Sequence and Series

Subjects : Maths

Previous Year Questions of JEE Mains

Maths - Section A (MCQ)

1. Let A be the set of first 101 terms of an A.P., whose first term is 1 and the common difference is 5 and let B be the set of first 71 terms of an A.P., whose first term is 9 and the common difference is 7. Then the number of elements in $A \cap B$, which are divisible by 3, is :

A) 4 **B)** 5 **C)** 6 **D)** 7

2. The sum $\frac{1^3}{1} + \frac{1^3+2^3}{1+3} + \frac{1^3+2^3+3^3}{1+3+5} + \cdots$ up to 8 terms, is:

A) 70 **B)** 71 **C)** 72 **D)** 73

3. The first term of an A.P. of 30 non-negative terms is $\frac{10}{3}$. If the sum of this A.P. is the cube of its last term, then its common difference is:

A) $\frac{5}{87}$ **B)** $\frac{25}{83}$ **C)** $\frac{15}{29}$ **D)** $\frac{5}{29}$

4. Let $\alpha = \frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \ldots \infty$ and $\beta = \frac{1}{3} + \frac{1}{9} + \frac{1}{27} + \ldots \infty$. Then the value of $(0.2)^{\log_{\sqrt{5}}(\alpha)} + (0.04)^{\log_5(\beta)}$ is equal to:

A) 4 **B)** 5 **C)** 8 **D)** 25

5. Let the sum of the first n terms of an A.P. be $3n^2 + 5n$. Then the sum of squares of the first 10 terms of the A.P. is:

A) 10220 **B)** 12860 **C)** 15220 **D)** 19780

6. $\sum_{n=1}^{10} \left(\frac{528}{n(n+1)(n+2)} \right)$ is equal to:

A) 65 **B)** 130 **C)** 220 **D)** 440

7. If the sum of the first 10 terms of the series $\frac{1}{1+1^4 \times 4} + \frac{2}{1+2^4 \times 4} + \frac{3}{1+3^4 \times 4} + \frac{4}{1+4^4 \times 4} + \ldots$ is $\frac{m}{n}$, $\gcd(m,n) = 1$, then $m+n$ is equal to :

A) 256 **B)** 264 **C)** 276 **D)** 284

8. The value of $1^3 - 2^3 + 3^3 - \ldots + 15^3$ is:

A) 1706 **B)** 1856 **C)** 1982 **D)** 2403

9. Let $A_1, A_2, A_3, \ldots, A_{39}$ be 39 arithmetic means between the numbers 59 and 159. Then the mean of A_{25}, A_{28}, A_{31} and A_{36} is equal to :

A) 129 **B)** 136 **C)** 131.50 **D)** 134

10. The sum $1 + \frac{1}{2}(1^2+2^2) + \frac{1}{3}(1^2+2^2+3^2) + \ldots$ upto 10 terms is equal to :

A) 130 B) 155 C) $\frac{315}{2}$ D) $\frac{325}{2}$

11. Let $\alpha = 3 + 4 + 8 + 9 + 13 + 14 + \ldots$ upto 40 terms. If $(\tan\beta)^{\frac{\alpha}{1020}}$ is a root of the equation $x^2 + x - 2 = 0$, $\beta \in \left(0, \frac{\pi}{2}\right)$, then $\sin^2\beta + 3\cos^2\beta$ is equal to:

A) 2 B) $\frac{7}{4}$ C) $\frac{5}{2}$ D) $\frac{3}{2}$

12. Let α, β be the roots of the equation $x^2 - x + p = 0$ and γ, δ be the roots the equation $x^2 - 4x + q = 0$; $p, q \in$ **Z**. If $\alpha, \beta, \gamma, \delta$ are in G.P., then $|p + q|$ equals :

A) 16 B) 32 C) 34 D) 38

13. $\frac{6}{3^{26}} + \frac{10\cdot1}{3^{25}} + \frac{10\cdot2}{3^{24}} + \frac{10\cdot2^2}{3^{23}} + \ldots + \frac{10\cdot2^{24}}{3}$ is equal to

A) 2^{25} B) 2^{26} C) 3^{25} D) 3^{26}

14. Let 729, 81, 9, 1, ... be a sequence and P_n denote the product of the first n terms of this sequence. If $2\sum_{n=1}^{40}(P_n)^{\frac{1}{n}} = \frac{3^\alpha - 1}{3^\beta}$ and $\gcd(\alpha, \beta) = 1$, then $\alpha + \beta$ is equal to

A) 73 B) 74 C) 75 D) 76

15. $(\frac{1}{3} + \frac{4}{7}) + (\frac{1}{3^2} + \frac{1}{3}\times\frac{4}{7} + \frac{4^2}{7^2}) + (\frac{1}{3^3} + \frac{1}{3^2}\times\frac{4}{7} + \frac{1}{3}\times\frac{4^2}{7^2} + \frac{4^3}{7^3}) + \ldots$ upto infinite terms is equal to -

A) $\frac{5}{2}$ B) $\frac{7}{4}$ C) $\frac{4}{3}$ D) $\frac{6}{5}$

16. Let $\alpha_1, \alpha_2, \alpha_3, \alpha_4$ be an A.P. of four terms such that each term of the A.P. and its common difference l are integers. If $\alpha_1 + \alpha_2 + \alpha_3 + \alpha_4 = 48$ and $\alpha_1, \alpha_2, \alpha_3, \alpha_4 + l^4 = 361$ then the largest term of the A.P. is equal to

A) 27 B) 24 C) 21 D) 23

17. Let $\sum_{k=1}^{n} a_k = \alpha n^2 + \beta n$. If $a_{10} = 59$ and $a_6 = 7a_1$ then $\alpha + \beta$ is equal to:

A) 12 B) 3 C) 5 D) 7

18. The value of $\frac{^{100}C_{50}}{51} + \frac{^{100}C_{51}}{52} + \cdots + \frac{^{100}C_{100}}{101}$ is:

A) $\frac{2^{101}}{100}$ B) $\frac{2^{100}}{100}$ C) $\frac{2^{101}}{101}$ D) $\frac{2^{100}}{101}$

19. If $\frac{1}{1^4} + \frac{1}{2^4} + \frac{1}{3^4} + \ldots..\infty = \frac{\pi^4}{90}$,
$\frac{1}{1^4} + \frac{1}{3^4} + \frac{1}{5^4} + \ldots..\infty = \alpha$,
$\frac{1}{2^4} + \frac{1}{4^4} + \frac{1}{6^4} + \ldots.\infty = \beta$,
then $\frac{\alpha}{\beta}$ is equal to

A) 23 B) 18 C) 15 D) 14

20. If the sum of the first 20 terms of the series
$\frac{4.1}{4+3.1^2+1^4} + \frac{4.2}{4+3.2^2+2^4} + \frac{4.3}{4+3.3^2+3^4} + \frac{4.4}{4+3.4^2+4^4} + \ldots$
is $\frac{m}{n}$, where m and n are coprime, then $m + n$ is equal to :-

A) 423 B) 420 C) 421 D) 422

21. The sum $1 + \frac{1+3}{2!} + \frac{1+3+5}{3!} + \frac{1+3+5+7}{4!} + \ldots$ upto ∞ terms, is equal to

A) $6e$ B) $4e$ C) $3e$ D) $2e$

22. The sum $1 + 3 + 11 + 25 + 45 + 71 + ..$ upto 20 terms, is equal to

A) 7240 B) 7130 C) 6982 D) 8124

23. If the sum of the first 10 terms of the series $\frac{4.1}{1+4.1^4} + \frac{4.2}{1+4.2^4} + \frac{4.3}{1+4.3^4} + \ldots$ is $\frac{m}{n}$, where $\gcd(m, n) = 1$, then $m + n$ is equal to_____

A) 440 **B)** 441 **C)** 442 **D)** 443

24. If $7 = 5 + \frac{1}{7}(5+\alpha) + \frac{1}{7^2}(5+2\alpha) + \frac{1}{7^3}(5+3\alpha) + \ldots\infty$, then the value of α is :

A) $\frac{6}{7}$ **B)** 6 **C)** $\frac{1}{7}$ **D)** 1

25. Let x_1, x_2, x_3, x_4 be in a geometric progression. $2, 7, 9, 5$ are subtracted respectively from $x_1, x_2, x_3\ x_4$ then the resulting numbers are in an arithmetic progression. Then the value of $\frac{1}{24}(x_1x_2x_3x_4)$ is :

A) 72 **B)** 18 **C)** 36 **D)** 216

26. Let $3, 7, 11, 15, \ldots, 403$ and $2, 5, 8, 11, \ldots, 404$ be two arithmetic progressions. Then the sum, of the common terms in them, is equal to .....

A) 6696 **B)** 6697 **C)** 668 **D)** 6699

27. The value of $\frac{1\times2^2+2\times3^2+\ldots+100\times(101)^2}{1^2\times2+2^2\times3+\ldots+100^2\times101}$ is

A) $\frac{306}{305}$ **B)** $\frac{305}{301}$ **C)** $\frac{32}{31}$ **D)** $\frac{31}{30}$

28. If $\frac{1}{\sqrt{1}+\sqrt{2}} + \frac{1}{\sqrt{2}+\sqrt{3}} + \ldots + \frac{1}{\sqrt{99}+\sqrt{100}} = m$ and $\frac{1}{1\cdot2} + \frac{1}{2\cdot3} + \ldots + \frac{1}{99\cdot100} = \mathrm{n}$, then the point (m, n) lies on the line

A) $11(x-1) - 100(y-2) = 0$ **B)** $11(x-2) - 100(y-1) = 0$

C) $11(x-1) - 100y = 0$ **D)** $11x - 100y = 0$

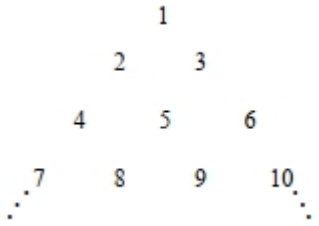
29. For $\mathrm{x} \geq 0$, the least value of K, for which $4^{1+\mathrm{x}} + 4^{1-\mathrm{x}}$, $\frac{\mathrm{K}}{2}$, $16^{\mathrm{x}} + 16^{-\mathrm{x}}$ are three consecutive terms of an $A.P.$ is equal to :

A) 10 **B)** 4 **C)** 8 **D)** 16

30. Let ABC be an equilateral triangle. A new triangle is formed by joining the middle points of all sides of the triangle ABC and the same process is repeated infinitely many times. If P is the sum of perimeters and Q is be the sum of areas of all the triangles formed in this process, then :

A) $\mathrm{P}^2 = 36\sqrt{3}\mathrm{Q}$ **B)** $\mathrm{P}^2 = 6\sqrt{3}\mathrm{Q}$ **C)** $P = 36\sqrt{3}Q^2$ **D)** $\mathrm{P}^2 = 72\sqrt{3}\mathrm{Q}$

31. Let the positive integers be written in the form :



If the k^{th} row contains exactly k numbers for every natural number k, then the row in which the number 5310 will be, is .....

A) 103 **B)** 105 **C)** 108 **D)** 107

32. If the sum of series $\frac{1}{1\cdot(1+d)} + \frac{1}{(1+d)(1+2d)} + \ldots\ldots + \frac{1}{(1+9d)(1+10d)}$ is equal to 5 , then $50\ \mathrm{d}$ is equal to :

A) 20 **B)** 5 **C)** 15 **D)** 10

33. Let $a, ar, ar^2, \ldots\ldots$ be an infinite $G.P.$ If $\sum_{n=0}^{\infty} a^n = 57$ and $\sum_{n=0}^{\infty} a^3r^{3n} = 9747$, then $a + 18r$ is equal to :

A) 27 **B)** 46 **C)** 38 **D)** 31

34. Let $\mathrm{T_r}$ be the r^{th} term of an A.P. If for some $\mathrm{m}, \mathrm{T_m} = \frac{1}{25}$, $\mathrm{T}_{25} = \frac{1}{20}$, and $20\sum_{\mathrm{r}=1}^{25} \mathrm{T_r} = 13$, then $5\ \mathrm{m}\sum_{\mathrm{r}=\mathrm{m}}^{2\ \mathrm{m}} \mathrm{T_r}$ is equal to

A) 98 **B)** 126 **C)** 142 **D)** 112

35. Let $A = \{1, 6, 11, 16, \ldots\}$ and $B = \{9, 16, 23, 30, \ldots\}$ be the sets consisting of the first 2025 terms of two arithmetic progressions. Then $n(A \cup B)$ is

A) 3814 **B)** 4027 **C)** 3761 **D)** 4003

36. Let $a_1, a_2, a_3, ...$ be a G.P. of increasing positive terms. If $a_1a_5 = 28$ and $a_2 + a_4 = 29$, then a_6 is equal to:

A) 628 **B)** 812 **C)** 526 **D)** 784

37. The number of terms of an A.P. is even; the sum of all the odd terms is 24 , the sum of all the even terms is 30 and the last term exceeds the first by $\frac{21}{2}$. Then the number of terms which are integers in the A.P. is :

A) 4 **B)** 10 **C)** 6 **D)** 8

38. The sum of the series $\frac{1}{1-3\cdot1^2+1^4} + \frac{2}{1-3\cdot2^2+2^4} + \frac{3}{1-3\cdot3^2+3^4} + ...$ up to 10 terms is

A) $\frac{45}{109}$ **B)** $-\frac{45}{109}$ **C)** $\frac{55}{109}$ **D)** $-\frac{55}{109}$

39. Let $a_1, \frac{a_2}{2}, \frac{a_3}{2^2}, ..., \frac{a_{10}}{2^9}$ be a G.P. of common ratio $\frac{1}{\sqrt{2}}$. If $a_1 + a_2 + ... + a_{10} = 62$, then a_1 is equal to :

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

Maths - Section B (Numeric)

40. In a G.P., if the product of the first three terms is 27 and the set of all possible values for the sum of its first three terms is $\mathbb{R} - (a, b)$, then $a^2 + b^2$ is equal to ___ .

41. If $\sum_{r=1}^{25}\left(\frac{r}{r^4+r^2+1}\right) = \frac{p}{q}$ where p and q are positive integers such that gcd(p,q)=1, then $p + q$ is equal to ____.

42. Suppose a, b, c are in A.P. and $a^2, 2b^2, c^2$ are in G.P. If $a < b < c$ and $a + b + c = 1$, then $9(a^2 + b^2 + c^2)$ is equal to ___ .

43. The interior angles of a polygon with n sides, are in an A.P. with common difference 6°. If the largest interior angle of the polygon is 219°, then n is equal to

44. The roots of the quadratic equation $3x^2 - \mathrm{p}x + \mathrm{q} = 0$ are 10^{th} and 11^{th} terms of an arithmetic progression with common difference $\frac{3}{2}$. If the sum of the first 11 terms of this arithmetic progression is 88 , then $q - 2p$ is equal to -.

45. If $\frac{1^3+2^3+3^3+.....\text{upto } n \text{ terms}}{1\cdot3+2\cdot5+3\cdot7+..... \text{ upto } n \text{ terms}} = \frac{9}{5}$, then the value of n is

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Sequence and Series

Subjects : Maths

Previous Year Questions of JEE Mains

Maths - Section A (MCQ)

1 - B	2 - B	3 - A	4 - C	5 - C	6 - B	7 - C	8 - B	9 - D	10 - C
11 - A	12 - C	13 - B	14 - A	15 - A	16 - A	17 - C	18 - D	19 - C	20 - C
21 - D	22 - A	23 - B	24 - B	25 - D	26 - D	27 - B	28 - D	29 - A	30 - A
31 - A	32 - B	33 - D	34 - B	35 - C	36 - D	37 - A	38 - D	39 - A	

Maths - Section B (Numeric)

40 - 90	41 - 976	42 - 9	43 - 20	44 - 474	45 - 5