) $\sqrt{y^2-xz}$ (c) $\sqrt{z^2-xy}$ (d) None of these

9. The 10^{th} term of the sequence $\sqrt{3}, \sqrt{12}, \sqrt{27}, ...$is

(a) $\sqrt{243}$ (b) $\sqrt{300}$ (c) $\sqrt{363}$ (d) $\sqrt{432}$

10. Which term of the sequence $(-8+18i)$, $(-6+15i)$, $(-4+12i)$, ...is purely imaginary

(a) 5^{th} (b) 7^{th} (c) 8^{th} (d) 6^{th}

11. If $(m+2)^{th}$ term of an A.P. is $(m+2)^2-m^2$, then its common difference is

(a) 4 (b) – 4 (c) 2 (d) – 2

12. For an A.P., $T_2 + T_5 - T_3 = 10$, $T_2 + T_9 = 17$, then common difference is

(a) 0 (b) 1 (c) – 1 (d) 13

Advance Level

13. If tan $n\theta = \tan m\theta$, then the different values of θ will be in **[Karnataka CET 1998]**

(a) A.P. (b) G.P. (c) H.P. (d) None of these

14. If the p^{th}, q^{th} and r^{th} term of an arithmetic sequence are a, b and c respectively, then the value of [a $(q - r)$+$b(r - p)$+ c $(p - q)$]=

[MP PET 1985]

(a) 1 (b) – 1 (c) 0 (d) $\frac{1}{2}$

15. If n^{th} terms of two A.P.'s are $3n + 8$ and $7n + 15$, then the ratio of their 12^{th} terms will be **[MP PET 1986]**

(a) $\frac{4}{9}$ (b) $\frac{7}{16}$ (c) $\frac{3}{7}$ (d) $\frac{8}{15}$

16. The 6^{th} term of an A.P. is equal to 2, the value of the common difference of the A.P. which makes the product $a_1 a_4 a_5$ least is given by

(a) $\frac{8}{5}$ (b) $\frac{5}{4}$ (c) $\frac{2}{3}$ (d) None of these

17. If p times the p^{th} term of an A.P. is equal to q times the q^{th} term of an A.P., then $(p+q)^{th}$ term is

[MP PET 1997; Karnataka CET 2002]

(a) 0 (b) 1 (c) 2 (d) 3

18. The numbers $t(t^2+1)$, $-\frac{1}{2}t^2$ and 6 are three consecutive terms of an A.P. If t be real, then the next two terms of A.P. are

(a) –2, –10 (b) 14, 6 (c) 14, 22 (d) None of these

19. If the p^{th} term of the series 25, $22\frac{3}{5}$, $20\frac{1}{2}$, $18\frac{1}{4}$,...... is numerically the smallest, then p=

(a) 11 (b) 12 (c) 13 (d) 14

20. The second term of an A.P. is $(x - y)$ and the 5^{th} term is $(x + y)$, then its first term is **[AMU 1989]**

(a) $x - \frac{1}{3}y$ (b) $x - \frac{2}{3}y$ (c) $x - \frac{4}{3}y$ (d) $x - \frac{5}{3}y$

21. The number of common terms to the two sequences 17, 21, 25, ...417 and 16, 21, 26, ... 466 is

(a) 21 (b) 19 (c) 20 (d) 91

22. In an A.P. first term is 1. If $T_1 T_3 + T_2 T_3$ is minimum, then common difference is

(a) –5/4 (b) –4/5 (c) 5/4 (d) 4/5

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

(a) $n(A \cap B)$ = 67 (b) $n(A \cup B)$ = 450 (c) $n(A \cap B)$ = 66 (d) $n(A \cup B)$ = 384

Sum to n terms of an Arithmetic progression

Basic Level

24. The sum of first n natural numbers is **[MP PET 1984; Rajasthan PET 1995]**

(a) $n(n-1)$ (b) $\frac{n(n-1)}{2}$ (c) $n(n+1)$ (d) $\frac{n(n+1)}{2}$

25. The sum of the series $\frac{1}{2}+\frac{1}{3}+\frac{1}{6}+......$ to 9 terms is **[MNR 1985]**

(a) $-\frac{5}{6}$ (b) $-\frac{1}{2}$ (c) 1 (d) $-\frac{3}{2}$

26. The sum of all natural numbers between 1 and 100 which are multiples of 3 is **[MP PET 1984]**

(a) 1680 (b) 1683 (c) 1681 (d) 1682

27. The sum of 1+3+5+7+..... upto n terms is **[MP PET 1984]**

(a) $(n+1)^2$ (b) $(2n)^2$ (c) n^2 (d) $(n-1)^2$

28. If the sum of the series 2+ 5+ 8+11 .... is 60100, then the number of terms are **[MNR 1991; DCE 2001]**

(a) 100 (b) 200 (c) 150 (d) 250

29. If the first term of an A.P. be 10, last term is 50 and the sum of all the terms is 300, then the number of terms are **[Rajasthan PET 1987]**

(a) 5 (b) 8 (c) 10 (d) 15

30. The sum of the numbers between 100 and 1000 which is divisible by 9 will be **[MP PET 1982]**

(a) 55350 (b) 57228 (c) 97015 (d) 62140

31. If the sum of three numbers of a arithmetic sequence is 15 and the sum of their squares is 83, then the numbers are **[MP PET 1985]**

(a) 4, 5, 6 (b) 3, 5, 7 (c) 1, 5, 9 (d) 2, 5, 8

32. If the sum of three consecutive terms of an A.P. is 51 and the product of last and first term is 273, then the numbers are

[MP PET 1986]

(a) 21, 17, 13 (b) 20, 16, 12 (c) 22, 18, 14 (d) 24, 20, 16

33. There are 15 terms in an arithmetic progression. Its first term is 5 and their sum is 390. The middle term is **[MP PET 19**

(a) 23 (b) 26 (c) 29 (d) 32

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

[JEE West Bengal 1994]

(a) $P+Q$ (b) $2P+3Q$ (c) $2Q$ (d) Q

35. The sum of numbers from 250 to 1000 which are divisible by 3 is **[Rajasthan PET 1997]**

(a) 135657 (b) 136557 (c) 161575 (d) 156375

36. Four numbers are in arithmetic progression. The sum of first and last term is 8 and the product of both middle terms is 15. The least number of the series is **[MP PET 2001]**

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

37. The number of terms of the A.P. 3, 7, 11, 15 ...... to be taken so that the sum is 406 is **[Kerala (Engg.) 2002]**

(a) 5 (b) 10 (c) 12 (d) 14

38. The consecutive odd integers whose sum is $45^2 - 21^2$ are

(a) 43, 45, ..., 75 (b) 43, 45,...... 79 (c) 43, 45, ..., 85 (d) 43, 45, ..., 89

39. If common difference of m A.P.'s are respectively 1, 2,...... m and first term of each series is 1, then sum of their m^{th} terms is

(a) $\frac{1}{2}m(m+1)$ (b) $\frac{1}{2}m(m^2+1)$ (c) $\frac{1}{2}m(m^2-1)$ (d) None of these

40. The sum of all those numbers of three digits which leave remainder 5 after division by 7 is

(a) 551 × 129 (b) 550 × 130 (c) 552 × 128 (d) None of these

41. If $S_n = n^2 p$ and $S_m = m^2 p, m \neq n,$ in A.P., then S_p is

(a) p^2 (b) p^3 (c) p^4 (d) None of these

42. An A.P. consists of n (odd terms) and its middle term is m. Then the sum of the A.P. is

(a) $2\,mn$ (b) $\frac{1}{2}mn$ (c) mn (d) mn^2

43. 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

Advance Level

44. If the ratio of the sum of n terms of two A.P.'s be $(7n+1) : (4n+27)$, then the ratio of their 11^{th} terms will be **[AMU 1996]**

(a) 2 : 3 (b) 3 : 4 (c) 4 : 3 (d) 5 : 6

45. The interior angles of a polygon are in A.P. If the smallest angle be 120° and the common difference be 5, then the number of sides is

[IIT 1980]

(a) 8 (b) 10 (c) 9 (d) 6

46. The sum of integers from 1 to 100 that are divisible by 2 or 5 is **[IIT 1984]**

(a) 3000 (b) 3050 (c) 4050 (d) None of these

47. If the sum of first n terms of an A.P. be equal to the sum of its first m terms, $(m \neq n)$, then the sum of its first $(m+n)$ terms will be

[MP PET 1984]

(a) 0 (b) n (c) m (d) $m+n$

48. If $a_1, a_2, ..., a_n$ are in A.P. with common difference d, then the sum of the following series is

$\sin d(\text{coses } a_1 . \text{cosec } a_2 + \text{cosec } a_2 . \text{cosec } a_3 + ... + \text{cosec } a_{n-1} \text{ cosec } a_n)$ **[Rajasthan PET 2000]**

(a) $\sec a_1 - \sec a_n$ (b) $\cot a_1 - \cot a_n$ (c) $\tan a_1 - \tan a_n$ (d) $\text{cosec } a_1 - \text{cosec } a_n$

49. The odd numbers are divided as follows

$$\begin{array}{cccccc} & & 1 & 3 & & \\ & 5 & 7 & 9 & 11 & \\ 13 & 15 & 17 & 19 & 21 & 23 \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \end{array}$$

Then the sum of n^{th} row is

(a) $2^{n-2}[2^n + 2^{n-1} - 1]$ (b) $\frac{1}{2}(2n+1)$ (c) $2n$ (d) $4n^3$

50. If the sum of n terms of an A.P. is $2n^2+5n,$ then the n^{th} term will be **[Rajasthan PET 1992]**

(a) $4n+3$ (b) $4n+5$ (c) $4n+6$ (d) $4n+7$

51. The nth term of an A.P. is $3n-1$. Choose from the following the sum of its first five terms **[MP PET 1983]**

(a) 14 (b) 35 (c) 80 (d) 40

52. If the sum of two extreme numbers of an A.P. with four terms is 8 and product of remaining two middle term is 15, then greatest number of the series will be **[Roorkee 1965]**

(a) 5 (b) 7 (c) 9 (d) 11

53. The ratio of sum of m and n terms of an A.P. is $m^2:n^2$, then the ratio of m^{th} and n^{th} term will be **[Roorkee 1963; MP PET 1**

(a) $\frac{m-1}{n-1}$ (b) $\frac{n-1}{m-1}$ (c) $\frac{2m-1}{2n-1}$ (d) $\frac{2n-1}{2m-1}$

54. The value of x satisfying $\log_a x+\log_{\sqrt{a}} x+\log_{\sqrt[3]{a}} x+.....+\log_{\sqrt[n]{a}} x=\frac{a+1}{2}$ will be

(a) $x=a$ (b) $x=a^a$ (c) $x=a^{-1/a}$ (d) $x=a^{1/a}$

55. Sum of first n terms in the following series $\cot^{-1}3+\cot^{-1}7+\cot^{-1}13+\cot^{-1}21+.....$ is given by

(a) $\tan^{-1}\left(\frac{n}{n+2}\right)$ (b) $\cot^{-1}\left(\frac{n+2}{n}\right)$ (c) $\tan^{-1}(n+1)-\tan^{-1}1$ (d) All of these

56. Let S_n denotes the sum of n terms of an A.P. If $S_{2n}=3S_n,$ then ratio $\frac{S_{3n}}{S_n}=$ **[MNR 1993; UPSEAT 2001]**

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

57. If the sum of the first n terms of a series be $5n^2+2n,$ then its second term is **[MP PET 1996]**

(a) 7 (b) 17 (c) 24 (d) 42

58. All the terms of an A.P. are natural numbers. The sum of its first nine terms lies between 200 and 220. If the second term is 12, then the common difference is

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

59. If $S_1=a_2+a_4+a_6+.....$up to 100 terms and $S_2=a_1+a_3+a_5+......$ up to 100 terms of a certain A.P. then its common difference d is

(a) S_1-S_2 (b) S_2-S_1 (c) $\frac{S_1-S_2}{2}$ (d) None of these

60. In the arithmetic progression whose common difference is non-zero, the sum of first $3n$ terms is equal to the sum of the next n terms. Then the ratio of the sum of the first $2n$ terms to the next $2n$ terms is

(a) $\frac{1}{5}$ (b) $\frac{2}{3}$ (c) $\frac{3}{4}$ (d) None of these

61. If the sum of n terms of an A.P. is $nA+n^2B,$ where A, B are constants, then its common difference will be **[MNR 1977]**

(a) $A - B$ (b) $A + B$ (c) $2A$ (d) $2B$

Arithmetic mean

Basic Level

62. A number is the reciprocal of the other. If the arithmetic mean of the two numbers be $\frac{13}{12}$, then the numbers are

(a) $\frac{1}{4}, \frac{4}{1}$ (b) $\frac{3}{4}, \frac{4}{3}$ (c) $\frac{2}{5}, \frac{5}{2}$ (d) $\frac{3}{2}, \frac{2}{3}$

63. The arithmetic mean of first n natural number **[Rajasthan PET 1986]**

(a) $\frac{n-1}{2}$ (b) $\frac{n+1}{2}$ (c) $\frac{n}{2}$ (d) n

64. The four arithmetic means between 3 and 23 are **[MP PET 1985]**

(a) 5, 9, 11, 13 (b) 7, 11, 15, 19 (c) 5, 11, 15, 22 (d) 7, 15, 19, 21

65. The mean of the series a, $a + nd$, $a + 2nd$ is **[DCE 2002]**

(a) $a+(n-1)d$ (b) $a+nd$ (c) $a+(n+1)d$ (d) None of these

66. If n A.M. s are introduced between 3 and 17 such that the ratio of the last mean to the first mean is 3 : 1, then the value of n is

(a) 6 (b) 8 (c) 4 (d) None of these

Advance Level

67. The sum of n arithmetic means between a and b, is **[Rajasthan PET 1986]**

(a) $\frac{n(a+b)}{2}$ (b) $n(a+b)$ (c) $\frac{(n+1)(a+b)}{2}$ (d) $(n+1)(a+b)$

68. Given that n A.M.'s are inserted between two sets of numbers a, $2b$ and $2a$, b, where $a, b \in R$. Suppose further that m^{th} mean between these sets of numbers is same, then the ratio $a : b$ equals

(a) $n - m + 1 : m$ (b) $n - m + 1 : n$ (c) $n : n - m + 1$ (d) $m : n - m + 1$

69. Given two number a and b. Let A denote the single A.M. and S denote the sum of n A.M.'s between a and b, then S/A depends on

[Pb. CET 1992]

(a) n, a, b (b) n, b (c) n, a (d) n

70. The A.M. of series $a+(a+d)+(a+2d)+.....+(a+2nd)$ is **[Pb. CET 1998]**

(a) $a+(n-1)d$ (b) $a+nd$ (c) $a+(n-1)d$ (d) None of these

71. If 11 AM's are inserted between 28 and 10, then three mid terms of the series are **[MNR 1997]**

(a) $\frac{41}{2}, 19, \frac{35}{2}$ (b) $20, \frac{41}{2}, \frac{43}{2}$ (c) $20, \frac{61}{2}, \frac{62}{3}$ (d) $20, 22, 24$

72. If $f(x+y, x-y) = xy$, then the arithmetic mean of $f(x, y)$ and $f(y, x)$ is **[AMU 2002]**

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

73. If 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 quadratic equation is

(a) $7x^2+16x+5=0$ (b) $7x^2-16x+5=0$ (c) $5x^2-16x+7=0$ (d) $5x^2-8x+7=0$

74. If $a_1=0$ and $a_1, a_2, a_3, ...a_n$ are real numbers such that $|a_i| = |a_{i-1}+1|$ for all i, then A.M. of the numbers $a_1, a_2, ...a_n$ has the value x where

(a) $x<1$ (b) $x < -\frac{1}{2}$ (c) $x \geq -\frac{1}{2}$ (d) $x = \frac{1}{2}$

75. If A.M. of the numbers 5^{1+x} and 5^{1-x} is 13 then the set of possible real values of x is

(a) $\{5, \frac{1}{5}\}$ (b) $\{1, -1\}$ (c) $\{x \mid x^2 - 1 \mid = 0, x \in R\}$ (d) None of these

Properties of A.P.

Basic Level

76. If $2x$, $x + 8$, $3x + 1$ are in A.P., then the value of x will be **[MP PET 1984]**

(a) 3 (b) 7 (c) 5 (d) – 2

77. 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 is equal to **[IIT 1990]**

(a) $1, \frac{1}{2}$ (b) $1, \frac{1}{3}$ (c) $1, \frac{3}{2}$ (d) None of these

78. If a_m denotes the m^{th} term of an A.P., then $a_m =$

(a) $\frac{a_{m+k} + a_{m-k}}{2}$ (b) $\frac{a_{m+k} - a_{m-k}}{2}$ (c) $\frac{2}{a_{m+k} + a_{m-k}}$ (d) None of these

79. If 1, $\log_y x$, $\log_z y$, – 15 $\log_x z$ are in A.P., then

(a) $z^3 = x$ (b) $x = y^{-1}$ (c) $z^{-3} = y$ (d) $x = y^{-1} = z^3$

(e) All of these

80. If $\frac{1}{p+q}, \frac{1}{r+p}, \frac{1}{q+r}$ are in A.P., then **[Rajasthan PET 1995]**

(a) p, q, r are in A.P. (b) p^2, q^2, r^2 are in A.P. (c) $\frac{1}{p}, \frac{1}{q}, \frac{1}{r}$ are in A.P. (d) None of these

81. If a, b, c, are in A.P., then $b^2 - ac$ is equal to **[Roorkee 1975]**

(a) $\frac{1}{4}(a+c)^2$ (b) $\frac{1}{4}(a-c)^2$ (c) $\frac{1}{2}(a+c)^2$ (d) $\frac{1}{2}(a-c)^2$

82. If $a_1, a_2, a_3, \ldots\ldots$ are in A.P. then a_p, a_q, a_r are in A.P. if p, q, r are in

(a) A.P. (b) G.P. (c) H.P. (d) None of these

Advance Level

83. If the sum of the roots of the equation $ax^2 + bx + c = 0$ be equal to the sum of the reciprocals of their squares, then bc^2, ca^2, ab^2 will be in **[IIT 1976]**

(a) A.P. (b) G.P. (c) H.P. (d) None of these

84. If $\frac{1}{b-c}, \frac{1}{c-a}, \frac{1}{a-b}$ be consecutive terms of an A.P., then $(b - c)^2$, $(c - a)^2$, $(a - b)^2$ will be in

(a) G.P. (b) A.P. (c) H.P. (d) None of these

85. If a^2, b^2, c^2 are in A.P., then $(b + c)^{-1}$, $(c+a)^{-1}$ and $(a+b)^{-1}$ will be in **[Roorkee 1968; Rajasthan PET 1996]**

(a) H.P. (b) G.P. (c) A.P. (d) None of these

86. If the sides of a right angled triangle are in A.P., then the sides are proportional to **[Roorkee 1974]**

(a) 1, 2, 3 (b) 2, 3, 4 (c) 3, 4, 5 (d) 4, 5, 6

87. If a, b, c are in A.P., then the straight line $ax + by + c = 0$ will always pass through the point **[IIT 1984]**

(a) $(-1,-2)$ (b) $(1,-2)$ (c) $(-1,2)$ (d) $(1,2)$

88. If a, b, c are in A.P. then $\frac{(a-c)^2}{(b^2-ac)} =$ **[Roorkee 1975]**

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

89. If a, b, c, d, e, f are in A.P., then the value of $e - c$ will be **[Pb. CET 1989, 91]**

(a) $2(c - a)$ (b) $2(f - d)$ (c) $2(d - c)$ (d) $d - c$

90. If p, q, r are in A.P. and are positive, the roots of the quadratic equation $px^2 + qx + r = 0$ are all real for **[IIT 1995]**

(a) $\left|\frac{r}{p}-7\right| \ge 4\sqrt{3}$ (b) $\left|\frac{p}{r}-7\right| < 4\sqrt{3}$ (c) All p and r (d) No p and r

91. If $a_1, a_2, a_3, \ldots\ldots a_n$ are in A.P., where $a_i > 0$ for all i, then the value of $\frac{1}{\sqrt{a_1}+\sqrt{a_2}} + \frac{1}{\sqrt{a_2}+\sqrt{a_3}} + \ldots\ldots + \frac{1}{\sqrt{a_{n-1}}+\sqrt{a_n}} =$ **[IIT 1982**

(a) $\frac{n-1}{\sqrt{a_1}+\sqrt{a_n}}$ (b) $\frac{n+1}{\sqrt{a_1}+\sqrt{a_n}}$ (c) $\frac{n-1}{\sqrt{a_1}-\sqrt{a_n}}$ (d) $\frac{n+1}{\sqrt{a_1}-\sqrt{a_n}}$

92. Given $a+d > b+c$ where a, b, c, d are real numbers, then **[Kurukshetra CEE 1998]**

(a) a, b, c, d are in A.P. (b) $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}, \frac{1}{d}$ are in A.P.

(c) $(a+b), (b+c), (c+d), (a+d)$ are in A.P. (d) $\frac{1}{a+b}, \frac{1}{b+c}, \frac{1}{c+d}, \frac{1}{a+d}$ are in A.P.

93. If a, b, c are in A.P., then $(a + 2b - c)(2b + c - a)(c + a - b)$ equals **[Pb. CET 1999]**

(a) $\frac{1}{2}abc$ (b) abc (c) $2\,abc$ (d) $4\,abc$

94. If the roots of the equation $x^3 - 12x^2 + 39x - 28 = 0$ are in A.P., then their common difference will be **[UPSEAT 1994, 99, 2001; Rajasthan PET 2001]**

(a) ± 1 (b) ± 2 (c) ± 3 (d) ± 4

95. If 1, $\log_9(3^{1-x}+2)$, $\log_3(4 . 3^x - 1)$ are in A.P., then x equals **[AIEEE 2002]**

(a) $\log_3 4$ (b) $1 - \log_3 4$ (c) $1 - \log_4 3$ (d) $\log_4 3$

96. If a, b, c, d, e are in A.P. then the value of $a+b+4c-4d+e$ in terms of a, if possible is **[Rajasthan PET 2002]**

(a) $4a$ (b) $2a$ (c) 3 (d) None of these

97. If $a_1, a_2, a_3, \ldots\ldots a_{2n+1}$ are in A.P. then $\frac{a_{2n+1}-a_1}{a_{2n+1}+a_1} + \frac{a_{2n}-a_2}{a_{2n}+a_2} + \ldots\ldots + \frac{a_{n+2}-a_n}{a_{n+2}+a_n}$ is equal to

(a) $\frac{n(n+1)}{2} . \frac{a_2-a_1}{a_{n+1}}$ (b) $\frac{n(n+1)}{2}$ (c) $(n+1)(a_2-a_1)$ (d) None of these

98. If the non-zero numbers x, y, z are in A.P. and $\tan^{-1}x, \tan^{-1}y, \tan^{-1}z$ are also in A.P., then

(a) $x = y = z$ (b) $xy = yz$ (c) $x^2 = yz$ (d) $z^2 = xy$

99. If three positive real numbers a, b, c are in A.P. such that $abc = 4$, then the minimum value of b is

(a) $2^{1/3}$ (b) $2^{2/3}$ (c) $2^{1/2}$ (d) $2^{3/2}$

100. If $\sin\alpha, \sin^2\alpha, 1, \sin^4\alpha$ and $\sin^5\alpha$ are in A.P., where $-\pi < \alpha < \pi$, then α lies in the interval

(a) $(-\pi/2, \pi/2)$ (b) $(-\pi/3, \pi/3)$ (c) $(-\pi/6, \pi/6)$ (d) None of these

101. If the sides of a triangle are in A.P. and the greatest angle of the triangle is double the smallest angle, the ratio of the sides of the triangle is

(a) 3 : 4 : 5 (b) 4 : 5 : 6 (c) 5 : 6 : 7 (d) 7 : 8 : 9

102. If *a, b, c* of a ΔABC are in A.P., then $\cot\frac{c}{2} =$ **[T.S. Rajendra 1990]**

(a) $3\tan\frac{A}{2}$ (b) $3\tan\frac{B}{2}$ (c) $3\cot\frac{A}{2}$ (d) $3\cot\frac{B}{2}$

103. If *a, b, c* are in A.P. then the equation $(a-b)x^2 + (c-a)x + (b-c) = 0$ has two roots which are

(a) Rational and equal (b) Rational and distinct (c) Irrational conjugates (d) Complex conjugates

104. The least value of 'a' for which $5^{1+x} + 5^{1-x}, \frac{a}{2}, 25^x + 25^{-x}$ are three consecutive terms of an A.P. is

(a) 10 (b) 5 (c) 12 (d) None of these

105. $\alpha, \beta, \gamma, \delta$ are in A.P. and $\int_0^2 f(x)dx = -4$, where $f(x) = \begin{vmatrix} x+\alpha & x+\beta & x+\alpha-\gamma \\ x+\beta & x+\gamma & x-1 \\ x+\gamma & x+\delta & x-\beta+\delta \end{vmatrix}$, then the common difference *d* is

(a) 1 (b) –1 (c) 2 (d) – 2

106. If the sides of a right angled triangle form an A.P. then the sines of the acute angles are

(a) $\frac{3}{5}, \frac{4}{5}$ (b) $\sqrt{3}, \frac{1}{3}$ (c) $\sqrt{\frac{\sqrt{5}-1}{2}}, \sqrt{\frac{\sqrt{5}+1}{2}}$ (d) $\frac{\sqrt{3}}{2}, \frac{1}{2}$

107. If x, y, z are positive numbers in A.P., then

(a) $y^2 \geq xz$ (b) $y \geq 2\sqrt{xz}$

(c) $\frac{x+y}{2y-x} + \frac{y+z}{2y-z}$ has the minimum value 2 (d) $\frac{x+y}{2y-x} + \frac{y+z}{2y-z} \geq 4$

General term of Geometric progression

Basic Level

108. If the $4^{th}, 7^{th}$ and 10^{th} terms of a G.P. be *a, b, c* respectively, then the relation between *a, b, c* is

[MNR 1995; Karnataka CET 1999]

(a) $b = \frac{a+c}{2}$ (b) $a^2 = bc$ (c) $b^2 = ac$ (d) $c^2 = ab$

109. 7^{th} term of the sequence $\sqrt{2}, \sqrt{10}, 5\sqrt{2}, ...$ is

(a) $125\sqrt{10}$ (b) $25\sqrt{2}$ (c) 125 (d) $125\sqrt{2}$

110. If the 5^{th} term of a G.P. is $\frac{1}{3}$ and 9^{th} term is $\frac{16}{243}$, then the 4^{th} term will be **[MP PET 1982]**

(a) $\frac{3}{4}$ (b) $\frac{1}{2}$ (c) $\frac{1}{3}$ (d) $\frac{2}{5}$

111. If the 10^{th} term of a geometric progression is 9 and 4^{th} term is 4, then its 7^{th} term is **[MP PET 1996]**

(a) 6 (b) 36 (c) $\frac{4}{9}$ (d) $\frac{9}{4}$

112. The third term of a G.P. is the square of first term. If the second term is 8, then the 6^{th} term is **[MP PET 1997]**

(a) 120 (b) 124 (c) 128 (d) 132

113. The 6^{th} term of a G.P. is 32 and its 8^{th} term is 128, then the common ratio of the G.P. is **[Pb. CET 1999]**

(a) – 1 (b) 2 (c) 4 (d) – 4

114. The first and last terms of a G.P. are a and l respectively, r being its common ratio; then the number of term in this G.P. is

(a) $\frac{\log l - \log a}{\log r}$ (b) $1 - \frac{\log l - \log a}{\log r}$ (c) $\frac{\log a - \log l}{\log r}$ (d) $1 + \frac{\log l - \log a}{\log r}$

115. If first term and common ratio of a G.P. are both $\frac{\sqrt{3}+i}{2}$. The absolute value of n^{th} term will be

(a) 2^n (b) 4^n (c) 1 (d) 4

116. In any G.P. the last term is 512 and common ratio is 2, then its 5^{th} term from last term is

(a) 8 (b) 16 (c) 32 (d) 64

117. Given the geometric progression 3, 6, 12, 24, ... the term 12288 would occur as the **[SCRA 1999]**

(a) 11^{th} term (b) 12^{th} term (c) 13^{th} term (d) 14^{th} term

118. Let $\{t_n\}$ be a sequence of integers in GP in which $t_4 : t_6 = 1:4$ and $t_2 + t_5 = 216$. Then t_1 is

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

Advance Level

119. α, β are the roots of the equation $x^2 - 3x + a = 0$ and γ, δ are the roots of the equation $x^2 - 12x + b = 0$. If $\alpha, \beta, \gamma, \delta$ form an increasing G.P., then $(a, b) =$ **[DCE 2000]**

(a) (3, 12) (b) (12, 3) (c) (2, 32) (d) (4, 16)

120. If $(p+q)^{th}$ term a G.P. be m and $(p - q)^{th}$ term be n, then the p^{th} term will be **[Rajasthan PET 1997; MP PET 1985, 99]**

(a) m / n (b) $\sqrt{mn}$ (c) mn (d) 0

121. If the third term of a G.P. is 4 then the product of its first 5 terms is **[IIT 1982; Rajasthan PET 1991]**

(a) 4^3 (b) 4^4 (c) 4^5 (d) None of these

122. If the first term of a G.P. $a_1, a_2, a_3, ...$ is unity such that $4a_2 + 5a_3$ is least, then the common ratio of G.P. is

(a) $-\frac{2}{5}$ (b) $-\frac{3}{5}$ (c) $\frac{2}{5}$ (d) None of these

123. Fifth term of a G.P. is 2, then the product of its 9 terms is **[Pb. CET 1990, 94; AIEEE 2002]**

(a) 256 (b) 512 (c) 1024 (d) None of these

124. If the nth term of geometric progression $5, -\frac{5}{2}, \frac{5}{4}, -\frac{5}{8}, ...$ is $\frac{5}{1024}$, then the value of n is **[Kerala (Engg.) 2002]**

(a) 11 (b) 10 (c) 9 (d) 4

Sum to n terms of Geometric progression

Basic Level

125. The sum of 100 terms of the series .9+ .09 + .009...... will be

(a) $1-\left(\frac{1}{10}\right)^{100}$ (b) $1+\left(\frac{1}{10}\right)^{106}$ (c) $1-\left(\frac{1}{10}\right)^{106}$ (d) $1+\left(\frac{1}{10}\right)^{100}$

126. If the sum of three terms of G.P. is 19 and product is 216, then the common ratio of the series is **[Roorkee 1972]**

(a) $-\frac{3}{2}$ (b) $\frac{3}{2}$ (c) 2 (d) 3

127. If the sum of first 6 terms is 9 times to the sum of first 3 terms of the same G.P., then the common ratio of the series will be

[Rajasthan PET 1985]

(a) – 2 (b) 2 (c) 1 (d) $\frac{1}{2}$

128. If the sum of n terms of a G.P. is 255 and n^{th} term is 128 and common ratio is 2, then first term will be**[Rajasthan PET 1**

(a) 1 (b) 3 (c) 7 (d) None of these

129. The sum of 3 numbers in geometric progression is 38 and their product is 1728. The middle number is**[MP PET 1994]**

(a) 12 (b) 8 (c) 18 (d) 6

130. The sum of few terms of any ratio series is 728, if common ratio is 3 and last term is 486, then first term of series will be

[UPSEAT 1999]

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

131. The sum of n terms of a G.P. is $3-\frac{3^{n+1}}{4^{2n}}$, then the common ratio is equal to

(a) $\frac{3}{16}$ (b) $\frac{3}{256}$ (c) $\frac{39}{256}$ (d) None of these

132. The value of n for which the equation $1+r+r^2.....+r^n=(1+r)(1+r^2)(1+r^4)(1+r^8)$ holds is

(a) 13 (b) 12 (c) 15 (d) 16

133. The value of the sum $\sum_{n=1}^{13}(i^n+i^{n+1})$, where $i=\sqrt{-1}$, equals **[IIT 1998]**

(a) i (b) i – 1 (c) – i (d) 0

134. For a sequence $a_1, a_2.........a_n$ given $a_1=2$ and $\frac{a_{n+1}}{a_n}=\frac{1}{3}$. Then $\sum_{r=1}^{20}a_r$ is

(a) $\frac{20}{2}[4+19\times 3]$ (b) $3\left(1-\frac{1}{3^{20}}\right)$ (c) $2(1-3^{-20})$ (d) None of these

135. The sum of $(x+2)^{n-1}+(x+2)^{n-2}(x+1)+(x+2)^{n-3}(x+1)^2+.....(x+1)^{n-1}$ is equal to **[IIT 1990]**

(a) $(x+2)^{n-2}-(x+1)^n$ (b) $(x+2)^{n-1}-(x+1)^{n-1}$

(c) $(x+2)^n-(x+1)^n$ (d) None of these

Advance Level

136. The sum of the first n terms of the series $\frac{1}{2}+\frac{3}{4}+\frac{7}{8}+\frac{15}{16}+........$ is

[IIT 1988; MP PET 1996; Rajasthan PET 1996, 2000; Pb. CET 1994; DCE 1995, 96]

(a) 2^n-n-1 (b) $1-2^{-n}$ (c) $n+2^{-n}-1$ (d) 2^n-1

137. If the product of three consecutive terms of G.P. is 216 and the sum of product of pair – wise is 156, then the numbers will be

[MNR 1978]

(a) 1, 3, 9 (b) 2, 6, 18 (c) 3, 9, 27 (d) 2, 4, 8

138. If $f(x)$ is a function satisfying $f(x+y)=f(x)f(y)$ for all $x,y\in N$ such that $f(1)=3$ and $\sum_{x=1}^{n} f(x)=120$. Then the value of n is

[IIT 1992]

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

139. The first term of a G.P. is 7, the last term is 448 and sum of all terms is 889, then the common ratio is **[MP PET 2003]**

(a) 5 (b) 4 (c) 3 (d) 2

140. The sum of a G.P. with common ratio 3 is 364, and last term is 243, then the number of terms is **[MP PET 2003]**

(a) 6 (b) 5 (c) 4 (d) 10

141. A G.P. consists of 2n terms. If the sum of the terms occupying the odd places is S_1, and that of the terms in the even places is S_2, then S_2/S_1 is

(a) Independent of a (b) Independent of r (c) Independent of a and r (d) Dependent on r

142. Sum of the series $\frac{2}{3}+\frac{8}{9}+\frac{26}{27}+\frac{80}{81}+.....$ to n terms is **[Karnataka CET 2001]**

(a) $n-\frac{1}{2}(3^n-1)$ (b) $n+\frac{1}{2}(3^n-1)$ (c) $n+\frac{1}{2}(1-3^{-n})$ (d) $n+\frac{1}{2}(3^{-n}-1)$

143. If the sum of the n terms of G.P. is S product is P and sum of their inverse is R, then P^2 is equal to**[IIT 1966; Roorkee 19**

(a) $\frac{R}{S}$ (b) $\frac{S}{R}$ (c) $\left(\frac{R}{S}\right)^n$ (d) $\left(\frac{S}{R}\right)^n$

144. The minimum value of n such that $1+3+3^2+.....+3^n>1000$ is

(a) 7 (b) 8 (c) 9 (d) None of these

145. If every term of a G.P. with positive terms is the sum of its two previous terms, then the common ratio of the series is

[Rajasthan PET 1986]

(a) 1 (b) $\frac{2}{\sqrt{5}}$ (c) $\frac{\sqrt{5}-1}{2}$ (d) $\frac{\sqrt{5}+1}{2}$

146. If $(1.05)^{50} = 11.658$, then $\sum_{n=1}^{49}(1.05)^n$ equals **[Roorkee 1991]**

(a) 208.34 (b) 212.12 (c) 212.16 (d) 213.16

147. If $a_1, a_2, a_3.....a_n$ are in G.P. with first term 'a' and common ratio 'r' then $\frac{a_1a_2}{a_1^2 - a_2^2} + \frac{a_2a_3}{a_2^2 - a_3^2} + \frac{a_3a_4}{a_3^2 - a_n^2} + ... + \frac{a_{n-1}a_n}{a_{n-1}^2 - a_n^2}$ is equal to

(a) $\frac{nr}{1-r^2}$ (b) $\frac{(n-1)^r}{1-r^2}$ (c) $\frac{nr}{1-r}$ (d) $\frac{(n-1)r}{1-r}$

148. The sum of the squares of three distinct real numbers which are in G.P. is S^2. If their sum is αS, then

(a) $1 < \alpha^2 < 3$ (b) $\frac{1}{3} < \alpha^2 < 1$ (c) $1 < \alpha < 3$ (d) $\frac{1}{3} < \alpha < 1$

Sum to infinite terms

Basic Level

149. If the sum of the series $1 + \frac{2}{x} + \frac{4}{x^2} + \frac{8}{x^3} + ...\infty$ is a finite number, then **[UPSEAT 2002]**

(a) $x > 2$ (b) $x > -2$ (c) $x > \frac{1}{2}$ (d) None of these

150. If $y = x - x^2 + x^3 - x^4 + ...\infty$, then value of x will be **[MNR 1975; Rajasthan PET 1988; MP PET 2002]**

(a) $y + \frac{1}{y}$ (b) $\frac{y}{1+y}$ (c) $y - \frac{1}{y}$ (d) $\frac{y}{1-y}$

151. If the sum of an infinite G.P. be 9 and the sum of first two terms be 5, then the common ratio is

(a) $\frac{1}{3}$ (b) $\frac{3}{2}$ (c) $\frac{3}{4}$ (d) $\frac{2}{3}$

152. $2.\dot{3}\dot{5}\dot{7} =$ **[IIT 1983; Rajasthan PET 1995]**

(a) $\frac{2355}{1001}$ (b) $\frac{2370}{997}$ (c) $\frac{2355}{999}$ (d) None of these

153. The first term of a G.P. whose second term is 2 and sum to infinity is 8, will be **[MNR 1979; Rajasthan PET 1992, 95]**

(a) 6 (b) 3 (c) 4 (d) 1

154. The sum of infinite terms of a G.P. is x and on squaring the each term of it, the sum will be y, then the common ratio of this series is

[Rajasthan PET 1988]

(a) $\frac{x^2 - y^2}{x^2 + y^2}$ (b) $\frac{x^2 + y^2}{x^2 - y^2}$ (c) $\frac{x^2 - y}{x^2 + y}$ (d) $\frac{x^2 + y}{x^2 - y}$

155. If $3 + 3\alpha + 3\alpha^2 + ...\infty = \frac{45}{8}$, then the value of α will be **[Pb. CET 1989]**

(a) $\frac{15}{23}$ (b) $\frac{7}{15}$ (c) $\frac{7}{8}$ (d) $\frac{15}{7}$

156. The sum can be found of a infinite G.P. whose common ratio is r **[AMU 1982]**

(a) For all values of r (b) For only positive value of r (c) Only for $0 < r < 1$ (d) Only for $-1 < r < 1 (r \neq 0)$

157. The sum of infinity of a geometric progression is $\frac{4}{3}$ and the first term is $\frac{3}{4}$. The common ratio is **[MP PET 1994]**

(a) $\frac{7}{16}$ (b) $\frac{9}{16}$ (c) $\frac{1}{9}$ (d) $\frac{7}{9}$

158. The value of $4^{1/3}.4^{1/9}.4^{1/27}.....\infty$ is **[Rajasthan PET 2003]**

(a) 2 (b) 3 (c) 4 (d) 9

159. 0.14189189189.... can be expressed as a rational number **[AMU 2000]**

(a) $\frac{7}{3700}$ (b) $\frac{7}{50}$ (c) $\frac{525}{111}$ (d) $\frac{21}{148}$

160. The sum of the series $5.05+1.212+0.29088+...\infty$ is **[AMU 2000]**

(a) 6.93378 (b) 6.87342 (c) 6.74384 (d) 6.64474

161. Sum of infinite number of terms in G.P. is 20 and sum of their square is 100. The common ratio of G.P. is **[AIEEE 2002]**

(a) 5 (b) 3/5 (c) 8/5 (d) 1/5

162. If in an infinite G.P. first term is equal to the twice of the sum of the remaining terms, then its common ratio is **[Rajas**

(a) 1 (b) 2 (c) 1/3 (d) – 1/3

163. The sum of infinite terms of the geometric progression $\frac{\sqrt{2}+1}{\sqrt{2}-1}, \frac{1}{2-\sqrt{2}}, \frac{1}{2}.....$ is **[Kerala (Engg.) 2002]**

(a) $\sqrt{2}(\sqrt{2}+1)^2$ (b) $(\sqrt{2}+1)^2$ (c) $5\sqrt{2}$ (d) $3\sqrt{2}+\sqrt{5}$

164. If $x > 0$, then the sum of the series $e^{-x}-e^{-2x}+e^{-3x}......\infty$ is **[AMU 1989]**

(a) $\frac{1}{1-e^{-x}}$ (b) $\frac{1}{e^{x}-1}$ (c) $\frac{1}{1+e^{-x}}$ (d) $\frac{1}{1+e^{x}}$

165. The sum of the series $0.4+0.004+0.00004+.......\infty$ is **[AMU 1989]**

(a) $\frac{11}{25}$ (b) $\frac{41}{100}$ (c) $\frac{40}{99}$ (d) $\frac{2}{5}$

166. A ball is dropped from a height of 120 *m* rebounds $(4/5)^{\text{th}}$ of the height from which it has fallen. If it continues to fall and rebound in this way. How far will it travel before coming to rest ?

(a) 240 *m* (b) 140 *m* (c) 1080 *m* (d) ∞

167. The series $C+\frac{C^2}{1+C}+\frac{C^3}{(1+C)^2}+\frac{C^4}{(1+C)^3}+.....$ has a finite sum if C is greater than

(a) – 1/2 (b) – 1 (c) – 2/3 (d) None of these

Advance Level

168. If $A=1+r^z+r^{2z}+r^{3z}+.....\infty$, then the value of r will be

(a) $A(1-A)^z$ (b) $\left(\frac{A-1}{A}\right)^{1/z}$ (c) $\left(\frac{1}{A}-1\right)^{1/z}$ (d) $A(1-A)^{1/z}$

169. The sum to infinity of the following series $2+\frac{1}{2}+\frac{1}{3}+\frac{1}{2^2}+\frac{1}{3^2}+\frac{1}{2^3}+\frac{1}{3^3}+.....,$ will be **[AMU 1984]**

(a) 3 (b) 4 (c) $\frac{7}{2}$ (d) $\frac{9}{2}$

170. $x=1+a+a^2+.......\infty(a<1)$, $y=1+b+b^2+.......\infty(b<1)$. Then the value of $1+ab+a^2b^2+......\infty$ is**[MNR 1980; MP PET 1985]**

(a) $\frac{xy}{x+y-1}$ (b) $\frac{xy}{x+y+1}$ (c) $\frac{xy}{x-y-1}$ (d) $\frac{xy}{x-y+1}$

171. The value of $a^{\log_b x}$, where $a=0.2, b=\sqrt{5}$, $x=\frac{1}{4}+\frac{1}{8}+\frac{1}{16}+......$ to ∞ is

(a) 1 (b) 2 (c) 1/2 (d) 4

172. The sum of an infinite geometric series is 3. A series, which is formed by squares of its terms have the sum also 3. First series will be \

[Rajasthan PET 1999; Roorkee 1972; UPSEAT 1999]

(a) $\frac{3}{2},\frac{3}{4},\frac{3}{8},\frac{3}{16},.....$ (b) $\frac{1}{2},\frac{1}{4},\frac{1}{8},\frac{1}{16},.....$ (c) $\frac{1}{3},\frac{1}{9},\frac{1}{27},\frac{1}{81},.....$ (d) $1,-\frac{1}{3},\frac{1}{3^2},-\frac{1}{3^3},.....$

173. If $1+\cos\alpha+\cos^2\alpha+.......\infty=2-\sqrt{2}$, then α, $(0<\alpha<\pi)$ is **[Roorkee 2000]**

(a) $\pi/8$ (b) $\pi/6$ (c) $\pi/4$ (d) $3\pi/4$

174. Consider an infinite G.P. with first term *a* and common ratio *r*, its sum is 4 and the second term is 3/4 , then **[IIT Screening 2000; DCE 2001]**

(a) $a=\frac{7}{4}, r=\frac{3}{7}$ (b) $a=\frac{3}{2}, r=\frac{1}{2}$ (c) $a=2, r=\frac{3}{8}$ (d) $a=3, r=\frac{1}{4}$

175. Let $n(>1)$ be a positive integer, then the largest integer *m* such that (n^m+1) divides $(1+n+n^2+.....+n^{127})$, is **[IIT 1995]**

(a) 32 (b) 63 (c) 64 (d) 127

176. If |*a*|<1 and |*b*|<1, then the sum of the series $a(a+b)+a^2(a^2+b^2)+a^3(a^3+b^3)+.....$ upto ∞ is

(a) $\frac{a}{1-a}+\frac{ab}{1-ab}$ (b) $\frac{a^2}{1-a^2}+\frac{ab}{1-ab}$ (c) $\frac{b}{a-b}+\frac{a}{1-a}$ (d) $\frac{b^2}{1-b^2}+\frac{ab}{1-ab}$

177. If *S* is the sum to infinity of a G.P., whose first term is *a*, then the sum of the first *n* terms is **[UPSEAT 2002]**

(a) $S\left(1-\frac{a}{S}\right)^n$ (b) $S\left[1-\left(1-\frac{a}{S}\right)^n\right]$ (c) $a\left[1-\left(1-\frac{a}{S}\right)^n\right]$ (d) None of these

178. If S denotes the sum to infinity and S_n the sum of *n* terms of the series $1+\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+.....$, such that $S-S_n<\frac{1}{1000}$, then the least value of *n* is

(a) 8 (b) 9 (c) 10 (d) 11

179. If exp. $\{(\sin^2 x+\sin^4 x+\sin^4 x+....+\infty)\ \log_e 2\}$ satisfies the equation $x^2-9x+8=0$, then the value of $\frac{\cos x}{\cos x+\sin x}, 0<x<\frac{\pi}{2}$ is

(a) $\frac{1}{2}(\sqrt{3}+1)$ (b) $\frac{1}{2}(\sqrt{3}-1)$ (c) 0 (d) None of these

Geometric mean

Basic Level

180. If G be the geometric mean of *x* and *y*, then $\frac{1}{G^2-x^2}+\frac{1}{G^2-y^2}=$

(a) G^2 (b) $\frac{1}{G^2}$ (c) $\frac{2}{G^2}$ (d) $3G^2$

181. If *n* geometric means be inserted between *a* and *b*, then the n^{th} geometric mean will be

(a) $a\left(\frac{b}{a}\right)^{\frac{n}{n-1}}$ (b) $a\left(\frac{b}{a}\right)^{\frac{n-1}{n}}$ (c) $a\left(\frac{b}{a}\right)^{\frac{n}{n+1}}$ (d) $a\left(\frac{b}{a}\right)^{\frac{1}{n}}$

182. If $\frac{a^n+b^n}{a^{n-1}+b^{n-1}}$ be the geometric mean of a and b, then n=

(a) 0 (b) 1 (c) 1/2 (d) None of these

183. The G.M. of roots of the equation $x^2-18x+9=0$ is **[Rajasthan PET 1997]**

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

184. If five G.M.'s are inserted between 486 and 2/3 then fourth G.M. will be **[Rajasthan PET 1999]**

(a) 4 (b) 6 (c) 12 (d) – 6

185. If 4 G.M's be inserted between 160 and 5 them third G.M. will be

(a) 8 (b) 118 (c) 20 (d) 40

186. The product of three geometric means between 4 and $\frac{1}{4}$ will be

(a) 4 (b) 2 (c) – 1 (d) 1

187. The geometric mean between –9 and –16 is

(a) 12 (b) – 12 (c) – 13 (d) None of these

Advance Level

188. If n geometric means between a and b be $G_1, G_2, ... G_n$ and a geometric mean be G, then the true relation is

(a) $G_1.G_2......G_n=G$ (b) $G_1.G_2......G_n=G^{1/n}$ (c) $G_1.G_2......G_n=G^n$ (d) $G_1.G_2......G_n=G^{2/n}$

189. If x and y be two real numbers and n geometric means are inserted between x and y. now x is multiplied by k and y is multiplied $\frac{1}{k}$ and then n G.M's. are inserted. The ratio of the n^{th} G.M's. in the two cases is

(a) $k^{\frac{n-1}{n+1}}:1$ (b) $1:k^{\frac{1}{n+1}}$ (c) $1:1$ (d) None of these

Properties of G.P.

Basic Level

190. If a, b, c are in G.P., then

(a) $a(b^2+a^2)=c(b^2+c^2)$ (b) $a(b^2+c^2)=c(a^2+b^2)$ (c) $a^2(b+c)=c^2(a-b)$ (d) None of these

191. If x is added to each of numbers 3, 9, 21 so that the resulting numbers may be in G.P., then the value of x will be**[MP PE**

(a) 3 (b) $\frac{1}{2}$ (c) 2 (d) $\frac{1}{3}$

192. If $\log_x a, a^{x/2}$ and $\log_b x$ are in G.P., then x =

(a) $-\log_a(\log_b a)$ (b) $-\log_a(\log_a b)$ (c) $\log_a(\log_e a)-\log_a(\log_e b)$ (d) $\log_a(\log_e b)-\log_a(\log_e a)$

193. If $\sum_{n=1}^{n} n, \frac{\sqrt{10}}{3}.\sum_{n=1}^{n} n^2, \sum_{n=1}^{n} n^3$ are in G.P. then the value of n is

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

194. If p, q, r are in A.P., then p^{th}, q^{th} and r^{th} terms of any G.P. are in

(a) AP (b) G.P.

(c) Reciprocals of these terms are in A.P. (d) None of these

195. If a, b, c are in G.P., then **[Rajasthan PET 1995]**

(a) a^2, b^2, c^2 are in G.P. (b) $a^2(b+c), c^2(a+b), b^2(a+c)$ are in G.P.

(c) $\frac{a}{b+c}, \frac{b}{c+a}, \frac{c}{a+b}$ are in G.P. (d) None of these

196. Let a and b be roots of $x^2 - 3x + p = 0$ and let c and d be the roots of $x^2 - 12x + q = 0$, where a, b, c, d form an increasing G.P. Then the ratio of $(q + p) : (q - p)$ is equal to

(a) 8 : 7 (b) 11 : 10 (c) 17 : 15 (d) None of these

197. If the roots of the cubic equation $ax^3 + bx^2 + cx + d = 0$ are in G.P., then

(a) $c^3a = b^3d$ (b) $ca^3 = bd^3$ (c) $a^3b = c^3d$ (d) $ab^3 = cd^3$

198. If x_1, x_2, x_3 as well as y_1, y_2, y_3 are in G.P. with the same common ratio, then the points $(x_1, y_1), (x_2, y_2)$ and (x_3, y_3) **[IIT 199**

(a) Lie on a straight line (b) Lie on an ellipse (c) Lie on a circle (d) Are vertices of a triangle

199. Let $f(x) = 2x + 1$. Then the number of real values of x for which the three unequal numbers $f(x), f(2x), f(4x)$ are in GP is

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

200. S_r denotes the sum of the first r terms of a G.P. Then $S_n, S_{2n} - S_n, S_{3n} - S_{2n}$ are in

(a) A.P. (b) G.P. (c) H.P. (d) None of these

201. If $a^{1/x} = b^{1/y} = c^{1/z}$ and a, b, c are in G.P., then x, y, z will be in **[IIT 1969; UPSEAT 2001]**

(a) A.P. (b) G.P. (c) H.P. (d) None of these

202. If x, y, z are in G.P. and $a^x = b^y = c^z$, then **[IIT 1966, 1968]**

(a) $\log_a c = \log_b a$ (b) $\log_b a = \log_c b$ (c) $\log_c b = \log_a c$ (d) None of these

General term of Harmonic progression

Basic Level

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

(a) 18 (b) $17\frac{1}{7}$ (c) 16 (d) None of these

204. The 5th term of the H.P., $2, 2\frac{1}{2}, 3\frac{1}{3}, ...$ will be **[MP PET 1984]**

(a) $5\frac{1}{5}$ (b) $3\frac{1}{5}$ (c) $1/10$ (d) 10

205. If 5th term of a H.P. is $\frac{1}{45}$ and 11th term is $\frac{1}{69}$, then its 16th term will be **[Rajasthan PET 1987, 97]**

(a) $\frac{1}{89}$ (b) $\frac{1}{85}$ (c) $\frac{1}{80}$ (d) $\frac{1}{79}$

206. If the 7th term of a H.P. is $\frac{1}{10}$ and the 12th term is $\frac{1}{25}$, then the 20th term is **[MP PET 1997]**

(a) $\frac{1}{37}$ (b) $\frac{1}{41}$ (c) $\frac{1}{45}$ (d) $\frac{1}{49}$

207. If 6th term of a H.P. is $\frac{1}{61}$ and its tenth term is $\frac{1}{105}$, then first term of that H.P. is **[Karnataka CET 2001]**

(a) $\frac{1}{28}$ (b) $\frac{1}{39}$ (c) $\frac{1}{6}$ (d) $\frac{1}{17}$

Advance Level

208. The 9th term of the series 27+ 9 + $5\frac{2}{5}+3\frac{6}{7}+.....$ will be **[MP PET 1983]**

(a) $1\frac{10}{17}$ (b) $\frac{10}{17}$ (c) $\frac{16}{27}$ (d) $\frac{17}{27}$

209. In a H.P., p^{th} term is q and the q^{th} term is p. Then pq^{th} term is **[Karnataka CET 2002]**

(a) 0 (b) 1 (c) pq (d) $pq(p+q)$

210. If a, b, c be respectively the p^{th}, q^{th} and r^{th} terms of a H.P., then $\Delta = \begin{vmatrix} bc & ca & ab \\ p & q & r \\ 1 & 1 & 1 \end{vmatrix}$ equals

(a) 1 (b) 0 (c) – 1 (d) None of these

Harmonic mean

Basic Level

211. If $\frac{a^{n+1}+b^{n+1}}{a^n+b^n}$ be the harmonic mean between a and b, then the value of n is **[Assam PET 1986]**

(a) 1 (b) – 1 (c) 0 (d) 2

212. If the harmonic mean between a and b be H, then $\frac{H+a}{H-a}+\frac{H+b}{H-b}$ **[AMU 1998]**

(a) 4 (b) 2 (c) 1 (d) $a + b$

213. If H is the harmonic mean between p and q, then the value of $\frac{H}{p}+\frac{H}{q}$ is **[MNR 1990; UPSEAT 2000; 2001]**

(a) 2 (b) $\frac{pq}{p+q}$ (c) $\frac{p+q}{pq}$ (d) None of these

214. H. M. between the roots of the equation $x^2-10x+11=0$ is **[MP PET 1995]**

(a) $\frac{1}{5}$ (b) $\frac{5}{21}$ (c) $\frac{21}{20}$ (d) $\frac{11}{5}$

215. The harmonic mean of $\frac{a}{1-ab}$ and $\frac{a}{1+ab}$ is **[MP PET 1996]**

(a) $\frac{a}{\sqrt{1-a^2b^2}}$ (b) $\frac{a}{1-a^2b^2}$ (c) *a* (d) $\frac{1}{a-a^2b^2}$

216. The sixth H.M. between 3 and $\frac{6}{13}$ is **[Rajasthan PET 1996]**

(a) $\frac{63}{120}$ (b) $\frac{63}{12}$ (c) $\frac{126}{105}$ (d) $\frac{120}{63}$

Advance Level

217. If there are *n* harmonic means between 1 and $\frac{1}{31}$ and the ratio of 7$^{\text{th}}$ and $(n-1)^{th}$ harmonic means is 9 : 5, then the value of *n* will be

[Rajasthan PET 1986]

(a) 12 (b) 13 (c) 14 (d) 15

218. If *m* is a root of the given equation $(1-ab)x^2-(a^2+b^2)x-(1+ab)=0$ and *m* harmonic means are inserted between *a* and *b*, then the difference between last and the first of the means equals

(a) *b* – *a* (b) *ab* (*b* – *a*) (c) *a* (*b* – *a*) (d) *ab*(*a* – *b*)

Properties of Harmonic progression

Basic Level

219. If $\frac{1}{b-a}+\frac{1}{b-c}=\frac{1}{a}+\frac{1}{c}$, then *a, b, c* are in **[MNR 1984; MP PET 1997; UPSEAT 2000]**

(a) A.P. (b) G.P. (c) H.P. (d) In G.P. and H.P. both

220. If *a, b, c* are in H.P., then $\frac{a}{b+c},\frac{b}{c+a},\frac{c}{a+b}$ are in **[Roorkee 1980]**

(a) A.P. (b) G.P. (c) H.P. (d) None of these

221. If *a, b, c, d* are any four consecutive coefficients of any expanded binomial, then $\frac{a+b}{a},\frac{b+c}{b},\frac{c+d}{c}$ are in

(a) A.P. (b) G.P. (c) H.P. (d) None of these

222. $\log_3 2, \log_6 2, \log_{12} 2$ are in **[Rajasthan PET 1993, 2001]**

(a) A.P. (b) G.P. (c) H.P. (d) None of these

223. If *a, b, c* are in H.P., then for all $n \in N$ the true statement is **[Rajasthan PET 1995]**

(a) $a^n+c^n<2b^n$ (b) $a^n+c^n>2b^n$ (c) $a^n+c^n=2b^n$ (d) None of these

224. Which number should be added to the numbers 13, 15, 19 so that the resulting numbers be the consecutive term of a H.P.

(a) 7 (b) 6 (c) – 6 (d) – 7

Advance Level

225. If b^2, a^2, c^2 are in A.P., then $a+c, b+c, c+a$ will be in **[AMU 1974]**

(a) A.P. (b) G.P. (c) H.P. (d) None of these

226. If *a*, *b*, *c*, *d* be in H.P., then

(a) $a^2+c^2 > b^2+d^2$ (b) $a^2+d^2 > b^2+c^2$ (c) $ac+bd > b^2+c^2$ (d) $ac+bd > b^2+d^2$

227. If $a_1, a_2, a_3, ..., a_n$ are in H.P., then $a_1a_2 + a_2a_3 + ... + a_{n-1}a_n$ will be equal to **[IIT 1975]**

(a) a_1a_n (b) na_1a_n (c) $(n-1)a_1a_n$ (d) None of these

228. If *x, y, z* are in H.P., then the value of expression $\log(x+z)+\log(x-2y+z)$ will be **[Rajasthan PET 1985, 2000]**

(a) $\log(x-z)$ (b) $2\log(x-z)$ (c) $3\log(x-z)$ (d) $4\log(x-z)$

229. If $\frac{x+y}{2}, y, \frac{y+z}{2}$ are in H.P., then *x, y, z* are in **[Rajasthan PET 1989; MP PET 2003]**

(a) A.P.(b) G.P. (c) H.P. (d)

230. If *a, b, c, d* are in H.P., then **[Rajasthan PET 1991]**

(a) *a* + *d* > *b* + *c* (b) *ad* > *bc* (c) Both (a) and (b) (d) None of these

Arithmetio-geometric progression

Basic Level

231. If |*x*| <1, then the sum of the series $1+2x+3x^2+4x^3+........\infty$ will be

(a) $\frac{1}{1-x}$ (b) $\frac{1}{1+x}$ (c) $\frac{1}{(1+x)^2}$ (d) $\frac{1}{(1-x)^2}$

232. The sum of 0.2+0.004 + 0.00006 + 0.0000008+...... to ∞ is

(a) $\frac{200}{891}$ (b) $\frac{2000}{9801}$ (c) $\frac{1000}{9801}$ (d) None of these

233. The n^{th} term of the sequence 1.1, 2.3, 4.5, 8.7,...... will be

(a) $2^n(2n-1)$ (b) $2^{n-1}(2n+1)$ (c) $2^{n-1}(2n-1)$ (d) $2^n(2n+1)$

Advance Level

234. The sum of infinite terms of the following series $1+\frac{4}{5}+\frac{7}{5^2}+\frac{10}{5^3}+$.....will be

[MP PET 1981; Rajasthan PET 1997; Roorkee 1992; DCE 1996, 2000]

(a) $\frac{3}{16}$ (b) $\frac{35}{8}$ (c) $\frac{35}{4}$ (d) $\frac{35}{16}$

235. The sum of the series 1+ 3*x*+ 6x^2+10x^3+.......∞ will be

(a) $\frac{1}{(1-x)^2}$ (b) $\frac{1}{1-x}$ (c) $\frac{1}{(1+x)^2}$ (d) $\frac{1}{(1-x)^3}$

236. $2^{1/4}.4^{1/8}.8^{1/16}.16^{1/32}.......$ is equal to **[MNR 1984; MP PET 1998; AIEEE 2002]**

(a) 1 (b) 2 (c) $\frac{3}{2}$ (d) $\frac{5}{2}$

237. The sum of $1+\frac{2}{5}+\frac{3}{5^2}+\frac{4}{5^3}+........$ upto *n* terms is **[MP PET 1982]**

(a) $\frac{25}{16}-\frac{4n+5}{16\times 5^{n-1}}$ (b) $\frac{3}{4}-\frac{2n+5}{16\times 5^{n+1}}$ (c) $\frac{3}{7}-\frac{3n+5}{16\times 5^{n-1}}$ (d) $\frac{1}{2}-\frac{5n+1}{3\times 5^{n+2}}$

238. The sum of *i* – 2 – 3*i* + 4 + ... upto 100 terms, where $i=\sqrt{-1}$ is

(a) $50(1-i)$ (b) $25i$ (c) $25(1+i)$ (d) $100(1-i)$

Method of Difference

Basic Level

239. n^{th} term of the series $2+4+7+11+......$ will be **[Roorkee 1977]**

(a) $\frac{n^2+n+1}{2}$ (b) n^2+n+2 (c) $\frac{n^2+n+2}{2}$ (d) $\frac{n^2+2n+2}{2}$

240. If t_n denotes the n^{th} term of the series $2+3+6+11+18+....$ then t_{50} is

(a) 49^2-1 (b) 49^2 (c) 50^2+1 (d) 49^3+2

241. First term of the 11^{th} group in the following groups (1), (2, 3, 4), (5, 6, 7, 8, 9), ... is

(a) 89 (b) 97 (c) 101 (d) 123

242. The sum of the series $6+66+666+......$ upto n terms is **[IIT 1974]**

(a) $(10^{n-1}-9n+10)/81$ (b) $2(10^{n+1}-9n-10)/27$ (c) $2(10^n-9n-10)/27$ (d) None of these

243. Sum of n terms of series $12+16+24+40+.....$ will be **[UPSEAT 1999]**

(a) $2(2^n-1)+8n$ (b) $2(2^n-1)+6n$ (c) $3(2^n-1)+8n$ (d) $4(2^n-1)+8n$

244. If $|a|<1$ and $|b|<1$, then the sum of the series $1+(1+a)b+(1+a+a^2)b^2+(1+a+a^2+a^3)b^3+......$ is

(a) $\frac{1}{(1-a)(1-b)}$ (b) $\frac{1}{(1-a)(1-ab)}$ (c) $\frac{1}{(1-b)(1-ab)}$ (d) $\frac{1}{(1-a)(1-b)(1-ab)}$

n^{th} Term of Special series

Basic Level

245. n^{th} term of the series $\frac{1^3}{1}+\frac{1^3+2^3}{1+3}+\frac{1^3+2^3+3^3}{1+3+5}+$ ....will be **[Pb. CET 2000]**

(a) n^2+2n+1 (b) $\frac{n^2+2n+1}{8}$ (c) $\frac{n^2+2n+1}{4}$ (d) $\frac{n^2-2n+1}{4}$

246. The n^{th} term of series $\frac{1}{1}+\frac{1+2}{2}+\frac{1+2+3}{3}+.........$ will be **[AMU 1982]**

(a) $\frac{n+1}{2}$ (b) $\frac{n-1}{2}$ (c) $\frac{n^2+1}{2}$ (d) $\frac{n^2-1}{2}$

247. If $a_1=a_2=2, a_n=a_{n-1}-1 (n>2)$, then a_5 is

(a) 1 (b) – 1 (c) 0 (d) – 2

Advance Level

248. The number 111.......1 (91 times) is a

(a) Even number (b) Prime number (c) Not prime (d) None of these

249. The difference between an integer and its cube is divisible by **[MP PET 1999]**

(a) 4 (b) 6 (c) 9 (d) None of these

250. 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 1025^{th} term is

(a) 2^9 (b) 2^{10} (c) 2^{11} (d) 2^8

251. Observe that $1^3=1, 2^3=3+5,\ 3^3=7+9+11, 4^3=13+15+17+19$. Then n^3 as a similar series is

(a) $\left[2\left\{\frac{n(n-1)}{2}+1\right\}-1\right]+\left[2\left\{\frac{(n+1)n}{2}+1\right\}+1\right]+......+\left[2\left\{\frac{(n+1)n}{2}+1\right\}+2n-3\right]$

(b) $(n^2+n+1)+(n^2+n+3)+(n^2+n+5)+.....+(n^2+3n-1)$

(c) $(n^2-n+1)+(n^2-n+3)+(n^2-n+5)+.....+(n^2+n-1)$

(d) None of these

Sum to n terms and infinite number of terms

Basic Level

252. The sum of the series 3 . 6 + 4 . 7 + 5 . 8 +....... upto (n – 2) terms **[EAMCET 1980]**

(a) n^3+n^2+n+2 (b) $\frac{1}{6}(2n^3+12n^2+10n-84)$ (c) n^3+n^2+n (d) None of these

253. The sum of the series $1+(1+2)+(1+2+3)+......$ upto n terms, will be **[MP PET 1986]**

(a) n^2-2n+6 (b) $\frac{n(n+1)(2n-1)}{6}$ (c) n^2+2n+6 (d) $\frac{n(n+1)(n+2)}{6}$

254. The sum to n terms of the series $2^2+4^2+6^2+.......$ is **[MP PET 1994]**

(a) $\frac{n(n+1)(2n+1)}{3}$ (b) $\frac{2n(n+1)(2n+1)}{3}$ (c) $\frac{n(n+1)(2n+1)}{6}$ (d) $\frac{n(n+1)(2n+1)}{9}$

255. $11^2+12^2+13^2+.......+20^2=$ **[MP PET 1995]**

(a) 2481 (b) 2483 (c) 2485 (d) 2487

256. The sum to n terms of $(2n-1)+2(2n-3)+3(2n-5)+.....$ is **[AMU 2001]**

(a) $(n+1)(n+2)(n+3)/6$ (b) $n(n+1)(n+2)/6$ (c) $n(n+1)(2n+3)$ (d) $n(n+1)(2n+1)/6$

257. $\frac{1^3+2^3+3^3+4^3+.....+12^3}{1^2+2^2+3^3+4^2+.....+12^2}=$ **[MP PET 1998]**

(a) $\frac{234}{25}$ (b) $\frac{243}{35}$ (c) $\frac{263}{27}$ (d) None of these

258. Sum of the squares of first n natural numbers exceeds their sum by 330, then n= **[Karnataka CET 1998]**

(a) 8 (b) 10 (c) 15 (d) 20

259. $\frac{1}{1.2}+\frac{1}{2.3}+\frac{1}{3.4}+.....+\frac{1}{n.(n+1)}$ equals **[AMU 1995; Rajasthan PET 1996; UPSEAT 1999, 2001]**

(a) $\frac{1}{n(n+1)}$ (b) $\frac{n}{n+1}$ (c) $\frac{2n}{n+1}$ (d) $\frac{2}{n(n+1)}$

260. The sum to n terms of the infinite series $1.3^2+2.5^2+3.7^2+.....\infty$ is **[AMU 1982]**

(a) $\frac{n}{6}(n+1)(6n^2+14n+7)$ (b) $\frac{n}{6}(n+1)(2n+1)(3n+1)$ (c) $4n^3+4n^2+n$ (d) None of these

Advance Level

261. The sum of all the products of the first n natural numbers taken two at a time is

(a) $\frac{1}{24}n(n-1)(n+1)(3n+2)$ (b) $\frac{n^2}{48}(n-1)(n-2)$ (c) $\frac{1}{6}n(n+1)(n+2)(n+5)$ (d) None of these

262. The sum of the series 1. 3. 5 + 2. 5. 8 +3. 7. 11+.....up to 'n' terms is **[Dhanbad Engg. 1972]**

(a) $\frac{n(n-1)(9n^2+23n+13)}{6}$ (b) $\frac{n(n-1)(9n^2+23n+12)}{6}$ (c) $\frac{(n+1)(9n^2+23n+13)}{6}$ (d) $\frac{n(9n^2+23n+13)}{6}$

263. The sum of first n terms of the given series $1^2+2.2^2+3^2+2.4^2+5^2+2.6^2+.......$ is $\frac{n(n+1)^2}{2}$, when n is even. When n is odd, the sum will be **[IIT 1988; AIEEE 2004]**

(a) $\frac{n(n+1)^2}{2}$ (b) $\frac{1}{2}n^2(n+1)$ (c) $n(n+1)^2$ (d) None of these

264. The value of $\sum_{r=1}^{n}\log\left(\frac{a^r}{b^{r-1}}\right)$ is

(a) $\frac{n}{2}\log\left(\frac{a^n}{b^n}\right)$ (b) $\frac{n}{2}\log\left(\frac{a^{n+1}}{b^2}\right)$ (c) $\frac{n}{2}\log\left(\frac{a^{n+1}}{b^{n-1}}\right)$ (d) $\frac{n}{2}\log\left(\frac{a^{n+1}}{b^{n+1}}\right)$

265. The sum of the series $\frac{1}{1+1^2+1^4}+\frac{2}{1+2^2+2^4}+\frac{3}{1+3^2+3^4}.........$ to n terms is

(a) $\frac{n(n^2+1)}{n^2+n+1}$ (b) $\frac{n(n+1)}{2(n^2+n+1)}$ (c) $\frac{n(n^2-1)}{2(n^2+n+1)}$ (d) None of these

266. For any odd integer $n\geq 1$, $n^3-(n-1)^3+......+(-1)^{n-1}1^3=$ **[IIT 1996]**

(a) $\frac{1}{2}(n-1)^2(2n-1)$ (b) $\frac{1}{4}(n-1)^2(2n-1)$ (c) $\frac{1}{2}(n+1)^2(2n-1)$ (d) $\frac{1}{4}(n+1)^2(2n-1)$

267. The sum of the infinite terms of the sequence $\frac{5}{3^2.7^2}+\frac{9}{7^2.11^2}+\frac{13}{11^2.15^2}+.....$ is

(a) $\frac{1}{18}$ (b) $\frac{1}{36}$ (c) $\frac{1}{54}$ (d) $\frac{1}{72}$

268. The sum of the infinite series $1^2+2^2x+3^2x^2+.....$ is

(a) $(1+x)/(1-x)^3$ (b) $(1+x)/(1-x)$ (c) $x/(1-x)^3$ (d) $1/(1-x)^3$

269. If in a series $t_n=\frac{n}{(n+1)!}$, then $\sum_{n=1}^{20}t_n$ is equal to

(a) $\frac{20!-1}{20!}$ (b) $\frac{21!-1}{21!}$ (c) $\frac{1}{2(n-1)!}$ (d) None of these

270. $\sum_{r=1}^{n}r^2-\sum_{m=1}^{n}\sum_{r=1}^{m}r$ is equal to

(a) 0 (b) $\frac{1}{2}\left(\sum_{r=1}^{n}r^2+\sum_{r=1}^{n}r\right)$ (c) $\frac{1}{2}\left(\sum_{r=1}^{n}r^2-\sum_{r=1}^{n}r\right)$ (d) None of these

271. For all positive integral values of n, the value of $3.1.2+3.2.3+3.3.4+.....+3.n.(n+1)$ is **[Rajasthan PET 1999]**

(a) $n(n+1)(n+2)$ (b) $n(n+1)(2n+1)$ (c) $(n-1)n(n+1)$ (d) $\frac{(n-1)\,n\,(n+1)}{2}$

272. The sum of $(n+1)$ terms of $\frac{1}{1}+\frac{1}{1+2}+\frac{1}{1+2+3}+......$ is **[Rajasthan PET 1999]**

(a) $\frac{n}{n+1}$ (b) $\frac{2n}{n+1}$ (c) $\frac{2}{n(n+1)}$ (d) $\frac{2(n+1)}{n+2}$

273. The sum of $(n-1)$ terms of $1+(1+3)+(1+3+5)+.......$ is **[Rajasthan PET 1999]**

(a) $\frac{n(n+1)(2n+1)}{6}$ (b) $\frac{n^2(n+1)}{4}$ (c) $\frac{n(n-1)(2n-1)}{6}$ (d) n^2

274. The sum $1(1!)+2(2!)+3(3!)+.....+n(n!)$ equals **[AMU 1999]**

(a) $3(n!)+n-3$ (b) $(n+1)!-(n-1)!$ (c) $(n+1)!-1$ (d) $2(n!)-2n-1$

275. Sum of the n terms of the series $\frac{3}{1^2}+\frac{5}{1^2+2^2}+\frac{7}{1^2+2^2+3^2}+...$ is **[Pb. CET 1999; Rajasthan PET 2001]**

(a) $\frac{2n}{n+1}$ (b) $\frac{4n}{n+1}$ (c) $\frac{6n}{n+1}$ (d) $\frac{9n}{n+1}$

276. The sum of the series $1+\frac{1.3}{6}+\frac{1.3.5}{6.8}+....\infty$ is **[UPSEAT 2001]**

(a) 1 (b) 0 (c) ∞ (d) 4

277. $11^3+12^3+....+20^3$ **[Pb. CET 1997; Rajasthan PET 2002]**

(a) Is divisible by 5 (b) Is an odd integer divisible by 5

(c) Is an even integer which is not divisible by 5 (d) Is an odd integer which is not divisible by 5

278. The sum of all numbers between 100 and 10,000 which are of form $n^3 (n\in N)$ is equal to **[IIT 1989]**

(a) 55216 (b) 53261 (c) 51261 (d) 53216

279. The cubes of the natural numbers are grouped as $1^3, (2^3, 3^3), (4^3, 5^3, 6^3), \ldots$ then sum of the numbers in the n^{th} group is

(a) $\frac{1}{8}n^3(n^2+1)(n^2+3)$ (b) $\frac{1}{16}n^3(n^2+16)(n^2+12)$ (c) $\frac{n^3}{12}(n^2+2)(n^2+4)$ (d) None of these

280. The value of the expression $2(1+\omega)(1+\omega^2)+3(2\omega+1)(2\omega^2+1)+4(3\omega+1)(3\omega^2+1)+\ldots+(n+1)(n\omega+1)(n\omega^2+1)$ is

(a) $\left[\frac{n(n+1)}{2}\right]^2$ (b) $\left[\frac{n(n+1)}{2}\right]^2+n$ (c) $\left[\frac{n(n+1)}{2}\right]^2-n$ (d) None of these

281. If $\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}+\ldots$up to $\infty=\frac{\pi^2}{6}$, then $\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\ldots$ equals to

(a) $\pi^2/6$ (b) $\pi^2/16$ (c) $\pi^2/8$ (d) None of these

282. The value of $\sum_{r=1}^{n}\frac{1}{\sqrt{a+rx}+\sqrt{a+(r-1)x}}$ is

(a) $\frac{n}{\sqrt{a}+\sqrt{a+nx}}$ (b) $\frac{\sqrt{a+nx}-\sqrt{a}}{x}$ (c) $\frac{n(\sqrt{a+nx}-a)}{x}$ (d) None of these

283. Let $\sum_{n=1}^{n}r^4=f(n)$. Then $\sum_{r=1}^{n}(2r-1)^4$ is equal to

(a) $f(2n)-16f(n)$, for all $n\in N$ (b) $f(n)-16f\left(\frac{n-1}{2}\right)$, when n is odd

(c) $f(n)-16f\left(\frac{n}{2}\right)$, when n is even (d) None of these

284. The sum to n terms of the series $\frac{1}{1.2.3.4}+\frac{1}{2.3.4.5}+\frac{1}{3.4.5.6}+\ldots$ is

(a) $\frac{1}{3(n+1)(n+2)(n+3)}$ (b) $\frac{1}{6(n+2)(n+3)(n+4)}$ (c) $\frac{15}{4n(n+1)(n+5)}$ (d) None of these

Relation between A.P., G.P. and H.P.

Basic Level

285. If a and b are two different positive real numbers, then which of the following relations is true **[MP PET 1982,2002]**

(a) $2\sqrt{ab}>(a+b)$ (b) $2\sqrt{ab}<(a+b)$ (c) $2\sqrt{ab}=(a+b)$ (d) None of these

286. If a, b, c are in A.P. as well as in G.P., then **[MNR 1981; AMU 1998]**

(a) $a=b\neq c$ (b) $a\neq b=c$ (c) $a\neq b\neq c$ (d) $a=b=c$

287. If three numbers be in G.P., then their logarithms will be in **[BIT 1992]**

(a) A.P. (b) G.P. (c) H.P. (d) None of these

288. If the arithmetic, geometric and harmonic means between two distinct positive real numbers be A, G and H respectively, then the relation between them **[MP PET 1984; Roorkee 1995]**

(a) $A>G>H$ (b) $A>G<H$ (c) $H>G>A$ (d) $G>A>H$

289. If the arithmetic, geometric and harmonic means between two positive real numbers be A, G and H, then

[AMU 1979,82; MP PET 1993]

(a) $A^2=GH$ (b) $H^2=AG$ (c) $G=AH$ (d) $G^2=AH$

290. If a, b, c are in A.P. then $\frac{a}{bc},\frac{1}{c},\frac{2}{b}$ are in **[MNR 1982; MP PET 2002]**

(a) A.P. (b) G.P. (c) H.P. (d) None of these

291. The geometric mean of two numbers is 6 and their arithmetic mean is 6.5. The numbers are **[MP PET 1994]**

(a) (3, 12) (b) (4, 9) (c) (2, 18) (d) (7, 6)

292. In the four numbers first three are in G.P. and last three in A.P. whose common difference is 6. If the first and last numbers are same, then first will be **[IIT 1974]**

(a) 2 (b) 4 (c) 6 (d) 8

293. If A_1, A_2 are the two A.M.'s between two numbers a and b and G_1, G_2 be two G.M.'s between same two numbers, then $\frac{A_1 + A_2}{G_1 . G_2} =$

[Roorkee 1983; DCE 1998]

(a) $\frac{a+b}{ab}$ (b) $\frac{a+b}{2ab}$ (c) $\frac{2ab}{a+b}$ (d) $\frac{ab}{a+b}$

294. If the A.M. and H.M. of two numbers is 27 and 12 respectively, then G.M. of the two numbers will be **[Rajasthan PET 19**

(a) 9 (b) 18 (c) 24 (d) 36

295. The A.M., H.M. and G.M. between two numbers are $\frac{144}{15}, 15$ and 12, but necessarily in this order. Then H.M., G.M. and A.M. respectively are

(a) $15, 12, \frac{144}{15}$ (b) $\frac{144}{15}, 12, 15$ (c) $12, 15, \frac{144}{15}$ (d) $\frac{144}{15}, 15, 12$

296. If G.M. =18 and A.M.=27, then H.M. is **[Rajasthan PET 1996]**

(a) $\frac{1}{18}$ (b) $\frac{1}{12}$ (c) 12 (d) $9\sqrt{6}$

297. If sum of A.M. and H.M. between two numbers is 25 and their G.M. is 12, then sum of numbers is

(a) 9 (b) 18 (c) 32 (d) 18 or 32

298. If $\frac{a+bx}{a-bx} = \frac{b+cx}{b-cx} = \frac{c+dx}{c-dx} (x \neq 0)$, then *a, b, c, d* are in **[Rajasthan PET 1986]**

(a) A.P. (b) G.P. (c) H.P. (d) None of these

299. The numbers 1,4, 16 can be three terms (not necessarily consecutive) of

(a) No A.P. (b) Only one G.P. (c) Infinite number of A.P's. (d)Infinite numbers of G.P's.

300. In a G.P. of alternately positive and negative terms, any terms is the A.M. of the next two terms . Then the common ratio is

(a) – 1 (b) – 3 (c) – 2 (d) $-\frac{1}{2}$

301. If *a, b, c* are in A.P., then $a + \frac{1}{bc}, b + \frac{1}{ca}, c + \frac{1}{ab}$ are in

(a) A.P. (b) G.P. (c) H.P. (d) None of these

302. The A.M. of two given positive numbers is 2. If the larger number is increased by 1, the G.M. of the numbers becomes equal to the A.M. of the given numbers. Then the H.M. of the given numbers is

(a) $\frac{3}{2}$ (b) $\frac{2}{3}$ (c) $\frac{1}{2}$ (d) None of these

Advance Level

303. If p^{th}, q^{th}, r^{th} and s^{th} terms of an A.P. be in G.P., then $(p-q), (q-r), (r-s)$ will be in

(a) G.P. (b) A.P. (c) H.P. (d) None of these

304. If *a, b, c* are the positive integers, then $(a+b)(b+c)(c+a)$ is **[DCE 2000]**

(a) $< 8abc$ (b) $> 8abc$ (c) $= 8abc$ (d) None of these

305. If *a, b, c* are in A.P., then $3^a, 3^b, 3^c$ shall be in **[Pb. CET 1990]**

(a) A.P. (b) G.P. (c) H.P. (d) None of these

306. If *a, b, c, d* and *p* are different real numbers such that $(a^2+b^2+c^2)p^2 - 2(ab+bc+cd)p + (b^2+c^2+d^2) \leq 0$, then *a, b, c, d* are in

[IIT 1987]

(a) A.P. (b) G.P. (c) H.P. (d) $ab = cd$

307. If the first and $(2n-1)^{th}$ terms of an A.P., G.P. and H.P. are equal and their n^{th} terms are respectively *a, b* and *c*, then **[IIT 1985,88]**

(a) $a \geq b \geq c$ (b) $a + c = b$ (c) $ac - b^2 = 0$ (d) (a) and (c) both

308. 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* in H.P., then the value of the ratio of the common difference to the terms of the A.P. is **[MNR 1989; Roorkee 1994]**

(a) $-\frac{2}{n}$ (b) $\frac{2}{n}$ (c) $-\frac{n}{2}$ (d) $\frac{n}{2}$

309. Given $a^x = b^y = c^z = d^u$ and *a, b, c, d* are in G.P., then *x, y, z, u* are in **[Dhanbad Engg. 1972; Roorkee 1984; Rajasthan PET**

(a) A.P. (b) G.P. (c) H.P. (d) None of these

310. If *a, b, c* are in G.P. and $\log a - \log 2b, \log 2b - \log 3c$ and $\log 3c - \log a$ are in A.P., then *a, b, c* are the length of the sides of a triangle which is

(a) Acute angled (b) Obtuse angled (c) Right angled (d) Equilateral

311. If *a, b, c* are in A.P., *b, c, d* are in G.P. and *c, d, e* are in H.P., then *a, c, e* are in **[AMU 1988,2001; MP PET 1993]**

(a) No particular order (b) A.P. (c) G.P. (d) H.P.

312. If *a, b, c* are in A.P. and a^2, b^2, c^2 are in H.P., then **[MNR 1986,88; IIT 1977,2003]**

(a) $a = b = c$ (b) $2b = 3a + c$ (c) $b^2 = \sqrt{(ac/8)}$ (d) None of these

313. The harmonic mean of two numbers is 4 and the arithmetic and geometric means satisfy the relation $2A + G^2 = 27$, the numbers are

[MNR 1987; UPSEAT 1999,2000]

(a) 6, 3 (b) 5, 4 (c) 5, – 2.5 (d) – 3, 1

314. In a G.P. the sum of three numbers is 14, if 1 is added to first two numbers and subtracted from third numbers, the series becomes A.P., then the greatest number is **[Roorkee 1973]**

(a) 8 (b) 4 (c) 24 (d) 16

315. If *a, b, c* are in G.P. and *x, y* are the arithmetic means between *a, b* and *b, c* respectively, then $\frac{a}{x} + \frac{c}{y}$ is equal to **[Roorkee 1969]**

(a) 0 (b) 1 (c) 2 (d) $\frac{1}{2}$

316. If *a, b, c* are in A.P. and *a, b, d* in G.P., then *a, a – b, d – c* will be in **[Ranchi BIT 1968]**

(a) A.P. (b) G.P. (c) H.P. (d) None of these

317. If *x*, 1, *z* are in A.P. and *x*, 2, *z* are in G.P., then *x*, 4, *z* will be in **[IIT 1965]**

(a) A.P. (b) G.P. (c) H.P. (d) None of these

318. $x + y + z = 15$, if $9, x, y, z, a$ are in A.P.; while $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = \frac{5}{3}$ if $9, x, y, z, a$ are in H.P., then the value of *a* will be **[IIT 1978]**

(a) 1 (b) 2 (c) 3 (d) 9

319. If 9 A.M.'s and H.M.'s are inserted between the 2 and 3 and if the harmonic mean *H* is corresponding to arithmetic mean *A*, then $A + \frac{6}{H} =$ **[Dhanbad Engg. 1987]**

(a) 1 (b) 3 (c) 5 (d) 6

320. If the p^{th}, q^{th} and r^{th} term of a G.P. and H.P. are *a, b, c*, then $a(b-c)\log a + b(c-a)\log b + c(a-b)\log c =$ **[Dhanbad Engg. 1976]**

(a) – 1 (b) 0 (c) 1 (d) Does not exist

321. If the product of three terms of G.P. is 512. If 8 added to first and 6 added to second term, so that number may be in A.P., then the numbers are **[Roorkee 1964]**

(a) 2, 4, 8, (b) 4, 8, 16 (c) 3, 6, 12 (d) None of these

322. If the ratio of H.M. and G.M. between two numbers *a* and *b* is $4:5$, then ratio of the two numbers will be **[IIT 1992; MP**

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

323. If the A.M. and G.M. of roots of a quadratic equations are 8 and 5 respectively, then the quadratic equation will be **[Pb.CET 1990]**

(a) $x^2 - 16x - 25 = 0$ (b) $x^2 - 8x + 5 = 0$ (c) $x^2 - 16x + 25 = 0$ (d) $x^2 + 16x - 25 = 0$

324. Let $a_1, a_2, ... a_{10}$ be in A.P. and $h_1, h_2, ..., h_{10}$ be in H.P. If $a_1 = h_1 = 2$ and $a_{10} = h_{10} = 3$, then $a_4 h_7$ is **[IIT 1999]**

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

325. If $\ln(a+c), \ln(c-a), \ln(a-2b+c)$ are in A.P., then **[IIT Screening 1994; Rajasthan PET 1999]**

(a) *a, b, c* are in A.P. (b) a^2, b^2, c^2 are in A.P. (c) *a, b, c* are in G.P. (d) *a, b, c* are in H.P.

326. If $A_1, A_2; G_1, G_2$ and H_1, H_2 be two A.M's, G.M's and H.M's between two numbers respectively, then $\frac{G_1 G_2}{H_1 H_2} \times \frac{H_1 + H_2}{A_1 + A_2}$ equals

[Rajasthan PET 1997; AMU 2000]

(a) 1 (b) 0 (c) 2 (d) 3

327. If $x>1, y>1, z>1$ are in G.P., then $\frac{1}{1+\ln x}, \frac{1}{1+\ln y}, \frac{1}{1+\ln z}$ are in **[IIT 1998; UPSEAT 2001]**

(a) A.P. (b) H.P. (c) G.P. (d) None of these

328. If *p, q, r* are in one geometric progression and *a, b, c* in another geometric progression, then cp, bq, ar are in **[Roorkee Qualifying 1998]**

(a) A.P. (b) H.P. (c) G.P. (d) None of these

329. If first three terms of sequence $\frac{1}{16}, a, b, \frac{1}{6}$ are in geometric series and last three terms are in harmonic series, then the value of a and b will be **[UPSEAT 1999]**

(a) $a=-\frac{1}{4}, b=1$ (b) $a=\frac{1}{12}, b=\frac{1}{9}$ (c) (*a*) and (*b*) both are true (d) None of these

330. If $a^x=b^y=c^z$ and a, b, c are in G.P., then x, y, z are in **[Pb. CET 1993; DCE 1999; AMU 1999]**

(a) A. P. (b) G. P. (c) H. P. (d) None of these

331. If G_1 and G_2 are two geometric means and A the arithmetic mean inserted between two numbers, then the value of $\frac{G_1^2}{G_2}+\frac{G_2^2}{G_1}$ is

[DCE 1999]

(a) $\frac{A}{2}$ (b) A (c) $2A$ (d) None of these

332. If $\frac{a}{b+c}, \frac{b}{c+a}, \frac{c}{a+b}$ are in H.P., then a, b, c are in **[Rajasthan PET 1999]**

(a) A.P. (b) G.P. (c) H.P. (d) None of these

333. If *a, b, c* are in A.P., then $\frac{1}{\sqrt{a}+\sqrt{b}}, \frac{1}{\sqrt{a}+\sqrt{c}}, \frac{1}{\sqrt{b}+\sqrt{c}}$ are in **[Roorkee 1999]**

(a) A.P. (b) G.P. (c) H.P. (d) None of these

334. The sum of three decreasing numbers in A.P. is 27. If $-1, -1, 3$ are added to them respectively, the resulting series is in G.P. The numbers are **[AMU 1999]**

(a) 5, 9, 13 (b) 15, 9, 3 (c) 13, 9, 5 (d) 17, 9, 1

335. If in the equation $ax^2+bx+c=0$, the sum of roots is equal to sum of square of their reciprocals, then $\frac{c}{a}, \frac{a}{b}, \frac{b}{c}$ are in

[Rajasthan PET 2000]

(a) A.P. (b) G.P. (c) H.P. (d) None of these

336. If *a, b, c* are in A.P., then $2^{ax+1}, 2^{bx+1}, 2^{cx+1}, x \neq 0$ are in **[DCE 2000; Pb. CET 2000]**

(a) A.P. (b) G.P. only when $x>0$ (c) G.P. if $x<0$ (d) G.P. for all $x \neq 0$

337. If $b+c,\ c+a,\ a+b$ are in H.P., then $\frac{a}{b+c}, \frac{b}{c+a}, \frac{c}{a+b}$ are in **[Rajasthan PET 2000]**

(a) A.P. (b) G.P. (c) H.P. (d) None of these

338. The common difference of an A.P. whose first term is unity and whose second, tenth and thirty fourth terms are in G.P., is

[AMU 2000]

(a) $\frac{1}{5}$ (b) $\frac{1}{3}$ (c) $\frac{1}{6}$ (d) $\frac{1}{9}$

339. The sum of three consecutive terms in a geometric progression is 14. If 1 is added to the first and the second terms and 1 is subtracted from the third, the resulting new terms are in arithmetic progression. Then the lowest of the original term is

[MP PET 2001]

(a) 1 (b) 2 (c) 4 (d) 8

340. a, g, h are arithmetic mean, geometric mean and harmonic mean between two positive numbers x and y respectively. Then identify the correct statement among the following **[Karnataka CET 2001]**

(a) *h* is the harmonic mean between *a* and *g* (b) No such relation exists between *a, g* and *h*

(c) g is the geometric mean between a and h (d) a is the arithmetic mean between g and h

341. Let the positive numbers a, b, c, d be in A.P., then abc, abd, acd, bcd are **[IIT Screening 2001]**

(a) Not in A.P./G.P./H.P. (b) In A.P. (c) In G.P. (d) In H.P.

342. If $(y-x)$, $2(y-a)$ and $(y-z)$ are in H.P., then $x-a, y-a, z-a$ are in **[Rajasthan PET 2001]**

(a) A.P. (b) G.P. (c) H.P. (d) None of these

343. If A and G are arithmetic and geometric means and $x^2 - 2Ax + G^2 = 0$, then **[UPSEAT 2001]**

(a) $A = G$ (b) $A > G$ (c) $A < G$ (d) $A = -G$

344. If A is the A.M. of the roots of the equation $x^2 - 2ax + b = 0$ and G is the G.M. of the roots of the equation $x^2 - 2bx + a^2 = 0$, then

[UPSEAT 2001]

(a) $A > G$ (b) $A \neq G$ (c) $A = G$ (d) None of these

345. If a, b, c are three unequal numbers such that a, b, c are in A.P. and $b - a$, $c - b$, a are in G.P., then $a : b : c$ is **[UPSEAT 2**

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

346. If a, b, c are in A.P. and a^2, b^2, c^2 are in H.P., then **[UPSEAT 2001]**

(a) $a \neq b \neq c$ (b) $a^2 = b^2 = \frac{c^2}{2}$ (c) a, b, c are in G.P. (d) $\frac{-a}{2}, b, c$ are in G.P.

347. Let a_1, a_2, a_3 be any positive real numbers, then which of the following statement is not true **[Orissa JEE 2002]**

(a) $3a_1a_2a_3 \leq a_1^3 + a_2^3 + a_3^3$ (b) $\frac{a_1}{a_2} + \frac{a_2}{a_3} + \frac{a_3}{a_1} \geq 3$

(c) $(a_1 + a_2 + a_3)\left(\frac{1}{a_1} + \frac{1}{a_2} + \frac{1}{a_3}\right) \geq 9$ (d) $(a_1 + a_2 + a_3)\left(\frac{1}{a_1} + \frac{1}{a_2} + \frac{1}{a_3}\right)^3 \leq 27$

348. If $a_1, a_2, ... a_n$ are positive real numbers whose product is a fixed number c, then the minimum value of $a_1 + a_2 + ... + a_{n-1} + 2a_n$ is

[IIT Screening 2002]

(a) $n(2c)^{1/n}$ (b) $(n+1)c^{1/n}$ (c) $2nc^{1/n}$ (d) $(n+1)(2c)^{1/n}$

349. Suppose a, b, c are in A.P. and a^2, b^2, c^2 are in G.P. If $a < b < c$ and $a + b + c = \frac{3}{2}$, then the value of a is

[IIT Screening 2002]

(a) $\frac{1}{2\sqrt{2}}$ (b) $\frac{1}{2\sqrt{3}}$ (c) $\frac{1}{2} - \frac{1}{\sqrt{3}}$ (d) $\frac{1}{2} - \frac{1}{\sqrt{2}}$

350. Two sequences $\{t_n\}$ and $\{s_n\}$ are defined by $t_n = \log\left(\frac{5^{n+1}}{3^{n-1}}\right), s_n = \left[\log\left(\frac{5}{3}\right)\right]^n$, then **[AMU 2002]**

(a) $\{t_n\}$ is an A.P., $\{s_n\}$ is a G.P. (b) $\{t_n\}$ and $\{s_n\}$ are both G.P.

(c) $\{t_n\}$ and $\{s_n\}$ are both A.P. (d) $\{s_n\}$ is a G.P., $\{t_n\}$ is neither A.P. nor G.P.

351. If $\begin{vmatrix} a & b & a\alpha - b \\ b & c & b\alpha - c \\ 2 & 1 & 0 \end{vmatrix} = 0$ and $\alpha \neq 1/2$, then a, b, c are in

(a) A.P. (b) G.P. (c) H.P. (d) None of these

352. If x, y, z are in G.P. and $\tan^{-1} x, \tan^{-1} y, \tan^{-1} z$ are in A.P., then

(a) $x = y = z$ or $y \neq 1$ (b) $z = 1/x$

(c) $x = y = z$, but their common value is not necessarily zero (d) $x = y = z = 0$

353. If in a progression $a_1, a_2, a_3 ......$, etc., $(a_r - a_{r+1})$ bears a constant ratio with $a_r . a_{r+1}$ then the terms of the progression are in

(a) A.P. (b) G.P. (c) H.P. (d) None of these

354. If $\frac{a_2 a_3}{a_1 a_4} = \frac{a_2 + a_3}{a_1 + a_4} = 3\left(\frac{a_2 - a_3}{a_1 - a_4}\right)$ then a_1, a_2, a_3, a_4 are in

(a) A.P. (b) G.P. (c) H.P. (d) None of these

355. If $a, a_1, a_2, a_3, ... a_{2n-1}, b$ are in A.P., $a, b_1, b_2, b_3, ... b_{2n-1}, b$ are in G.P. and $a, c_1, c_2, c_3, ... c_{2n-1}, b$ are in H.P., where *a, b* are positive, then the equation $a_n x^2 - b_n x + c_n = 0$ has its roots

(a) Real and unequal (b) Real and equal (c) Imaginary (d) None of these

356. 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 $a > 0, b > 0$ then

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

357. If *a, b, c* are in G.P. and *a, p, q* in A.P. such that $2a, b + p, c + q$ are in G.P. then the common difference of the A.P. is

(a) $\sqrt{2}a$ (b) $(\sqrt{2} + 1)(a - b)$ (c) $\sqrt{2}(a + b)$ (d) $(\sqrt{2} - 1)(b - a)$

Applications of Progressions

Basic Level

358. If *x, y, z* are positive then the minimum value of $x^{\log y - \log z} + y^{\log z - \log x} + z^{\log x - \log y}$ is

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

359. *a, b, c* are three positive numbers and abc^2 has the greatest value $\frac{1}{64}$. Then

(a) $a = b = \frac{1}{2}, c = \frac{1}{4}$ (b) $a = b = \frac{1}{4}, c = \frac{1}{2}$ (c) $a = b = c = \frac{1}{3}$ (d) None of these

360. If $a > 0,\ b > 0, c > 0$ and the minimum value of $a(b^2 + c^2) + b(c^2 + a^2) + c(a^2 + b^2)$ is λabc, then the λ is

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

361. If *x, y, z* are three real numbers of the same sign then the value of $\frac{x}{y} + \frac{y}{z} + \frac{z}{x}$ lies in the interval

(a) $[2, +\infty)$ (b) $[3, +\infty)$ (c) $(3, +\infty)$ (d) $(-\infty, 3)$

362. The sum of the products of the ten numbers $\pm 1, \pm 2, \pm 3, \pm 4, \pm 5$ taking two at a time is

(a) 165 (b) – 55 (c) 55 (d) None of these

363. Let $S_1, S_2 .....$ be squares such that for each $n \geq 1$, the length of a side of S_n equals the length of a diagonal of S_{n+1}. If the length of a side of S_1 is 10 *cm,* then for which of the following values of *n* is the area of S_n less then 1 *sq cm* **[IIT 1999]**

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

364. Jairam purchased a house in Rs. 15000 and paid Rs. 5000 at once. Rest money he promised to pay in annual installment of Rs. 1000 with 10% per annum interest. How much money is to be paid by Jairam **[UPSEAT 1999]**

(a) Rs. 21555 (b) Rs. 20475 (c) Rs. 20500 (d) Rs. 20700

365. The sum of the integers from 1 to 100 which are not divisible by 3 or 5 is **[MP PET 2000]**

(a) 2489 (b) 4735 (c) 2317 (d) 2632

366. The product of n positive numbers is unity. Their sum is

(a) A positive integer (b) Equal to $n+\frac{1}{n}$ (c) Divisible by n (d) Never less than n

367. If a,b,c,d are positive real numbers such that $a+b+c+d=2$, then $M=(a+b)(c+d)$ satisfies the relation **[IIT Screening**

(a) $0<M\le 1$ (b) $1\le M\le 2$ (c) $2\le M\le 3$ (d) $3\le M\le 4$

368. The sum of all positive divisors of 960 is **[Karnataka CET 2000]**

(a) 3048 (b) 3087 (c) 3047 (d) 2180

369. $2^{\sin\theta}+2^{\cos\theta}$ is greater than **[AMU 2000]**

(a) $\frac{1}{2}$ (b) $\sqrt{2}$ (c) $2^{\frac{1}{\sqrt{2}}}$ (d) $2^{\left(1-\frac{1}{\sqrt{2}}\right)}$

370. If the altitudes of a triangle are in A.P., then the sides of the triangle are in **[EAMCET 2002]**

(a) A.P. (b) H.P.

(c) G.P. (d) Arithmetico-geometric progression

371. A boy goes to school from his home at a speed of x *km/hour* and comes back at a speed of y *km/hour*, then the average speed is given by

(a) A.M. (b) G.M. (c) H.M. (d) None of these

372. A monkey while trying to reach the top of a pole height 12 *metres* takes every time a jump of 2 *metres* but slips 1 *metre* while holding the pole. The number of jumps required to reach the top of the pole, is

(a) 6 (b) 10 (c) 11 (d) 12

373. Balls are arranged in rows to form an equilateral triangle. The first row consists of one ball, the second row of two balls and so on. If 669 more balls are added then all the balls can be arranged in the shape of a square and each of the sides then contains 8 balls less than each side of the triangle did. The initial number of balls is **[Roorkee 1**

(a) 1600 (b) 1500 (c) 1540 (d) 1690

374. If a, b and c are three positive real numbers, then the minimum value of the expression $\frac{b+c}{a}+\frac{c+a}{b}+\frac{a+b}{c}$ is

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

375. If $x_1>0, i=1,2,.....,50$ and $x_1+x_2+.....+x_{50}=50$, then the minimum value of $\frac{1}{x_1}+\frac{1}{x_2}+.....+\frac{1}{x_{50}}$ equals to

(a) 50 (b) $(50)^2$ (c) $(50)^3$ (d) $(50)^4$

376. If a, b and c are positive real numbers, then least value of $(a+b+c)\left(\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right)$ is

(a) 9 (b) 3 (c) 10/3 (d) None of these

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

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

378. If $(1-p)(1+3x+9x^2+27x^3+81x^4+243x^5)=1-p^6, p\neq 1$ then the value of $\frac{p}{x}$ is

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

379. Let $f(n)=\left[\frac{1}{2}+\frac{n}{100}\right]$ where$[x]$ denotes the integral part of x. Then the value of $\sum_{n=1}^{100} f(n)$ is

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

380. $A_r; r=1,2,3,....., n$ are n points on the parabola $y^2=4x$ in the first quadrant. If $A_r=(x_r, y_r)$, where $x_1, x_2, x_3,....., x_n$ are in G.P. and $x_1=1, x_2=2$, then y_n is equal to

(a) $-2^{\frac{n+1}{2}}$ (b) 2^{n+1} (c) $(\sqrt{2})^{n+1}$ (d) $2^{\frac{n}{2}}$

381. The lengths of three unequal edges of a rectangular solid block are in G.P. The volume of the block is $216\ cm^3$ and the total surface area is $252\ cm^2$. The length of the longest edge is

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

382. *ABC* is right-angled triangle in which $\angle B = 90°$ and $BC = a$. If n points $L_1, L_2, \ldots\ldots, L_n$ on *AB* are such that *AB* is divided in $n+1$ equal parts and $L_1M_1, L_2M_2, \ldots\ldots, L_nM_n$ are line segments parallel to *BC* and $M_1, M_2, \ldots\ldots, M_n$ are on *AC* then the sum of the lengths of $L_1M_1, L_2M_2, \ldots\ldots, L_nM_n$ is

(a) $\frac{a(n+1)}{2}$ (b) $\frac{a(n-1)}{2}$

(c) $\frac{an}{2}$ (d) Impossible to find from the given data

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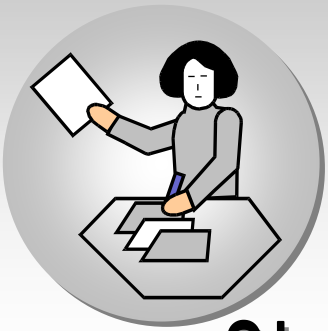

Answer Sheet

Progressions ***Assignment (Basic and Advance Level)***

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
c	b	b	a	b	b	a	b	b	a	a	c	a	c	a	c	a	c	b	d
21	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
c	a	c,d	d	d	b	c	b	c	a	b	a	b	d	d	d	d	d	b	a
41	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**	**51**	**52**	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**
b	c	b	c	c	b	a	b	d	a	d	b	c	d	d	b	b	c	d	a
61	**62**	**63**	**64**	**65**	**66**	**67**	**68**	**69**	**70**	**71**	**72**	**73**	**74**	**75**	**76**	**77**	**78**	**79**	**80**
d	d	b	b	b	b	a	d	d	b	a	c	c	c	b	c	d	a	e	b
81	**82**	**83**	**84**	**85**	**86**	**87**	**88**	**89**	**90**	**91**	**92**	**93**	**94**	**95**	**96**	**97**	**98**	**99**	**100**
b	a	a	b	c	c	b	d	c	a	a	b	d	c	b	d	a	a	b	d
101	**102**	**103**	**104**	**105**	**106**	**107**	**108**	**109**	**110**	**111**	**112**	**113**	**114**	**115**	**116**	**117**	**118**	**119**	**120**
b	a	a	c	a	a	a,d	c	d	b	a	c	b	b	c	c	c	a	c	b
121	**122**	**123**	**124**	**125**	**126**	**127**	**128**	**129**	**130**	**131**	**132**	**133**	**134**	**135**	**136**	**137**	**138**	**139**	**140**
c	a	b	a	a	b	b	a	a	a	a	c	b	b	c	c	b	a	d	a
141	**142**	**143**	**144**	**145**	**146**	**147**	**148**	**149**	**150**	**151**	**152**	**153**	**154**	**155**	**156**	**157**	**158**	**159**	**160**
d	d	d	d	d	c	b	a,b	a	d	d	c	c	c	b	d	a	a	d	d
161	**162**	**163**	**164**	**165**	**166**	**167**	**168**	**169**	**170**	**171**	**172**	**173**	**174**	**175**	**176**	**177**	**178**	**179**	**180**
b	c	a	d	c	c	a	b	c	a	d	a	d	d	c	b	b	c	b	b
181	**182**	**183**	**184**	**185**	**186**	**187**	**188**	**189**	**190**	**191**	**192**	**193**	**194**	**195**	**196**	**197**	**198**	**199**	**200**
c	c	a	b	c	d	b	c	a	b	a	c	c	b	a	c	a	a	c	b
201	**202**	**203**	**204**	**205**	**206**	**207**	**208**	**209**	**210**	**211**	**212**	**213**	**214**	**215**	**216**	**217**	**218**	**219**	**220**
a	b	b	d	a	d	c	a	b	b	b	b	a	d	c	a	c	b	c	c
221	**222**	**223**	**224**	**225**	**226**	**227**	**228**	**229**	**230**	**231**	**232**	**233**	**234**	**235**	**236**	**237**	**238**	**239**	**240**
c	c	b	d	c	c	c	b	b	c	d	b	c	d	d	b	a	a	c	d
241	**242**	**243**	**244**	**245**	**246**	**247**	**248**	**249**	**250**	**251**	**252**	**253**	**254**	**255**	**256**	**257**	**258**	**259**	**260**
c	b	d	c	c	a	b	c	b	b	c	b	d	b	c	d	a	b	b	a
261	**262**	**263**	**264**	**265**	**266**	**267**	**268**	**269**	**270**	**271**	**272**	**273**	**274**	**275**	**276**	**277**	**278**	**279**	**280**
a	a	b	c	b	d	d	a	b	c	a	d	c	c	c	d	b	b	a	b
281	**282**	**283**	**284**	**285**	**286**	**287**	**288**	**289**	**290**	**291**	**292**	**293**	**294**	**295**	**296**	**297**	**298**	**299**	**300**
c	a,b	a	d	b	d	a	a	d	d	b	d	a	b	b	c	c	b	a	c
301	**302**	**303**	**304**	**305**	**306**	**307**	**308**	**309**	**310**	**311**	**312**	**313**	**314**	**315**	**316**	**317**	**318**	**319**	**320**
a	a	a	b	b	b	d	a	c	b	c	a	a	a	c	b	c	a	c	b
321	**322**	**323**	**324**	**325**	**326**	**327**	**328**	**329**	**330**	**331**	**332**	**333**	**334**	**335**	**336**	**337**	**338**	**339**	**340**
b	c,d	c	d	d	a	b	c	c	c	c	c	a	d	a	d	a	b	b	c
341	**342**	**343**	**344**	**345**	**346**	**347**	**348**	**349**	**350**	**351**	**352**	**353**	**354**	**355**	**356**	**357**	**358**	**359**	**360**
d	b	b	c	a	d	d	a	d	a	b	a	c	c	c	b	b,d	a	b	c
361	**362**	**363**	**364**	**365**	**366**	**367**	**368**	**369**	**370**	**371**	**372**	**373**	**374**	**375**	**376**	**377**	**378**	**379**	**380**
b	b	b,c,d	c	d	d	a	a	d	b	c	c	c	d	a	a	d	b	b	c
381	**382**																		
a	c																		