fo/u fopkjr Hkh# tu] ugh vkjEHk dke]
foifr n[k NkM rjr e/;e eu dj ';keA
i#"k flg ldYi dj] lgr foifr vud]
^cuk^ u NkM /;; dk] j?kcj jk[k VdAA
jfpr% eluo /ke i.krk
lnx# Jh j.kNkMnklth egkjkt

ASSERTION & REASON FOR SEQUANCE AND SERIES

Some questions (Assertion–Reason type) are given below. Each question contains **Statement – 1 (Assertion)** and **Statement – 2 (Reason)**. Each question has 4 choices (A), (B), (C) and (D) out of which **ONLY ONE** is correct. So select the correct choice:

(A) **Statement – 1** is True, **Statement – 2** is True; **Statement – 2 is** a correct explanation for **Statement – 1**.
(B) **Statement – 1** is True, **Statement – 2** is True; **Statement – 2 is NOT** a correct explanation for **Statement – 1**.
(C) **Statement – 1** is True, **Statement – 2** is False.
(D) **Statement – 1** is False, **Statement – 2** is True.

549. **Statement–1 :** In the expression (x + 1) (x + 2) . . . (x + 50), coefficient of x^{49} is equal to 1275.

Statement–2 : $\sum_{r=i}^{n} r = \frac{n(n+1)}{2}, n \in N$.

550. Let a, b, c, d are four positive number

Statement–1 : $\left(\frac{a}{b}+\frac{b}{c}\right)\left(\frac{c}{d}+\frac{d}{e}\right) \ge 4\sqrt{\frac{a}{e}}$ **Statement–2** : $\frac{b}{a}+\frac{c}{b}+\frac{d}{c}+\frac{e}{d}+\frac{a}{e} \ge 5$.

551. Let a, b, c and d be distinct positive real numbers in H.P.

Statement–1 : a + d > b + c **Statement–2** : $\frac{1}{a}+\frac{1}{d}=\frac{1}{b}+\frac{1}{c}$

552. Let a, r ∈ R – {0, 1, – 1} and n be an even number.
Statement–1 : a. ar. ar^2 . . . $ar^{n-1} = (a^2 r^{n-1})^{n/2}$.
Statement–2 : Product of k^{th} term from the beginning and from the end in a G.P. is independent of k.

553. **Statement–1** : Let p, q, r ∈ R^+ and $27pqr \ge (p + q + r)^3$ and 3p + 4q + 5r = 12, then $p^3 + q^4 + r^5$ is equal to 4.
Statement–2 : If A,G, and H are A.M., G.M., and H.M. of positive numbers $a_1, a_2, a_3, \ldots, a_n$ then H ≤ G ≤ A.

554. **Statement–1** : The sum of series n.n + (n – 1) (n + 1) + (n – 2) (n + 2) + . . . 1. (2n – 1) is $\frac{1}{6}n(n+1)(4n+1)$.

Statement–2 : The sum of any series S_n can be given as, $S_n = \sum_{r=1}^{n} T_r$, where T_r is the general ten of the series.

555. **Statement–1** : P is a point (a, b, c). Let A, B, C be images of P in yz, zx and xy plane respectively, then equation of plane must be $\frac{x}{a}+\frac{y}{b}+\frac{z}{c}=1$.
Statement–2 : The direction ratio of the line joining origin and point (x, y, z) must be x, y, z.

556. **Statement–1** : If A, B, C, D be the vertices of a rectangle in order. The position vector of A, B, C, D be a, b, c, d respectively, then $\vec{a}.\vec{c} = \vec{b}.\vec{d}$.
Statement–2 : In a triangle ABC, let O, G and H be the circumcentre, centroid and orthocentre of the triangle ABC, then OA + OB + OC = OH.

557. **Statement-1:** 1 + 3 7 + 13 + ... upto n terms = $\frac{n(n+2)}{3}$ **Statement-2:** $\frac{a^{n+1}+b^{n+1}}{a^n+b^n}$ is HM of a & b if n = - $\frac{1}{2}$

558. **Statement-1:** 1111 .... 1 (up to 91 terms) is a prime number
Statement-2: If $\frac{b+c-a}{a}, \frac{c+a-b}{b}, \frac{a+b-c}{c}$ are in A.P., then $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are also in A.P.

559. **Statement-1:** For a infinite G.P. whose first term is 'a' and common ratio is r, then $S_\infty = \frac{a}{1-r}$ where $|r| \geq 1$

Statement-2: A, G, H are arithmetic mean, Geometric mean and harmonic mean of two positive real numbers a & b. Then A, G, H are in G.P.

560. **Statement-1:** 11 11 …… 1 (up to 91 terms) is a prime number.

Statement-2: If $\frac{b+c-a}{a}, \frac{c+a-b}{b}, \frac{a+b-c}{c}$ Are in A.P., then $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are also in A.P.

561. **Statement-1:** The sum of all the products of the first n positive integers taken two at a time is $\frac{1}{24}$ (n – 1) (n + 1) n(3n + 2) **Statement-2:** $\sum_{i \leq i < j \leq n} a_i a_j = (a_1 + a_2 + ... + a_n)^2 - (a_1^2 + a_2^2 + a_n^2)$

562. **Statement-1:** Let the positive numbers a, b, c, d, e be in AP, then abcd, abce, abde, acde, bcde are in HP
Statement-2: If each term of an A.P. is divided by the same number k, the resulting sequence is also

563. **Statement-1:** If a, b, c are in G.P., $\frac{1}{\log a}, \frac{1}{\log b}, \frac{1}{\log c}$ are in H.P.

Statement-2: When we take logarithm of the terms in G.P., they occur in A.P.

564. **Statement-1:** If 3p + 4q + 5r = 12 then $p^3q^4r^5 \geq 1$ here p, q, r $\in R^+$
S-2: If the quantities are positive then weighted arithmetic mean is greater than or equal to geometric mean.

565. **Statement-1:** $S = 1/4 - 1/2 + 1 - 2 + 2^2 - .... = \frac{1/4}{1+2} = \frac{1}{12}$

S-2: Sum of n terms of a G.P. with first term as 'a' and common ratio as r in given by $a\left(\frac{r^n - 1}{r-1}\right)$, |r| > 1.

566. **Statement-1:** -4 + 2 – 1 + 1/2 – 1/4 + ... ∞ is a geometric sequence.
Statement-2: Terms of a sequence are positive numebrs.

567. **Statement-1:** The sum of the infinite A.P. $1 + 2 + 2^2 + 2^3 + ….. + …..$ is given by $\frac{a}{1-r} = \frac{1}{1-2} = -1$

Statement-2: The sum of an infinite G.P. is given by $\frac{a}{1-r}$ where |r| < 1 a is first term and r is common ratio.

568. **Statement-1:** If $a_1, a_2, a_3, ….. a_n$ 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 $n(2c)^{1/n}$.

Statement-2: If $a_1, a_2, a_3, ….. a_n \in R^+$. then $\frac{a_1 + a_2 + a_3 + ... + a_n}{n} \geq (a_1a_2a_3.....a_n)^{1/n}$

569. **Statement-1:** If $a(b-c)x^2 + b(c-a)x + c(a-b) = 0$ has equal roots, then a, b, c are in H.P.
Statement-2: Sum of the roots and product of the root are equal

570. **Statement-1:** $\lim_{n\to\infty} \frac{x^n}{n!} = 0$ for every n > 0

Statement-2: Every sequence whose nth term contains n! in the denominator converges to zero.

571. **Statement-1:** Sum of an infinite geometric series with common ratio more than one is not possible to find out.
S-2: The geometric series (Infinite) with common ratio more than one becomes diverging and sum is not fixed.

572. **Statement-1:** If arithmetic mean of two numbers is 5/2, Geometric mean of the numbers is 2 then harmonic mean will be 8/5.
Statement-2: for a group of numbers $(GM)^2 = (AM) \times (HM)$.

573. **Statement-1:** If a, b, c, d be four distinct positive quantities in H.P. then a + d > b + c, ad > bc.
Statement-2: A.M. > G.M. > H.M.

574. **Statement-1:** The sum of n arithmetic means between two given numbers is n times the single arithmetic mean between them.
Statement-2: n^{th} term of the A.P. with first term a and common difference d is a + (n + 1)d.

575. **Statement-1:** If a + b + c = 3 a > 0, b > 0, c > 0, then greatest value of $a^2b^3c^4 = 3^{10}2^4 - 77$.

Statement-2: If $a_i > 0$ i = 1, 2, 3, ….. n, then $\frac{a_1 + a_2 + a_3 + ... + a_n}{n} \geq (a_1a_2.....a_n)^{1/n}$

ANSWER SHEET

549. A 550. B 551. B 552. B 553. D 554. D 555. B 556. B 557. C 558. D 559. D 560. D 561. A
562. A 563. A 564. D 565. D 566. D 567. D568. A 569. C 570. C 571. A 572. C 573. A 574. C 575. A

IMP QUESTION FROM COMPETETIVE EXAMS

1. If the angles of a quadrilateral are in A.P. whose common difference is 10^o, then the angles of the quadrilateral are

(a) $65^o, 85^o, 95^o, 105^o$ (b) $75^o, 85^o, 95^o, 105^o$ (b) $65^o, 75^o, 85^o, 95^o$ (d) $65^o, 95^o, 105^o, 115^o$

2. 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) $m+n$

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

4. The sums of n terms of three A.P.'s whose first term is 1 and common differences are 1, 2, 3 are S_1, S_2, S_3 respectively. The true relation is

(a) $S_1 + S_3 = S_2$ (b) $S_1 + S_3 = 2S_2$ (c) $S_1 + S_2 = 2S_3$ (d) $S_1 + S_2 = S_3$

5. The value of x satisfying

$\log_a x + \log_{\sqrt{a}} x + \log_{3\sqrt{a}} x + \text{.........} \log_{a\sqrt{a}} x = \frac{a+1}{2}$ will be

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

6. 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

7. Let $S_1, S_2, \text{.......}$ 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 $10cm$, then for which of the following values of n is the area of S_n less then 1 $sq\ cm$

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

8. If $S_1, S_2, S_3, \text{..........} S_m$ are the sums of n terms of m A.P.'s whose first terms are $1, 2, 3, \text{...............}, m$ and common differences are $1, 3, 5, \text{...........} 2m-1$ respectively, then $S_1 + S_2 + S_3 + \text{.......} S_m =$

(a) $\frac{1}{2}mn(mn+1)$ (b) $mn(m+1)$ (c) $\frac{1}{4}mn(mn-1)$ (d) None of the above

9. If $a_1, a_2, a_3, \text{......} a_{24}$ are in arithmetic progression and $a_1 + a_5 + a_{10} + a_{15} + a_{20} + a_{24} = 225$, then $a_1 + a_2 + a_3 + \text{........} + a_{23} + a_{24} =$ ***[MP PET 1999; AMU 1997]***

(a) 909 (b) 75 (c) 750 (d) 900

10. If the roots of the equation $x^3 - 12x^2 + 39x - 28 = 0$ are in A.P., then their common difference will be

(a) ± 1 (b) ± 2 (c) ± 3 (4) ± 4 ***[UPSEAT 1994, 99, 2001; RPET 2001]***

11. If the first term of a G.P. $a_1, a_2, a_3, \text{..........}$ 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

12. If the sum of the n terms of G.P. is S product is P and sum of their inverse is R, than P^2 is equal to

(a) $\frac{R}{S}$ (b) $\frac{S}{R}$ (c) $\left(\frac{R}{S}\right)^n$ (d) $\left(\frac{S}{R}\right)^n$ ***[IIT 1966; Roorkee 1981]***

13. Let $n(>1)$ be a positive integer, then the largest integer m such that $(n^m + 1)$ divides $(1 + n + n^2 + \text{.......} + n^{127})$, is

(a) 32 (b) 63 (c) 64 (d) 127 ***[IIT 1995]***

14. A G.P. consists of an even number of terms. If the sum of all the terms is 5 times the sum of the terms occupying odd places, then the common ratio will be equal to

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

15. 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

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

17. 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)

18. $2.\dot{3}\dot{5}\dot{7}=$ ***[IIT 1983; RPET 1995]***

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

19. If $1+\cos\alpha+\cos^2\alpha+.......\infty = 2-\sqrt{2}$, then α, $(0<\alpha<\pi)$ is ***[Roorkee 2000; AMU 2005]***

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

20. The first term of an infinite geometric progression is x and its sum is 5. Then ***[IIT Screening 2004]***

(a) $0 \le x \le 10$ (b) $0<x<10$ (c) $-10<x<0$ (d) $x>10$

21. If a, b, c are in H.P., then the value of $\left(\frac{1}{b}+\frac{1}{c}-\frac{1}{a}\right)\left(\frac{1}{c}+\frac{1}{a}-\frac{1}{b}\right)$, is ***[MP PET 1998; Pb. CET 2000]***

(a) $\frac{2}{bc}+\frac{1}{b^2}$ (b) $\frac{3}{c^2}+\frac{2}{ca}$ (c) $\frac{3}{b^2}-\frac{2}{ab}$ (d) None of these

22. 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 the last and the first of the means equals

(a) $b-a$ (b) $ab(b-a)$ (c) $a(b-a)$ (d) $ab(a-b)$

23. 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 ***[DCE 2002]***

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

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

25. 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

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

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

27. 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

28. If $A_1, A_2; G_1, G_2$ and H_1, H_2 be $AM's, GM's$ and $HM's$ between two quantities, then the value of $\frac{G_1G_2}{H_1H_2}$ is

(a) $\frac{A_1+A_2}{H_1+H_2}$ (b) $\frac{A_1-A_2}{H_1+H_2}$ (c) $\frac{A_1+A_2}{H_1-H_2}$ (d) $\frac{A_1-A_2}{H_1-H_2}$

29. 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

30. If the A.M. of two numbers is greater than G.M. of the numbers by 2 and the ratio of the numbers is $4:1$, then the numbers are ***[RPET 1988]***

(a) 4, 1 (b) 12, 3 (c) 16, 4 (d) None of these

31. 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) $x^2+16x-25=0$

32. The A.M., H.M. and G.M. between two numbers are $\frac{144}{15}$, 15 and 12, but not 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) $\frac{144}{15}, 15, 12$

33. If a be the arithmetic mean of b and c and G_1, G_2 be the two geometric means between them, then $G_1^3+G_2^3=$

(a) G_1G_2a (b) $2G_1G_2a$ (c) $3G_1G_2a$ (d) None of these

34. Three numbers form a G.P. If the 3^{rd} term is decreased by 64, then the three numbers thus obtained will constitute an A.P. If the second term of this A.P. is decreased by 8, a G.P. will be formed again, then the numbers will be

(a) 4, 20, 36 (b) 4, 12, 36 (c) 4, 20, 100 (d) None of the above

35. 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

36. 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

37. $2^{\sin\theta}+2^{\cos\theta}$ is greater than ***[AMU 2000]***

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

38. 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 2000]

(a) $0<M\le 1$ (b) $1\le M\le 2$

(c) $2\le M\le 3$ (d) $3\le M\le 4$

39. 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) $\frac{1}{2}-\frac{1}{\sqrt{2}}$

40. n^{th} term of the series $1+\frac{4}{5}+\frac{7}{5^2}+\frac{10}{5^3}+........$ will be

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

41. 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

42. For any odd integer $n \ge 1$,

$n^3-(n-1)^3+..........+(-1)^{n-1}1^3=$ ***[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) $\frac{1}{4}(n+1)^2(2n-1)$

43. The sum of n terms of the series $\frac{1}{1+\sqrt{3}}+\frac{1}{\sqrt{3}+\sqrt{5}}+\frac{1}{\sqrt{5}+\sqrt{7}}+.........$ is ***[UPSEAT 2002]***

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

44. 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) $\frac{n^2-2n+1}{4}$

45. The sum of the series $\frac{1}{\sqrt{1}+\sqrt{2}}+\frac{1}{\sqrt{2}+\sqrt{3}}+\frac{1}{\sqrt{3}+\sqrt{4}}+...+\frac{1}{\sqrt{n^2-1}+\sqrt{n^2}}$

equals ***[AMU 2002]***

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

ANSWER

1	b	2	a	3	a	4	b	5	d
6	c	7	b,c,d	8	a	9	d	10	c
11	a	12	d	13	c	14	c	15	a
16	c	17	c	18	c	19	d	20	b
21	c	22	b	23	c	24	c	25	b
26	a	27	b	28	a	29	a	30	c
31	c	32	b	33	b	34	c	35	b
36	c	37	d	38	a	39	d	40	c
41	b	42	d	43	d	44	c	45	d