Chapter 3

Sequence and Progression

Objective Questions

SINGLE CORRECT

1. Let $a_1, a_2, a_3, a_4, \ldots, a_{11}$ be a geometric sequence. If $\prod_{k=1}^{11} a_k = 6$, then the value of $(a_5 a_6 a_7)$ is equal to :

(A) $(6)^{\frac{5}{11}}$ (B) $(25)^{\frac{1}{11}}$ (C) $(216)^{\frac{1}{11}}$ (D) $(343)^{\frac{1}{11}}$

2. If a, b and c are in A.P. and p, p' are the A.M. and G.M. between a and b respectively, while q, q' are the A.M. and G.M. between b and c respectively, then :

(A) $p^2 + q^2 = p'^2 + q'^2$ (B) $pq = p'q'$

(C) $p^2 - q^2 = p'^2 - q'^2$ (D) $pq' = p'q$

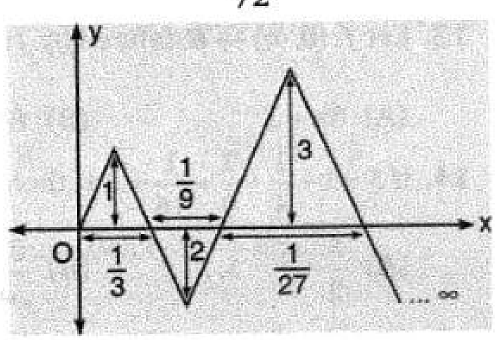
3. For $x > 0$, the sum of the series $\frac{1}{1+x} - \frac{(1-x)}{(1+x)^2} + \frac{(1-x)^2}{(1+x)^3} - \ldots \infty$ is equal to :

(A) $\frac{1}{4}$ (B) $\frac{1}{2}$ (C) $\frac{3}{4}$ (D) 1

4. The limiting sum of the infinite series $\frac{1}{10} + \frac{2}{10^2} + \frac{3}{10^3} + \ldots$ whose n^{th} term is $\frac{n}{10^n}$ is equal to :

(A) $\frac{1}{9}$ (B) $\frac{10}{81}$ (C) $\frac{1}{8}$ (D) $\frac{17}{72}$

5. Infinite number of triangles are formed as shown in figure. If total area of these triangles is A then $8A$ is equal to :



(A) 3

(B) 4

(C) 1

(D) 2

6. Let $<a_n>$ be an arithmetic sequence whose first term is 1 and $<b_n>$ be a geometric sequence whose first term is 2. If the common ratio of geometric sequence is half the common difference of arithmetic sequence, then the minimum value of $(a_4 b_1 + a_3 b_2 + 2a_1 b_3)$ is equal to :

(A) $\frac{25}{12}$ (B) $\frac{-3}{2}$ (C) $\frac{3}{2}$ (D) $\frac{-25}{12}$

7. If roots of the cubic $64x^3 - 144x^2 + 92x - 15 = 0$ are in arithmetic progression, then the difference between the largest and smallest root is equal to :

(A) 2 (B) 1 (C) 1/2 (D) 3/8

8. If the equation $2^x + 2^{-2} = 2k$ has exactly one real solution, then sum of all integral values of k in $[-100, 100]$ is equal to :

(A) 5050 (B) 10100 (C) 0 (D) -5050

9. If $H_1, H_2, H_3, ..., H_{101}$ are in H.P., then $\sum_{i=1}^{100} (-1)^i \left(\frac{H_i + H_{i+1}}{H_i - H_{i+1}} \right)$ is equal to :

(A) 99 (B) 101 (C) 100 (D) 1

10. If $\frac{1}{a} + \frac{1}{a-2b} + \frac{1}{c} + \frac{1}{c-2b} = 0$ and a, b, c are not in A.P. then :

(A) a, b, c are in G.P. (B) $a, \frac{b}{2}, c$ are in A.P. (C) $a, \frac{b}{2}, c$ are in H.P. (D) $a, 2b, c$ are in H.P.

11. If $S_n = n^2 a + \frac{n}{4}(n-1)d$ is the sum of first n terms of an A.P., then common difference is equal to :

(A) $a + 2d$ (B) $2a + d$ (C) $\frac{a+d}{2}$ (D) $2a + \frac{d}{2}$

12. A line segment initially 1 unit long grows according to the law

$$1 + \frac{\sqrt{2}}{4} + \frac{1}{4} + \frac{\sqrt{2}}{16} + \frac{1}{16} + \frac{\sqrt{2}}{64} + \frac{1}{64} + ... \infty$$

If the growth process continues indefinitely, then length of the line is equal to :

(A) $\frac{4}{3}$ (B) $\frac{8}{3}$ (C) $\frac{4+\sqrt{2}}{3}$ (D) $\frac{2}{3}(4+\sqrt{2})$

13. Let $f: (0, \infty) \to \boldsymbol{R}$ defined by $f(x) = x^2 + \frac{16\pi^4}{x^2} - \cos 3x$, then the minimum value of $f(x)$ is :

(A) $8\pi + 1$ (B) $8\pi - 1$ (C) $8\pi^2 + 1$ (D) $8\pi^2 - 1$

14. If $S = 1 + \frac{1}{4} + \frac{1}{9} + \frac{1}{16} + ... \infty$, then $1 + \frac{1}{9} + \frac{1}{25} + \frac{1}{49} + ... \infty$ is equal to :

(A) $\frac{S}{2}$ (B) $\frac{3S}{4}$ (C) $S - \frac{1}{4}$ (D) $S - \frac{1}{2}$

15. The quadratic equation whose roots are A.M. and H.M. of the roots of the equation $ax^2 + bx + c = 0 (a, b, c \in \boldsymbol{R}, a \neq 0)$ is :

(A) $2ax^2+(b^2+4ac)x+2bc=0$ (B) $2abx^2+(b^2+4ac)x+2bc=0$

(C) $abx^2+(b^2+4ac)x+bc=0$ (D) $ax^2+(b^2+4ac)x+bc=0$

16. The value of $\frac{1\cdot 2}{3!}+\frac{2\cdot 2^2}{4!}+\frac{3\cdot 2^3}{5!}+\dots+\frac{15\cdot 2^{15}}{17!}$ equals :

(A) $2-\frac{16\cdot 2^{17}}{17!}$ (B) $2-\frac{2^{17}}{17!}$ (C) $1-\frac{16\cdot 2^{17}}{17!}$ (D) $1-\frac{2^{16}}{17!}$

17. Given distinct straight lines OA and OB. From a point in OA, a perpendicular is drawn to OB, from the foot of this perpendicular a line is drawn perpendicular to OA. From the foot of this second perpendicular, a line is drawn perpendicular to OB and so on indefinitely. The lengths of the first and second perpendiculars are 'a' and 'b', respectively. Then the sum of the lengths of the perpendiculars approaches a limit as the number of perpendiculars grow beyond all bound. This limit is equal to :

(A) $\frac{b}{a-b}$ (B) $\frac{a}{a-b}$ (C) $\frac{ab}{a-b}$ (D) $\frac{a^2}{a-b}$

18. In a convex polygon, the degree measures of the interior angles form an arithmetic progression. If the smallest angle is 159° and the largest angle is 177°, then the number of sides in the polygon is :

(A) 21 (B) 27 (C) 30 (D) 31

19. Given a sequence of ten numbers, if the first number is 2 and each other number is the square of the preceding number, then the tenth number is :

(A) between 10 and 10^5 (B) between 10^5 and 10^{10}

(C) between 10^{50} and 10^{100} (D) more than 10^{100}

20. The value of $\sum_{n=3}^{\infty}\frac{1}{n^5-5n^3+4n}$ is equal to :

(A) $\frac{1}{120}$ (B) $\frac{1}{96}$ (C) $\frac{1}{24}$ (D) $\frac{1}{144}$

21. A ball is dropped onto a floor from a height of 1 meter. Each time that the ball hits the floor, it rebounds to half its previous height. (After falling one meter it rebounds to a height of $\frac{1}{2}$ meter. The next time it hits the floor, it rebounds to a height of $\frac{1}{4}$ meter, etc.) How far has the ball travelled when it hits the floor for the 40^{th} time?

(A) $T=2+\frac{(2^{38}-1)}{2^{38}}$ (B) $T=1+\frac{(2^{28}-1)}{2^{39}}$ (C) $T=8$ (D) $T>3$

22. For $x\in(1,\infty)$, if $P=x^3-\frac{1}{x^3}$ and $Q=x-\frac{1}{x}$ then the minimum value of $\frac{P}{Q^2}$ equals :

(A) $2\sqrt{3}$ (B) $4\sqrt{3}$ (C) $\sqrt{3}$ (D) $3\sqrt{3}$ (E) $\frac{\sqrt{3}}{2}$

23. Given that a and b are positive real numbers with $a+b=4$, the minimum value of $\left(1+\frac{1}{a}\right)\left(1+\frac{1}{b}\right)$ is :

(A) 2 (B) 8/3 (C) 9/4 (D) 3

24. The value of the sum

$$S=\frac{1}{2}+\frac{1}{6}(1^2+2^2)+\frac{1}{12}(1^2+2^2+3^2)+\frac{1}{20}(1^2+2^2+3^2+4^2)+\ldots+\frac{1}{3660}(1^2+2^2+3^2+\ldots+60^2)$$

is :

(A) 620 (B) 720 (C) 520 (D) 420

25. For a given arithmetic series the sum of the first 50 terms is 200 and the sum of the next 50 terms is 2700. The first term of the series is :

(A) -12221 (B) -21.5 (C) -20.5 (D) 3

26. The 3^{rd} term of an arithmetic progression is 7 and its 7^{th} term is 2 more than thrice of its 3^{rd} term. The sum of its first 20 terms equals :

(A) 470 (B) 740 (C) 704 (D) 770

27. If a, b, c are in H.P., then $\log_e(a+c)+\log_e(a-2b+c)$ equals :

(A) $2\log_e(a+c)$ (B) $\log_e(a^2+b^2)$ (C) $2\log_e|a-c|$ (D) $\log_e|a^2-b^2|$

28. The sum of the series, $1+2\cdot\left(1+\frac{1}{n}\right)+3\cdot\left(1+\frac{1}{n}\right)^2+\ldots$ is :

(A) n^2 (B) $n(n+1)$ (C) $n\left(1+\frac{1}{n}\right)^2$ (D) $(n+1)(n+2)$

29. A sequence is such that the sum of its any number of terms, beginning from the first, is four times as large as the square of the number of terms. If the n^{th} term of such a sequence is 996, then value of n is equal to :

(A) 100 (B) 112 (C) 125 (D) 132

30. The value of $\dfrac{\left(1+\frac{1}{2^2}+\frac{1}{3^2}+\frac{1}{4^2}+\ldots\infty\right)}{\left(1-\frac{1}{2^2}+\frac{1}{3^2}-\frac{1}{4^2}+\ldots\infty\right)}$ is :

(A) 1 (B) 2 (C) 3/2 (D) 5/2

31. The least integral value of $\dfrac{(x-1)^7+3(x-1)^6+(x-1)^5+1}{(x-1)^5}\ \forall\, x>1$ is :

(A) 2 (B) 4 (C) 6 (D) 8

32. The value of $\sum_{k=1}^{\infty}\dfrac{6^k}{(3^k-2^k)(3^{k+1}-2^{k+1})}$ is :

(A) 1 (B) 2 (C) 3 (D) 4

23. Given that a and b are positive real numbers with $a+b=4$, the minimum value of $\left(1+\frac{1}{a}\right)\left(1+\frac{1}{b}\right)$ is :

(A) 2 (B) 8/3 (C) 9/4 (D) 3

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$$S=\frac{1}{2}+\frac{1}{6}(1^2+2^2)+\frac{1}{12}(1^2+2^2+3^2)+\frac{1}{20}(1^2+2^2+3^2+4^2)+...+\frac{1}{3660}(1^2+2^2+3^2+...+60^2)$$

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27. If a, b, c are in H.P., then $\log_e(a+c)+\log_e(a-2b+c)$ equals :

(A) $2\log_e(a+c)$ (B) $\log_e(a^2+b^2)$ (C) $2\log_e|a-c|$ (D) $\log_e|a^2-b^2|$

28. The sum of the series, $1+2\cdot\left(1+\frac{1}{n}\right)+3\cdot\left(1+\frac{1}{n}\right)^2+...$ is :

(A) n^2 (B) $n(n+1)$ (C) $n\left(1+\frac{1}{n}\right)^2$ (D) $(n+1)(n+2)$

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(A) 100 (B) 112 (C) 125 (D) 132

30. The value of $\dfrac{\left(1+\frac{1}{2^2}+\frac{1}{3^2}+\frac{1}{4^2}+...\infty\right)}{\left(1-\frac{1}{2^2}+\frac{1}{3^2}-\frac{1}{4^2}+...\infty\right)}$ is :

(A) 1 (B) 2 (C) 3/2 (D) 5/2

31. The least integral value of $\dfrac{(x-1)^7+3(x-1)^6+(x-1)^5+1}{(x-1)^5}\ \forall\, x>1$ is :

(A) 2 (B) 4 (C) 6 (D) 8

32. The value of $\sum\limits_{k=1}^{\infty}\dfrac{6^k}{(3^k-2^k)(3^{k+1}-2^{k+1})}$ is :

(A) 1 (B) 2 (C) 3 (D) 4

33. If $a_1, a_2, a_3, \ldots$ and $b_1, b_2, b_3, \ldots$ are two geometric progressions with $a_1 = 2\sqrt{3}$ and $b_1 = \frac{52}{9}\sqrt{3}$. If $3a_{99}b_{99} = 104$, then $\sum_{i=1}^{102} a_i b_i$ is :

(A) 102 (B) 3536 (C) 2040 (D) None of these

34. If $a+b+c+d+e=12$, where a, b, c, d and e are positive numbers and $a^4 b^3 c^3 de = 4\times 6^6$, then the value of $(4a+3b+3c+d+e)$ can be :

(A) 32 (B) 36 (C) 38 (D) 40

35. Let a, b, c, d and e are positive integers such that $abcde = a+b+c+d+e$, then the maximum possible value of 'e' is :

(A) 2 (B) 5 (C) 6 (D) 7

36. The value of $S = \frac{1}{3^2+1} + \frac{1}{4^2+2} + \frac{1}{5^2+3} + \ldots\infty$ is :

(A) $\frac{1}{3}$ (B) $\frac{13}{36}$ (C) $\frac{7}{18}$ (D) $\frac{5}{12}$

37. Let $F_0 = 0, F_1 = 1$ and $F_n = F_{n-1} + F_{n-2}\ (n \geq 2)$, then the value of the sum $\sum_{n=1}^{\infty} \frac{F_n}{3^n}$ is :

(A) $\frac{3}{5}$ (B) $\frac{1}{3}$ (C) $\frac{2}{3}$ (D) $\frac{7}{9}$

38. Let two sequences of rational numbers are defined as $a_{n+1} = \frac{a_n^2}{b_n}$ and $b_{n+1} = \frac{b_n^2}{a_n}$ (where $a_0 = 2$ and $b_0 = 3$ and $n \geq 0$). If $b_8 = \frac{3^m}{2^n}$, then $(m-n)$ (where m and $n \in N$) is equal to :

(A) 1 (B) 2 (C) 3 (D) 4

39. The maximum value attained by $\frac{x^4 - x^2}{x^6 + 2x^3 - 1}$ over real numbers $x > 1$ is :

(A) $\frac{1}{3}$ (B) $\frac{1+\sqrt{5}}{2}$ (C) $\frac{1}{6}$ (D) $\frac{1}{8}$

40. If a, b, c are in A.P. and a, b, d are in G.P., then $a, a-b, d-c$ are in :

(A) A.P. (B) G.P. (C) H.P. (D) None of these

41. If P is the product of geometric progression, S_1 be their sum and S_2 be the sum of their reciprocals, then P in terms of S_1, S_2 and n is :

(A) $(S_1 S_2)^{n/2}$ (B) $\left(\frac{S_1}{S_2}\right)^{n/2}$ (C) $(S_1 S_2)^{n-2}$ (D) $\left(\frac{S_1}{S_2}\right)^{n}$

42. The sum of infinite terms of the series

$$\frac{1}{1+1^2+1^4} + \frac{2}{1+2^2+2^4} + \frac{3}{1+3^2+3^4} + \ldots\infty \text{ is :}$$

(A) $\frac{1}{2}$ (B) $\frac{1}{3}$ (C) 1 (D) $\frac{1}{4}$

43. Let n be a positive integer such that $<a_n>$ is a sequence satisfying $a_0 = 1$ and $a_n = \frac{1}{2}a_{n-1}(na_n + 2)$ then a_n is :

(A) $\frac{4}{4-n^2-n}$ (B) $\frac{4-n^2-n}{4}$ (C) $4-n^2-n$ (D) $\frac{6}{n^2+n-24}$

44. If the distinct non-zero numbers $x(y-z)$, $y(z-x)$, $z(x-y)$ form a geometric progression with common ratio r, then r satisfies the equation :

(A) $r^2+r+1=0$ (B) $r^2-r+1=0$ (C) $r^4+r^2-1=0$ (D) $(r-1)^4+r=0$

45. If roots of the equation $x^3+ax^2+bx+c=0$ are in arithmetic progression then $2a^3-9ab+27c$ is (where a, b, c are non-zero) :

(A) 0 (B) 9 (C) 18 (D) 27

46. The value of $\sum_{n=2}^{\infty}\frac{n^4+3n^2+10n+10}{2^n(n^4+4)}$ is :

(A) 1 (B) $\frac{11}{10}$ (C) $\frac{3}{2}$ (D) 2

47. Let $a_0 = \frac{6}{7}$ and $a_{n+1} = \begin{cases} 2a_n & \text{if } a_n < \frac{1}{2} \\ 2a_n - 1 & \text{if } a_n \geq \frac{1}{2} \end{cases}$, then a_{2015} is :

(A) $\frac{3}{7}$ (B) $\frac{4}{7}$ (C) $\frac{5}{7}$ (D) $\frac{6}{7}$

48. The value of $11^2-1^2+12^2-2^2+13^2-3^2+...+20^2-10^2$ is :

(A) 2015 (B) 2050 (C) 2100 (D) 2200

49. Let $a = \frac{1^2}{1}+\frac{2^2}{3}+\frac{3^2}{5}+...+\frac{1001^2}{2001}$ and $b = \frac{1^2}{3}+\frac{2^2}{5}+\frac{3^2}{7}+...+\frac{1001^2}{2003}$, then the integer which is closest to $a-b$ is :

(A) 500 (B) 501 (C) 1000 (D) 1001

50. The minimum value of the expression $E = 3^{x+y}(3^{x-1}+3^{y-1}-1)$ is :

(A) -1 (B) -2 (C) $-\frac{1}{3}$ (D) $-\frac{2}{3}$

51. The value of $\sum_{n=1}^{9999}\frac{1}{(\sqrt{n}+\sqrt{n+1})(\sqrt[4]{n}+\sqrt[4]{n+1})}$ is :

(A) 9 (B) 99 (C) 999 (D) 9999

52. Let $\{a_n\}_{n\geq1}$ be an arithmetic sequence and $\{g_n\}_{n\geq1}$ be a geometric sequence such that first four terms of $\{a_n+g_n\}$ are 0, 0, 1 and 0 in that order then the tenth term of $\{a_n+g_n\}$ is :

(A) 54 (B) -54 (C) 27 (D) -27

53. Let $a_0, a_1, a_2, \ldots$ denote the sequence of real numbers such that $a_0 = 2$ and $a_{n+1} = \frac{a_n}{1+a_n}$ for $n \geq 0$, then a_{2015} is :

(A) $\frac{2}{4025}$ (B) $\frac{2}{4027}$ (C) $\frac{2}{4029}$ (D) $\frac{2}{4031}$

54. The value of the sum $1\cdot 2^2 + 2\cdot 3^2 + 3\cdot 4^2 + \ldots + 19\cdot 20^2$ is :

(A) 44100 (B) 44000 (C) 41230 (D) 40000

55. The value of $\sum_{n=1}^{\infty} \sum_{k=1}^{n-1} \frac{k}{2^{n+k}}$ is :

(A) $\frac{14}{9}$ (B) $\frac{5}{9}$ (C) $\frac{4}{9}$ (D) $\frac{10}{9}$

56. The number of ordered pair (a, b) for which the real numbers $10, a, b, ab$ is in arithmetic progression :

(A) 1 (B) 2 (C) 3 (D) 4

57. Let ABC be a triangle with $AB = 5$, $BC = 4$ and $AC = 3$. Let P and Q be squares inside ABC with disjoint interiors such that they both have one side lying on AB. Also, the two squares each have an edge lying on a common line perpendicular to AB and P has one vertex on AC and Q has one vertex on BC. The minimum value of sum of the areas of two square is :

(A) $\frac{12}{7}$ (B) $\frac{144}{49}$ (C) $\frac{13}{7}$ (D) $\frac{25}{49}$

58. The value of $\sum_{n=1}^{\infty} \frac{7n+32}{n(n+2)} \cdot \frac{3^n}{4^n}$ is :

(A) $\frac{3}{2}$ (B) $\frac{15}{2}$ (C) $\frac{33}{2}$ (D) $\frac{17}{2}$

59. The value of $S = \sqrt{1 + \frac{1}{1^2} + \frac{1}{2^2}} + \sqrt{1 + \frac{1}{2^2} + \frac{1}{3^2}} + \ldots + \sqrt{1 + \frac{1}{(2014)^2} + \frac{1}{(2015)^2}}$ is :

(A) 2015 (B) $2015 - \frac{1}{2015}$ (C) $2016 - \frac{1}{2016}$ (D) $2014 - \frac{1}{2014}$

60. Let $S = x_1 + x_2 + x_3 + \ldots + x_n$, where $x_i > 0$ $\forall i = 1, 2, 3, \ldots, n$ then the minimum value of $\frac{S}{S - x_1} + \frac{S}{S - x_2} + \ldots + \frac{S}{S - x_n}$ is :

(A) $\frac{n}{n-1}$ (B) $\frac{n}{n^2-1}$ (C) $\frac{n^2}{n^2-1}$ (D) $\frac{n^2}{n-1}$

61. Let $xyz = 1$, then the sum of minimum and maximum values of

$S = \frac{1}{1+x+xy} + \frac{1}{1+y+yz} + \frac{1}{1+z+zx}$ is :

(A) 2 (B) 3 (C) 5 (D) Dose not exist

62. Let a, b, c be positive real numbers then least value of $\frac{a}{b+c}+\frac{b}{c+a}+\frac{c}{a+b}$ is :

(A) $\frac{1}{2}$ (B) 1 (C) $\frac{3}{2}$ (D) 2

63. For $a, b>0$, let g_1, g_2, g_3 and g_4 be geometric means between a and b, then the roots of the equation $(g_2g_3)x^2-\left(\frac{g_2}{g_1+g_3}\right)x-g_1g_4=0$ are :

(A) both negative (B) both positive
(C) one negative and one positive (D) imaginary

64. Which of the following statement(s) is(are) correct?

(A) Sum of the reciprocal of all the n harmonic means inserted between a and b is equal to n times the harmonic mean between two given numbers a and b.

(B) Sum of the cubes of first n natural number is equal to square of the sum of the first n natural numbers.

(C) If $a, A_1, A_2, A_3, \ldots, A_{2n}, b$ are in A.P., then $\sum_{i=1}^{2n} A_i=(n+1)(a+b)$.

(D) If the first term of the geometric progression $g_1, g_2, g_3, \ldots, \infty$ is unity, then the value of the common ratio of the progression such that $(4g_2+5g_3)$ is minimum equals $\frac{2}{5}$.

MULTIPLE CORRECT

1. If $1, x, y$ be a geometric sequence and $x, y, 3$ be an arithmetic sequence, then possible values of $(x+y)$ is /are :

(A) 0 (B) 1 (C) $\frac{15}{4}$ (D) 4

2. If $x \in R$, the numbers $(5^{1+x}+5^{1-x}), a/2, (25^x+25^{-x})$ are in A.P., then 'a' can be :

(A) 5 (B) 10 (C) 12 (D) 14

3. If the sum of first 100 terms of an arithmetic progression is -1 and the sum of the even terms lying in first 100 terms is 1, then which of the following statement(s) is (are) correct ?

(A) Common difference of the arithmetic progression is $-\frac{3}{50}$.

(B) First term of the arithmetic progression is $\frac{149}{50}$.

(C) 100^{th} term of the arithmetic progression is $\frac{74}{25}$.

(D) Sum of an infinite geometric progression whose first term is $\frac{47}{25}$ and common ratio is common difference of arithmetic sequence, equals 2 .

4. If $\sin\theta$, $\sin^2\theta$, 1 are the first 3 terms of an A.P., where $\theta \in (-\pi, \pi)$ then the sum of the first 3 terms of an A.P. can be equal to :

(A) 3 (B) $\frac{3}{4}$ (C) $\frac{15}{4}$ (D) $\frac{17}{4}$

5. Which of the following statement(s) is (are) correct ?

(A) If the discriminant of the quadratic trinomial $P(x) = ax^2 + bx + c\,(a, b, c \in R)$ vanishes then the range of $P(x)$ is $[0, \infty)$.

(B) If $\sin^2 x + \sec^2 y = 1$ then number of ordered pairs (x, y) of real numbers where $x, y \in [0, 2\pi]$ is equal to 9.

(C) If triangle ABC, let a, b and c denote the lengths of the sides opposite to vertices A, B and C respectively. If $(a + c - b)(a - c + b) = bc$, then angle A is equal to $\frac{\pi}{3}$.

(D) If $a, b > 0$, then minimum value of $\left(\frac{8a}{b} + \frac{b}{2a}\right)$ is equal to 4.

6. An arithmetic progression has the following property: For an even number of terms, the ratio of the sum of first half of the terms to the sum of second half is always equal to a constant 'k'. Let the first term of arithmetic progression is 1. Then which of the following statement(s) is(are) correct ?

(A) Absolute difference of all possible values of k is $\frac{2}{3}$.

(B) The sum of all possible values of k is $\frac{4}{3}$.

(C) If the number of terms of arithmetic progression is 20, then the sum of all terms of all possible arithmetic progression is 420.

(D) The number of possible non-zero values of common difference of arithmetic progression is 1.

7. The first term of an infinite geometric series is 21. The second term and the sum of the series are both positive integers. The possible value(s) of the second term can be :

(A) 12 (B) 14 (C) 18 (D) 20

8. The first term of an A.P. and a G.P. of positive terms, are same and equal to the distance travelled by the body moving rectilinearly with the speed $v(t) = 3t^2 - 4t + 1$ m/s in first two seconds. Let the third term of both the sequences are also equal and the non-negative difference of their second terms is 4. If S_n denotes the sum to n terms of A.P. and σ_n denotes the corresponding for G.P., then which of the following is(are) correct ?

(A) First term of the G.P. is 1

(B) Common difference of the A.P. is 8

(C) $S_5 > \sigma_4$

(D) n^{th} term of the G.P. is $(3^n - 1)$.

9. In an A.P. whose first term and common difference is non-zero, the ratio R of the sum of the first n terms to the sum of n terms succeeding them does not depend on n. Then :

(A) ratio of common difference of A.P. to its first term is 2.

(B) R has value equal to $\frac{1}{3}$.

(C) R has value equal to $\frac{1}{2}$.

(D) ratio of common difference of A.P. to its first term is 3.

10. The sum of three positive numbers α, β, γ is equal to $\frac{\pi}{2}$. If $e^{\cot\alpha}, e^{\cot\beta}$ and $e^{\cot\gamma}$ form a G.P., then which of the following hold(s) good ?

(A) $\Sigma \cot\alpha = \Pi \cot\alpha$
(B) $2\cot\beta = \cot\alpha + \cot\gamma$
(C) $\cot\alpha \cot\gamma = 3$
(D) $4\Pi \cos\alpha = \Sigma \sin 2\alpha$

11. Let x_1 and x_2 be the roots of the equation $x^2 - 3x + \alpha = 0$ and let x_3 and x_4 be the roots of the equation $x^2 - 12x + \beta = 0$. If the numbers x_1, x_2, x_3, x_4 (in that order) form an increasing geometric progression with common ratio r, then which of the following is (are) correct ?

(A) The value of r is equal to 2.

(B) The value of $\alpha + \beta$ equals 34.

(C) Geometric mean of α and β is 6.

(D) The sum of an infinite geometric progression whose first term is 2 and common ratio $\frac{1}{r}$ is 4.

12. The first term of a geometric progression is 6 and the sum of the first n terms is 45/4 and the sum of the reciprocals of the same numbers of terms is 5/2. Then which of the following is correct?

(A) The sequence is decreasing.

(B) The value of n equals 8.

(C) Sum of the first two terms is 9.

(D) The sum to infinite number of terms is 12.

13. Four A.M.'s A_1, A_2, A_3, A_4 are inserted between the numbers 5 and $\frac{45}{2}$, then which of the following is a G.P. ?

(A) $\left(A_1 - \frac{5}{2}\right); A_2; \left(A_3 + \frac{5}{2}\right)$
(B) $A_2; \left(A_3 + \frac{5}{2}\right); (A_4 + 8)$
(C) $(A_4 - 1); A_2; \left(A_1 - \frac{1}{2}\right)$
(D) $\left(A_1 - \frac{3}{2}\right); \left(A_3 - \frac{3}{2}\right); (A_4 + 9)$

14. If a, b, c are distinct positive numbers in H.P. then which of the relations must always hold good ?

(A) $\frac{b}{c} = \frac{a-b}{b-c}$
(B) $b^2 > ac$
(C) $b^2 < ac$
(D) $\frac{a}{c} = \frac{a-b}{b-c}$

15. The sum of all but one of the interior angles of a convex polygon equals 2570°. Then:

(A) number of sides in the polygon is 16.

(B) number of sides in the polygon is 17.

(C) remaining angle of the polygon is 130°

(D) remaining angle of the polygon is 144°

16. Consider a sequence $\{a_n\}$ with $a_1 = 2$ and $a_n = \frac{a_{n-1}^2}{a_{n-2}}$ for all $n \geq 3$, terms of the sequence being distinct. Given that a_2 and a_5 are positive integers and $a_5 \leq 162$ then the possible value(s) of a_5 can be :

(A) 2 (B) 32 (C) 64 (D) 162

17. The sum of the first three numbers in an A.P. is 24 and their product is 384. Then which of the following hold(s) good ?

(A) Sum to n terms can be $2n(n+1)$.

(B) Sum to n terms can be $2n(n+3)$

(C) Sum to n terms can be $14n - 2n^2$

(D) Sum of the squares of the 3 numbers is 224.

18. If $5x - y, 2x + y, x + 2y$ are in A.P. and $(x-1)^2, (xy+1), (y+1)^2$ are in G.P., $x \neq 0$, then $(x+y)$ equals :

(A) $\frac{3}{4}$ (B) 3 (C) –5 (D) –6

19. For the A.P. given by $a_1, a_2, \ldots, a_n, \ldots$ the equations satisfied are :

(A) $a_1 + 2a_2 + a_3 = 0$ (B) $a_1 - 2a_2 + a_3 = 0$

(C) $a_1 + 3a_2 - 3a_3 - a_4 = 0$ (D) $a_1 - 4a_2 + 6a_3 - 4a_4 + a_5 = 0$

20. An increasing sequence is formed so that the difference between consecutive terms is a constant. If the first four terms of this sequence are $x, y, 3x + y$ and $x + 2y + 2$, then which of the following statements hold good ?

(A) $y - x$ is equal to 6.

(B) $y = 3x$.

(C) n^{th} term of the sequence is $2(3n-2)$.

(D) sum of the first 43 terms of the series is 5050.

21. a, b, c are the first three terms of geometric series. If the H.M. of a and b is 12 and that of b and c is 36 then which of the following hold(s) good ?

(A) Sum of the first term and common ratio of the G.P. is 11.

(B) Sum of the first five terms of the G.P. is 948.

(C) If the value of the first term and common ratio of the given G.P. is taken as the first term and common difference of an A.P. then its 8^{th} term is 29.

(D) The number 648 is one of the term of the G.P.

22. The real numbers x_1, x_2, x_3 satisfying the equation $x^3 - x^2 + \alpha x + \beta = 0$ are in A.P., then select the correct alternative(s).

(A) $\alpha \leq \frac{1}{3}$ (B) $\beta \geq -\frac{1}{27}$ (C) $\alpha \geq \frac{1}{3}$ (D) $\beta \leq -\frac{1}{27}$

23. Let a,b,c be unequal real numbers. If a,b,c are in G.P. and $a+b+c=bx$, then 'x' cannot be equal to:

(A) -1 (B) 0 (C) 2 (D) 3

24. Let $f_n(\theta)=\sum_{n=0}^{n}\frac{1}{4^n}\sin^4(2^n\theta)$. Then which of the following alternative(s) is/are correct ?

(A) $f_2\left(\frac{\pi}{4}\right)=\frac{1}{\sqrt{2}}$ (B) $f_3\left(\frac{\pi}{8}\right)=\frac{2+2\sqrt{2}}{4}$ (C) $f_4\left(\frac{3\pi}{2}\right)=1$ (D) $f_5(\pi)=0$

25. For any odd integer $n\ge 1$, if the value of the sum :

$n^3-(n-1)^3+(n-2)^3+...+(-1)^{n-1}(1)^3$ equals 208, then 'n' cannot be :

(A) 5 (B) 7 (C) 9 (D) 11

26. Let S_n denotes the sum of n terms of an arithmetic progression whose first term is -4 and common difference is 1. If $V_n=2S_{n+2}-2S_{n+1}+S_n$ $(n\in N)$, then :

(A) $V_n=-\frac{9n^2+5n-12}{2}, n\in N$ (B) $V_n=\frac{n^2-5n-12}{2}, n\in N$

(C) minimum value of V_n is -9 (D) minimum value of V_n is $-\frac{73}{8}$

27. The p^{th} term T_p of H.P. is $q(p+q)$ and q^{th} term T_q is $p(p+q)$ when $p>2, q>2$, then :

(A) $T_{p+q}=pq$ (B) $T_{pq}=p+q$

(C) $T_{p+q}>T_{pq}$ (D) $T_{p+q}<T_{pq}$

28. If $\sum_{i=1}^{4}a_i^2x^2-2\sum_{i=1}^{4}a_ia_{i+1}x+\sum_{i=1}^{4}a_{i+1}^2\le 0\ \forall\ x>0$ where $a_i>0$ and all are distinct then :

(A) $a_1+a_5>2a_3$ (B) $\sqrt{a_1a_5}=a_3$

(C) $\frac{2}{\sqrt{a_1a_4}}>\frac{1}{a_1}+\frac{1}{a_4}$ (D) $\prod_{i=1}^{5}a_i=a_3^5$

Comprehension Type Questions

Comprehension 1

Let $a_1,a_2,a_3,...,$ be an arithmetic progression and $b_1,b_2,b_3,...,$ be a geometric progression. The sequence $c_1,c_2,c_3,...$ is such that $c_n=a_n+b_n\ \forall n\in N$. Suppose $c_1=1, c_2=4, c_3=15$ and $c_4=2$.

1. The common ratio of geometric progression is equal to :

(A) -2 (B) -3 (C) 2 (D) 3

2. The value of the sum $\sum_{i=1}^{20}a_i$ is equal to :

(A) 480 (B) 770 (C) 960 (D) 1040

Comprehension 2

Let α, β, γ be three numbers such that $\alpha+\beta+\gamma=2, \alpha^2+\beta^2+\gamma^2=6$ and $\frac{1}{\alpha}+\frac{1}{\beta}+\frac{1}{\gamma}=\frac{1}{2}$.

1. The value of $(\alpha^3+\beta^3+\gamma^3)$ is equal to :
   (A) -2 (B) -1 (C) 6 (D) 8
2. If roots of the quadratic equation $x^2=4ax+12$ lies on either side of $(\alpha\beta+\beta\gamma+\gamma\alpha)$, then the largest integral value of a equals :
   (A) 2 (B) 3 (C) 4 (D) 5
3. The sum of first 10 terms of a geometric progression whose first term and common ratio are $\alpha^2+\beta^2+\gamma^2$ and $\alpha\beta\gamma$ respectively, is equal to :
   (A) -1023 (B) -2025 (C) -2046 (D) -4045

Comprehension 3

The first four terms of a sequence are given by $T_1=0, T_2=1, T_3=1, T_4=2$.
The general term is given by $T_n=A\alpha^{n-1}+B\beta^{n-1}$ where A, B, α, β are independent of n and A is positive.

1. The value of $(\alpha^2+\beta^2+\alpha\beta)$ is equal to :
   (A) 1 (B) 2 (C) 5 (D) 4
2. The value of $5(A^2+B^2)$ is equal to :
   (A) 2 (B) 4 (C) 6 (D) 8
3. The quadratic equation whose roots are α and β is given by :
   (A) $x^2-2x-1=0$ (B) $x^2-2x-2=0$ (C) $x^2-x-1=0$ (D) None of these

Comprehension 4

Let $\langle a_n \rangle$ and $\langle b_n \rangle$ be the arithmetic sequences each with common difference 2 such that $a_1<b_1$ and let $c_n=\sum_{k=1}^{n} a_k, d_n=\sum_{k=1}^{n} b_k$. Suppose that the points $A_n(a_n, c_n), B_n(b_n, d_n)$ are all lying on the parabola : $C: y=px^2+qx+r$ where p, q, r are constants.

1. The value of p equals :
   (A) $\frac{1}{4}$ (B) $\frac{1}{3}$ (C) $\frac{1}{2}$ (D) 2
2. The value of q equals :
   (A) $\frac{1}{4}$ (B) $\frac{1}{3}$ (C) $\frac{1}{2}$ (D) 2
3. If $r=0$, then the value of a_1 and b_1 are :
   (A) $\frac{1}{2}$ and 1 (B) 1 and $\frac{3}{2}$ (C) 0 and 2 (D) $\frac{1}{2}$ and 2

Comprehension 5

Consider ΔXYZ whose sides x, y and z opposite to angular points X, Y and Z are in geometric progression.

1. If r be the common ratio of G.P., then :

(A) $\frac{\sqrt{5}-1}{2} < r < \frac{\sqrt{5}+1}{2}$ (B) $\frac{\sqrt{5}-2}{2} < r < \frac{\sqrt{5}+2}{2}$

(C) $\frac{\sqrt{5}-1}{3} < r < \frac{\sqrt{5}+1}{3}$ (D) $\frac{\sqrt{5}-2}{3} < r < \frac{\sqrt{5}+2}{3}$

2. The integral values of $\frac{\sin Y}{\sin X}$ is :

(A) prime only (B) even (C) composite (D) odd

3. The maximum value of $\frac{\sin Z}{\sin Y}$ is :

(A) irrational number (B) rational number but not integer

(C) integer (D) not defined

Comprehension 6

Given a, b, c, d, e are such that $a+b+c+d+e=8$ and $a^2+b^2+c^2+d^2+e^2=16$, then

1. Greatest value of e is :

(A) $\frac{3}{5}$ (B) $\frac{6}{5}$ (C) $\frac{8}{5}$ (D) $\frac{16}{5}$

2. The value of 'a' when e attains its greatest value is :

(A) $\frac{3}{5}$ (B) $\frac{6}{5}$ (C) $\frac{8}{5}$ (D) $\frac{16}{5}$

Match the Columns

1.

	Column-I		Column-II
(A)	Number of positive integral ordered pairs of (a, b) such that $6, a, b$ are in harmonical progression, is	(P)	6
(B)	If x, y and z are positive real numbers and $x = \frac{12-yz}{y+z}$. The maximum value of (xyz) equals	(Q)	7
(C)	If the roots of the equation $3x^3 - 26x^2 + 52x - 24 = 0$ are in G.P. then the largest root, is	(R)	8
		(S)	9

2.

	Column-I	Column-II	
(A)	The value of $3^{\left(\frac{1}{2}+\frac{2}{2^2}+\frac{3}{2^3}+\frac{4}{2^4}+\ldots+\infty \text{ terms}\right)}$	(P)	6
(B)	If $1+\cos x+\cos^2 x+\cos^3 x+\ldots\infty=4+2\sqrt{3}$, then number of solutions in $[0, 4\pi]$ will be	(Q)	7
(C)	If the roots of the equation $x^3-18x^2+px-q=0$ are in A.P., then maximum value of $(q-2p+7)$ is	(R)	8
(D)	If roots of the quadratic equation $4x^2-2x-1=0$ are α and β, then the value of $\left(\sum_{r=0}^{\infty}(\alpha^r+\beta^r)\right)$ is	(S)	9

3. If $\sum_{r=1}^{\infty}\frac{8}{(2r+3)\sqrt{(2r+7)(2r+9)}+(2r+7)\sqrt{(2r+3)(2r+5)}}=\sqrt{\frac{a}{5}}+\sqrt{\frac{b}{7}}-\sqrt{c}$

where a, b, c are natural numbers, then :

	Column-I	Column-II	
(A)	a is equal to	(P)	4
(B)	b is equal to	(Q)	7
(C)	c is equal to	(R)	8
(D)	$\left(\frac{a}{7}+\frac{b}{3}+c\right)$ is equal to	(S)	9

4. If $x^6-12x^5+ax^4-bx^3+cx^2-dx+64=0$ has all positive real roots, then :

	Column-I	Column-II	
(A)	a is equal to	(P)	240
(B)	b is equal to	(Q)	192
(C)	c is equal to	(R)	160
(D)	d is equal to	(S)	60

5. If the integers p, q, r and s are in increasing arithmetic progression such that $s=p^2+q^2+r^2$ then :

	Column-I	Column-II	
(A)	$(p+q+r+s)$ is equal to	(P)	0
(B)	$(p-q-r+2)$ is equal to	(Q)	2
(C)	$(p^2+q^2+r^2+s^2)$ is equal to	(R)	6
(D)	$(p^3+q^3+r^3+s^3)$ is equal to	(S)	8

Integer Type Questions

1. Suppose that x, x^2-24 and $x+x^2$ are consecutive terms in arithmetic progression, then sum of all possible values of the common difference of sequence is :

2. If the roots of $x^5-40x^4+Px^3+Qx^2+Rx+S=0$ are in geometric progression and the sum of their reciprocals is 10, then the value of $|S|$ is :

3. If $a_1, a_2, a_3, \ldots$ is in arithmetic progression with common difference 1 and $a_1+a_2+a_3+\ldots+a_{98}=137$, then the value of $a_2+a_4+a_6+\ldots+a_{98}$ is :

4. Let a and b be positive integers. The value of xyz is 55 or $\dfrac{343}{55}$ according as a, x, y, z, b are in arithmetic progression or harmonic progression. Find the value of (a^2+b^2).

5. Find the sum of all integral values of x in interval $[-4, 100]$ satisfying $\left|2x-\sqrt{(2x-1)^2}\right|=1$.

6. A geometric sequence $\{a_n\}$ has $a_1=\sin x, a_2=\cos x$ and $a_3=\tan x$ for some real number x. If $a_n=(1+\cos x)$, then find the value of n.

7. If the sum of the series $\sigma=0.9\left(99+999+9999+\ldots+\underbrace{999\ldots\ldots\ldots9}_{\substack{\text{string of 101} \\ \text{digits all equal to 9}}}\right)$ can be expressed in the form of (10^a-b) where $a, b \in N$, then find $(a+b)$.

8. There are two sets M_1 and M_2 each of which consists of three numbers in arithmetic sequence whose sum is 15. Let d_1 and d_2 be the common differences such that $d_1=1+d_2$ and $8p_1=7p_2$ where p_1 and p_2 are the product of the numbers respectively in M_1 and M_2. If $d_2>0$ then find the value of $\left(\dfrac{p_2-p_1}{d_1+d_2}\right)$.

9. Let the first term of a certain sequence is $\sin\dfrac{\pi}{3}$ and each of it's successive term is also a sine term whose arguments bear the same common difference equal to $\dfrac{\pi}{3}$ with the arguments of the immediately preceding sine term. If the sum of the first 5050 terms can be expressed in the form as $\sqrt{\dfrac{p}{q}}$ where p and q are relatively prime. Find $(p+q)$.

10. Let S_k, $k=1,2,3,\ldots$ denote the sum of infinite geometric series whose first term is (k^2-1) and the common ratio is $\dfrac{1}{k}$. Find the value of $\sum\limits_{k=1}^{\infty}\dfrac{S_k}{2^{k-1}}$.

11. Let $3\cos\theta+5\cos^2\theta+7\cos^3\theta+\ldots\infty=\dfrac{-1}{2}$, where $|\cos\theta|<1$. Find the value of $\left(1+2\sin^2\dfrac{\theta}{2}\right)^2$.

12. For $a, b, c \in R-\{0\}$, let $\frac{a+b}{1-ab}, b, \frac{b+c}{1-bc}$ are in A.P. If α, β are the roots of the quadratic equation $2acx^2 + 2abcx + (a+c) = 0$, then find the value of $(1+\alpha)(1+\beta)$.

13. Let T_n denotes the n^{th} term of a G.P. with common ratio 2 and $(\log_2(\log_3(\log_{512} T_{100}))) = 1$. If three sides of a triangle ABC are the values of $(T_1 + T_2), T_2$ and T_3 then area of the triangle is $\frac{\sqrt{2160}}{N}$, where N is positive integer. Find the remainder when N is divided by 2^{10}.

14. If the sum of first n terms of an A.P. (having positive terms) is given by $S_n = (1+2T_n)(1-T_n)$ where T_n is the n^{th} term of series then $T_2^2 = \frac{\sqrt{a}-\sqrt{b}}{4}$ $(a, b \in N)$. Find the value of $(a+b)$.

15. Let $\{a_n\}$ be an arithmetic sequence with first term 77 and common difference -3. Find the maximum value of $\sum_{k=1}^{n} a_k$.

16. Three non-zero real numbers a, b, c are said to be in harmonic progression if $\frac{1}{a} + \frac{1}{c} = \frac{2}{b}$. Number of harmonic progression a, b, c of strictly increasing positive integers in which $a = 20$ and b divides c.

17. The number of values of x such that the three numbers $2^x, 2^{x^2}$ and 2^{x^3} form a non-constant arithmetic progression in same order.

18. If $a_n = \sqrt{1+\left(1-\frac{1}{n}\right)^2} + \sqrt{1+\left(1+\frac{1}{n}\right)^2}$ $(n \geq 1)$, then the value of $\sum_{i=1}^{20} \frac{1}{a_i}$ is :

19. Let a, b and c be positive real numbers. If the least value of $\frac{a^3}{4b} + \frac{b}{8c^2} + \frac{1+c}{2a}$ can be expressed as $\frac{p}{q}$ (where p and q are relatively prime) then $(p+q)$ is:

20. If $\sum_{m=1}^{\infty} \sum_{n=1}^{\infty} \frac{m^2 n}{3^m (n \cdot 3^m + m \cdot 3^n)} = \frac{p}{q}$ (where p and q are relatively prime), then $(p+q)$ is :

21. Let $a_0, a_1, a_2, \ldots, a_n$ be a sequence of numbers satisfying $(3-a_{n+1})(6+a_n) = 18$ and $a_0 = 3$. If $\sum_{i=0}^{n} \frac{1}{a_i} = \frac{1}{k}(2^{n+2} - n - 3)$, then k is.

22. The number of ordered pairs (x, y) where $x \in \left(0, \frac{\pi}{2}\right)$ such that $\frac{(\sin x)^{2y}}{(\cos x)^{y^2/2}} + \frac{(\cos x)^{2y}}{(\sin x)^{y^2/2}} = \sin 2x$ is:

23. A sequence of integers $a_1, a_2, a_3, \ldots$ is chosen such that $a_n = a_{n-1} - a_{n-2}$ for each $n \geq 3$. What is the sum of first 2019 terms of this sequence if the sum of first 1492 term is 1985 and sum of first 1985 terms is 1492.

24. For any sequence of real numbers of $A=(a_1, a_2, a_3, ...)$, let us define a sequence denoted by ΔA as $(a_2-a_1, a_3-a_2, ...)$. Suppose all terms of $\Delta(\Delta A)$ are 1 and $a_{19}=a_{92}=0$, then a_1 is :

25. Given that $A_k=\frac{k(k-1)}{2}\cos\left(\frac{k(k-1)\pi}{2}\right)$, then $|A_{19}+A_{20}+...+A_{98}|$ is:

26. Given that $x_1=211, x_2=375, x_3=420, x_4=523, x_5=267$ and $x_n=x_{n-1}-x_{n-2}+x_{n-3}-x_{n-4}$ (when $n\geq 5$) then the value of $|x_{2015}+x_{2016}+x_{2017}|$ is :

27. A sequence of positive integers with $a_1=1$ and $a_9+a_{10}=646$ is formed so that the first three terms are in geometric progression, the second, the third and the fourth terms are in arithmetic progression and in general for $n\geq 1$, the terms, $a_{2n-1}, a_{2n}, a_{2n+1}$ are in G.P. and the terms $a_{2n}, a_{2n+1}, a_{2n+2}$ are in A.P. Let a_n be the greatest term of this sequence that is less than 1000 then $(n+a_n)$ is :

28. The sequence (a_n) satisfies $a_1=1$ and $5^{(a_{n+1}-a_n)}-1=\frac{3}{3n+2}$ for $n\geq 1$. Let k be the least integer greater than 1 for which a_k is an integer then k^2 is :

29. Let $x_1, x_2, ..., x_6$ be non-negative real numbers such that $x_1+x_2+x_3+x_4+x_5+x_6=1$ and $x_1x_3x_5+x_2x_4x_6\geq\frac{1}{540}$. If the maximum possible value of $x_1x_2x_3+x_2x_3x_4+x_3x_4x_5+x_4x_5x_6+x_5x_6x_1+x_6x_1x_2$ can be expressed as $\left(\frac{p}{q}\right)$ (where p and q are coprime, then $(p+q)$ is:

30. If $\sum_{k=1}^{360}\frac{1}{k\sqrt{k+1}+(k+1)\sqrt{k}}=\frac{p}{q}$ (where p and q are coprime, then $(p+q)$ is :

31. For any positive integer n, $\langle n\rangle$ denotes the closest integer to $\sqrt{n}$ then $\sum_{n=1}^{\infty}\frac{2^{\langle n\rangle}+2^{-\langle n\rangle}}{2^n}$ is :

32. Let $H_n=1+\frac{1}{2}+\frac{1}{3}+...+\frac{1}{n}$ and $T_n=\frac{1}{(n+1)H_nH_{n+1}}$, then the value of $(T_1+T_2+T_3+...+\infty)$ is :

33. The value of $\sum_{k=1}^{511}\frac{1}{\sqrt[3]{k^2}+\sqrt[3]{k(k+1)}+\sqrt[3]{(k+1)^2}}$ is .

34. Let $\langle a_n\rangle$ be an arithmetic sequence. If $\sum_{r=1}^{10^{99}}a_{2r}=10^{100}$ and $\sum_{r=1}^{10^{99}}a_{2r-1}=10^{99}$, then find the common difference of arithmetic sequence.

35. If three non-zero distinct real numbers form an arithmetic progression and the squares of these numbers taken in the same order constitute a geometric progression, then find the sum of all possible common ratios of the geometric progression.

36. Find sum of integral values of b in the interval [1,20] for which the equation $4^x+(1-b)2^{x+1}+b=0$ has roots of opposite sign.

37. A cricketer has to score 4500 runs. Let a_n denotes the number of runs he scores in the n^{th} match. If $a_1 = a_2 = ... = a_{10} = 150$ and $a_{10}, a_{11}, a_{12}, ...,$ are in A.P. with common difference -2, then find the total number of matches played by him to score 4500 runs.

38. If the value of $\sum_{n=1}^{20} \frac{n^2 - \frac{1}{2}}{n^4 + \frac{1}{4}} = \frac{p}{q}$, where $p, q \in N$ and are relatively prime to each other, then find the value of $(p+q)$.

39. If $a_1, a_2, a_3, ..., a_{4001}$ are terms of an A.P. such that $\frac{1}{a_1 a_2} + \frac{1}{a_2 a_3} + ... + \frac{1}{a_{4000} a_{4001}} = 10$ and $a_2 + a_{4000} = 50$, then find the value of $|a_1 - a_{4001}|$.

40. Let 'a' denotes the number of non-negative values of p for which the equation $p \cdot 2^x + 2^{-x} = 5$ possess a unique solution. If $a, \alpha_1, \alpha_2, \alpha_3, ..., \alpha_{20}, 6$ are in H.P. and $a, \beta_1, \beta_2, \beta_3, ..., \beta_{20}, 6$ are in A.P., then find the value of $\alpha_{18}\beta_3$.

Previous Year Questions

JEE MAINS

Single Correct

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

(A) $\log_3 4$ (B) $1 - \log_3 4$ (C) $1 - \log_4 3$ (D) $\log_4 3$

2. l, m, n are the p^{th}, q^{th} and r^{th} terms of a G.P. all positive, then $\begin{vmatrix} \log l & p & 1 \\ \log m & q & 1 \\ \log n & r & 1 \end{vmatrix}$ equals: **[2002]**

(A) -1 (B) 2 (C) 1 (D) 0

3. The value of $2^{1/4} \cdot 4^{1/8} \cdot 8^{1/16} ... \infty$ is: **[2002]**

(A) 1 (B) 2 (C) $3/2$ (D) 4

4. Fifth term of a G.P. is 2, then the product of its 9 terms is: **[2002]**

(A) 256 (B) 512 (C) 1024 (D) none of these

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

(A) 5 (B) 3/5 (C) 8/5 (D) 1/5

6. $1^3 - 2^3 + 3^3 - 4^3 + ... + 9^3 =$ **[2002]**

(A) 425 (B) -425 (C) 475 (D) -475

7. If $S_n = \sum_{r=0}^{n} \frac{1}{^nC_r}$ and $t_n = \sum_{r=0}^{n} \frac{r}{^nC_r}$, then $\frac{t_n}{S_n}$ is equal to: **[2004]**

(A) $\frac{2n-1}{2}$ (B) $\frac{1}{2}n - 1$ (C) $n-1$ (D) $\frac{1}{2}n$

8. Let T_r be the r^{th} term of an A.P. whose first term is a and common difference is d. If for some positive integers $m, n, m \neq n, T_m = \frac{1}{n}$ and $T_n = \frac{1}{m}$, then $a - d$ equals: **[2004]**

(A) $\frac{1}{m} + \frac{1}{n}$ (B) 1 (C) $\frac{1}{mn}$ (D) 0

9. The sum of the first n terms of the series $1^2 + 2 \cdot 2^2 + 3^2 + 2 \cdot 4^2 + 5^2 + 2 \cdot 6^2 + ...$ is $\frac{n(n+1)^2}{2}$ when n is even. When n is odd, the sum is: **[2004]**

(A) $\left[\frac{n(n+1)}{2}\right]^2$ (B) $\frac{n^2(n+1)}{2}$ (C) $\frac{n(n+1)^2}{4}$ (D) $\frac{3n(n+1)}{2}$

10. If the coefficients of $r^{\text{th}}, (r+1)^{\text{th}}$ and $(r+2)^{\text{th}}$ terms in the binomial expansion of $(1+y)^m$ are in A.P., then m and r satisfy the equation: **[2005]**

(A) $m^2 - m(4r-1) + 4r^2 - 2 = 0$

(B) $m^2 - m(4r+1) + 4r^2 + 2 = 0$

(C) $m^2 - m(4r+1) + 4r^2 - 2 = 0$

(D) $m^2 - m(4r-1) + 4r^2 + 2 = 0$

11. If $x = \sum_{n=0}^{\infty} a^n, y = \sum_{n=0}^{\infty} b^n, z = \sum_{n=0}^{\infty} c^n$ where a, b, c are in A.P. and $|a| < 1, |b| < 1, |c| < 1$ then x, y, z are in: **[2005]**

(A) G.P. (B) A.P.

(C) arithmetic-geometric progression (D) H.P.

12. Let $a_1, a_2, a_3 ...$ be terms on A.P. If $\frac{a_1 + a_2 + ... + a_p}{a_1 + a_2 + ... + a_q} = \frac{p^2}{q^2}, p \neq q$, then $\frac{a_6}{a_{21}}$ equals: **[2006]**

(A) $\frac{41}{11}$ (B) $\frac{7}{2}$ (C) $\frac{2}{7}$ (D) $\frac{11}{41}$

13. If $a_1, a_2, ..., a_n$ are in H.P., then the expression $a_1 a_2 + a_2 a_3 + ... + a_{n-1} a_n$ is equal to: **[2006]**

(A) $n(a_1 - a_n)$ (B) $(n-1)(a_1 - a_n)$ (C) $n a_1 a_n$ (D) $(n-1) a_1 a_n$

14. In a geometric progression consisting of positive terms, each term equals the sum of the next two terms. Then the common ratio of its progression is equals: **[2007]**

(A) $\sqrt{5}$ (B) $\frac{1}{2}(\sqrt{5} - 1)$ (C) $\frac{1}{2}(1 - \sqrt{5})$ (D) $\frac{1}{2}\sqrt{5}$

15. The first two terms of a geometric progression add upto 12. The sum of the third and the fourth terms is 48. If the terms of the geometric progression are alternately positive and negative, then the first term is: **[2008]**

(A) –4 (B) –12 (C) 12 (D) 4

16. The sum to infinite term of the series $1 + \frac{2}{3} + \frac{6}{3^2} + \frac{10}{3^3} + \frac{14}{3^4} + ...$ is: **[2009]**

(A) 3 (B) 4 (C) 6 (D) 2

17. A person is to count 4500 currency notes. Let a_n denotes the number of notes he counts in the n^{th} minute. If $a_1 = a_2 = ... = a_{10} = 150$ and $a_{10}, a_{11}, ...$ are in an A.P. with common difference -2, then the time taken by him to count all notes is: **[2010]**

(A) 34 minutes (B) 125 minutes (C) 135 minutes (D) 24 minutes

18. A man saves ₹ 200 in each of the first three months of his service. In each of the subsequent months his saving increases by ₹ 40 more than the saving of immediately previous month. His total saving from the start of service will be ₹ 11040 after: **[2011]**

(A) 19 months (B) 20 months (C) 21 months (D) 18 months

19. Let a_n be the n^{th} term of an A.P. If $\sum_{r=1}^{100} a_{2r} = \alpha$ and $\sum_{r=1}^{100} a_{2r-1} = \beta$, then the common difference of the A.P. is: **[2011RS]**

(A) $\alpha - \beta$ (B) $\frac{\alpha - \beta}{100}$ (C) $\beta - \alpha$ (D) $\frac{\alpha - \beta}{200}$

20. **Statement- 1:** The sum of the series $1 + (1+2+4) + (4+6+9) + (9+12+16) + ... + (361+380+400)$ is 8000.

Statement- 2: $\sum_{k=1}^{n} (k^3 - (k-1)^3) = n^3$, for any natural number n. **[2012]**

(A) Statement-1 is false, Statement-2 is true.

(B) Statement-1 is true, Statement-2 is true; Statement-2 is a correct explanation for Statement-1.

(C) Statement-1 is true, Statement-2 is true; Statement-2 is not a correct explanation for Statement-1.

(D) Statement-1 is true, Statement-2 is false.

21. The sum of first 20 terms of the sequence 0.7, 0.77, 0.777, ..., is: **[JEE M 2013]**

(A) $\frac{7}{81}(179 - 10^{-20})$ (B) $\frac{7}{9}(99 - 10^{-20})$ (C) $\frac{7}{81}(179 + 10^{-20})$ (D) $\frac{7}{9}(99 + 10^{-20})$

22. Three positive numbers form an increasing G.P. If the middle term in this G.P. is doubled, the new numbers are in A.P. Then the common ratio of the G.P. is : **[JEE M 2014]**

(A) $2 + \sqrt{3}$ (B) $\sqrt{2} + \sqrt{3}$ (C) $3 + \sqrt{2}$ (D) $2 - \sqrt{3}$

23. If $(10)^9 + 2(11)^1(10)^8 + 3(11)^2(10)^7 + ... + 10(11)^9 = k(10)^9$, then k is equal to : **[JEE M 2014]**

(A) 110 (B) $\frac{121}{10}$ (C) $\frac{441}{100}$ (D) 100

24. The sum of first 9 terms of the series

$$\frac{1^3}{1} + \frac{1^3 + 2^3}{1+3} + \frac{1^3 + 2^3 + 3^3}{1+3+5} + ... \text{ is :}$$ **[JEE M 2015]**

(A) 192 (B) 71 (C) 96 (D) 142

25. If m is the A.M. of two distinct real numbers l and n $(l, n > 1)$ and G_1, G_2 and G_3 are three geometric means between l and n, then $G_1^4 + 2G_2^4 + G_3^4$ equals : **[JEE M 2015]**

(A) $4l^2m^2n^2$ (B) $4l^2mn$ (C) $4lm^2n$ (D) $4lmn^2$

JEE ADVANCED

Single Correct

1. Consider an infinite geometric series with first term a and common ratio r. If its sum is 4 and the second term is 3/4, then: [2000S]

(A) $a=\frac{4}{7}, r=\frac{3}{7}$ (B) $a=2, r=\frac{3}{8}$ (C) $a=\frac{3}{2}, r=\frac{1}{2}$ (D) $a=3, r=\frac{1}{4}$

2. 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 : [2000 S]

(A) $0 \le M \le 1$ (B) $1 \le M \le 2$ (C) $2 \le M \le 3$ (D) $3 \le M \le 4$

3. Let α, β be the roots of $x^2-x+p=0$ and γ, δ be the roots of $x^2-4x+q=0$. If $\alpha, \beta, \gamma, \delta$ are in G.P., then the integral values of p and q respectively are: [2001 S]

(A) $-2, -32$ (B) $-2, 3$ (C) $-6, 3$ (D) $-6, -32$

4. Let the positive numbers a,b,c,d be in A.P. Then abc, abd, acd, bcd are: [2001 S]

(A) NOT in A.P. / G.P. / H.P.
(B) in A.P.
(C) in G.P.
(D) in H.P.

5. If the sum of the first $2n$ terms of the A.P. 2, 5, 8, ..., is equal to the sum of the first n terms of the A.P. 57, 59, 61, ..., then n equals: [2001 S]

(A) 10 (B) 12 (C) 11 (D) 13

6. 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: [2002 S]

(A) $\frac{1}{2\sqrt{2}}$ (B) $\frac{1}{2\sqrt{3}}$ (C) $\frac{1}{2}-\frac{1}{\sqrt{3}}$ (D) $\frac{1}{2}-\frac{1}{\sqrt{2}}$

7. If $a_1, a_2, \ldots, a_n$ are positive real numbers whose product is a fixed number c, then the minimum value of $a_1+a_2+\ldots+a_{n-1}+2a_n$ is: [2002 S]

(A) $n(2c)^{1/n}$ (B) $(n+1)c^{1/n}$ (C) $2nc^{1/n}$ (D) $(n+1)(2c)^{1/n}$

8. If $\alpha \in \left(0, \frac{\pi}{2}\right)$ then $\sqrt{x^2+x}+\frac{\tan^2\alpha}{\sqrt{x^2+x}}$ is always greater than or equal to: [2003 S]

(A) $2\tan\alpha$ (B) 1 (C) 2 (D) $\sec^2\alpha$

9. An infinite G.P. has first term 'x' and sum '5', then x belongs to: [2004 S]

(A) $x<-10$ (B) $-10<x<0$ (C) $0<x<10$ (D) $x>10$

10. In the quadratic equation $ax^2+bx+c=0$, $\Delta=b^2-4ac$ and $\alpha+\beta, \alpha^2+\beta^2, \alpha^3+\beta^3$, are in G.P., where α, β are the roots of $ax^2+bx+c=0$, then: [2005 S]

(A) $\Delta \ne 0$ (B) $b\Delta=0$ (C) $c\Delta=0$ (D) $\Delta=0$

11. If the sum of first n terms of an A.P. is cn^2. Then the sum of squares of these n terms is: [2009]

(A) $\frac{n(4n^2-1)c^2}{6}$ (B) $\frac{n(4n^2+1)c^2}{3}$ (C) $\frac{n(4n^2-1)c^2}{3}$ (D) $\frac{n(4n^2-1)c^2}{6}$

12. Let $a_1, a_2, a_3, \ldots$ be in harmonic progression with $a_1 = 5$ and $a_{20} = 25$. The least positive integer n for which $a_n < 0$ is : **[JEE 2012, 3M, –1 M]**

(A) 22 (B) 23 (C) 24 (D) 25

Multiple Correct

1. A straight line through the vertex P of a triangle PQR intersects the side QR at the point S and the circumcircle of the triangle PQR at the point T. If S is not the centre of the circumcircle then: **[JEE 2008]**

(A) $\frac{1}{PS} + \frac{1}{ST} < \frac{2}{\sqrt{QS \times SR}}$ (B) $\frac{1}{PS} + \frac{1}{ST} > \frac{2}{\sqrt{QS > SR}}$

(C) $\frac{1}{PS} + \frac{1}{ST} < \frac{4}{QR}$ (D) $\frac{1}{PS} + \frac{1}{ST} > \frac{4}{QR}$

2. Let $S_n = \sum_{k=1}^{4n} (-1)^{\frac{k(k+1)}{2}} k^2$. Then S_n can take value (s): **[JEE Advanced 2013, 4, (–1)]**

(A) 1056 (B) 1088 (C) 1120 (D) 1332

Comprehension Type Questions

Comprehension 1

Let V_r denotes the sum of first r terms of an arithmetic progression (A.P.) whose first term is r and the common difference is $(2r-1)$.

Let $T_r = V_{r+1} - V_r - 2$ and $Q_r = T_{r+1} - T_r$ for $r = 1, 2, \ldots$

1. The sum $V_1 + V_2 + \ldots + V_n$ is: **[2007-4 Marks]**

(A) $\frac{1}{12} n(n+1)(3n^2 - n + 1)$ (B) $\frac{1}{12} n(n+1)(3n^2 + n + 2)$

(C) $\frac{1}{2} n(2n^2 - n + 1)$ (D) $\frac{1}{3}(2n^3 - 2n + 3)$

2. T_r is always : **[2007 -4 Marks]**

(A) an odd number (B) an even number

(C) a prime number (D) a composite number

3. Which one of the following is a correct statement? **[2007 - 4 Marks]**

(A) $Q_1, Q_2, Q_3, \ldots$ are in A.P. with common difference 5.

(B) $Q_1, Q_2, Q_3, \ldots$ are in A.P. with common difference 6.

(C) $Q_1, Q_2, Q_3, \ldots$ are in A.P. with common difference 11.

(D) $Q_1 = Q_2 = Q_3 = \ldots$

Comprehension 2

Let A_1, G_1, H_1 denote the arithmetic, geometric and harmonic means, respectively, of two distinct positive numbers for $n \geq 2$. Let A_{n-1} and H_{n-1} have arithmetic, geometric and harmonic means as A_n, G_n, H_n respectively.

1. Which one of the following statement is correct? **[2007 -4 Marks]**
   (A) $G_1 > G_2 > G_3 > \ldots$
   (B) $G_1 < G_2 < G_3 < \ldots$
   (C) $G_1 = G_2 = G_3 = \ldots$
   (D) $G_1 < G_3 < G_5 < \ldots$ and $G_2 > G_4 > G_6 > \ldots$
2. Which one of the following statement is correct? **[2007-4 Marks]**
   (A) $A_1 > A_2 > A_3 > \ldots$
   (B) $A_1 < A_2 < A_3 < \ldots$
   (C) $A_1 > A_3 > A_5 > \ldots$ and $A_2 < A_4 < A_6 < \ldots$
   (D) $A_1 < A_3 < A_5 < \ldots$ and $A_2 > A_4 > A_6 > \ldots$
3. Which one of the following statement is correct? **[2007-4 Marks]**
   (A) $H_1 > H_2 > H_3 > \ldots$
   (B) $H_1 < H_2 < H_3 < \ldots$
   (C) $H_1 > H_3 > H_5 > \ldots$ and $H_2 < H_4 < H_6 < \ldots$
   (D) $H_1 < H_3 < H_6 < \ldots$ and $H_2 > H_4 > H_6 > \ldots$

Subjective Type Questions

1. The fourth power of the common difference of an arithmetic progression with integer entries is added to the product of any four consecutive terms of it. Prove that the resulting sum is the square of an integer. **[2004- 4 Marks]**
2. Let $a_1, a_2, \ldots, a_n$ be positive real numbers in geometric progression. For each n, let A_n, G_n, H_n be respectively, the arithmetic mean, geometric mean, and harmonic mean of $a_1, a_2, \ldots, a_n$. Find an expression for the geometric mean of $G_1, G_2, \ldots, G_n$ in terms of $A_1, A_2, \ldots, A_n, H_1, H_2, \ldots, H_n$. **[2001 - 5 Marks]**
3. Let a, b be positive real numbers. If a, A_1, A_2, b are in arithmetic progression, a, G_1, G_2, b are in geometric progression and a, H_1, H_2, b are in harmonic progression.

   Show that $\dfrac{G_1G_2}{H_1H_2} = \dfrac{A_1 + A_2}{H_1 + H_2} = \dfrac{(2a+b)(a+2b)}{9ab}$ **[2002 - 5 Marks]**
4. If a, b, c are in A.P., a^2, b^2, c^2 are in H.P., then prove that either $a = b = c$ or $a, b, -c/2$ form a G.P. **[2003- 4 Marks]**
5. If $a_n = \dfrac{3}{4} - \left(\dfrac{3}{4}\right)^2 + \left(\dfrac{3}{4}\right)^3 + \ldots (-1)^{n-1}\left(\dfrac{3}{4}\right)^n$ and $b_n = 1 - a_n$, then find the least natural number n_0 such that $b_n > a_n \ \forall n \geq n_0$. **[2006 - 6 M]**
6. Let $a_1, a_2, a_3, \ldots a_{11}$ be real numbers satisfying

   $a_1 = 15, 27 - 2a_2 > 0$ and $a_k = 2a_{k-1} - a_{k-2}$ for $k = 3, 4 \ldots, 11$.

If $\frac{a_1^2+a_2^2+...+a_{11}^2}{11}=90$, then the value of $\frac{a_1+a_2+...+a_{11}}{11}$ is equal to : **[JEE 2010]**

7. The minimum value of the sum of real numbers $a^{-5}, a^{-4}, 3a^{-3}, 1, a^8$ and a^{10} with $a>0$ is :

[JEE 2011]

8. Let $a_1, a_2, a_3 ... a_{100}$ be an arithmetic progression with $a_1=3$ and $S_p=\sum_{i=1}^{p} a_i, 1 \le p \le 100$. For any integer n with $1 \le n \le 20$, let $m=5n$. If $\frac{S_m}{S_n}$ does not depend on n, then a_2 is : **[JEE 2011]**

9. A pack contains n cards numbered from 1 to n. Two consecutive numbered cards are removed from the pack and the sum of the numbers on the remaining cards is 1224. If the smaller to the numbers on the removed cards is k, then $k-20=$ **[JEE Advanced 2013, 4, (–1)]**

10. Let a, b, c be positive integers such that $\frac{b}{a}$ is an integer. If a, b, c are in geometric progression and the arithmetic mean of a, b, c is $b+2$, then the value of $\frac{a^2+a-14}{a+1}$ is : **[JEE 2014]**

11. Suppose that all terms of an A.P. are natural numbers. If the ratio of the sum of first seven terms to the sum of first eleven terms is 6 : 11 and the seventh term lies in between 130 and 140, then the common difference of A.P is: **[JEE 2015]**

Answer

SINGLE CORRECT

1. C	2. C	3. B	4. B	5. A	6. D	7. B	8. A
9. C	10. D	11. D	12. C	13. D	14. B	15. B	16. D
17. D	18. C	19. D	20. B	21. A	22. A	23. C	24. A
25. C	26. B	27. C	28. A	29. C	30. B	31. C	32. B
33. B	34. B	35. B	36. B	37. A	38. A	39. C	40. B
41. B	42. A	43. A	44. A	45. A	46. B	47. A	48. C
49. B	50. C	51. A	52. B	53. D	54. C	55. C	56. B
57. B	58. C	59. B	60. D	61. A	62. C	63. C	64. B

MULTIPLE CORRECT

1. A,C	2. C,D	3. C,D	4. A,B	5. B,C,D	6. A,B,C,D	7. A,B,C,D	8. B,C
9. A,B	10. A,B,C,D	11. A,B,D	12. A,C,D	13. B,C,D	14. C,D	15. B,C	16. B,D
17. A,C,D	18. A,D	19. B,D	20. A,C	21. A,C,D	22. A,B	23. A,B,C,D	24. C,D
25. A,C,D	26. B,C	27. A,B,C	28. A,B,D				

COMPREHENSION TYPE

Comprehension —1	1. B	2. C	
Comprehension —2	1. D	2. A	3. C
Comprehension —3	1. B	2. A	3. C
Comprehension —4	1. A	2. C	3. C
Comprehension —5	1. A	2. D	3. D
Comprehension —6	1. D	2. B	

MATCH THE COLUMN

1. (A) Q;	(B) R;	(C) P	
2. (A) S;	(B) R:	(C) Q;	(D) P
3. (A) Q;	(B) S;	(C) P;	(D) R
4. (A) S;	(B) R;	(C) P;	(D) Q
5. (A) Q;	(B) P;	(C) R;	(D) S

INTEGER TYPE

1. 50	2. 32	3. 93	4. 50	5. 5050	6. 8	7. 201	8. 5
9. 7	10. 14	11. 5	12. 1	13. 0	14. 6	15. 1027	16. 5
17. 0	18. 7	19. 9	20. 41	21. 3	22. 1	23. 986	24. 819
25. 40	26. 319	27. 973	28. 1681	29. 559	30. 37	31. 3	32. 1
33. 7	34. 9	35. 6	36. 204	37. 34	38. 1641	39. 30	40. 12

PREVIOUS YEARS

JEE MAINS

Single Correct

1. B	2. D	3. B	4. B	5. B	6. A	7. D	8. D
9. B	10. C	11. D	12. D	13. D	14. B	15. B	16. A
17. A	18. C	19. B	20. B	21. C	22. A	23. D	24. C
25. C							

JEE ADVANCED

Single Correct

1. D	2. A	3. A	4. D	5. A	6. D	7. A	8. A
9. C	10. C	11. C	12. D				

Multiple Correct

1. B,D	2. A,D

Comprehension Type Questions

Comprehension —1	1. B	2. D	3. B
Comprehension —2	1. C	2. A	3. B

Subjective Type

2. $G=(A_1A_2\ldots A_n, H_1H_2\ldots H_n)^{1/2n}$	5. 6	6. 0	7. 8	8. 9 or 3
9. 5	10. 4	11. 9		