BOARD OF SCHOOL EDUCATION HARYANA

MARKING SCHEME

CLASS: 12th (Sr. Secondary)

Practice Paper 2025 – 26 **SET – A**

गणित

[MATHEMATICS]

[ENGLISH MEDIUM]

- मार्किंग स्कीम में दिए गए हल केवल एक विधि है इसके अतिरिक्त सब विधियां भी बराबर मान्य होंगी यदि वे गणितीय रूप से सही हैं |
- The solution methods adopted in the marking scheme are suggestive. Different methods are also acceptable if these are mathematically correct.

Section -A : (1 Mark each)

Question No.	Answer	Hints/ Solution
1.	$\frac{3\pi}{4}$	$\cos^{-1}(-\frac{1}{\sqrt{2}}) = \pi - \cos^{-1}\left(\frac{1}{\sqrt{2}}\right) = \pi - \frac{\pi}{4} = \frac{3\pi}{4}$
2.	C	Skew Symmetric
3.	D	$A^{-1}\ exists\ if\ \lvert A\rvert \neq 0 \Rightarrow \lambda \neq \frac{-8}{5}$
4.	C	$put\ \Delta = 86 \Rightarrow a = -7,3$
5.	$\frac{1}{x\ log 7 \log x}$	$y = \log_7(\log x) = \frac{\log(\log x)}{\log 7}$
6.	2	$\frac{df}{dg} = \frac{f'(x)}{g'(x)} = \frac{-2\sqrt{1-x^2}}{-1\sqrt{1-x^2}} = 2$

7.	D	$\frac{g(x)}{f(x)}$ *may be discontinuous at x* $= 0$; *all other are definitely continuous.*
8.	$10\sqrt{3}\ cm^2/s$	$\frac{dA}{dt} = \frac{\sqrt{3}}{4}.2x.\frac{dx}{dt} = \frac{\sqrt{3}}{2}.10.2 = 10\sqrt{3}\,cm^2/s$
9.	B	$\int \frac{1.dx}{sin^2x.cos^2x} = \int \frac{sin^2x+cos^2x}{sin^2x.cos^2x}dx$ $\int (sec^2x + cosec^2x)dx = \tan x - cot\ x + c$
10.	D	$\frac{dy}{dx} = \frac{x}{y} \Rightarrow \int y\ dy = \int x\ dx$ $y^2 - x^2 = c$
11.	B	Put $\sin x = t \Rightarrow \cos x\ dx = dt$
12.	1	Since the highest power raised to $\frac{d^2y}{dx^2}$ is one.
13.	B	$\pm(\vec{a} \times \vec{b})$ *are the set of two vectors* $\perp$ *both* $\vec{a}, \vec{b}$
14.	D	For reflection in XY-plane negate the z-coordinate.
15.	A	$\vec{r} = \vec{a} + \lambda\vec{b}$; where $\vec{a}$ *denotes the passing point and* $\vec{b}$ denotes the direction vector of the line.
16.	B	$P(two\ hits) = P(A)P(B)P(C') + P(A)P(B')P(C) + P(A')P(B)P(C)$
17.	B	$\frac{dy}{dx} = \frac{3t}{2} \Rightarrow \frac{d^2y}{dx^2} = \frac{3}{2}.\frac{dt}{dx} = \frac{3}{4t}$
18.	1	*for point of local minima put* $f'(x) = 0$ $\Rightarrow x = 4$ *and* $f''(x) = +ve$ Then f(4)=1=minimum value
19.	D	A is false as for mutually exclusive events $P(A \cap B) = 0$ *always* ; but R is true here.
20.	A	Both A and R are true and correct explanation.

खंड – ब

SECTION – B (2×5=10)

21.

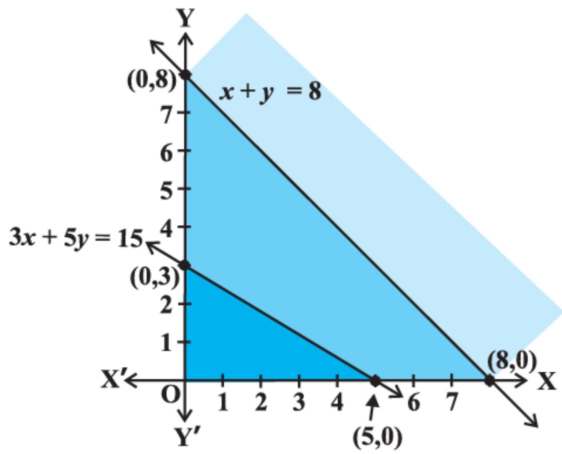
Consider the corresponding eqn. system:

$x + y = 8$ $\qquad$ $3x + 5y = 15$

x	0	8
y	8	0

x	5	0
y	0	3

Marks: 1



Marks: 1

No feasible region.

22(a).

On multiplying first two — ½

$$\begin{bmatrix} 2x-9 & 4x \end{bmatrix}\begin{bmatrix} x \\ 8 \end{bmatrix} = \begin{bmatrix} 0 \end{bmatrix}$$

$$2x^2 + 23x = 0$$ — ½

$$x = 0, -\frac{23}{2}$$ — **1**

OR

22(b).

Area of triangle$=\frac{1}{2}\begin{vmatrix} 1 & 0 & 1 \\ 6 & 0 & 1 \\ 4 & 3 & 1 \end{vmatrix}$ — **1**

$$= \frac{15}{2} \ square\ units$$ — **1**

23(a).

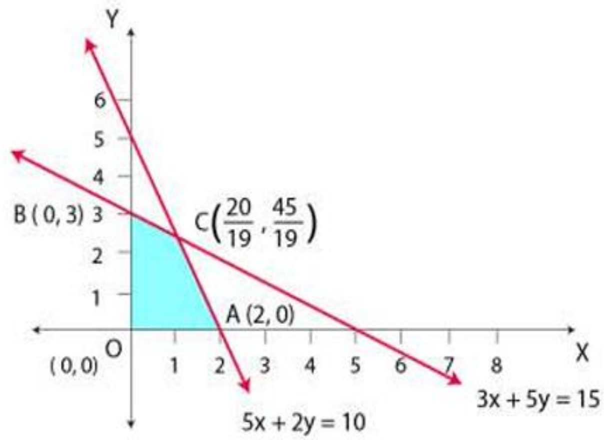
$$f \ will\ be\ continuous\ at\ x = 3\ if$$

OR 23(b).	$R.H.L. = L.H.L. = f(0)$ $\lim_{x\to 0}\frac{2sin^2 2x}{8x^2} = k$ $\lim_{x\to 0}\left(\frac{\sin 2x}{2x}\right)^2 = k$ $\Rightarrow k = 1$ $V = x^3 \Rightarrow \frac{dV}{dt} = 3x^2\frac{dx}{dt} = 9x^2$ Put $x = 10\ cm \Rightarrow \frac{dV}{dt} = 900\ cm^3/s$	**1** 1 1 1
24.	P (Exactly one of A, B is selected) = 0.6 (given) P (A∩B′) + P (A′∩B) = 0.6 P (A) P (B′) + P (A′) P (B) = 0.6 ⇒ (0.7) (1 – p) + (0.3) p = 0.6 ⇒ p = 0.25 Thus the probability that B gets selected is 0.25	**1** 1
25.	$\int tan^2x.tan^2x.dx = \int (sec^2 x - 1).tan^2x$ $= \int sec^2x.tan^2x.dx - \int sec^2dx + \int 1dx$ $== \frac{1}{3}tan^3x - \tan x + x + c$	**1** **1**

खंड – स

SECTION – C (3×6=18)

26.



1.5

O (0, 0), A (2, 0), B (0, 3) and C ($\frac{20}{19}$, $\frac{45}{19}$) are the corner points of the feasible region.

0.5

Corner Point	Value of Z	Remarks
O(0,0)	0	
A(2,0)	10	
B(0,3)	9	
C(20/19,45/19)	235/19	MAXIMUM

1

27(a).

R is reflexive since $(L_1, L_1) \in R$

R is symmetric since if $(L_1, L_2) \in R$, then $(L_2, L_1) \in R$ **1**

R is transitive since if $(L_1, L_2) \in R$, and $(L_2, L_3) \in R$ then $(L_1, L_3) \in R$ **1**

$\Longrightarrow$ R is transitive.

Set of all lines related to $y = 2x + 4$ is given by **1**

$$y = 2x + c$$

OR

27(b).

Put $x = tan\theta \Longrightarrow \theta = tan^{-1}x$

Then $tan^{-1}\frac{\sqrt{1+x^2}-1}{x} = \tan^{-1}\left(\frac{sec\theta-1}{\tan\theta}\right) =$ **1.5**

$= \tan^{-1}\left(\frac{1-cos\theta}{sin\theta}\right) = \tan^{-1}\left(\tan\frac{\theta}{2}\right) = \frac{\theta}{2} = \frac{1}{2}\tan^{-1}x$ **1.5**

28.	The total amount of money that will be received from the sale of all these books can be represented in the form of matrix multiplication as: (Total Amount)= 12[10 8 10][80 60 40] =12[10×80+8×60+10×40] =12[800+480+400] =12[1680]=20160 Rs.	1 1 1
29(a). OR 29(b).	$$y=(\tan^{-1}x)^2$$ $$\Rightarrow y_1 = 2\ \tan^{-1}x\frac{d}{dx}(\tan^{-1}x)$$ $$y_1 = 2\ \tan^{-1}x.\frac{1}{1+x^2}$$ $(1+x^2).y_1$=2 $\tan^{-1}x$ Diff . again we get the result. y=log($\frac{1-x2}{1+x2}$) = log (1-x) + log$(1+x)$ − log $(1+x^2)$ $$\frac{dy}{dx}=\frac{-1}{1-x}+\frac{1}{1+x}-\frac{2x}{1+x^2}$$ $$=\frac{-4x}{1-x^4}$$	1½ 1½ 1 1 1
30.	$$\int x\log x\, dx =$$ Integrating by parts: $$\Rightarrow \log x.\frac{x^2}{2}-\int\frac{1}{x}.\frac{x^2}{2}dx$$ $$\Rightarrow \frac{x^2\log x}{2}-\frac{x^2}{4}+c$$	1.5 1.5
31.	Here $m=cos\frac{\pi}{4}=\frac{1}{\sqrt{2}}$,$n=cos\frac{\pi}{2}$=0 $$l^2+m^2+n^2=1$$ $$l=\pm\frac{1}{\sqrt{2}}$$ $$\vec{r}=l\hat{\imath}+m\hat{\jmath}+n\hat{k}$$ $$\vec{r}=\pm 3\hat{\imath}+3\hat{\jmath}$$	1 1 1

खंड – द

SECTION – D (5×4=20)

32(a).	$$\int_0^{\frac{\pi}{2}} \log\sin x\,dx = \int_0^{\frac{\pi}{2}} \log\sin\left(\frac{\pi}{2}-x\right)dx$$ $$= \int_0^{\frac{\pi}{2}} \log\cos x\,dx$$ 2I=$\int_0^{\frac{\pi}{2}}(\log\sin x + \log\cos x\,)dx = \int_0^{\frac{\pi}{2}} log\left(\frac{\sin 2x}{2}\right)dx$ 2I= $\int_0^{\frac{\pi}{2}} \sin 2x\,dx$ -$\frac{\pi}{2}\log 2$ Put $2x = t \Longrightarrow 2dx = dt, when\ x = 0, t =$ $0\,; when\ x = \frac{\pi}{2}, t = \pi$ 2I=$\frac{1}{2}\int_0^{\pi} \log\sin t\,dt - \frac{\pi}{2}\log 2$ $= \frac{2}{2}\int_0^{\frac{\pi}{2}} \log\sin t\,dt - \frac{\pi}{2}\log 2$ 2I=I-$\frac{\pi}{2}\log 2$ I=$\frac{-\pi}{2}\log 2$	1 1 1 1 1
OR 32(b).	Given D.E. is of the form: $$\frac{dy}{dx} + Py = Q\ where\ P = -1, Q = \cos x$$ I.F. =$e^{\int -1.dx} = e^{-x}$ Solution is : $$ye^{-x} = \int e^{-x}\cos x\,dx + C$$ Let I=$\int e^{-x}\cos x\,dx$ $= -\cos x\, e^{-x} - \int sinx\, e^{-x}dx$ I $=-\cos x\, e^{-x} + sinx\, e^{-x} - \int e^{-x}\cos x\,dx$ I= $\frac{e^{-x}(\sin x - \cos x)}{2}$ Using this we get: $$y = \left(\frac{\sin x - \cos x}{2}\right) + Ce^{x}$$	1 1 1 1 1

33(a).	(Let the three amounts are) = x, y, z Rs. (According to question): $$x + y + z = 7000$$ $$x - y = 0$$ $$\frac{5}{100}x + \frac{8}{100}y + \frac{17}{200}z = 550$$ $$\Rightarrow 10x + 16y + 17z = 110000$$	1
	This system of equations can be written as: $$AX = B, where \text{ जहाँ}$$ $$A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & -1 & 0 \\ 10 & 16 & 17 \end{bmatrix}, X = \begin{bmatrix} x \\ y \\ z \end{bmatrix}, B = \begin{bmatrix} 7000 \\ 0 \\ 110000 \end{bmatrix}$$ $$\Rightarrow \lvert A \rvert = -8 \neq 0$$	1
	(Now): $$A_{11} = -17, A_{12} = -17, A_{13} = 26$$ $$A_{21} = -1, A_{22} = 7, A_{23} = -6$$ $$A_{31} = 1, A_{32} = 1, A_{33} = -2$$ $$adj\ A = \begin{bmatrix} -17 & -1 & 1 \\ -17 & 7 & 1 \\ 26 & -6 & -2 \end{bmatrix}$$	1
	(Thus): $$A^{-1} = \frac{1}{\lvert A \rvert}. adj\ A = \frac{1}{-8}\begin{bmatrix} -17 & -1 & 1 \\ -17 & 7 & 1 \\ 26 & -6 & -2 \end{bmatrix}$$	1
	(Since): $$X = A^{-1}B = \frac{1}{-8}\begin{bmatrix} -17 & -1 & 1 \\ -17 & 7 & 1 \\ 26 & -6 & -2 \end{bmatrix}\begin{bmatrix} 7000 \\ 0 \\ 110000 \end{bmatrix}$$ $$X = \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1125 \\ 4750 \\ 4750 \end{bmatrix}$$	1
OR 33(b).	**अथवा (OR)** Let $\frac{1}{x} = p, \frac{1}{y} = q, \frac{1}{z} = r$ The given system of equations can be written as: $$AX = B, where$$	

	$$A = \begin{bmatrix} 2 & 3 & 10 \\ 4 & -6 & 5 \\ 6 & 9 & -20 \end{bmatrix}, \quad X = \begin{bmatrix} p \\ q \\ r \end{bmatrix}, B = \begin{bmatrix} 4 \\ 1 \\ 2 \end{bmatrix}$$ $$\|A\| = 1200 \neq 0$$ $$\Rightarrow A^{-1}\ exists$$ Co-factors of A are : $$A_{11} = 75, A_{12} = 110, A_{13} = 72$$ $$A_{21} = 150, A_{22} = -100, A_{23} = 0$$ $$A_{31} = 75, A_{32} = 30, A_{33} = -24$$ $$\Rightarrow adjA = \begin{bmatrix} 75 & 150 & 75 \\ 110 & -100 & 30 \\ 72 & 0 & -24 \end{bmatrix}$$ $$\Rightarrow A^{-1} = \frac{adj\ A}{\|A\|} = \frac{1}{1200}\begin{bmatrix} 75 & 150 & 75 \\ 110 & -100 & 30 \\ 72 & 0 & -24 \end{bmatrix}$$ $$\Rightarrow X = A^{-1}B = \frac{1}{1200}\begin{bmatrix} 75 & 150 & 75 \\ 110 & -100 & 30 \\ 72 & 0 & -24 \end{bmatrix}\begin{bmatrix} 4 \\ 1 \\ 2 \end{bmatrix}$$ $$\Rightarrow X = \frac{1}{1200}\begin{bmatrix} 600 \\ 400 \\ 240 \end{bmatrix} = \begin{bmatrix} \frac{1}{2} \\ 1/3 \\ \frac{1}{5} \end{bmatrix}$$ $$\Rightarrow p = \frac{1}{2}, q = \frac{1}{3}, r = \frac{1}{5} \Rightarrow x = 2, y = 3, z = 5$$	1 1 1 1 1
34(a)	Comparing with $\vec{r} = \vec{a} + \lambda\vec{b}$ we get $\vec{a}_1,\ \vec{a}_2,\ \vec{b}_1, \overrightarrow{b_2}$ Now $\vec{a}_2 - \vec{a}_1 = -10\hat{\imath} - 2\hat{\jmath} - 3\hat{k}$ And $\vec{b}_1 \times \overrightarrow{b_2} = \begin{vmatrix} \hat{\imath} & \hat{\jmath} & \hat{k} \\ 1 & -2 & 2 \\ 3 & -2 & -2 \end{vmatrix} = 8\hat{\imath} + 8\hat{\jmath} + 4\hat{k}$	1 1 1

	Shortest Distance = $\left\|\frac{(\vec{b}_1 \times \vec{b}_2).(\vec{a}_2 - \vec{a}_1)}{\|\vec{b}_1 \times \vec{b}_2\|}\right\|$	1
	$= \left\|\frac{-108}{12}\right\| = 9\ units$	1
OR 34(b).	Rewrite the eqn of given line $$\frac{x}{1} = \frac{y-1}{2} = \frac{z-2}{3} = k\ (say)$$ Then arbitrary D(x,y,z) point on the line is $$x = k\ , y = 2k + 1\ , z = 3k + 2$$ Let this point D is the foot of perpendicular on the line. Now position vector from given point P (1,6,3) to Point D is given by: $\overrightarrow{PD} = (k-1)\hat{\imath} + (2k-5)\hat{\jmath} + (3k-1)\hat{k}$ Now Direction vector of line $\vec{b} = 1\hat{\imath} + 2\hat{\jmath} + 3\hat{k}$	1
	Here $\vec{b} \perp \overrightarrow{PD} \Rightarrow \vec{b}.\overrightarrow{PD} = 0$ $$\Rightarrow k - 1 + 4k - 10 + 9k - 3 = 0$$ $$\Rightarrow 14k - 14 = 0$$ $$\Rightarrow k = 1$$ So foot of perpendicular is:	1
	D = (1 , 3, 5) Let $E(a\ , b\ , c\ )$ be the image of P(1,6,3) then D(1,3,5) will be mid point of PE. So by mid point formula :	1
	$$\frac{a+1}{2} = 1\ , \frac{b+6}{2} = 3\ , \frac{c+3}{2} = 5$$ $$\Rightarrow a = 1, b = 0, c = 7$$ So image of P = E (1,0,7)	1

	Also the distance PE = $\sqrt{(1-1)^2+(6-0)^2+(3-7)^2} = \sqrt{0+36+16}$ $= \sqrt{52}\,units$	1
35(a).	Let S denotes the success(getting 6) and F denotes the failure(not getting 6). Thus P(S) = $\frac{1}{6}$, P(F) = $\frac{5}{6}$ P(A wins the first throw)= P(S) = $\frac{1}{6}$ A gets the third throw ,when the first throw by A and second throw by B results in failures. So, P(A wins in the third throw)=P(FFS) $= \frac{5}{6}\times\frac{5}{6}\times\frac{1}{6} = \left(\frac{5}{6}\right)^2\times\frac{1}{6}$ Similarly P(A wins in the fifth throw)= $\left(\frac{5}{6}\right)^4\times\frac{1}{6}$ Hence P(A wins) = $\frac{1}{6} + \left(\frac{5}{6}\right)^2\times\frac{1}{6} + \left(\frac{5}{6}\right)^4\times\frac{1}{6} + \cdots$..... $= \frac{\frac{1}{6}}{1-\frac{25}{36}} = \frac{6}{11}, P(B) = 1-\frac{6}{11} = \frac{5}{11}$	1 1 1 1 1
OR 35(b).	Let E= the chosen coin is two headed F= the chosen coin is biased G = the chosen coin is unbiased Then E,F,G are mutually exclusive and exhaustive events. P(E)=P(F)=P(G)=$\frac{1}{3}$ Let A = the tossed coin shows head	1

	Then P(A/E)=1 , P(A/F) = ¾ , P(A/G)=1/2 Using Bayes' Theorem : P(E/A) = $\frac{P(E).P(\frac{A}{E})}{P(E).P(\frac{A}{E})+P(F).P(\frac{A}{F})+P(G).P(\frac{A}{G})} = \frac{4}{9}$	2 2

खंड – ल

SECTION – E **(4×3=12)**

36.	Here: (a). Semi circular (b). $(-2,0)$ *and* $(2,0)$ (c). Area = $\int_{-2}^{2}\sqrt{4-x^2}\ dx = \left[\frac{x}{2}\sqrt{4-x^2} + \frac{4}{2}.\sin^{-1}\frac{x}{2}\right]_{-2}^{2}$ $= 2\pi$ sq. units	 1 1 2
37. (a) (b) (c)	If AR= $x\ m \Rightarrow\ BR = (20-x)\ m$ $S(x) = RP^2 + RQ^2 = 2x^2 - 40x + 1140$ Here co-eff. Of $x = -40$ Using second derivative test : $on\ putting\ \ S'(x) = 0 \Rightarrow 4x - 40 = 0$ $\Rightarrow x = 10$ $S''(x) = 4 = +ve\ \Rightarrow x = 10\ is\ a\ point\ of\ minima.$ $AR = 10\ m, BR = 10\ m$	 1 1 1 1
38. (a)	n(S)= 4 , n(J)= 3 $No.of\ Relations = 2^{n(S).n(J)} = 2^{12}$	1

(b) (c)	Many one and onto since J_2 $has\ two\ preimages.$ Number of one one functions from S to J = $\frac{m!}{(m-n)!}$, Where m= n(S)=4, n = n(J)=3 So Number of one one functions from S to J= $\frac{4!}{(4-3)!} = 24$	1 2