MATHEMATICS

1. The sum of the first three terms of a G.P, is S and their product is 27. Then all such S lie in
(a) $(-\infty,-3]\cup[9,\infty)$ (b) $(-\infty,-9]\cup[3,\infty)$
(c) $[-3,\infty)$ (d) $(-\infty,9]$

2. Box I contains 30 cards numbered I to 30 and Box II contains 20 cards numbered 31 to 50. A box is selected at random and a card is drawn from it. The number on the card is found to be a non-prime number. The probability that the card was drawn from Box I is :
(a) $\frac{2}{3}$ (b) $\frac{2}{5}$
(c) $\frac{8}{17}$ (d) $\frac{4}{17}$

3. Area (in sq. units) of the region outside $\frac{|x|}{2}+\frac{|y|}{3}=1$ and inside the ellipse $\frac{x^2}{4}+\frac{y^2}{9}=1$ is
(a) $3(\pi-2)$ (b) $3(4-\pi)$
(c) $6(\pi-2)$ (d) $6(4-\pi)$

4. The domain of the function $f(x)=sin^{-1}\left(\frac{|x|+5}{x^2+1}\right)$ is $(-\infty,-a]\cup[a,\infty)$, Then a is equal to :
(a) $\frac{1+\sqrt{17}}{2}$ (b) $\frac{\sqrt{17}-1}{2}$
(c) $\frac{\sqrt{17}}{2}$ (d) $\frac{\sqrt{17}}{2}+1$

5. If |x| < 1, |y| < 1 and x ≠ y, then the sum to infinity of the following series $(x+y)+(x^2+xy+y^2)+(x^3+x^2y+xy^2+y^3)+\ .....$ is
(a) $\frac{x+y+xy}{(1-x)(1-y)}$ (b) $\frac{x+y-xy}{(1-x)(1-y)}$
(c) $\frac{x+y-xy}{(1-x)(1+y)}$ (d) $\frac{x+y+xy}{(1+x)(1+y)}$

6. The value of $\left(\frac{1+sin\frac{2\pi}{9}+icos\frac{2\pi}{9}}{1+sin\frac{2\pi}{9}-icos\frac{2\pi}{9}}\right)^3$ is :
(a) $-\frac{1}{2}(\sqrt{3}-i)$ (b) $\frac{1}{2}(\sqrt{3}-i)$
(c) $\frac{1}{2}(1-i\sqrt{3})$ (d) $-\frac{1}{2}(1-i\sqrt{3})$

7. Let Y = y(x) be the solution of the differential equation, $\frac{2+sinx}{y+1}.\frac{dy}{dx}=-cosx, y>0, y(0)=1$. If $y(\pi)=a$ and $\frac{dy}{dx}$ at $x=\pi$ is b, then the ordered pair (a, b) is equal to :
(a) $\left(2,\frac{3}{2}\right)$ (b) (1, –1)
(c) (2, 1) (d) (1, 1)

8. The plane passing through the points (1, 2, 1), (2, 1, 2) and parallel to the line, 2x = 3y, z = 1 also passes through the point :
(a) (2, 0, –1) (b) (0, 6, –2)
(c) (0, –6, 2) (d) (–2, 0, 1)

9. Let $\alpha>0, \beta>0$ be such that $\alpha^3+\beta^2=4$. If the maximum value of the term independent of x in the binomial expansion of $\left(\alpha x^{1/9}+\beta x^{-1/6}\right)$ is 10k, then k is equal to :
(a) 176 (b) 336
(c) 352 (d) 84

10. If $R=\{(x,y): x,y\in Z, x^2+3y^2\leq 8\}$ is a relation on the set of integers Z, then the domain R^{-1} is
(a) {–1, 0, 1} (b) {–2, –1, 1, 2}
(c) {0, 1} (d) {–2, –1, 0, 1, 2}

11. If p(x) be a polynomial of degree three that has a local maximum value 8 at x = 1 and a local minimum value 4 at x = 2; then p(0) is equal to
(a) –24 (b) –12
(c) 6 (d) 12

12. A line parallel to the straight line 2x – y = 0 is tangent to the hyperbola $\frac{x^2}{4}-\frac{y^2}{2}=1$ at the point (x_1,y_1). Then $x_1^2+5y_1^2$ is equal to :
(a) 10 (b) 5
(c) 8 (d) 6

13. The contrapositive of the statement "If reach the station in time, then I will catch the train" is :
(a) If i will catch the train, then I reach the station in time.
(b) If do not reach the station in time, then I will not catch the train.
(c) If I do not reach the station in time, then I will catch the train.
(d) If I will not catch the train, then I do not reach the station in time

14. Let P(h, k) be a point on the curve $y=x^2+7x+2$, nearest to the line, y = 3x – 3. Then the equation of the normal to the curve at P is :
(a) x + 3y – 62 = 0 (b) x + 3y + 26 = 0
(c) x – 3y – 11 = 0 (d) x – 3y + 22 = 0

15. Let A be a 2 × 2 real matrix with entries from {0, 1} and |A| ≠ 0. Consider the following two statements :
(P) If $A\neq I_2$, then |A| = –1
(Q) If $|A|=1$, then tr(A) = 2
Where I_2 denotes 2×2 identity matrix and tr(A) denotes the sum of the diagonal entries of A. Then :
(a) (P) is true and (Q) are false
(b) Both (P) and (Q) are true
(c) Both (P) and (Q) are false
(d) (P) is false and (Q) are true

16. Let s be the set of all $\lambda\in R$ which the system of linear equations
2x – y + 2z = 2
x – 2y + $\lambda z=-4$
x + λy + z = 4
has no solution, then the set S
(a) is a singleton
(b) contains exactly two elements
(c) contains more than two elements
(d) is an empty set

17. If the tangent to the curve y = x + siny at a point (a, b) is parallel to the line joining $\left(0,\frac{3}{2}\right)$ and $\left(\frac{1}{2},2\right)$, then
(a) |b – a| = 1 (b) $b=\frac{\pi}{2}+a$
(c) |a + b| = 1 (d) b = a

18. If a function f(x) defined by

$$f(x) = \begin{cases} ae^x + be^{-x}, & -1 \le x < 1 \\ cx^2, & 1 \le x \le 3 \\ ax^2 + 2cx, & 3 < x \le 4 \end{cases}$$

Be continuous for some a, b, c ∈ R and f'(0) + f'(2) = e, then the value of a is :

(a) $\frac{1}{e^2-3e+13}$ (b) $\frac{e}{e^2-3e+13}$

(c) $\frac{e}{e^2-3e-13}$ (d) $\frac{e}{e^2+3e+13}$

19. Let α and β be the roots of the equation, $5x^2 + 6x - 2 = 0$. If $S_n = \alpha^n + \beta^n$n n = 1, 2, 3, ….., then :

(a) $6S_6 + 5S_5 = 2S_4$ (b) $5S_6 + 6S_5 = 2S_4$

(c) $5S_6 + 6S_5 + 2S_4 = 0$ (d) $5S_6 + 5S_5 + 2S_4 = 0$

20. Let $X = \{x \in N : 1 \le 1 \le 17\}$ and $Y = \{ax + b : x \in X$ and $a, b \in R, a > 0\}$. If mean and variance of elements of Y are 17 and 216 respectively then a + b is equal to :

(a) 7 (b) 9

(c) –7 (d) –27

21. Let $\vec{a}, \vec{b}$ and $\vec{c}$ be three unit vectors such that $|\vec{a} - \vec{c}|^2 + |\vec{a} - \vec{c}|^2 = 8$. Then $|\vec{a} + 2\vec{b}|^2 + |\vec{a} + 2\vec{c}|^2$ is equal to

22. If $\lim_{x \to 1} \frac{x + x^2 + x^3 + \cdots + x^n - n}{x-1} = 820$, (n ∈ N) then the value of n is equal to …….

23. The number of integral values of k for which the line, 3x + 4y = k intersects the circle, $x^2 + y^2 - 2x - 4y + 4 = 0$ at two distinct points is ………

24. If the letters of the word 'MOTHER' be permuted and all the words so formed (with or without meaning be listed as in a dictionary, then the position of the word 'MOTHER' is ……

25. The integral $\int_0^2 ||x-1| - 1| dx$ is equal to :

ANSWER

1. (a)	**2.** (c)	**3.** (c)	**4.** (a)	**5.** (b)	**6.** (a)	**7.** (d)	**8.** (d)	**9.** (b)	**10.** (a)
11. (b)	**12.** (d)	**13.** (d)	**14.** (b)	**15.** (b)	**16.** (b)	**17.** (a)	**18.** (b)	**19.** (b)	**20.** (c)
21. (02.00)	**22.** (40.00)	**23.** (09.00)	**24.** (309.00)	**25.** (01.50)					