BOARD OF SCHOOL EDUCATION HARYANA

MARKING SCHEME

CLASS: 12th (Sr. Secondary)

Practice Paper 2026 – 27 **SET – A**

गणित

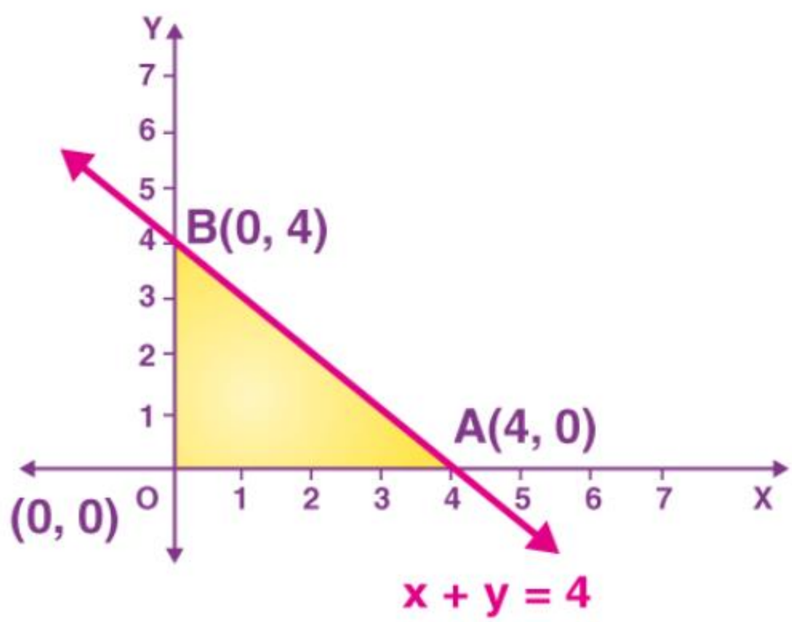
[MATHEMATICS]

[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.	B	Because single element relation is always transitive.
2.	A	$\cos^{-1}\left(\cos\frac{3\pi}{2}\right) = \cos^{-1}\cos^{-1}\left(\cos\left(2\pi - \frac{\pi}{2}\right)\right)$ $= \cos^{-1}\left(\cos\left(\frac{\pi}{2}\right)\right) = \frac{\pi}{2}$
3.	D	None of these is always true.
4.	D	$(A+B)^{-1} = B^{-1} + A^{-1}$
5.	B	$\frac{dx}{dt} = 2t, \frac{dy}{dt} = 3t^2$, so $\frac{dy}{dx} = \frac{3}{2t}$ $\frac{d^2y}{dx^2} = \frac{3}{4t}$
6.	$\frac{-2}{\sqrt{1-x^2}}$	$put\ x = \cos\theta \Longrightarrow\ \theta = \cos^{-1} x$ So $y = \cos^{-1}(2cos^2\theta - 1) = \cos^{-1}\cos 2\theta = 2\theta$ $\Longrightarrow 2\cos^{-1} x$, so $\frac{dy}{dx} = \frac{-2}{\sqrt{1-x^2}}$
7.	$\cos x$	$Many\ examples\ possible$

8.	D	$y = x^2 e^{-x}$ $\frac{dy}{dx} = xe^{-x}(-x+2) = \frac{x(2-x)}{e^x} > 0 \; in \; (0,2)$
9.	Critical point	$At\ critical\ ponit\ the\ given\ condition\ holds.$
10.	A	$I = \int \frac{2cos^2x - 1 - 2cos^2\theta + 1}{\cos x - \cos\theta} dx = 2\int \frac{cos^2x - cos^2\theta}{\cos x - \cos\theta} dx$ $= 2\int (\cos x + \cos\theta)\, dx$ $= 2(\sin x + x\cos\theta) + c$ Note: $treat \cos\theta \ as\ constant.$
11.	A	Degree = no. of arbitrary constants = 1
12.	D	For orthogonal vectors $\vec{a}.\vec{b} = 0.$ So $\left(2\hat{\imath} + \lambda\hat{\jmath} + \hat{k}\right).\left(\hat{\imath} + 2\hat{\jmath} + 3\hat{k}\right) = 0$ $2 + 2\lambda + 3 = 0 \Rightarrow \lambda = \frac{-5}{2}$
13.	$\vec{a}.\hat{b}$	$\left(\frac{\vec{a}.\vec{b}}{\lvert\vec{b}\rvert}\right) \; or \; \frac{1}{\lvert\overrightarrow{\vec{b}}\rvert} \left(\vec{a}.\vec{b}\right)$
14.	D	Required Distance = $\sqrt{(\alpha - 0)^2 + (\beta - \beta)^2 + (\gamma - 0)^2} =$ $\sqrt{\alpha^2 + \gamma^2}\ since\ any\ point\ on\ y - axis\ is\ (0, \beta, 0)$
15.	B	$objective\ function\ is\ a\ function\ to\ be\ optimised.$
16.	C	 Z is maximum at (0,4) where Z = 16

17.	A	Given, $P(A) = 0.8, P(B) = 0.5$ *and* $P(B\|A) = 0.4$ By conditional probability, we have; $P(B\|A) = P(A \cap B)/P(A)$ $\Rightarrow P(A \cap B) = P(B\|A).P(A) = 0.4\, x\, 0.8 = 0.32$
18.	$P(A \cap B) = P(A).P(B)$	*By definition of independent events.*
19.	D	A is false but R is true here.
20.	D	A is false *Since* $\lambda = -1$ *here for the given condition.* but R is true here.

खंड – ब

SECTION – B (2×5=10)

21.	Check for one to one function: $f(1) = f(2) = f(3) = 1, so\ f\ is\ not\ one - one.$ Check for Onto Function: Here range of $f = \{-1,0,1\}$ but domain of $f \neq R$ *So f is not onto.*	1 1
22(a). OR 22(b).	Since the corresponding elements of equal matrices are identical, we get: $2x + y = 7$ $x - 2y = -4$ On solving we get $x = 2, y = 3$ Area of triangle=$\frac{1}{2}\begin{vmatrix} 1 & 0 & 1 \\ 6 & 0 & 1 \\ 4 & 3 & 1 \end{vmatrix}$ On solving: $= \frac{15}{2}\ square\ units$	1 1 1 1
23	$y = 2^{cos^2 x}$ $\log y = log\ 2^{cos^2 x} = cos^2 x. \log 2$	0.5

	So, $\frac{1}{y}\frac{dy}{dx} = \log 2\,.(2\cos x)(-\sin x)$ $\frac{dy}{dx} = -2^{\cos^2 x}.\log 2\,(\sin 2x)$	1 0.5
24(a) 24(b)	$I = \int \frac{2x-1}{2x+3}dx = \int \frac{2x+3-3-1}{2x+3}dx$ $= \int 1dx - 4\int \frac{1}{2x+3}dx$ $= x - 2log(2x+3) + C$ $x - log(2x+3)^2 + C$ $I = \int_0^1 \frac{x}{\sqrt{1+x^2}}dx$ $put\ 1 + x^2 = t^2, 2x\,dx = 2t\,dt \Longrightarrow x\,dx = t\,dt$ When $x = 0, t = 1\,; if\ x = 1\,, t = \sqrt{2}$ $I = \int_1^{\sqrt{2}} \frac{t\,dt}{t} = [t]_1^{\sqrt{2}} = \sqrt{2} - 1$	0.5 0.5 0.5 0.5 0.5 0.5 1
25.	$Given\ that\ A\ and\ B\ are\ independent$ So $P(A \cap B) = P(A).P(B)$ Now $P(problem\ is\ solved)$ $= Problem\ is\ solved\ by\ A\ or\ problem\ is\ solved\ by\ B$ $or\ problem\ is\ solved\ by\ both$ $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ $P(A \cup B) = P(A) + P(B) - P(A).P(B)$ $P(A \cup B) = \frac{1}{2} + \frac{1}{3} - \frac{1}{2}.\frac{1}{3}$ $P(A \cup B) = \frac{3+2-1}{6} = \frac{2}{3}$	0.5 0.5 0.5 0.5

खंड – स

SECTION – C (3×6=18)

26.	put $x = \cos 2\theta$ $\tan^{-1}\left(\frac{\sqrt{1+x}-\sqrt{1-x}}{\sqrt{1+x}+\sqrt{1-x}}\right) =$ $= \tan^{-1}\left(\frac{\sqrt{1+\cos 2\theta}-\sqrt{1-\cos 2\theta}}{\sqrt{1+\cos 2\theta}+\sqrt{1-\cos 2\theta}}\right)$	0.5

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

$$= \tan^{-1}\left(\frac{\cos\theta - \sin\theta}{\cos\theta + \sin\theta}\right)$$

$$= \tan^{-1}\left(\frac{1 - \tan\theta}{1 + \tan\theta}\right) = \tan^{-1}\left(\tan\left(\frac{\pi}{4} - \theta\right)\right)$$

$$= \frac{\pi}{4} - \frac{1}{2}\cos^{-1} x$$

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<tr>
<td>27(a).

OR
27(b).</td>
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At $x = 0$

$$\lim_{x \to 0} f(x) = \lim_{x \to 0} \frac{3x + 4\tan x}{x} = \frac{0}{0}\ form$$

So we cannot say it continuous at $x = 0$

For f to be continuous we should have

$$\lim_{x \to 0} f(x) = f(0)$$

Applying L'Hospital Rule:

$$\lim_{x \to 0} f(x) = \lim_{x \to 0} \frac{3 + 4\,sec^2 x}{1} = 3 + 4 = 7$$

So $at\ x = 0$ for being continuous function should be redefined as:

$$f(x) = \begin{cases} \dfrac{3x + 4\tan x}{x} & ;\ x \neq 0 \\ 7 & ;\quad x = 0 \end{cases}$$

Then $\lim_{x \to 0} f(x) = f(0) = 7$

So f is continuous at $x = 0$

OR

Here

$$f(x) = 4x^3 - 6x^2 - 72x + 30$$

So

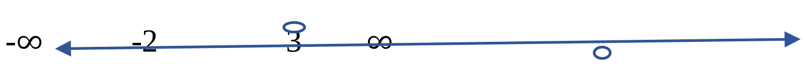
$$f'(x) = 12x^2 - 12x - 72$$

$= 12(x^2 - x - 6)$

$= 12(x - 3) + (x + 2)$

Put $f'(x) = 0$ gives

$x = 3, x = -2$



INTERVAL	SIGN OF $f'(x)$	Nature of $f(x)$
$(-\infty, -2)$	> 0	$f\ is\ strictly\ increasing$
$(-2,3)$	< 0	$f\ is\ strictly\ decreasing$
$(3, \infty)$	> 0	$f\ is\ strictly\ increasing$

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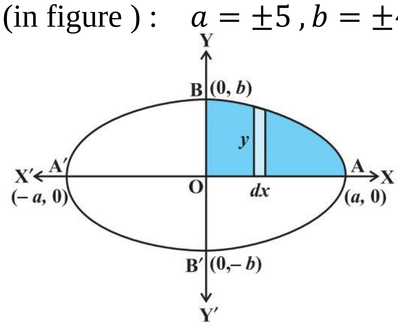
28.	Here: $$f(x) = \lvert x\ sin\ \pi x \rvert = \begin{cases} x \sin \pi x\ ;\ -1 \leq x \leq 1 \\ -x \sin \pi x\ ; 1 \leq x \leq \frac{3}{2} \end{cases}$$ Now : $$\int_{-1}^{\frac{3}{2}} \lvert x \sin \pi x \rvert dx = \int_{-1}^{1} x \sin \pi x\ dx + \int_{1}^{\frac{3}{2}} -x \sin \pi x\ dx$$ $$= \int_{-1}^{1} x \sin \pi x\ dx - \int_{1}^{\frac{3}{2}} x \sin \pi x\ dx$$ $$= \left[\frac{-x \cos \pi x}{\pi} + \frac{\sin \pi x}{\pi^2}\right]_{-1}^{1} - \left[\frac{-x \cos \pi x}{\pi} + \frac{\sin \pi x}{\pi^2}\right]_{1}^{\frac{3}{2}}$$ $$= \frac{2}{\pi} - \left[-\frac{1}{\pi^2} - \frac{1}{\pi}\right] = \frac{3}{\pi} + \frac{1}{\pi^2}$$	1 1 1
29.	$$V = x^3 \Longrightarrow \frac{dV}{dt} = 3x^2 \frac{dx}{dt} = 3x^2 . 2 = 6x^2$$ Put $x = 12\ cm \Longrightarrow \frac{dV}{dt} = (6 \times 144)\ cm^3/s = 864\ cm^3/s$	1.5 1.5
30(a). 30(b)	$$\vec{a} + \vec{b} = (\hat{\imath} + \hat{\jmath} + \hat{k}) + (\hat{\imath} + 2\hat{\jmath} + 3\hat{k}) = 2\hat{\imath} + 3\hat{\jmath} + 4\hat{k}$$ $$\vec{a} - \vec{b} = (\hat{\imath} + \hat{\jmath} + \hat{k}) - (\hat{\imath} + 2\hat{\jmath} + 3\hat{k}) = -\hat{\jmath} - 2\hat{k}$$ Now $$\vec{c} = (\vec{a} + \vec{b}) \times (\vec{a} - \vec{b}) = \begin{vmatrix} \hat{\imath} & \hat{\jmath} & \hat{k} \\ 2 & 3 & 4 \\ 0 & -1 & -2 \end{vmatrix}$$ $$\vec{c} = -2\hat{\imath} + 4\hat{\jmath} \pm 2\hat{k}$$ $$\lvert \vec{c} \rvert = 2\sqrt{6}$$ $$\Longrightarrow \hat{c} = \frac{\vec{c}}{\lvert \vec{c} \rvert} = \frac{-1}{\sqrt{6}}\hat{\imath} + \frac{2}{\sqrt{6}}\hat{\jmath} - \frac{1}{\sqrt{6}}\hat{k}$$ Then $\hat{c}$ will be perpendicular to $(\vec{a} + \vec{b})\ and\ (\vec{a} - \vec{b})$ $since$ $\vec{a} \times \vec{b}\ is\ always\ perpendicular\ to\ both\ \vec{a}\ and\ \vec{b}.$ **OR** Here $m = cos\frac{\pi}{4} = \frac{1}{\sqrt{2}}\ , n = cos\frac{\pi}{2}$=0 $$l^2 + m^2 + n^2 = 1$$ $$l = \pm\frac{1}{\sqrt{2}}$$ $$\vec{r} = l\hat{\imath} + m\hat{\jmath} + n\hat{k}$$	1 1 1 1 1 1

	$\vec{r} = \pm 3\hat{\imath} + 3\hat{\jmath}$	
31.	Here $n(s) = 6 \times 6 \times 6 = 216$ Let $E_1 = \textit{the event that sum of numbers on the dic was } 6$ $E_1 = \left\{\begin{matrix}(1,1,4),(1,2,3),(1,3,2),(1,4,1),(2,1,3),(2,2,2),(2,3,1)\\(3,1,2),(3,2,1),(4,1,1)\end{matrix}\right\}$ Let $E_2 = \textit{the event that three two's occurs}$ $E_2 = \{(2,2,2)\}$ So $n(E_1) = 10 \text{ and } n(E_2) = 1, n(E_1 \cap E_2) = 1$ $P\left(\frac{E_1}{E_2}\right) = \frac{P(E_1 \cap E_2)}{P(E_1)} = \frac{1}{10}$	1 1 1

खंड – द

SECTION – D (5×4=20)

32(a).	The given system of equations can be written as: $AX = B, where$ $A = \begin{bmatrix} 3 & 2 & -2 \\ 1 & 2 & 3 \\ 2 & -1 & 1 \end{bmatrix}, \quad X = \begin{bmatrix} x \\ y \\ z \end{bmatrix}, B = \begin{bmatrix} 3 \\ 6 \\ 2 \end{bmatrix}$ $\lvert A \rvert = 35 \neq 0$ $\Longrightarrow A^{-1} \; exists$ Co-factors of A are : $A_{11} = 5, A_{12} = 5, A_{13} = -5$ $A_{21} = 0, A_{22} = 7, A_{23} = 7$ $A_{31} = 10, A_{32} = -11, A_{33} = 4$ $\Longrightarrow adjA = \begin{bmatrix} 5 & 0 & 10 \\ 5 & 7 & -11 \\ -5 & 7 & 4 \end{bmatrix}$ $\Longrightarrow A^{-1} = \frac{adj\,A}{\lvert A \rvert} = \frac{1}{35}\begin{bmatrix} 5 & 0 & 10 \\ 5 & 7 & -11 \\ -5 & 7 & 4 \end{bmatrix}$ $\Longrightarrow X = A^{-1}B = \frac{1}{35}\begin{bmatrix} 5 & 0 & 10 \\ 5 & 7 & -11 \\ -5 & 7 & 4 \end{bmatrix}\begin{bmatrix} 3 \\ 6 \\ 2 \end{bmatrix}$ $\Longrightarrow A^{-1} = \frac{adj\,A}{\lvert A \rvert} = \frac{1}{35}\begin{bmatrix} 15+20 \\ 15+42-22 \\ -15+42+8 \end{bmatrix}$	0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5

	$\Rightarrow X = A^{-1}B = \frac{1}{35}\begin{bmatrix}35\\35\\35\end{bmatrix} = \begin{bmatrix}1\\1\\1\end{bmatrix}$ $\Rightarrow x = 1, y = 1, z = 1$ **OR**	0.5
OR 32(b).	Given that $A = \begin{bmatrix}2 & 2 & -4\\-4 & 2 & -4\\2 & -1 & 5\end{bmatrix}, B = \begin{bmatrix}1 & -1 & 0\\2 & 3 & 4\\0 & 1 & 2\end{bmatrix}$ So $BA = \begin{bmatrix}6 & 0 & 0\\0 & 6 & 0\\0 & 0 & 6\end{bmatrix} = 6I$ So $B^{-1} = \frac{1}{6}A = \frac{1}{6}\begin{bmatrix}2 & 2 & -4\\-4 & 2 & -4\\2 & -1 & 5\end{bmatrix} = \begin{bmatrix}1 & -1 & 0\\2 & 3 & 4\\0 & 1 & 2\end{bmatrix}^{-1}$ Also $y + 2z = 7$ $x - y = 3$ $2x + 3y + 4z = 17$ So $\begin{bmatrix}x\\y\\z\end{bmatrix} = \begin{bmatrix}1 & -1 & 0\\2 & 3 & 4\\0 & 1 & 2\end{bmatrix}^{-1}\begin{bmatrix}3\\17\\7\end{bmatrix} = \frac{1}{6}\begin{bmatrix}6+34-28\\-12+34-28\\6-17+35\end{bmatrix} = \frac{1}{6}\begin{bmatrix}12\\-6\\24\end{bmatrix}$ $\Rightarrow x = 2, y = -1, z = 4$	1 1 1+1 1
33(a).	Given ellipse is : $\frac{x^2}{5^2} + \frac{y^2}{4^2} = 1$ $\Rightarrow y = 4\sqrt{1 - \frac{x^2}{5^2}} = \frac{4}{5}\sqrt{5^2 - x^2}$ (in figure) : $a = \pm 5, b = \pm 4$  Required Area $= A = 4.\int_0^a y.dx$	1 1 1

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<td>OR
33(b).</td>
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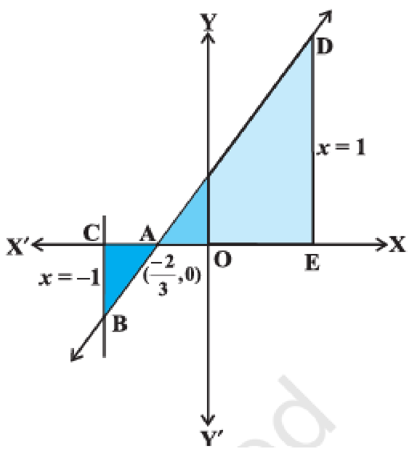
$$A = 4\int_0^5 \frac{4}{5}\sqrt{5^2 - x^2}dx = \frac{16}{5}\int_0^5 \sqrt{5^2 - x^2}\ dx$$

$$\Rightarrow A = \frac{16}{5}\left[\frac{x}{2}\sqrt{25 - x^2} + \frac{25}{2}\sin^{-1}\frac{x}{5}\right]_0^5$$

$$A = \frac{16}{5}\left[\frac{25}{2} \times \frac{\pi}{2}\right] = 20\pi\ square\ units.$$

(OR)



The line $y = 3x + 2$ meets $x - axis\ at\ x = -\frac{2}{3}$
and its graph lies below $x - axis\ for\ x \in \left(-1, -\frac{2}{3}\right)$

$$and\ above\ x - axis\ for x \in \left(-\frac{2}{3}, 1\right)$$

Required area =
Area of the region ACBA+ Area of the region ADEA

$$= \left|\int_{-1}^{-\frac{2}{3}}(3x + 2)dx\right| + \int_{-\frac{2}{3}}^{1}(3x + 2)dx$$

$$= \left[\frac{3x^2}{2} + 2x\right]_{-1}^{-\frac{2}{3}} + \left[\frac{3x^2}{2} + 2x\right]_{-\frac{2}{3}}^{1}$$

$$= \frac{1}{6} + \frac{25}{6} = \frac{13}{3}$$

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<td>34(a)</td>
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Here :

$$\overrightarrow{a_1} = -\hat{\imath} - \hat{\jmath} - \hat{k}\ ,\qquad \overrightarrow{b_1} = 7\hat{\imath} - 6\hat{\jmath} + \hat{k}$$

$$\overrightarrow{a_2} = 3\hat{\imath} + 5\hat{\jmath} + 7\hat{k}\ ,\qquad \overrightarrow{b_2} = \hat{\imath} - 2\hat{\jmath} + \hat{k}$$

$$\overrightarrow{a_2} - \overrightarrow{a_1} = 4\hat{\imath} + 6\hat{\jmath} + 8\hat{k}$$

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	$$\overrightarrow{b_1} \times \overrightarrow{b_2} = \begin{vmatrix} \hat{\imath} & \hat{\jmath} & \hat{k} \\ 7 & -6 & 1 \\ 1 & -2 & 1 \end{vmatrix} = -4\hat{\imath} - 6\hat{\jmath} - 8\hat{k}$$ $$S.D. = \left\| \frac{(\overrightarrow{b_1} \times \overrightarrow{b_2}).(\overrightarrow{a_2} - \overrightarrow{a_1})}{\|\overrightarrow{b_1} \times \overrightarrow{b_2}\|} \right\|$$ $$(S.D.) = \left\| \frac{(-4\hat{\imath} - 6\hat{\jmath} - 8\hat{k}).(4\hat{\imath} + 6\hat{\jmath} + 8\hat{k})}{\|\sqrt{16+36+64}\|} \right\|$$ $$S.D. = \left\| \frac{116}{\|\sqrt{116}\|} \right\| = \sqrt{116} = 2\sqrt{29}\ units$$	1 0.5 1 1
OR 34(b).	**OR** 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 $\vec{b} = 1\hat{\imath} + 2\hat{\jmath} + 3\hat{k}$ 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: 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 : $$\frac{a+1}{2} = 1\ , \frac{b+6}{2} = 3\ , \frac{c+3}{2} = 5$$ $$\Rightarrow a = 1, b = 0, c = 7$$ So image of P = E (1,0,7)	1 0.5 0.5 0.5 1 1

Also the distance PE $= \sqrt{(1-1)^2 + (6-0)^2 + (3-7)^2} = \sqrt{0 + 36 + 16}$

$$= \sqrt{52}\, units$$

0.5

35(a).

Objective function : $Z = -x + 2y$

Given constraints are:

$$x \geq 3, x + y \geq 5, x + 2y \geq 6, y \geq 0$$

Consider the system of lines according to given constraints:

$x = 3$

x	3	3
y	0	1

0.5

$x + y = 5$

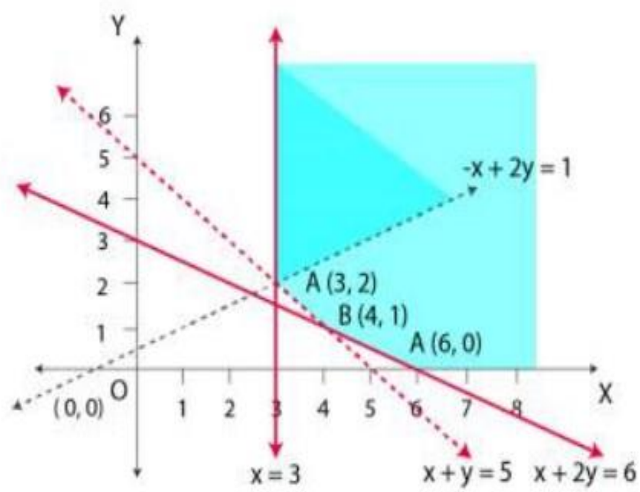
x	5	0
y	0	5

0.5

$x + 2y = 6$

x	6	0
y	0	3

0.5



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Corner Point	$Z = -x + 2y$ (Value of Z)	
(6,0)	-6	0.5
(4,1)	-2	0.5
(3,2)	1	0.5

OR 35(b).	Since feasible region is unbounded so we have to graph the inequality $Z > 1$ from which we find that resulting region has points in common with U.F.R. So Z has no maximum value **OR** Let $E_1 = \text{ the chosen person have blood group } O$ $E_2 = \text{ the chosen person have blood group other than } O$ $A = \text{ the chosen person is left handed}$ Now $P(E_1) = 30\% = \frac{30}{100}$ $P(E_2) = 70\% = \frac{70}{100}$ Now $P\left(\frac{A}{E_1}\right) =$ $P(\text{Left handed person with blood group } O) = 6\% = 6/100$ Now $P(A/E_2) =$ $P(\text{Left handed person with blood group other than } O = 10\% = 10/100$ Using Bayes Theorem: $$P\left(\frac{E_1}{A}\right) = \frac{P(E_1).P\left(\frac{A}{E_1}\right)}{P(E_1).P\left(\frac{A}{E_1}\right) + P(E_2).P\left(\frac{A}{E_2}\right)}$$ $$= \frac{0.3 \times 0.06}{0.3 \times 0.06 + 0.7 \times 0.1}$$ $$= \frac{0.0180}{0.0880} = \frac{180}{880} = \frac{9}{44}$$	1 1 1 1 1 1

खंड – ल

SECTION – E (4×3=12)

36.	Here: (a). $A + B = \begin{bmatrix} 15000 & 30000 & 36000 \\ 70000 & 40000 & 20000 \end{bmatrix}$ (b). $A - B = \begin{bmatrix} 5000 & 10000 & 24000 \\ 30000 & 20000 & 0 \end{bmatrix}$ (c). $2\% \text{ of } B = 0.02 \times B$	1 1

<table>
<tr><td></td><td>$A =$
$$\begin{array}{c} \\ \\ \\ \end{array}\begin{bmatrix} Basmati & Permal & Naura \\ 100 & 200 & 120 \\ 400 & 200 & 200 \end{bmatrix}\begin{array}{l} \\ Ramkishan \\ Gurcharan\ singh \end{array}$$</td><td>2</td></tr>
<tr><td>37.
(a)
(b)

(c)</td><td>If AR= $x\ m \implies BR = (20 - x)\ m$

$S(x) = RP^2 + RQ^2 = 2x^2 - 40x + 1140$
Here co-eff. Of $x = -40$

Using second derivative test :
$$on\ putting\ \ S'(x) = 0 \implies 4x - 40 = 0$$ $$\implies x = 10$$ $$S''(x) = 4 = +ve \implies x = 10\ is\ a\ point\ of\ minima.$$ $$AR = 10\ m, BR = 10\ m$$</td><td>1

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(a)

(b)

(c)</td><td>Given differential equation is :
$$\frac{dy}{dx} = \frac{1+y^2}{1+x^2}$$here degree =1,order = 1

Suitable method : separating the variables

General Solution:
Separating the variables we get:
$$\frac{dy}{1+y^2} = \frac{dx}{1+x^2}$$Integrating both sides
$$\int \frac{dy}{1+y^2} = \int \frac{dx}{1+x^2}$$ $$\tan^{-1} y = \tan^{-1} x + c$$Which is the required general solution where c is the constant of integration.</td><td>1

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