MATHEMATICS
KARNATAKA CET - 2025

Version: **C-2**

KEY ANSWERS

1	**2**	16	**4**	31	**1**	46	**2**
2	**3**	17	**4**	32	**1**	47	**4**
3	**2**	18	**3**	33	**2**	48	**4**
4	**1**	19	**1**	34	**3**	49	**1**
5	**3**	20	**1**	35	**3**	50	**4**
6	**3**	21	**2**	36	**1**	51	**1**
7	**4**	22	**2**	37	**2**	52	**1**
8	**1**	23	**1**	38	**3**	53	**2**
9	**1**	24	**1**	39	**3**	54	**3**
10	**2**	25	**2**	40	**2**	55	**3**
11	**3**	26	**1**	41	**3**	56	**4**
12	**3**	27	**3**	42	**4**	57	**3**
13	**4**	28	**4**	43	**2**	58	**2**
14	**3**	29	**3**	44	**4**	59	**4**
15	**4**	30	**3**	45	**1**	60	**3**

1. If a matrix $A = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$ satisfies $A^6 = kA'$, then the value of k is

(1) 6 (2) 32 (3) 1 (4) $\frac{1}{32}$ **Ans: (2)**

Solution: $A = \begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix} \Rightarrow A^2 = 2A$; $A' = A$; $A^3 = 2A^2 = 4A$

$\therefore A^6 = 8A^3 = 32A = 32A' = kA' \Rightarrow k = 32$

2. If $A = \begin{bmatrix} k & 2 \\ 2 & k \end{bmatrix}$ and $|A^3| = 125$, then the value of k is

(1) – 4 (2) ± 2 (3) ± 3 (4) –5 **Ans: (3)**

Solution: $|A| = k^2 - 4 \therefore |A^3| = |A|^3 = (k^2 - 4)^3 = 5^3 \Rightarrow k^2 - 4 = 5$

$\therefore k^2 = 9 \therefore k = \pm 3$

3. If A is a square matrix satisfying the equation $A^2 - 5A + 71 = 0$, where I is the identity matrix and 0 is null matrix of same order, then $A^{-1} =$

(1) $\frac{1}{5}(7I - A)$ (2) $\frac{1}{7}(5I - A)$ (3) $\frac{1}{7}(A - 5I)$ (4) $7(51 - A)$ **Ans: (2)**

Solution: $A^2 - 5A + 7I = 0 \Rightarrow A - 5I + 7A^{-1} = 0 \Rightarrow A^1 = \frac{1}{7}(5I - A)$

4. If A is a square matrix of order 3 × 3, det A = 3, then the value of det $(3A^{-1})$ is

(1) 9 (2) $\frac{1}{3}$ (3) 3 (4) 27 **Ans: (1)**

Solution: $|3A^{-1}| = 3^3 . |A^{-1}| = 3^3 . \frac{1}{|A|} = 3^3 . \frac{1}{3} = 9$

5. If $B = \begin{bmatrix} 1 & 3 \\ 1 & \alpha \end{bmatrix}$ be the adjoint of a matrix A and $|A| = 2$, then the value of a is

(1) 3 (2) 4 (3) 5 (4) 2 **Ans: (3)**

Solution: $|B| = |\text{adj}\,A| = |A| = \alpha - 3 = 2 \Rightarrow \alpha = 5$

6. The system of equations $4x + 6y = 5$ and $8x + 12y = 10$ has
(1) Only two solutions (2) No solution
(3) Infinitely many solutions (4) A unique solution **Ans: (3)**
Solution: Second equation is the same as the first equation.

7. If $\vec{a} = \hat{i} + 2\hat{j} + \hat{k}$, $\vec{b} = \hat{i} - \hat{j} - 4\hat{k}$ and $\vec{c} = \hat{i} + \hat{j} + \hat{k}$ are such that $\vec{a} + \lambda\vec{b}$ is perpendicular to $\vec{c}$, then the value of λ is
(1) 0 (2)1 (3) ±1 (4) – 1 **Ans: (4)**
Solution: $\vec{a} + \lambda\vec{b} = (1 + \lambda)i + (2 - \lambda)j + (1 + 4\lambda)k$
$(\vec{a} + \lambda\vec{b}) . \vec{c} = 0 \Rightarrow 1 + \lambda + 2 - \lambda + 1 + 4\lambda = 0 \Rightarrow \lambda = -1$

8. If $|\vec{a}| = 10$, $|\vec{b}| = 2$ and $\vec{a}.\vec{b} = 12$, then the value of $|\vec{a} \times \vec{b}|$ is
(1) 16 (2) 5 (3) 10 (4)14 **Ans: (1)**
Solution: $|\vec{a} \times \vec{b}|^2 + (\vec{a} . \vec{b})^2 = |\vec{a}|^2 |\vec{b}|^2$
$\Rightarrow |\vec{a} \times \vec{b}|^2 + 144 = 100 \times 4 \Rightarrow |\vec{a} \times \vec{b}| = \sqrt{256} = 16$

9. Consider the following statements:
Statement(I) : If either $|\vec{a}| = 0$ or $|\vec{b}| = 0$, then $\vec{a} . \vec{b} = 0$.
Statement (II) : If $\vec{a} \times \vec{b} = 0$, then $\vec{a}$ is perpendicular to $\vec{b}$.
Which of the following is correct?
(1) Both Statement (I) and Statement (II) are false
(2) Statement (I) is true but Statement (II) is false
(3) Statement (I) is false but Statement (II) is-true
(4) Both Statement (I) and Statement (II) are true **Ans: (1)**

10. If a line makes angles 90^o, $60°$ and θ with x, y and z axes respectively, where θ is acute, then the value of θ is
(1) $\frac{\pi}{2}$ (2) $\frac{\pi}{6}$ (3) $\frac{\pi}{4}$ (4) $\frac{\pi}{3}$ **Ans: (2)**
Solution: $\cos^2 90^o + \cos^2 60^o + \cos^2 \theta = 1 \Rightarrow \theta = 30^o$ i.e. $\frac{\pi}{6}$

11. The equation of the line through the point (0, 1, 2) and perpendicular to the line $\frac{x-1}{2} = \frac{y+1}{3} = \frac{z-1}{-2}$ is
(1) $\frac{x}{3} = \frac{y-1}{-4} = \frac{z-2}{3}$ (2) $\frac{x}{3} = \frac{y-1}{4} = \frac{z-2}{-3}$
(3) $\frac{x}{-3} = \frac{y-1}{4} = \frac{z-2}{3}$ (4) $\frac{x}{3} = \frac{y-1}{4} = \frac{z-2}{3}$ **Ans: (3)**
Solution: All the lines in the options are through the point (0, 1, 2). But ⊥ condition is satisfied by the line (3) because (2) (– 3) + 3(4) + (– 2) (3) = 0.

12. A line passes through (– 1, – 3) and perpendicular to $x + 6y = 5$. Its x intercept is
(1) 2 (2) $\frac{1}{2}$ (3) $-\frac{1}{2}$ (4) – 2 **Ans: (3)**
Solution: $6x - y = -6 + 3$
Put $y = 0 \Rightarrow 6x = -3 \therefore x = -\frac{1}{2}$

13. The length of the latus rectum of $x^2 + 3y^2 = 12$ is

(1) 24 units (2) $\frac{2}{3}$ units (3) $\frac{1}{3}$ units (4) $\frac{4}{\sqrt{3}}$ units **Ans: (4)**

Solution: $\frac{x^2}{12} + \frac{y^2}{4} = 1 \therefore LR = 2 . \frac{b^2}{a} = 2 . \frac{4}{2\sqrt{3}} = \frac{4}{\sqrt{3}}$

14. $\lim_{x \to 1} \frac{x^4 - \sqrt{x}}{\sqrt{x} - 1}$ is

(1) $\frac{1}{2}$ (2) 0 (3) 7 (4) does not exist **Ans: (3)**

Solution: $l = \lim_{x \to 1} \sqrt{x} \frac{\left(\left(\sqrt{x}\right)^7 - 1\right)}{\sqrt{x} - 1} = 1 \times 7 \times 1^6 = 7$

Aliter: $l = \lim_{x \to 1} \frac{4x^3 - \frac{1}{2\sqrt{x}}}{\frac{1}{2\sqrt{x}}} = \frac{4 - \frac{1}{2}}{\frac{1}{2}} = 7$

15. If $y = \frac{\cos x}{1 + \sin x}$, then

(a) $\frac{dy}{dx} = \frac{-1}{1 + \sin x}$ (b) $\frac{dy}{dx} = \frac{1}{1 + \sin x}$

(c) $\frac{dy}{dx} = -\frac{1}{2}\sec^2\left(\frac{\pi}{4} - \frac{x}{2}\right)$ (d) $\frac{dy}{dx} = \frac{1}{2}\sec^2\left(\frac{\pi}{4} - \frac{x}{2}\right)$

(1) Both b and d are correct (2) Only b is correct

(3) Only a is correct (4) Both a and c are correct **Ans: (4)**

Solution: $y = \frac{\cos x}{1 + \sin x} = \frac{\sin\left(\frac{\pi}{2} - x\right)}{1 + \cos\left(\frac{\pi}{2} - x\right)} = \tan\left(\frac{\pi}{4} - \frac{x}{2}\right)$

$\therefore \frac{dy}{dx} = \sec^2\left(\frac{\pi}{4} - \frac{x}{2}\right) \times \left(-\frac{1}{2}\right) = -\frac{1}{2}\sec^2\left(\frac{\pi}{4} - \frac{x}{2}\right)$, which is (c)

Also, $\frac{dy}{dx} = \frac{\left((1 + \sin x)(-\sin x) - \cos x . \cos x\right)}{(1 + \sin x)^2} = \frac{-(\sin x + 1)}{(1 + \sin x)^2} = \frac{-1}{1 + \sin x}$, which is (a)

16. Match the following:

In the following, [x] denotes the greatest integer less than or equal to x.

Column-I	Column-11
(a) $x\lvert x\rvert$	(i) continuous in (– 1, 1)
(b) $\sqrt{\lvert x\rvert}$	(ii) differentiable in (– 1, 1)
(c) $x + [x]$	(iii) strictly increasing in (– 1, 1)
(d) $\lvert x - 1\rvert + \lvert x + 1\rvert$	(iv) not differentiable at, at least one point in (– 1, 1)

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

(3) a – iv, b – iii, c – i, d – ii (4) a – ii, b – iv, c – iii, d – i **Ans: (4)**

Solution: (a) $x\lvert x\rvert$ is (i) , (ii) , (iii)

(b) is (ii), (iii) , (iv)

(c) is (iii) $\therefore$ option (4)

17. The function $f(x) = \begin{cases} e^x + ax , & x < 0 \\ b(x - 1)^2 , & x \geq 0 \end{cases}$ is differentiable at x = 0. Then

(1) a = 3, b = 1 (2) a = 1, b = 1 (3) a = 3, b = 1 (4) a = – 3, b = 1 **Ans: (4)**

Solution: Continuous at x = 0 $\Rightarrow e^o + o = b(0 - 1)^2 \Rightarrow b = 1$

LHD = RHD $\Rightarrow e^o + 1 = b . 2(0 - 1) \Rightarrow a = -2b - 1 = -3$

18. A function $f(x)=\begin{cases}\dfrac{e^{\frac{1}{x}}-1}{e^{\frac{1}{x}+1}}, & \text{if } x\neq 0\\ 0, & \text{if } x=0\end{cases}$, is

(1) differentiable at x = 0, but not continuous at x = 0
(2) continuous at x = 0
(3) not continuous at x = 0
(4) differentiable at x = 0 **Ans: (3)**

Solution: $\lim\limits_{x\to o^-} f(x)=\dfrac{e^{-\infty}-1}{e^{-\infty}+1}=-1\neq f(o)$

$\therefore$ f(x) is not continuous at x = 0

19. If y = a $\sin^3 t$, x = a $\cos^3 t$, then $\dfrac{dy}{dx}$ at $t=\dfrac{3\pi}{4}$ is

(1) 1 (2) – 1 (3) $\dfrac{1}{\sqrt{3}}$ (4) $-\sqrt{3}$ **Ans: (1)**

Solution: $\dfrac{dy}{dx}=\dfrac{.\,3\sin^2 t\,.\,\cos t}{a\,.\,3\cos^2 t(-\sin t)}=-\tan t$

At $t=\dfrac{3\pi}{4}$, $\dfrac{dy}{dx}=-(-1)=1$

20. The derivative of sin x with respect to log x is

(1) $\dfrac{\cos x}{x}$ (2) cos x (3) x cos x (4) $\dfrac{\cos x}{\log x}$ **Ans: (3)**

Solution: $u=\sin x\ ;\ v=\log x\ \therefore \dfrac{du}{dv}=\dfrac{\cos x}{\left(\frac{1}{x}\right)}=x\cos x$

21. The minimum value of 1 – sin x is

(1) 2 (2) 0 (3) – 1 (4) 1 **Ans: (2)**

Solution: Min(1 – sin x) = 1 – max (sin x) = 1 – 1 = 0

22. The function f (x) = tan x – x

(1) neither increases nor decreases (2) always increases
(3) always decreases (4) never increases **Ans: (2)**

Solution: $f'(x)=\sec^2 x-1\geq 0, \forall x$ $\therefore$ f(x) is increasing $\forall x$

23. The value of $\int\dfrac{dx}{(x+1)(x+2)}$ is

(1) $\log\left|\dfrac{x+1}{x+2}\right|+c$ (2) $\log\left|\dfrac{x-1}{x+2}\right|+c$ (3) $\log\left|\dfrac{x-1}{x-2}\right|+c$ (4) $\log\left|\dfrac{x+2}{x+1}\right|+c$ **Ans: (1)**

Solution: $\dfrac{1}{(x+1)(x+2)}=\dfrac{1}{x+1}-\dfrac{1}{x+2}$

$\therefore I=\log|x+1|-\log|x+2|=\log\left|\dfrac{x+1}{x+2}\right|+c$

24. The value of $\int_{-1}^{1}\sin^5 x\cos^4 x\,dx$ is

(1) 0 (2) $\dfrac{-\pi}{2}$ (3) π (4) $\dfrac{\pi}{2}$ **Ans: (1)**

Solution: I = 0, by a property [$\sin^5 x\,.\,\cos^4 x$ is odd]

25. The value of $\int_0^{2x} \sqrt{1+\sin\left(\frac{x}{2}\right)}dx$ is

(1) 0 (2) 8 (3) 4 (4) 2 **Ans: (2)**

Solution: $I = \int_0^{2\pi}\left(\sin\frac{x}{4}+\cos\frac{x}{4}\right)dx = \left(-4\cos\frac{x}{4}+4\sin\frac{x}{4}\right)\Big|_0^{2\pi} = (-4\times 0+4\times 1)+4 = 8$

26. $\int \frac{dx}{x^2(x^4+1)^{3/4}}$ equals

1) $-\left(\frac{x^4+1}{x^4}\right)^{\frac{1}{4}}+c$ 2) $\left(\frac{x^4+1}{x^4}\right)^{\frac{1}{4}}+c$ 3) $(x^4+1)^{\frac{1}{4}}+c$ 4) $-(x^4+1)^{\frac{1}{4}}+c$ **Ans: (1)**

Solution: $I = \int \frac{dx}{x^2 . x^3\left(1+\frac{1}{2^4}\right)^{\frac{2}{4}}} = -\frac{1}{4}\int\left(1+\frac{1}{x^4}\right)^{-\frac{3}{4}} . d\left(1+\frac{1}{x^4}\right)$

$= -\frac{1}{4} . \frac{\left(1+\frac{1}{x^4}\right)}{\frac{1}{4}} = -\left(1+\frac{1}{x^4}\right)^{\frac{1}{4}} = -\left(\frac{x^4+1}{x^4}\right)^{\frac{1}{4}}$

27. $\int_0^1 \log\left(\frac{1}{x}-1\right) dx$ is

(1) $\log_e\left(\frac{1}{2}\right)$ (2) 1 (3) 0 (4) $\log_e 2$ **Ans: (3)**

Solution: $I = \int_0^1 \log\frac{1-x}{x}dx = \int_0^1 \log(1-x)dx - \int_0^1 \log x\, dx$

$= 0 \because \int_0^1 \log x\, dx = \int_0^1 \log(1-x)dx$, by a property

28. The area bounded by the curve $y = \sin\left(\frac{x}{3}\right)$, x-axis, the lines $x = 0$ and $x = 3\pi$ is

(1) 3 sq. units (2) 9 sq. units 3) $\frac{1}{3}$ sq. units (4) 6 sq. units **Ans: (4)**

Solution: $A = \int_0^1 \sin\frac{x}{3}dx = -3\cos\frac{x}{3}\Big|_0^{3\pi} = -3(-1-1) = 6$

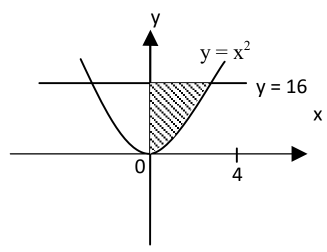
29. The area of the region bounded by the curve $y = x^2$ and the line $y = 16$ is

(1) $\frac{128}{3}$ sq. units (2) $\frac{32}{3}$ sq. units 3) $\frac{256}{3}$ sq. units (4) $\frac{64}{3}$ sq. units **Ans: (4)**

Solution: $A = 2\int_0^{16} x\,dy$

$= 2\int_0^{16}\sqrt{y}dy = 2 . \frac{2}{3}y^{\frac{3}{2}}\Big|_0^{16}$

$= \frac{4}{3}\left(16\sqrt{16}-0\right) = \frac{256}{3}$



30. General solution of the differential equation $\frac{dy}{dx} + y\tan x = \sec x$ is

(1) $x\sec x = \tan y + c$ (2) $y\sec x = \tan x + c$
(3) $y\tan x = \sec x + c$ (4) $\text{cosec}\, x = y\tan x + c$ **Ans: (2)**

Solution: If $= e^{\int \tan x\, dx} = e^{\log\sec x} = \sec x$

$\therefore$ G.S. is (y(sec x) = $\int \sec x . \sec x\, dx + c$ i.e. y(sec x) = tan x + e

31. If 'a' and 'b' are the order and degree respectively of the differentiable equation
$\left(\frac{d^2y}{dx^2}\right)^2 + \left(\frac{dy}{dx}\right)^3 + x^4 = 0$, then a – b =
(1) 0 (2) 1 (3) 2 (4) –1 **Ans. (1)**
Solution: order = 2; degree = 2
a = 2, b = 2 } a – b = 0

32. The distance of the point P(–3, 4, 5) from yz plane is
(1) 3 units (2) 4 units 3) 5 units (4) – 3 units **Ans. (1)**
Solution: P(– 3, 4, 5) to the point Q(0, 4, 5) ∴ PQ = 3 or it is the |x – coordinate|

33. If A = {x: x is an integer and $x^2 - 9 = 0$}
B = {x: x is a natural number and $2 \le x < 5$}
C = {x: x is a prime number ≤ 4}
Then (B – C) ∪ A is,
(1) (2, 3, 5} (2) {–3, 3, 4} (3) {2, 3, 4} (4){3, 4, 5} **Ans. (2)**
Solution: A = {–3, 3}, B = {2, 3, 4}, C = {2, 3} ∴ B – C = {4} ∴ (B – C) ∪ A = {–3, 3, 4}

34. A and B are two sets having 3 and 6 elements respectively. Consider the following statements.
Statement (I): Minimum number of elements in A ∪ B is 3
Statement (II): Maximum number of elements in A ∩ B is 3
Which of the following is correct?
(1) Both statements (I) and (II) are false
(2) Statement (I) is true, statement (II) is false
(3) Statement (I) is false, statement (II) is true
(4) Both statements (I) and **(II)** are true **Ans. (3)**
Solution: n(A) = 3, n(B) = 6
∴ Min no. of elements in A ∪ B is 6
∴ Max no. of elements in A ∩ B is 3
∴ (I) is false, (II) is true

35. Domain of the function f, given by f(x) = $\frac{1}{\sqrt{(x-2)(x-5)}}$ is
(1) (– ∞, 3] ∪ (5, ∞) (2) (– ∞, 2] ∪ [5, ∞)
(3) (– ∞, 2) ∪ (5, ∞) (4) (– ∞, 3) ∪ [5, ∞) **Ans. (3)**
Solution: (x – 2) (x – 5) > 0 ⇒ x ∈ (∞, 2) ∪ (5, ∞)

36. If f(x) = sin[π^2] x – sin [–π^2] x, where [x] = greatest integer ≤ x, then which of the following is not true?
(1) f(π) = –1 (2) f(0) = 0 (3) $f\left(\frac{\pi}{2}\right) = 1$ (4) $f\left(\frac{\pi}{4}\right) = 1 + \frac{1}{\sqrt{2}}$ **Ans. (1)**
Solution: f(x) = sin 9x + sin 10x
1) f(π) = sin 9π + sin 10π = 0 ≠ –1
2) f(0) = 0 + 0 = 0
3) $f\left(\frac{\pi}{2}\right) = \sin\frac{9\pi}{2} + \sin\frac{10\pi}{2} = 1$
4) $f\left(\frac{\pi}{4}\right) = \sin\frac{9\pi}{4} + \sin\frac{10\pi}{4} = \frac{1}{\sqrt{2}} + 1$
} are true

37. Which of the following is not correct?
(1) tan 45° = tan (– 315°) (2) cos 5π = cos 4π
(3) sin 2π = sin (– 2π) (4) sin 4π = sin 6π **Ans. (2)**
Solution: cos 5π = –1 ; cos 4π = 1

38. If $\cos x + \cos^2 x = 1$, then the value of $\sin^2 x + \sin^4 x$ is
(1)2 (2) –1 (3)1 (4) 0 **Ans. (3)**
Solution: $\cos x = 1 - \cos^2 x = \sin^2 x$
$\therefore \sin^2 x + \sin^4 x = \sin^2 x + \cos^2 x = 1$

39. The mean deviation about the mean for the data 4,7,8, 9, 10, 12, 13, 17 is
(1) 4.03 (2) 10 (3) 3 (4) 8.5 **Ans. (3)**
Solution:

x	$\lvert x - \bar{x} \rvert$
4	6
7	3
8	2
9	1
10	0
12	2
13	3
17	7

$\Sigma x = 80;\ n = 8$

$\therefore\ \bar{x} = \frac{\Sigma x}{n} = 10$

$\Sigma|x - \bar{x}| = 24$

$\therefore\ MD(\bar{x}) = \frac{\Sigma|x - \bar{x}|}{n} = \frac{24}{8} = 3$

40. A random experiment has five outcomes w_1, w_2, w_3, w_4 and w_5. The probabilities of the occurrence of the outcomes w_1, w_2, w_4 and w_5 are respectively $\frac{1}{6}$, a, b and $\frac{1}{12}$ such that $12a + 12b - 1 = 0$. Then the probabilities of occurrence of the outcome w_3 is
(1) $\frac{1}{12}$ (2) $\frac{2}{3}$ (3) $\frac{1}{3}$ (4) $\frac{1}{6}$ **Ans. (2)**
Solution: $P(w_1) + P(w_2) + P(w_3) + P(w_4) + P(w_5) = 1$

$\frac{1}{6} + a + P(w_3) + b + \frac{1}{12} = 1$

$P(w_3) = 1 - \frac{1}{6} - \frac{1}{12} - a - 6 = \frac{12 - 2 - 1 - 12a - 12b}{12}$

$= \frac{10 - (12a + 12b + 1)}{12} = \frac{10 - (1 + 1)}{12}$ $(\because\ 12a + 12b = 1)$

$= \frac{2}{3}$

41. A die has two faces each with number '1', three faces each with number '2' and one face with number '3'. If the die is rolled once, then P(1 or 3) is
(1) $\frac{1}{6}$ (2) $\frac{2}{3}$ (3) $\frac{1}{2}$ (4) $\frac{1}{3}$ **Ans. (3)**
Solution: $P(1\ \text{or}\ 3) = \frac{2}{6} + \frac{1}{6} = \frac{3}{6} = \frac{1}{2}$

42. Let A = {a, b, c}, then the number of equivalence relations on A containing (b, c) is
(1) 4 (2) 1 (3) 3 (4) 2 **Ans. (4)**
Solution: R_1 = {(a, a), (b, b), (c, c), b, c), (c, b)}
R_2 = {(a, a), (b, b), (c, c), (b, c), (c, b), (a, b), (b, a), (a, c), (c, a)}
2 equivalence relations possible containing (b, c)

43. Let the functions "f" and "g" be f: $\left[0, \frac{\pi}{2}\right] \to R$ given by f(x) = sin x and g: $\left[0, \frac{\pi}{2}\right] \to R$ given by g(x) = cos x, where R is the set of real numbers. Consider the following statements:
Statement (I): f and g are one-one
Statement (II): f + g is one-one
Which of the following is correct?
(1) Both statements (I) and (II) are false
(2) Statement (I) is true, statement (II) is false
(3) Statement (I) is false, statement (II) is true
(4) Both statements (I) and (II) are true **Ans. (2)**

Solution: Statement (I) is true, statement (II) is false

$(f + g)(x) = \sin x + \cos x$

$(f + g)(0) = 1;\ (f + g)\left(\frac{\pi}{2}\right) = 1$

$\therefore$ f + g is not one-one

44. $\sec^2(\tan^{-1} 2) + \csc^2(\cot^{-1} 3) =$

(1)10 2) 1 (3) 5 (4) 15 **Ans. (4)**

Solution: $\tan^{-1} 2 = \alpha \Rightarrow \tan\alpha = 2$; $\cot^{-1} 3 = \beta \Rightarrow \cot\beta = 3$

$\therefore \sec^2\alpha + \csc^2\beta = 1 + \tan^2\alpha + 1 + \cot^2\beta = 2 + 4 + 9 = 15$

45. $2\cos^{-1} x = \sin^{-1}\left(2x\sqrt{1-x^2}\right)$ is valid for all values of 'x' satisfying

(1) $\frac{1}{\sqrt{2}} \le x \le 1$ 2) $0 \le x \le \frac{1}{\sqrt{2}}$ (3) $-1 \le x \le 1$ (4) $0 \le x \le 1$ **Ans. (1)**

Solution: $\sin^{-1}(2x\sqrt{1-x^2}) = 2\cos^{-1} x$ holds good for $\frac{1}{\sqrt{2}} \le x \le 1$

46. Consider the following statements:

Statement (I): In a LPP, the objective function is always linear

Statement (II): In a LPP, the linear inequalities on variables are called constraints.

Which of the following is correct?

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

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

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

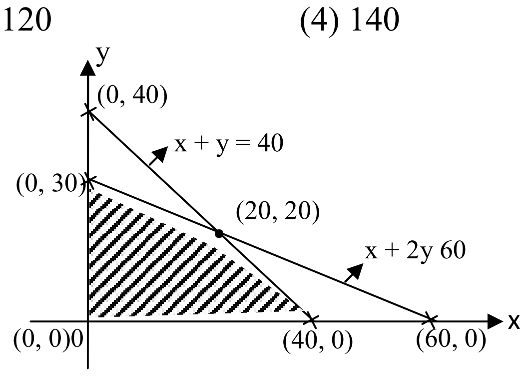
(4) Both Statements (I) and (II) are false **Ans. (2)**

47. The maximum value of $Z = 3x + 4y$, subject to the constraints $x + y \le 40$, $x + 2y \le 60$ and $x, y \ge 0$ is

(1) 40 2) 130 (3) 120 (4) 140 **Ans. (4)**

Solution:

Corner points	**Z = 3x + 4y**
(x, y) = (0, 0)	z = 0
(x, y) = (40, 0)	Z = 120
(x, y) = (20, 20)	Z = (140) → Z_{max}
(x, y) = (0, 30)	Z = 120



48. Consider the following statements.

Statement (I): If E and F are two independent events, then E' and F' are also independent.

Statement (II): Two mutually exclusive events with on-zero probabilities of occurrence cannot be independent.

Which of the following is correct?

(1) Both the statements are false

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

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

(4) Both the statements are true **Ans. (4)**

Solution : Both true ; $[P(A \cap B) = 0 \ne P(A) . P(B)]$

49. If A and B are two non-mutually exclusive events such that $P(A|B) = P(B|A)$, then

(1) $P(A) = P(B)$ 2) $A \subset B$ but $A \ne B$ (3) $A = B$ (4) $A \cap B = \phi$ **Ans. (1)**

Solution: $P(A | B) = P(B | A)$

$\frac{P(A \cap B)}{P(B)} = \frac{P(A \cap B)}{P(A)} \Rightarrow P(A) = P(B)$

50. If A and B are two events such that $A \subset B$ and $P(B) \neq 0$, then which of the following is correct?

(1) $P(A) = P(B)$ (2) $P(A|B) = \frac{P(B)}{P(A)}$ (3) $(A | B) < P(A)$ (4) $P(A | B) \geq P(A)$ **Ans. (4)**

Solution: $A \subset B$ & $P(B) \neq 0$

$$P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{P(A)}{P(B)} \quad (\because\ A \cap B = A)$$

$\geq P(A) \quad \because\ 0 < P(B) \leq 1$

51. Meera visits only one of the two temples A and B in her locality. Probability that she visits temple A is $\frac{2}{5}$. If the visits temple A, $\frac{1}{3}$ is the probability that she meets her friend, whereas it is $\frac{2}{7}$ if visits temple B. Meera met her friend at one of the two temples. The probability that she met her temple B is

(1) $\frac{9}{16}$ (2) $\frac{7}{16}$ (3) $\frac{5}{16}$ (4) $\frac{3}{16}$ **Ans. (1)**

Solution: E_1: Meera visits temple A $\Rightarrow P(E_1) = \frac{2}{5}$

E_2: She visits temple B $\Rightarrow P(E_2) = 1 - \frac{2}{5} = \frac{3}{5}$

A : She meets her friend

$\therefore P(A|E_1) = \frac{1}{3};\ P(A|E_2) = \frac{2}{7}$

$$\text{Required} = P(E_2|A) = \frac{P(E_2)\,P(A|E_2)}{P(E_1)P(A|E_1) + P(E_2)P(A|E_2)}$$

$$= \frac{\frac{3}{5}\times\frac{2}{7}}{\frac{2}{5}\times\frac{1}{3}+\frac{3}{5}\times\frac{2}{7}} = \frac{\frac{6}{35}}{\frac{2}{15}+\frac{6}{35}} = \frac{\frac{6}{35}}{\frac{70+90}{15\times35}} = \frac{6\times15}{160} = \frac{90}{160} = \frac{9}{16}$$

52. If Z_1 and Z_2 are two non-zero complex numbers, then which of the following is not true?

(1) $|Z_1 + Z_2| \geq |Z_1| + |Z_2|$ (2) $\overline{Z_1 + Z_2} = \overline{Z_1} + \overline{Z_2}$

(3) $|Z_1 Z_2| = |Z_1| \cdot |Z_2|$ (4) $\overline{Z_1 Z_2} = \overline{Z_1}.\overline{Z_2}$ **Ans. (1)**

Solution: Infact, $|z_1 + z_2| \leq |z_1| + z_2|$

53. Consider the following statements:

Statement (I): The set of all solutions of the linear inequalities $3x + 8 < 17$ and $2x + 8 \geq 12$ and $x < 3$ and $x \geq 2$ respectively.

Statement (II): The common set of solutions of linear inequalities $3x + 8 < 17$ and $2x + 8 \geq 12$ is (2, 3). Which of the following is true?

(1) Both the statements are false

(2) Statement (I) is true but statement (II) is false

(3) Statement (I) is false but statement (II) is true

(4) Both the statements are true **Ans. (2)**

Solution: (I) : $3x < 9 \Rightarrow x < 3$ and $2x \geq 4 \Rightarrow x \geq 2$

$\therefore$ (I) is true

(II) : Common set of solutions of $x < 3$ & $x \geq 2$ is [2, 3) not (2, 3)

$\therefore$ (II) is false

54. The number of four digit even number that can be formed using the digits 0, 1, 2 and 3 withoout repetition is

(1)12 (2) 6 (3)10 (4)4 **Ans. (3)**

Solution: | | | | |

Case (1) :- No's end with digit '2'

| | | | 2 | $\therefore\ 2 \times 2 \times 1 \times 1 = 4$

2 ways 2w 1w 1way

Case (2) : No's end with digit '0'

| | | | 0 | $\therefore\ {}^3P_3 \times 1 = 6$

${}^3P_3$ 1 w

$\therefore$ Required = 4 + 6 = 10

55. The number of diagonals that can be drawn in an octagon is

(1)30 (2)15 (3)20 4) 28 **Ans. (3)**

Solution: Required = ${}^nC_2 - n = {}^8C_2 - 8 = 20$

56. If the number of terms in the binomial expansion of $(2x + 3)^{3n}$ is 22, then the value of n is

(1)9 (2)8 3) 6 (4)7 **Ans. (4)**

Solution: Given $3n + 1 = 22 \Rightarrow n = 7$

57. If 4^{th}, 10^{th} and 16^{th} terms of a G.P. are x, y and z respectively, then

(1) $y = \frac{x+z}{2}$ (2) $z = \sqrt{xy}$ (3) $y = \sqrt{xz}$ (4) $x = \sqrt{yz}$ **Ans. (3)**

Solution: $a_4 = x \Rightarrow ar^3 = x$

$a_{10} = y \Rightarrow ar^9 = y$

$a_{16} = z \Rightarrow ar^{15} = z$

$\therefore \sqrt{xz} = \sqrt{a^2r^{18}} = ar^9 = y$

58. If A is a square matrix such that $A^2 = A$, then $(I - A)^3$ is

(1) $-I - A$ (2) $I - A$ 3) $A - I$ 4) $I + A$ **Ans. (2)**

Solution: $(I - A)^3 = I^3 - A^3 - 3IA\,(I - A)$

$= I - A^2A - 3I^2A + 3IA^2 = I - A^2 - 3A + 3A = I - A = I - A$

59. If A and B are two matrices such that AB is an identity matrix and the order of matrix B is 3×4, then the order of matrix A is

(1) 4×4 (2) 3×4 (3) 3×3 (4) 4×3 **Ans. (4)**

60. Which of the following statements is not correct?

(1) A skew symmetric matrix has all diagonal elements equal to zero

(2) A row matrix has only one row

(3) A diagonal matrix has all diagonal elements equal to zero

(4) A symmetric matrix A is a square matrix satisfying $A' = A$. **Ans. (3)**