SECTION – A (MATHEMATICS)

PART - I

SINGLE OPTION CORRECT (+ 4, – 1, 0)

1. The number of non-negative integral solutions of $x + y + z \le n$ where $n \in N$ is:

   (A) ${}^{n+4}C_4$ (B) ${}^{n+5}C_5$ (C) ${}^{n+3}C_3$ (D) None of these

2. 3 women and 15 men are to be arranged in a row such that there should be at least 2 men between any two women. The number of such arrangements is:

   (A) ${}^{14}C_4 \times 3!$ (B) ${}^{14}C_3 \times 3!$ (C) $3! \times 15!$ (D) ${}^{19}C_2$

3. The number of ordered quadruples (a_1, a_2, a_3, a_4) of positive odd integers that satisfy $a_1 + a_2 + a_3 + a_4 = 32$ is

   (A) 286 (B) 4495 (C) 680 (D) 4040

4. The number of matrices of order $n \times n$ of which one element in each row and each column is equal to unity, the other being zero, is:

   (A) n^n (B) $(n!)^2$ (C) $n!$ (D) 2^n

5. If N is the number of positive integral solution of $x_1x_2x_3x_4 = 770$, then N is?

   (A) 292 (B) a perfect square (C) A prime Number (D) a perfect 8^{th} power

ROUGH SPACE

⟻~■: ☺ ☺ Best of Luck! ☺ ☺ :■~⟼

6. Let be the $B=\begin{bmatrix}1 & 3 & \alpha\\ 1 & 2 & 3\\ \alpha & \alpha & 4\end{bmatrix}, \alpha>2$ adjoint of a matrix A and $|A|$ = 2, then $\begin{bmatrix}\alpha & -2\alpha & \alpha\end{bmatrix}B\begin{bmatrix}\alpha\\ -2\alpha\\ \alpha\end{bmatrix}$ is equal to:

(A) 16 (B) 32 (C) - 16 (D) 0

7. If P is a 3×3 real matrix such that $P^T = aP + (a-1)I$, where a > 1, then

(A) P is a singular matrix (B) $|adj\ P| > 1$

(C) $|adj\ P| = 1/2$ (D) $|adj\ P| = 1$

8. If the system of equations

$2x+y-z=5$

$2x-5y+\lambda z=\mu$ has infinitely many solutions, then $(\lambda+\mu)^2+(\lambda-\mu)^2$ is equal to

$x+2y-5z=7$

(A) 916 (B) 912 (C) 920 (D) 904

9. The fifth term from the end in the expansion of $\left(\frac{x^3}{2}-\frac{2}{x^3}\right)^9$ is

(A) $63x^3$ (B) $-\frac{252}{x^3}$ (C) $\frac{672}{x^{18}}$ (D) $\frac{612}{x^{18}}$

10. If the second term of the expansion $\left(a^{1/13}+\frac{a}{\sqrt{a^{-1}}}\right)^n$ is $14a^{5/2}$ then the value of $\frac{{}^nC_3}{{}^nC_2}$ is/are

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

ROUGH SPACE

⟻~■: ☺ ☺ Best of Luck! ☺ ☺ :■~⟼

11. Let $A = \begin{pmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 3 & 2 & 1 \end{pmatrix}$. If u_1 and u_2 are the column matrices such that $Au_1 = \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$ and $Au_2 = \begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix}$, then $u_1 + u_2$ is equal to

(A) $\begin{pmatrix} -1 \\ -1 \\ 0 \end{pmatrix}$ (B) $\begin{pmatrix} 1 \\ -1 \\ -1 \end{pmatrix}$ (C) $\begin{pmatrix} -1 \\ 1 \\ 0 \end{pmatrix}$ (D) $\begin{pmatrix} -1 \\ 1 \\ -1 \end{pmatrix}$

12. The value of $\frac{1}{81^n} - \frac{10}{81^n}.{}^{2n}C_1 + \frac{10^2}{81^n}.{}^{2n}C_2 - \frac{10^3}{81^n}.{}^{2n}C_3 + ... + \frac{(10)^{2n}}{81^n}$ is

(A) 2 (B) 1 (C) 0 (D) $\frac{1}{2}$

13. Let S denote the set of all real values of λ such that the system of equations

$\lambda x + y + z = 1$
$x + \lambda y + z = 1$ is inconsistent, then $\sum_{\lambda \in S} \left(|\lambda|^2 + |\lambda| \right)$ is equal to
$x + y + \lambda z = 1$

(A) 12 (B) 2 (C) 6 (D) 4

14. The sum of the rational terms in the expression of $\left(\sqrt{2} + 3^{1/5}\right)^{10}$ is

(A) 41 (B) 40 (C) 42 (D) none of these

15. If the trivial solution is the only solution of the system of equations

$x - ky + z = 0$
$kx + 3y - kz = 0$ Then, the set of values of k is:
$3x + y - z = 0$

(A) {2, - 3} (B) R – {2, -3} (C) R – {2} (D) R – {- 3}

ROUGH SPACE

⟻~■: ☺ ☺ Best of Luck! ☺ ☺ :■~⟼

16. The coefficient of x^4 *in* $(1+5x+9x^2+13x^3+\ldots\ldots\ldots\text{upto }\infty\text{ terms})(1+x^2)^{11}$ in the expansion is:

(A) ${}^{11}c_2+4\times{}^{11}c_1+3$ (B) ${}^{11}c_2+3{}^{11}c_1+4$ (C) $3\times{}^{11}c_2+4\times{}^{11}c_1+3$ (D) 171

17. Let $A=\begin{bmatrix}0 & \alpha\\ 0 & 0\end{bmatrix}$ and $(A+I)^{50}-50A=\begin{bmatrix}a & b\\ c & d\end{bmatrix}$, then the value of a + b + c + d is:

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

18. The sum of the coefficients in $\left(1+x-3x^2\right)^{2143}$ is

(A) 2^{2143} (B) 0 (C) 1 (D) – 1

19. Let a and b be two real numbers such that a > 1, b > 1. If $A=\begin{pmatrix}a & 0\\ 0 & b\end{pmatrix}$, then $\lim\limits_{n\to\infty}\left(A^n\right)^{-1}=$

(A) unit matrix (B) null matrix (C) 2I (D) None of these

20. $\begin{vmatrix}a^2+2a & 2a+1 & 1\\ 2a+1 & a+2 & 1\\ 3 & 3 & 1\end{vmatrix}=$

(A) $(a-1)^2(a+1)$ (B) $(a-1)^3$ (C) $a\left(a^2-1\right)$ (D) $\left(a^2-1\right)(a+2)$

ROUGH SPACE

⟻~■: ☺ ☺ Best of Luck! ☺ ☺ :■~⟼

PART – II

Integer Type (+ 4, -1, 0).

21. Let n be the number of ways in which 5 boys and 5 girls can stand in a queue in such a way that all the girls stand consecutively in the queue. Let m be the numbers of ways in which 5 boys and 5 girls can stand in a queue in such a way that exactly four girls stand consecutively in the queue. Then value of $\frac{m}{n}$ is___?

22. Let p and p + 2 be prime numbers and let $\Delta = \begin{vmatrix} p! & (p+1)! & (p+2)! \\ (p+1)! & (p+2)! & (p+3)! \\ (p+2)! & (p+3)! & (p+4)! \end{vmatrix}$. Then the sum of the maximum values of $\alpha \& \beta$, such that $p^{\alpha} \& (p+2)^{\beta}$ divide Δ, is ____________

23. The expansion $\left[x+\left(x^3-1\right)^{1/2}\right]^5+\left[x-\left(x^3-1\right)^{1/2}\right]^5$ is a polynomial of degree__________?

24. The number of different real roots of the equation $\left(x^2-7x+11\right)^{\left(x^2-11x+30\right)}=1$?

25. If a, b, c, d are positive real numbers such that $\frac{a}{3}=\frac{a+b}{4}=\frac{a+b+c}{5}=\frac{a+b+c+d}{6}$, then value of $\frac{b+2c+3d}{a}$ is ___________?

ROUGH SPACE

⟻~■: ☺ ☺ Best of Luck! ☺ ☺ :■~⟼

26. Let $2^{a_1}+3^{a_2}+5^{a_3}+7^{a_4}+9^{a_5}$ is divisible by 4, where $a_1,a_2,a_3,a_4,a_5\in\{0,1,2,3,....,9\}$. If number of such ordered pair (a_1,a_2,a_3,a_4,a_5) is P, then $\frac{P}{9\times 5^4}$ is ____?

27. Let A be a symmetric matrix such that $|A| = 2$ and $\begin{bmatrix} 2 & 1 \\ 3 & \frac{3}{2} \end{bmatrix} A = \begin{bmatrix} 1 & 2 \\ \alpha & \beta \end{bmatrix}$. If the sum of the diagonal elements of A is s, then $\frac{\beta s}{\alpha^2}$ is equal to ______

28. No. of ways in which 38808 can be expressed as a product of two co-prime factors are:

29. Let $n \geq 2$ be an integer. Take n distinct points on a circle and join each pair of points by a line segment. Colour the line segment joining every pair of adjacent points by blue and the rest by red. If the number of red and blue line segments are equal, then value of n is:

30. Let T_n denotes the number of triangles which can be formed using the vertices of a regular polygon of n sides. If $T_{n+1} - T_n = 21$, then n equals ______

ROUGH SPACE

Mathsarc Education
A learning place to fulfill your dreams of success!

☺

Keep smiling!

Visit Us: https://www.mathsarc.com

ANSWER KEY

1. C	2. B	3. C	4. C
5. A	6. C	7. D	8. A
9. B	10. D	11. B	12. B
13. C	14. A	15. B	16. D
17. B	18. D	19. B	20. B
21. 5	22. 4	23. 7	24. 5
25. 2	26. 8	27. 5	28. 8
29. 5	30. 7