MATHEMATICS - CET 2026 - VERSION CODE - B2
KEYS

1. If $\vec{a} = \hat{i} + \hat{j} + \hat{k}$, $\vec{b} = \hat{j} - \hat{k}$ and $\vec{a} \times \vec{c} = \vec{b}$, $\vec{a} \cdot \vec{c} = 3$, then $\vec{c}$ is

   (1) $\frac{5}{3}\hat{i} + \frac{2}{3}\hat{j} - \frac{2}{3}\hat{k}$ (2) $\frac{5}{3}\hat{i} - \frac{2}{3}\hat{j} + \frac{2}{3}\hat{k}$ (3) $\frac{5}{3}\hat{i} + \frac{2}{3}\hat{j} + \frac{2}{3}\hat{k}$ (4) $\frac{5}{3}\hat{i} - \frac{2}{3}\hat{j} - \frac{2}{3}\hat{k}$

   Ans (3)

   $\vec{b}$ is perpendicular to both $\vec{a}$ and $\vec{c}$

   $\therefore\ \vec{b} \cdot \vec{c} = 0 \Rightarrow$ (3) or (4)

   Checking for $\vec{a} \cdot \vec{c} = 3$, $\frac{5}{3} + \frac{2}{3} + \frac{2}{3} = \frac{9}{3} = 3$

2. The value of λ for which the vectors $\vec{a} = 2\hat{i} + \lambda\hat{j} + \hat{k}$ and $\vec{b} = \hat{i} + 2\hat{j} + 3\hat{k}$ are orthogonal is

   (1) $\frac{5}{2}$ (2) $\frac{-5}{2}$ (3) $\frac{2}{5}$ (4) $\frac{-2}{5}$

   Ans (2)

   $\vec{a} \cdot \vec{b} = 0 \Rightarrow 2 + 2\lambda + 3 = 0$

   $\Rightarrow \lambda = -\frac{5}{2}$

3. The angle between the lines whose direction ratios are a, b, c and b − c, c − a, a − b is

   (1) 90° (2) 60° (3) 30° (4) 0°

   Ans (1)

   Consider a(b − c) + b(c − a) + c(a − b) = ab − ac + bc − ab + ac − bc = 0

   $\therefore$ angle = 90°

4. The measure of the angle between the lines x = k + 1, y = 2k − 1, z = 2k + 3, k ∈ **R** and $\frac{x-1}{2} = \frac{y-2}{1} = \frac{z-3}{1}$ is

   (1) $\cos^{-1}\left(\frac{2}{3}\right)$ (2) $\cos^{-1}\left(\sqrt{\frac{2}{3}}\right)$ (3) $\cos^{-1}\left(\sqrt{\frac{3}{2}}\right)$ (4) $\cos^{-1}\left(\frac{3}{2}\right)$

   Ans (2)

   Given: $\frac{x-1}{1} = \frac{y+1}{2} = \frac{z-3}{2}$ and $\frac{x-1}{2} = \frac{y-2}{1} = \frac{z-3}{1}$

   $$\cos\theta = \frac{1(2)+2(1)+2(1)}{\sqrt{1+4+4}\,\sqrt{4+1+1}} = \frac{6}{3\times\sqrt{6}} = \frac{2}{\sqrt{6}} = \frac{\sqrt{2}\times\sqrt{2}}{\sqrt{3}\times\sqrt{2}} = \sqrt{\frac{2}{3}}$$

   $\theta = \cos^{-1}\left(\sqrt{\frac{2}{3}}\right)$

5. The line L_1 joining the two points (−1, 2) and (3, 6) divides the line L_2 which passes through (3, −1) in the ratio 1 : 3 internally, then the equation of L_2 is

   (A) 4x − 3y − 9 = 0 (2) 4x − 3y + 9 = 0 (3) 4x + 3y − 9 = 0 (4) 4x + 3y + 9 = 0

   Ans (3)

   Point of division $= \left(\frac{3-3}{4}, \frac{6+6}{4}\right) = (0, 3)$

Equation of L_2 is $\dfrac{y-3}{x-0} = \dfrac{-1-3}{3-0}$

$\Rightarrow \dfrac{y-3}{x} = \dfrac{-4}{3}$

$\Rightarrow 3y - 9 = -4x$

$\Rightarrow 4x + 3y - 9 = 0$

6. In the figure

Statement I: When $\alpha > \beta \geq 0$, the section is hyperbola

Statement II: When $\beta > 90°$, the section is ellipse

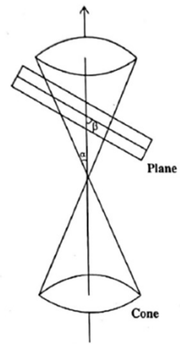
Which of the following is correct?

(1) Statement I is true, Statement II is false

(2) Statement I is false, Statement II is true

(3) Both the Statements are true

(4) Both the Statements are false



Ans (1)

7. The three points A(2, 4, 3), B (4, a, 9) and C(10, −1, 7) form a right-angled triangle with $\underline{|B} = 90°$, then the value of 'a' is

(1) 1 or 4 (2) −1 or 4 (3) 1 or −4 (4) −1 or −4

Ans (2)

$\overrightarrow{BA} \perp \overrightarrow{BC} \Rightarrow -2(6) + (4 - a)(-1 - a) + (-6)(-2) = 0$

$\Rightarrow a = 4, -1$

8. If $\lim\limits_{x\to3}\left(\dfrac{x^2 - ax - 3b}{x-3}\right) = 5$, then a + b =

(1) 1 (2) 2 (3) 3 (4) 4

Ans (3)

$\lim\limits_{x\to3}\left(\dfrac{x^2 - ax - 3b}{x-3}\right) = 5$

$9 - 3a - 3b = 0$

$a + b = 3$

9. If $f(x) = \begin{cases} x^2 - 1 & \text{if} \quad x \geq 2 \\ x + 1 & \text{if} \quad x < 2 \end{cases}$, then $\lim\limits_{x\to1} f(x) + \lim\limits_{x\to2} f(x) =$

(1) 3 (2) 5 (3) 7 (4) 9

Ans (2)

$f(x) = \begin{cases} x^2 - 1 & \text{if } x \geq 2 \\ x + 1 & \text{if } x < 2 \end{cases}$

$\lim\limits_{x\to1} f(x) + \lim\limits_{x\to2} f(x)$

$= \lim\limits_{x\to1}(x+1) + \lim\limits_{x\to2}(x^2 - 1)$

$= (1 + 1) + (4 - 1)$

$= 2 + 3 = 5$

10. If $y=\sqrt[3]{\tan x+y}$, then $\frac{dy}{dx}=$

(1) $\frac{\tan x}{3y^2-1}$ (2) $\frac{\sec^2 x}{3y-1}$ (3) $\frac{\tan x}{3y-1}$ (4) $\frac{\sec^2 x}{3y^2-1}$

Ans (4)

$y=\sqrt[3]{\tan x+y}$

$y^3 = \tan x + y$

$3y^2\frac{dy}{dx}=\sec^2 x+\frac{dy}{dx}$

$\frac{dy}{dx}\left(3y^2-1\right)=\sec^2 x$

$\frac{dy}{dx}=\frac{\sec^2 x}{3y^2-1}$

11. If $f(x)=\begin{cases} ax+7 & \text{if} \quad x<1 \\ 3x-1 & \text{if} \quad x=1 \\ \frac{x+3}{b} & \text{if} \quad x>1 \end{cases}$ is continuous at x = 1, then

(1) a = 5, b = 2 (2) a = – 5, b = – 2 (3) a = 5, b = – 2 (4) a = –5, b = 2

Ans (4)

$\lim_{x\to1^-} ax+7=\lim_{x\to1^+}\frac{x+3}{b}=f(1)$

$a+7=\frac{4}{b}=3(1)-1$

$a+7=\frac{4}{b}=2$

$a + 7 = 2$ $\frac{4}{b}=2$

$a = -5$ $b = 2$

12. The second order derivative of $\cos^{-1}(4x^3 - 3x)$ with respect to $\cos^{-1}(2x^2 - 1)$, where $\frac{1}{2}<x<1$ is

(1) 0 (2) $\frac{-1}{\sqrt{1-x^2}}$ (3) $\frac{3}{2}$ (4) $\frac{-3}{2}$

Ans (1)

$u=\cos^{-1}\left(4x^3-3x\right)=3\cos^{-1}x$

$v=\cos^{-1}\left(2x^2-1\right)=2\cos^{-1}x$

$\frac{du}{dv}=\frac{\frac{du}{dx}}{\frac{dv}{dx}}=\frac{3}{2}$

$\frac{d^2u}{dv^2}=0$

13. If $f(x)=\sin^{-1}\left(\frac{2x}{1+x^2}\right)$, then $f'\left(\frac{1}{2}\right)=$

(1) $\frac{8}{5}$ (2) $\frac{5}{8}$ (3) $\frac{4}{5}$ (4) 0

Ans (1)

$f(x)=\sin^{-1}\left(\frac{2x}{1+x^2}\right)$

$x = \tan\theta$

$f(x) = 2\tan^{-1} x$

$f'(x)=2\frac{1}{1+x^2}$

$f'\left(\frac{1}{2}\right)=2\frac{1}{1+\left(\frac{1}{2}\right)^2}=\frac{2}{1+\frac{1}{4}}=\frac{8}{5}$

14. If $\sqrt{x}\,\sqrt[3]{y}=(x+y)^n$ and $x\frac{dy}{dx}-y=0$, then n =

(1) 1 (2) $\frac{6}{5}$ (3) $\frac{5}{6}$ (4) $\frac{4}{9}$

Ans (3)

$\sqrt{x}\,\sqrt[3]{y}=(x+y)^n$

If $x^m y^n = (x+y)^{m+n}$ then

$\frac{dy}{dx}=\frac{y}{x}$

$x^{1/2}\, y^{1/3}=(x+y)^{\frac{1}{2}+\frac{1}{3}}$

$n=\frac{1}{2}+\frac{1}{3}=\frac{5}{6}$

15. In a Mahakumbh, a drone camera is moving along $3y = x^3 - 3$. When y-coordinate changes 9 times as fast as x-coordinate, it captures good quality pictures. Then one of the precise positions of the drone at that instant is

(1) (–3, –8) (2) (3, –8) (3) (3, 8) (4) (–3, 8)

Ans (3)

$\frac{dy}{dt}=9\frac{dx}{dt}$

Given $3y = x^3 - 3$ ... (1)

$\frac{3dy}{dt}=3x^2.\frac{dx}{dt}$

$\frac{9dx}{dt}=\frac{x^2dx}{dt}$

$\Rightarrow x = 3$ or $x = -3$

(1) $\Rightarrow y = 8$ $y = -10$

$\therefore$ (3, 8)

16. A Youtube short video is getting viral according to $f(t) = -2t^3 + 3t^2 + 5$. At what time does the video get maximum number of shares? (t is in hours)

(1) 1 (2) 2 (3) 3 (4) 4

Ans (1)

$f(t) = -2t^3 + 3t^2 + 5$

$f'(t) = -6t^2 + 6t = 0$

$\Rightarrow -6t(t-1) = 0$

$\Rightarrow t = 0$ or $t = 1$

$f''(t) = -12t + 6$

$f''(0) = 6 > 0$ point of local minima

$f''(1) = -6 < 0$ point of local maxima

$\therefore t = 1$

17. $\int x f(x)\,dx + \frac{f(x)}{2} = 0$, then f (x) is equal to

(1) e^{-2x} (2) e^{2x} (3) e^{-x^2} (4) e^{x^2}

Ans (3)

$\int x f(x)\,dx + \frac{f(x)}{2} = 0$

Keeping x and + in consideration, we can verify

Let $f(x) = e^{-x^2}$

$\Rightarrow \int x.e^{-x^2}\,dx$

Let $-x^2 = t$

$\Rightarrow -x\,dx = \frac{dt}{2}$

$= -\frac{1}{2}\int e^t\,dt$

$= -\frac{e^{-x^2}}{2}$

$\therefore -\frac{e^{-x^2}}{2} + \frac{e^{-x^2}}{2} = 0$

Aliter

$\int x f(x)\,dx = \frac{-f(x)}{2}$

$\Rightarrow \frac{d}{dx}\left(\frac{-f(x)}{2}\right) = x f(x)$

$\Rightarrow \frac{d}{dx}(f(x)) = -2x f(x)$

Keeping x and − 2 in consideration $f(x) = e^{-x^2}$

18. One of the possible functions f (x) which satisfies $\int_{-2}^{2} f(x)\,dx = 0$ is

(1) $\log\left(\frac{2+x}{2-x}\right)$ (2) sin (2 + x) (3) $2x^3 + 2x + 1$ (4) 2x tan x

Ans (1)

$\int_{-2}^{2} f(x)\,dx = 0$

$\Rightarrow$ f(x) should be odd function

Let $f(x)=\log\left(\frac{2+x}{2-x}\right)$

$f(-x)=\log\left(\frac{2-x}{2+x}\right)=\log\left(\frac{2+x}{2-x}\right)^{-1}$

$f(-x)=-\log\left(\frac{2+x}{2-x}\right)=-f(x)$

$\therefore$ odd function

19. $\int_{a-6}^{b-6} f(x+6)dx$ is equal to

(1) $\int_a^b f(x-6)dx$ (2) $\int_a^b f(x+6)dx$ (3) $\int_a^b f(x)dx$ (4) $\int_a^b f(-x)dx$

Ans (3)

$\int_{a-6}^{b-6} f(x+6)dx$

Let x + 6 = t $\Rightarrow$ dx = dt

When x = a – 6 $\Rightarrow$ t = a

x = b – 6 $\Rightarrow$ t = b

$\int_a^b f(t)dt=\int_a^b f(x)dx$

20. If ‘n’ is a natural number, then $\int\frac{\sin^n x}{\cos^{n+2} x}dx=$

(1) $\frac{\tan^{n-1} x}{n-1}+C$ (2) $\frac{\tan^n x}{n}+C$ (3) $\frac{\tan^{n+2} x}{n+2}+C$ (4) $\frac{\tan^{n+1} x}{n+1}+C$

Ans (4)

$\int\frac{\sin^n x}{\cos^{n+2} x}dx$

$=\int\tan^n x.\sec^2 x.dx$

Let tan x = t

$\Rightarrow \sec^2 x$. dx = dt

$=\int t^n dt=\frac{t^{n+1}}{n+1}+C \ =\frac{\tan^{n+1} x}{n+1}+C$

21. $\int e^{-x\log 2}2^x dx=$

(1) log x + C (2) x + C (3) $\frac{1}{x}+C$ (4) $\frac{x^2}{2}+C$

Ans (2)

$\int e^{-x\log 2}2^x dx$

$=\int e^{\log 2^{-x}}.2^x\ dx \ =\int 2^{-x}.2^x\ dx=\int 1.dx=x+C$

22. The area of the region bounded by the curve $y^2 = x^3$, the y-axis and the lines y = 1 and y = 8 is

(1) $\frac{155}{3}$ sq. units (2) $\frac{93}{5}$ sq. units (3) 93 sq. units (4) 155 sq. units

Ans (2)

Bounded by y-axis $y^2 = x^3$

$\therefore \int_1^8 x.dy$

$= \int_1^8 y^{2/3}\, dy$

$= \frac{3}{5}\left[y^{5/3}\right]_1^8$

$= \frac{3}{5}[32-1]$

$= \frac{93}{5}$ sq. units

23. The area enclosed by the curve $x = \sqrt{3}\cos\theta, y = \sqrt{3}\sin\theta$ is

(1) $\sqrt{3}\pi$ sq.units (2) 9π sq. units (3) 6π sq. units (4) 3π sq. units

Ans (4)

$x^2 + y^2 = 3$

$A = \pi a^2 = 3\pi$ sq. units

24. Sum of the squares of the order and degree (if defined) of a differential equation $2y' + (y'')^2 = \sqrt{y''-3}$ is

(1) 3 (2) 20 (3) 8 (4) 16

Ans (2)

$2y' + (y'')^2 = \sqrt{y''-3}$

$\left[2y' + (y'')^2\right]^2 = (y''-3)$

Order = 2

Degree = 4

$\Rightarrow 2^2 + 4^2 = 4 + 16$

$= 20$

25. If A = {a, b, c, d, e, f}, then the number of subsets of A which contains at least 2 elements is

(1) 64 (2) 65 (3) 57 (4) 59

Ans (3)

n (A) = 6

Required number of subsets = $2^6 - (1 + 6) = 64 - 7 = 57$

26. If A = {1, 2, 3, 4……..10}, then the number of non empty subsets of A containing only even number is

(1) 31 (2) 32 (3) 30 (4) 29

Ans (1)

Required number of subsets = $2^5 - 1 = 31$

27. The domain of the function $\sqrt{\frac{x-7}{9-x}}$ is

(1) (7, 9) (2) [7, 9) (3) [7, 9] (4) (7, 9]

Ans (2)

f is defined $\Rightarrow \frac{x-7}{9-x} \geq 0, \quad x \neq 9$

$(x-7)(x-9) \leq 0$

$x \in [7, 9)$

Aliter

If $\sqrt{\frac{x-a}{b-x}}$ then $x \in (a, b), a < b$

28. If n (A) = 2 and the number of relations from set A to set B is 1024, then n(B) is

(1) 2 (2) 5 (3) 2^5 (4) 5^2

Ans (2)

$2^{2q} = 1024 = 2^{10}$

$\Rightarrow 2q = 10$

$\Rightarrow q = 5$

29. Probability of at least one of the events A and B occur is 0.6. If A and B occur simultaneously with probability 0.2, then $P(\overline{A}) + P(\overline{B})$ is

(1) 1 (2) 0.8 (3) 0.6 (4) 1.2

Ans (4)

$P(A \cup B) = 0.6$

$P(A \cap B) = 0.2$

$0.6 = P(A) + P(B) - 0.2$

$0.8 = 1 - P(\overline{A}) + 1 - P(\overline{B})$

$P(\overline{A}) + P(\overline{B}) = 2 - 0.8 = 1.2$

30. The maximum value of $\sin\left(x+\frac{\pi}{6}\right)+\cos\left(x+\frac{\pi}{6}\right)$ is attained at x =

(1) $\frac{\pi}{2}$ (2) $\frac{\pi}{4}$ (3) $\frac{\pi}{6}$ (4) $\frac{\pi}{12}$

Ans (4)

Maximum value of $\cos\left(x+\frac{\pi}{6}\right)+\sin\left(x+\frac{\pi}{6}\right)$ occurs when $x+\frac{\pi}{6}=\frac{\pi}{4}$

$\Rightarrow x = \frac{\pi}{4}-\frac{\pi}{6}=\frac{\pi}{12}$

31. The angles of a triangle are in A.P and the greatest angle is double the least angle, then sine of the third angle is

(1) $\frac{\sqrt{3}}{2}$ (2) $\frac{1}{\sqrt{2}}$ (3) $\frac{1}{2}$ (4) 0

Ans (1)

Let a – d, a, a + d be the angles

$\Rightarrow a - d + a + a + d = 180°$

$\Rightarrow 3a = 180°$

$\Rightarrow a = 60°$ …(1)

Also, $a + d = 2(a - d)$

$\Rightarrow a - 3d = 0$

$\Rightarrow a = 3d$

$\Rightarrow 60° = 3d$

$\Rightarrow d = 20°$ ($\because$ from (1))

Now the angles are 40°, 60°, 80°

Required value is $\sin 60° = \frac{\sqrt{3}}{2}$

Aliter

$A + B + C = \pi$

$C = 2A$

32. The mean and standard deviation of 100 items are 50 and 4, respectively then the sum of all squares of the items is

(1) 250000 (2) 251600 (3) 256100 (4) 265100

Ans (2)

Given n = 100, $\overline{x} = 50$, $\sigma = 4$

$\Rightarrow \sigma^2 = 16$

We have, $\sigma^2 = \left(\frac{1}{n}\sum_{i=1}^{n} x_i^2\right) - \overline{x}^2$

$\Rightarrow 16 = \frac{1}{100}\sum_{i=1}^{100} x_i^2 - (50)^2$

$\Rightarrow 16 + 2500 = \frac{1}{100}\sum_{i=1}^{100} x_i^2$

$\Rightarrow 2516 = \frac{1}{100}\sum_{i=1}^{100} x_i^2$

$\Rightarrow \sum_{i=1}^{100} x_i^2 = 251600$

33. Probability of occurrence of an event A is 1/2 and that of B is 3/10. If A and B are mutually exclusive, then the probability of occurrence of neither A nor B is

(1) $\frac{4}{5}$ (2) $\frac{3}{5}$ (3) $\frac{2}{5}$ (4) $\frac{1}{5}$

Ans (4)

$P(A) = \frac{1}{2}, P(B) = \frac{3}{10}$

$P(A \cap B) = 0$

$P[(A \cup B)'] = 1 - P(A \cup B)$

$= 1 - [(P(A) + P(B)]$

$= 1 - \left[\frac{1}{2} + \frac{3}{10}\right]$

$= 1 - \frac{5+3}{10} = 1 - \frac{8}{10} = \frac{2}{10} = \frac{1}{5}$

34. Let R be the relation in the set N given by R = {(a, b) : a = b – 2, b > 6}. Which of the following is the correct answer?

(1) $(2, 4) \in R$ (2) $(3, 8) \in R$ (3) $(6, 8) \in R$ (4) $(8, 7) \in R$

Ans (3)

$R \subseteq N \times N$

b = 8 [$\because$ b > 6] and a = 6

By option verification $(6, 8) \in R$

35. $f(x) = (x + 1)^2$ for $x \geq 1$, g(x) is a function whose graph is the reflection of the graph of f(x) in the line y = x, then g(x) is

(1) $-\sqrt{x}-1$ (2) $\sqrt{x}+1$ (3) $\sqrt{x}-1$ (4) $\sqrt{x-1}$

Ans (3)

Let $f(x) = y \Rightarrow x = f^{-1}(y)$

Now, $(x + 1)^2 = y$

$\Rightarrow x+1=\sqrt{y}$

$\Rightarrow x=\sqrt{y}-1$ ($\because x \geq 1$ is positive)

i.e., $g(y)=\sqrt{y}-1$, here $g = f^{-1}$

Now, $g(x)=\sqrt{x}-1$

36. If $\sin^{-1} x + \sin^{-1} y = \pi/2$, then x^2 is equal to

(1) $1 - y^2$ (2) $1 + y^2$ (3) $\sqrt{1-y^2}$ (4) $\sqrt{1+y^2}$

Ans (1)

Given $\sin^{-1}x+\sin^{-1}y=\frac{\pi}{2}$

$\Rightarrow \sin^{-1}x+\cos^{-1}\left(\sqrt{1-y^2}\right)=\frac{\pi}{2}$

$\Rightarrow x=\sqrt{1-y^2}$

$\Rightarrow x^2 = 1 - y^2$

37. $\tan^{-1}\left(\frac{1}{1+1\times2}\right)+\tan^{-1}\left(\frac{1}{1+2\times3}\right)+....+\tan^{-1}\left(\frac{1}{1+n(n+1)}\right)=$

(1) $\tan^{-1}\left(\frac{n}{n+2}\right)$ (2) $\tan^{-1}\left(\frac{n+1}{n}\right)$ (3) $\tan^{-1}\left(\frac{n}{n+1}\right)$ (4) $\tan^{-1}\left(\frac{n+2}{n}\right)$

Ans (1)

$\tan^{-1}\left(\frac{2-1}{1+2(1)}\right)+\tan^{-1}\left(\frac{3-2}{1+3(2)}\right)+...+\tan^{-1}\left(\frac{n+1-n}{1+(n+1)n}\right)$

$= \tan^{-1} 2 - \tan^{-1} 1 + \tan^{-1} 3 - \tan^{-1} 2 + \ldots + \tan^{-1} n - \tan^{-1} (n-1) + \tan^{-1} (n+1) - \tan^{-1} n$

$= \tan^{-1}(n+1) - \tan^{-1} 1$

$=\tan^{-1}\left(\frac{n+1-1}{1+(n+1)(1)}\right)$

$=\tan^{-1}\left(\frac{n}{n+2}\right)$

38. The corner points of the feasible region determined by the system of linear constraints are (0, 10), (5, 5), (15, 15), (0, 20). Let z = px + qy where p, q > 0. The relation between p and q, so that the maximum z occurs at both points (15, 15) and (0, 20) is

(1) p = q (2) p = 2q (3) q = 2p (4) q = 3p

Ans (4)

z = px + qy

at (15, 15)

$z_{max} = 15p + 15q$ … (i)

at (0, 20)

$z_{max} = 0 + 20q$

20q = 15q + 15 p

5q = 15 p

q = 3p

39. In Linear Programming Problem (LPP), the objective function Z = ax + by has the same maximum value at two corner points. The number of points at which Z_{max} occurs is

(1) 1 (2) 2 (3) 0 (4) Infinity

Ans (4)

40. Probability of obtaining an even prime number on each die when a pair of dice is rolled is

(1) 0 (2) $\frac{1}{6}$ (3) $\frac{1}{12}$ (4) $\frac{1}{36}$

Ans (4)

E : {(2, 2)} n(s) = 6 × 6 = 36

$P(E) = \frac{1}{36}$

41. The probability that a man and his wife live after 20 years are $\frac{1}{4}$ and $\frac{1}{3}$ respectively. The probability that neither the man nor his wife live after 20 years is

(1) $\frac{3}{4}$ (2) $\frac{1}{12}$ (3) $\frac{7}{12}$ (4) $\frac{1}{2}$

Ans (4)

$P(M) = \frac{1}{4}$ $P(W) = \frac{1}{3}$

$P(\bar{M} \cap \bar{W}) = P(\bar{M})P(\bar{W})$

$= \frac{3}{4} \times \frac{2}{3}$

$= \frac{1}{2}$

42. Integrating factor of the differential equation $(1-x^2)\frac{dy}{dx} - xy = 1$ is

(1) $1 - x^2$ (2) $\frac{1}{2}\log|1-x^2|$ (3) $\frac{x}{1+x^2}$ (4) $\sqrt{1-x^2}$

Ans (4)

$(1-x^2)\frac{dy}{dx}-xy=1 \qquad \div(1-x^2)$

$\frac{dy}{dx}-\frac{x}{1-x^2}y=\frac{1}{1-x^2}$

$I.F = e^{\frac{1}{2}\int\frac{-2x}{1-x^2}dx}$

$= e^{\frac{1}{2}\log(1-x^2)}$

$= e^{\log\sqrt{1-x^2}}$

$= \sqrt{1-x^2}$

43. Recent studies suggest that 12% of the world population is left handed. Depending on parents' hand usage, the chances of having left handed children are as follows:

A: Both parents are left handed, chances of having left handed children = 24%

B: Both parents are right handed, chances of having left handed children = 9%

C: Father left handed and mother right handed, chances of having left handed children = 17%

D: Father right handed and mother left handed, chances of having left handed children = 22%

Given P(A) = P(B) = P(C) = P(D) = 1/4 and L denotes child is left handed. What is the probability that P(A|L)?

(1) $\frac{17}{100}$ (2) $\frac{19}{25}$ (3) $\frac{1}{3}$ (4) $\frac{2}{3}$

Ans (3)

$$P(A/L)=\frac{P(L/A)P(A)}{P(L/A)P(A)+P(L/B)P(B)+P(L/C)P(C)+P(L/D)\,P(D)}$$

$$=\frac{0.24\left(\frac{1}{4}\right)}{(0.24)\left(\frac{1}{4}\right)+(0.09)\left(\frac{1}{4}\right)+(0.17)\left(\frac{1}{4}\right)+(0.22)\left(\frac{1}{4}\right)}$$

$P(A)=P(B)=P(C)=P(D)=\frac{1}{4}$

$$P(A/L)=\frac{0.24}{0.24+0.09+0.17+0.22}=\frac{0.24}{0.72}=\frac{24}{72}=\frac{1}{3}$$

44. If α and β are acute angles such that α + β and α – β satisfy the equation $\tan^2\theta - 4\tan\theta + 1 = 0$, then α and β are respectively,

(1) 45°, 30° (2) 30°, 45° (3) 30°, 60° (4) 60°, 45°

Ans (1)

$\tan^2\theta - 4\tan\theta + 1 = 0$

$\tan\theta=\frac{4\pm\sqrt{16-4}}{2}=2\pm\sqrt{3}$

$\tan(\alpha+\beta)=2+\sqrt{3},\ \tan(\alpha-\beta)=2-\sqrt{3}$

$= \tan 75° \qquad = \tan 15°$

$\alpha+\beta = 75° \qquad \alpha-\beta = 15°$

$\alpha = 45°, \beta = 30°$

45. $\sum_{n=1}^{4}\left(\sqrt{-1}\right)^{2n}$ = ____________

(1) 2 (2) –i (3) 0 (4) i

Ans (3)

$$\sum_{n=1}^{4}\left(\sqrt{-1}\right)^{2n} = \sum_{n=1}^{4} i^{2n}$$

$= i^2 + i^4 + i^6 + i^8$

$= -1 + 1 + (-1) + 1$

$= 0$

46. The solution of $3(x - 1) \le 2(x - 3)$ is

(1) $x \le -3$ (2) $x \ge -3$ (3) $x \le 3$ (4) $x \ge 3$

Ans (1)

$3(x - 1) \le 2(x - 3)$

$3x - 3 \le 2x - 6$

$3x - 3 - 2x \le 2x - 6 - 2x$

$x - 3 \le -6$

$x - 3 + 3 \le -6 + 3$

$x \le -3$

47. 10 distinct points are taken on a circle. Then using these points

Statement I: The number of triangles that can be formed is 100

Statement II: The number of chords that can be formed is 45

Which of the following is correct?

(1) Both Statement I and Statement II are true (2) Both Statement I and Statement II are false

(3) Statement I is true and Statement II is false (4) Statement I is false and Statement II is true

Ans (4)

Statement I: Number of triangles = $^{10}C_3 = 120$

Statement II: Number of chords $^{10}C_2 = 45$

48. How many ways can you arrange all the letters and numbers in "KCET 2025'' which start with K and end with 5?

(1) 720 (2) 360 (3) 120 (4) 180

Ans (2)

K							5

$$\frac{6!}{2!} = \frac{720}{2} = 360$$

49. The value at $x = 2$ for $\frac{x^3 + 3x^2 + 3x + 1}{x^4 + 4x^3 + 6x^2 + 4x + 1}$ = _____

(1) 3 (2) $\frac{25}{61}$ (3) $\frac{1}{3}$ (4) $\frac{19}{73}$

Ans (3)

$$\frac{x^3 + 3x^2 + 3x + 1}{x^4 + 4x^3 + 6x^2 + 4x + 1} = \frac{(x+1)^3}{(x+1)^4} = \frac{1}{x+1}$$

At $x = 2, \frac{1}{x+1} = \frac{1}{2+1} = \frac{1}{3}$

50. If we insert two numbers between $\sqrt{2}$ and 4 so that the resulting sequence is in G.P, then the inserted numbers in the order are

(1) $8, \sqrt{2}$ (2) $2, \sqrt{8}$ (3) $\sqrt{8}, 2$ (4) $\sqrt{2}, 8$

Ans (2)

$a = \sqrt{2} \quad b = 4 \quad n = 2$

WKT $r = \left(\frac{b}{a}\right)^{\frac{1}{n+1}} = \left(\frac{4}{\sqrt{2}}\right)^{\frac{1}{2+1}} = \left[\frac{2^2}{2^{\frac{1}{2}}}\right]^{\frac{1}{3}}$

$= \left[2^{2-\frac{1}{2}}\right]^{\frac{1}{3}} = \left(2^{\frac{3}{2}}\right)^{\frac{1}{3}} = 2^{\frac{1}{2}} = \sqrt{2}$

$\therefore$ Numbers are $(\sqrt{2})\cdot(\sqrt{2}) = 2$ and $(2\sqrt{2}) = \sqrt{8}$

51. Match List-I with List-II

List-I		**List-II**	
a)	A matrix which is not a square matrix	i)	Symmetric matrix
b)	A square matrix $A' = A$	ii)	Null matrix
c)	The diagonal elements of a diagonal matrix are same	iii)	Rectangular matrix
d)	A matrix which is both symmetric and skew symmetric	iv)	Scalar matrix

Codes:

(1) a – iii, b – i, c – ii, d - iv (2) a – iii, b – ii, c – iv, d - i

(3) a – iii, b – i, c – iv, d - ii (4) a – iii, b – iv, c – i, d - ii

Ans (3)

a – iii, b – i, c – iv, d - ii

52. Consider the following statements:

Statement I: If A is a non-singular matrix, then A^{-1} exists.

Statement II: If A and B are symmetric matrices of same order, then (AB – BA) is a skew symmetric matrix

Choose the correct option

(1) Statement I is true and Statement II is false (2) Statement I is false and Statement II is false

(3) Statement I is true and Statement II is true (4) Statement I is false and Statement II is true

Ans (3)

AB – BA is a skew symmetric matrix

53. A row matrix has only

(1) One element (2) One row with one or more columns

(3) One column with one or more rows (4) One row and one column

Ans (2)

54. Let X be a matrix of order $2 \times n$ and Z be a matrix of order $2 \times p$. If n = p, then the order of the matrix 8X – 9Z is

(1) $2 \times n$ (2) $p \times 2$ (3) $n \times 3$ (4) $p \times n$

Ans (1)

$x = 2 \times n$

$z = 2 \times p$

$n = p \qquad \therefore 2 \times n$

55. Which of the following is correct?

(1) Determinant is a square matrix

(2) Determinant is a number associated to a matrix

(3) Determinant is a unique number associated to a square matrix

(4) Determinant is not defined for a square matrix

Ans (3)

Definition

56. If A and B are invertible matrices of same order, then which of the following is not correct?

(1) A. (adj A) = (adj A) . A = AI

(2) A(adj A) = (adj A) . A = |A|I

(3) $(AB)^{-1} = B^{-1}A^{-1}$

(4) $|A| \neq 0, |B| \neq 0$

Ans (1)

Definition

57. If A and B are invertible square matrices of order n, then which of the following is not correct?

(1) det (AB) = det (A) . det (B)

(2) det (kA) = k^n det (A)

(3) det (A + B) = det (A) + det (B)

(4) $\det(A') = \dfrac{1}{\det(A^{-1})}$

Ans (3)

Property

58. The area of the triangle with vertices (3, 8), (–4, 2) and (5, 1) is $\dfrac{P}{4}$, then the value of P is

(1) $\dfrac{61}{2}$

(2) $\dfrac{2}{61}$

(3) 122

(4) $\dfrac{1}{122}$

Ans (3)

$$\frac{P}{4} = \frac{1}{2}\begin{vmatrix} 3 & 8 & 1 \\ -4 & 2 & 1 \\ 5 & 1 & 1 \end{vmatrix}$$

$$\frac{P}{2} = |3(2-1) - 8(-4-5) + 1(-4-10)|$$

$$\frac{P}{2} = |3(1) - 8(-9) - 14|$$

$$\frac{P}{2} = 61$$

P = 122

59. The system of equations x + 2y = 3 and 2x + 3y = 3 has

(1) No solution

(2) Unique solution

(3) Infinite solutions

(4) Only two solutions

Ans (2)

x + 2y = 3

2x + 3y = 3

$$\frac{a_1}{a_2} \neq \frac{b_1}{b_2} \quad \frac{1}{2} \neq \frac{2}{3}$$

60. If $\vec{a} = 2\hat{i} + 2\hat{j} - k$, $\vec{b} = \alpha\hat{i} + \beta\hat{i} + 2\hat{k}$ and $|\vec{a} + \vec{b}| = |\vec{a} - \vec{b}|$, then $\alpha + \beta$ is equal to

(1) 2 (2) –1 (3) 0 (4) 1

Ans (4)

$|\vec{a} + \vec{b}| = |\vec{a} - \vec{b}|$

$\Rightarrow \vec{a} \cdot \vec{b} = 0$

$\Rightarrow 2(\alpha) + 2(\beta) - 1(2) = 0$

$2\alpha + 2\beta - 2 = 0$

$\alpha + \beta = 1$

* * *