ASSIGNMENT: GEOMETRIC PROGRESSION

General term of Geometric progression

Basic Level

1. 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) $c^2 = ab$

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

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

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

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

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

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

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

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

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

(a) – 1 (b) 2 (c) 4 (d) – 4

7. 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) $1 + \frac{\log l - \log a}{\log r}$

8. 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

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

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

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

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

11. 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

12. 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)

13. 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

14. 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

15. If the first term of a G.P. $a_1, a_2, a_3, \ldots\ldots$ 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

16. 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

17. If the nth term of geometric progression $5, -\frac{5}{2}, \frac{5}{4}, -\frac{5}{8}, \ldots\ldots$ 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

18. 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) $1+\left(\frac{1}{10}\right)^{100}$

19. 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

20. 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) $\frac{1}{2}$

21. 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 1990]**

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

22. 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

23. 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

24. 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

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

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

26. 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

27. 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

28. 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

29. 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) $2^n - 1$

30. 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

31. 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

32. 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

33. 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

34. 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

35. 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) $n + \frac{1}{2}(3^{-n} - 1)$

36. 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 1981]**

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

37. 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

38. 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) $\frac{\sqrt{5}+1}{2}$

39. 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

40. 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) $\frac{(n-1)r}{1-r}$

41. 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

42. 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

43. 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) $\frac{y}{1-y}$

44. 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) $\frac{2}{3}$

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

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

46. 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

47. 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) $\frac{x^2+y}{x^2-y}$

48. 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) $\frac{15}{7}$

49. 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 $-1 < r < 1 (r \neq 0)$

50. 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) $\frac{7}{9}$

51. 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

52. 0.14189189189.... can be expressed as a rational number **[AMU 2000]**

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

53. 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

54. 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

55. 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 **[Rajasthan PET 2002]**

(a) 1 (b) 2 (c) 1/3 (d) – 1/3

56. 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) $3\sqrt{2}+\sqrt{5}$

57. 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) $\frac{1}{1+e^x}$

58. 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) $\frac{2}{5}$

59. A ball is dropped from a height of 120 m rebounds $(4/5)^{th}$ 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) ∞

60. 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

61. 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) $A(1-A)^{1/z}$

62. 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) $\frac{9}{2}$

63. $x = 1 + a + a^2 + ... \infty (a < 1)$, $y = 1 + b + b^2 + ... \infty (b < 1)$. 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) $\frac{xy}{x-y+1}$

64. 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

65. 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) $1, -\frac{1}{3}, \frac{1}{3^2}, -\frac{1}{3^3}, ...$

66. 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) $3\pi/4$

67. 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) $a = 3, r = \frac{1}{4}$

68. 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

69. 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) $\frac{b^2}{1-b^2} + \frac{ab}{1-ab}$

70. 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

71. 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

72. 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

73. 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) $3G^2$

74. 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) $a\left(\frac{b}{a}\right)^{\frac{1}{n}}$

75. 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

76. 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

77. 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

78. 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

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

(a) 4 (b) 2 (c) – 1 (d) 1

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

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

Advance Level

81. 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) $G_1.G_2......G_n = G^{2/n}$

82. 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^{tn} 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

83. 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

84. 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 PET 1986]**

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

85. 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) $\log_a(\log_e b)-\log_a(\log_e a)$

86. 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

87. 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

88. 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

89. 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

90. 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) $ab^3 = cd^3$

91. 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 1999]**

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

92. 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

93. 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

94. 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

95. 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

96. 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

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

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

98. 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) $\frac{1}{79}$

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

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

100. If 6^{th} 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

101. The 9^{th} 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) $\frac{17}{27}$

102. 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) $pq(p+q)$

103. 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

104. 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

105. 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) $a+b$

106. 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

107. 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) $\frac{11}{5}$

108. 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) $\frac{1}{a-a^2b^2}$

109. 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

110. If there are n harmonic means between 1 and $\frac{1}{31}$ and the ratio of 7th 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

111. 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

112. 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

113. 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

114. 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

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

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

116. 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

117. 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

118. 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

119. 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) $ac+bd>b^2+d^2$

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

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

121. 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) $4\log(x-z)$

122. 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) None of these

123. 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

124. 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) $\frac{1}{(1-x)^2}$

125. 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

126. 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

127. 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) $\frac{35}{16}$

128. The sum of the series $1 + 3x + 6x^2 + 10x^3 + ...\infty$ will be

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

129. $2^{1/4}.4^{1/8}.8^{1/16}.16^{1/32}.......$ is equal to **[MNR 1984; MP PET 1998; AIEEE 2002]**

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

130. 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) $\frac{1}{2} - \frac{5n+1}{3 \times 5^{n+2}}$

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

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