

## Pre- Board- II Examination, Class XII- 2025-26

## Chennai Region

## MARKING SCHEME

Class: XII  
Sub: Mathematics

Max Marks: 80  
Duration: 3 Hrs

Q. No.	SECTION A Question nos. 1 to 18 are of multiple choice questions (MCQs) of 1 mark each	Marks
1	(C) 0	1
2	(B) 1	1
3	(D) 0.7	1
4	(C) (1, -5, -6)	1
5	(B) -1	1
6	(D) $-\frac{y}{x}$	1
7	(B) 120	1
8	(D) 1	1
9	(B) $\pi$ cm/s	1
10	(D) $6\sin\sqrt{x} + C$	1
11	(C) 3	1
12	(C) 0	1
13	(A) $0, -\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}$	1
14	(D) $2\hat{i} + 3\hat{k}$	1
15	(D) -1	1
16	(D) $\sqrt{\alpha^2 + \gamma^2}$	1
17	(D) not defined	1
18	(D) infinite	1
	<b>Question nos. 19 &amp; 20 are Assertion &amp; Reasoning questions of 1 mark each</b>	
19	(C) Assertion (A) is true. Reason (R) is false.	1
20	(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct	1

	explanation of the Assertion (A).	
	<b>SECTION B</b> <b>Question nos.21 to 25 are very short answer questions of 2 marks each</b>	
21	<p>The argument of <math>\cos^{-1}</math> must be between -1 and 1 , inclusive</p> $-1 \leq x^2 - 4 \leq 1$ <p>Add 4 to all parts of the inequality.</p> $\Rightarrow -1 + 4 \leq x^2 - 4 + 4 \leq 1 + 4$ $\Rightarrow 3 \leq x^2 \leq 5$ <p>Take the square root of all parts, remembering both positive and negative roots.</p> $\Rightarrow (\sqrt{3})^2 \leq x^2 \leq (\sqrt{5})^2$ $\Rightarrow x^2 \leq (\sqrt{5})^2 \Rightarrow -\sqrt{5} \leq x \leq \sqrt{5} \dots\dots\dots(1)$ <p>And <math>x^2 \geq (\sqrt{3})^2 \Rightarrow x \leq -\sqrt{3}, x \geq \sqrt{3} \dots\dots\dots(2)</math></p> <p>This implies two separate intervals for <math>x</math>.</p> <p>The intersection (1) and (2) is the domain <math>x \in [-\sqrt{5}, -\sqrt{3}] \cup [\sqrt{3}, \sqrt{5}]</math></p> <p><b>OR</b></p> <p>21(b) Sol: <math>\sec^2\left(\tan^{-1}\frac{1}{2}\right) + \operatorname{cosec}^2\left(\cot^{-1}\frac{1}{3}\right)</math></p> $= \left[1 + \tan^2\left(\tan^{-1}\frac{1}{2}\right)\right] + \left[1 + \cot^2\left(\cot^{-1}\frac{1}{3}\right)\right]$ $= \left[1 + \left(\frac{1}{2}\right)^2\right] + \left[1 + \left(\frac{1}{3}\right)^2\right]$ $= \frac{85}{36}$	<p>1/2</p> <p>1/2</p> <p>1</p>
22	<p>Sol <math>\because f(x)</math> is continuous at <math>x = 1</math></p> $\therefore \lim_{x \rightarrow 1^-} f(x) = f(1) = \lim_{x \rightarrow 1^+} f(x)$ <p>Here <math>f(1) = 11</math></p> $\lim_{x \rightarrow 1^-} f(x) = \lim_{h \rightarrow 0} f(1 - h) = \lim_{h \rightarrow 0} [5a(1 - h) - 2b]$ $= 5a - 2b$ $\lim_{x \rightarrow 1^+} f(x) = \lim_{h \rightarrow 0} f(1 + h) = \lim_{h \rightarrow 0} [3a(1 + h) + b] = 3a + b$ <p><math>\therefore</math> From (1), we get</p> $5a - 2b = 11 \text{ and } 3a + b = 11$	<p>1/2</p> <p>1/2</p> <p>1/2</p> <p>1/2</p>

	Solving these, we get $a = 3, b = 2$ .	
23	$f(x) = -x^2 + 6x + 100$ $f'(x) = -2x + 6$ $f'(x) = 0$ then $x = 3$ $f(x)$ is strictly increasing on $(-\infty, 3)$ and $f(x)$ is strictly decreasing on $(3, \infty)$ OR $V = \frac{4}{3}\pi r^3 = 36\pi \Rightarrow r = 3$ $\frac{dv}{dt} = 4\pi r^2 \frac{dr}{dt}$ $\Rightarrow \frac{dr}{dt} = \frac{4}{9}\pi \text{cm/sec}$ $= 0.14 \text{cm/sec}$	 1 1 1 1
24	Sol $\int \frac{dx}{x^2 - 6x + 13}$ $= \int \frac{dx}{(x - 3)^2 + (2)^2}$ $= \frac{1}{2} \tan^{-1} \frac{(x - 3)}{2} + C$	 1 1
25	Let $I = \int_{-1}^1 \frac{x^3 +  x  + 1}{x^2 + 2 x  + 1} dx$ $= \int_{-1}^1 \frac{x^3}{x^2 + 2 x  + 1} dx + \int_{-1}^1 \frac{ x  + 1}{x^2 + 2 x  + 1} dx, \{ \text{Odd} + \text{even} \}$ $= 0 + 2 \int_0^1 \frac{ x  + 1}{( x  + 1)^2} dx = 2 \int_0^1 \frac{x + 1}{(x + 1)^2} dx = 2 \int_0^1 \frac{1}{x + 1} dx$ $= [2 \log x + 1 ]_0^1 = 2 \log 2$	 1/2 1/2 1/2 1/2
	<b>SECTION C</b>	
	<b>Question nos.26 to 31 are short answer questions of 3 marks each</b>	
26	Sol : $y = b \tan \theta \Rightarrow \frac{dy}{d\theta} = b \sec^2 \theta$ $x = a \sec \theta \Rightarrow \frac{dx}{d\theta} = a \sec \theta \tan \theta$ $\frac{dy}{dx} = \frac{\frac{dy}{d\theta}}{\frac{dx}{d\theta}} = \frac{b \sec^2 \theta}{a \sec \theta \tan \theta} = \frac{b}{a} \operatorname{cosec} \theta$  Differentiating both sides w.r.t. $x$ , we get	 1 1/2 1

	$\frac{d^2y}{dx^2} = \frac{-b}{a} \operatorname{cosec} \theta \cot \theta \times \frac{d\theta}{dx}$ $= \frac{-b}{a} \operatorname{cosec} \theta \cot \theta \times \frac{1}{a \sec \theta \tan \theta} \quad [\text{using (2)}]$ $= \frac{-b}{a \cdot a} \cot^3 \theta$ $\left. \frac{d^2y}{dx^2} \right _{\theta=\frac{\pi}{6}} = \frac{-b}{a} \left[ \cot \frac{\pi}{6} \right]^3 = \frac{-b}{a} (\sqrt{3})^3 = -\frac{3\sqrt{3}b}{a \cdot a}$ <p>OR (b)</p> <p><math>y = x^x \Rightarrow \log y = x \log x</math>,</p> <p>differentiating with respect to 'x',</p> <p>we get <math>\frac{dy}{dx} = y(1 + \log x)</math>,</p> <p>differentiating with respect to 'x',</p> <p>we get <math>\frac{d^2y}{dx^2} = \frac{y}{x} + (1 + \log x) \frac{dy}{dx}</math></p> $\Rightarrow \frac{d^2y}{dx^2} = \frac{y}{x} + \frac{1}{y} \left( \frac{dy}{dx} \right)^2$ $\Rightarrow \frac{d^2y}{dx^2} - \frac{1}{y} \left( \frac{dy}{dx} \right)^2 - \frac{y}{x} = 0$	1/2
27	<p>Sol We have <math>I = \int \frac{(x^2+1)e^x}{(x+1)^2} dx = \int e^x \left[ \frac{x^2-1+1+1}{(x+1)^2} \right] dx</math></p> $= \int e^x \left[ \frac{x^2-1}{(x+1)^2} + \frac{2}{(x+1)^2} \right] dx = \int e^x \left[ \frac{x-1}{x+1} + \frac{2}{(x+1)^2} \right] dx$ <p>Consider <math>f(x) = \frac{x-1}{x+1}</math>, then <math>f'(x) = \frac{2}{(x+1)^2}</math></p> <p>Thus, the given integrand is of the form <math>e^x[f(x) + f'(x)]</math>.</p> <p>Therefore, <math>\int \frac{x^2+1}{(x+1)^2} e^x dx = \frac{x-1}{x+1} e^x + C</math></p>	1  1  1
28	<p>W <math>x^3 - x \geq 0</math> on <math>[-1,0]</math> and <math>x^3 - x \leq 0</math> on <math>[0,1]</math> and that <math>x^3 - x \geq 0</math> on <math>[1, 2]</math>.</p> $\int_{-1}^2  x^3 - x  dx = \int_{-1}^0 (x^3 - x) dx + \int_0^1 -(x^3 - x) dx + \int_1^2 (x^3 - x) dx$ $= \left[ \frac{x^4}{4} - \frac{x^2}{2} \right]_{-1}^0 + \left[ \frac{x^2}{2} - \frac{x^4}{4} \right]_0^1 + \left[ \frac{x^4}{4} - \frac{x^2}{2} \right]_1^2$ $= -\frac{1}{4} + \frac{1}{2} + \frac{1}{2} - \frac{1}{4} + 2 - \frac{1}{4} + \frac{1}{2} = \frac{3}{2} - \frac{3}{4} + 2 = \frac{11}{4}$	1  1  1

**OR**

$$(b) I = \int_0^{\pi} \frac{x \sin x}{1 + \cos^2 x} dx \dots \dots (i)$$

$$= \int_0^{\pi} \frac{(\pi - x) \sin(\pi - x)}{1 + [\cos(\pi - x)]^2} dx$$

$$\Rightarrow I = \int_0^{\pi} \frac{(\pi - x) \sin x}{1 + \cos^2 x} dx \dots \dots (ii)$$

Adding (i) and (ii), we get  $2I = \int_0^{\pi} \frac{\pi \sin x}{1 + \cos^2 x} dx$

Put  $\cos x = t \Rightarrow -\sin x dx = dt$

When  $x = 0$ , then  $t = 1$  and when  $x = \pi$ , then  $t = -1$

$$\therefore 2I = \int_1^{-1} \frac{-\pi dt}{1 + t^2} \Rightarrow I = \frac{\pi}{2} \int_{-1}^1 \frac{dt}{1 + t^2}$$

$$\therefore I = \frac{\pi}{2} [\tan^{-1} t]_{-1}^1 = \frac{\pi}{2} [\tan^{-1}(1) - \tan^{-1}(-1)]$$

$$= \frac{\pi}{2} \left[ \frac{\pi}{4} - \left( -\frac{\pi}{4} \right) \right] = \frac{\pi^2}{4}$$

1

1

1

29

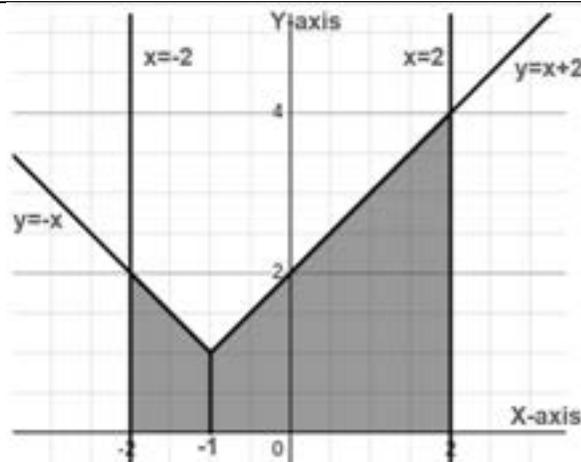
Sol  $\vec{a} \times \vec{b} = 32\hat{i} - \hat{j} - 14\hat{k}$   
 Let  $\vec{d} = \lambda (\vec{a} \times \vec{b})$   
 $\vec{d} = \lambda (32\hat{i} - \hat{j} - 14\hat{k})$   
 given  $\vec{c} \cdot \vec{d} = 18$   
 $\lambda (32\hat{i} - \hat{j} - 14\hat{k}) \cdot (2\hat{i} - \hat{j} + 4\hat{k}) = 18$   
 $\Rightarrow \lambda = 2$   
 $\vec{d} = 2 (32\hat{i} - \hat{j} - 14\hat{k}) = 64\hat{i} - 2\hat{j} - 28\hat{k}$

1

1

1

30(a)



2 marks  
for  
correct  
graph  
and  
shading

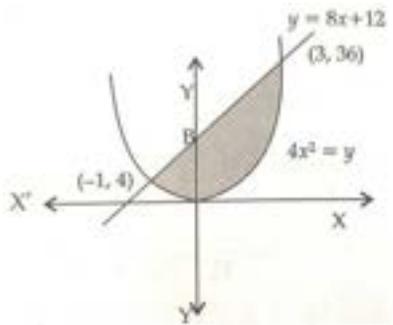
1

1

$$\begin{aligned} \text{Required area} &= \int_{-2}^{-1} (-x) dx + \int_{-1}^2 (x+2) dx \\ &= -\frac{1}{2} [x^2]_{-2}^{-1} + \left[ \frac{1}{2} x^2 + 2x \right]_{-1}^2 \\ &= 9 \end{aligned}$$

**OR**

- 30(b) Solving: curve:  $4x^2 = y$  and the line  $y = 8x + 12$  to get:  $x = -1, 3$
- Figure:



- Required Area =  $\int_{-1}^3 \{(8x + 12) - 4x^2\} dx = \frac{128}{3}$  sq. units

1

1

31

Sol (i) Contradiction occurs if one person speaks the truth and the other lies.

- A speaks the truth and B lies:  $P(A \text{ truth}) \times P(B \text{ lies}) = 0.6 \times 0.3 = 0.18$
- A lies and B speaks the truth:  $P(A \text{ lies}) \times P(B \text{ truth}) = 0.4 \times 0.7 = 0.28$

The total probability of contradiction is the sum of these probabilities:

$$0.18 + 0.28 = 0.46. \text{ As a percentage, this is } 46\%.$$

(ii) Percentage of cases they agree with each other

Agreement occurs if both people speak the truth or if both lie.

- Both A and B speak the truth:  $P(A \text{ truth}) \times P(B \text{ truth}) = 0.6 \times 0.7 = 0.42$
- Both A and B tell a lie:  $P(A \text{ lies}) \times P(B \text{ lies}) = 0.4 \times 0.3 = 0.12$

The total probability of agreement is the sum of these probabilities:  $0.42 + 0.12 = 0.54$ .  
As a percentage, this is 54%.

1

1/2

1

1/2

**SECTION D**

**Question nos.32 to 35 are long answer questions of 5 marks each**

32	<p>(a) Ans If (a,b) R (c,d) then <math>a + d = b + c</math>  <u>Reflexive</u> : If (a,b) R (a,b) if <math>a + b = b + a</math>, which is true Therefore relation is reflexive.</p> <p><u>Symmetric</u>:- If (a,b) R (c,d) then <math>a + d = b + c</math>  <math>\Rightarrow</math> If (c,d) R (a,b) then <math>c + b = d + a</math>, which is true, Therefore symmetric</p> <p><u>Transitive</u>: If (a,b) R (c,d) then <math>a + d = b + c</math>.....(i)  And if (c,d) R (e,f) then <math>c + f = d + e</math>.....(ii)  Adding (i) and (ii), we get <math>a + f = b + e</math>  Therefore (a,b) R (e,f) .Therefore relation is an equivalence relation.  Now, equivalence class containing [(2, 5)] is  {(1, 4), (2, 5), (3, 6), (4, 7), (5, 8), (6, 9)}.</p> <p>OR</p> <p>32(b) sol Let <math>f(x_1) = f(x_2) \Rightarrow \frac{x_1}{1+x_1^2} = \frac{x_2}{1+x_2^2}</math></p> <p><math>\Rightarrow x_1 + x_1x_2^2 = x_2 + x_1^2x_2</math>  <math>\Rightarrow (x_1 - x_2)(1 - x_1x_2) = 0</math></p> <p>for <math>x_1 = 2, x_2 = \frac{1}{2}</math>  we have <math>(x_1 - x_2)(1 - x_1x_2) = 0</math> but <math>x_1 \neq x_2</math>  <math>\Rightarrow f</math> is not one-one.</p> <p>Let <math>x \in R</math> such that <math>f(x) = y \Rightarrow y = \frac{x}{1+x^2}</math></p> <p><math>x^2y - x + y = 0</math>  <math>\Rightarrow x = \frac{1 \pm \sqrt{1 - 4y^2}}{2y} (y \neq 0)</math></p> <p><math>\Rightarrow y \in \left[-\frac{1}{2}, \frac{1}{2}\right] - \{0\}</math>. Also, <math>y = 0</math> when <math>x = 0</math>  [For <math>y = 0 \in \left[-\frac{1}{2}, \frac{1}{2}\right]</math>, we have <math>0 \in R</math> such that <math>f(0) = 0</math> ]  <math>\therefore</math> Range = <math>\left[-\frac{1}{2}, \frac{1}{2}\right] =</math> Codomain</p> <p><math>x \neq 0, x \in R \Rightarrow 1 - 4y^2 \geq 0, y \neq 0</math></p> <p><math>\therefore f</math> is onto.</p>	<p>1</p> <p>1</p> <p>2</p> <p>1</p> <p>1</p> <p>1</p> <p><math>\frac{1}{2}</math></p> <p>1</p> <p>1</p> <p><math>\frac{1}{2}</math></p>
33	<p>(a) SOL: <math>A = \begin{bmatrix} -4 &amp; 4 &amp; 4 \\ -7 &amp; 1 &amp; 3 \\ 5 &amp; -3 &amp; -1 \end{bmatrix}; B = \begin{bmatrix} 1 &amp; -1 &amp; 1 \\ 1 &amp; -2 &amp; -2 \\ 2 &amp; 1 &amp; 3 \end{bmatrix}</math></p> <p><math>AB = \begin{bmatrix} 8 &amp; 0 &amp; 0 \\ 0 &amp; 8 &amp; 0 \\ 0 &amp; 0 &amp; 8 \end{bmatrix} = 8I_3</math> i.e <math>AB = 8I_3</math></p> <p><math>A(BB^{-1}) = 8I_3 \Rightarrow A = 8B^{-1}</math></p> <p>hence <math>B^{-1} = \frac{1}{8}A</math></p>	<p>2</p> <p>1</p>

	<p>The system of given equations can be written as</p> $BX = C, \text{ where } B = \begin{bmatrix} 1 & -1 & 1 \\ 1 & -2 & -2 \\ 2 & 1 & 3 \end{bmatrix}; X = \begin{bmatrix} x \\ y \\ z \end{bmatrix}; C = \begin{bmatrix} 4 \\ 9 \\ 1 \end{bmatrix}$ $\Rightarrow B^{-1}(BX) = B^{-1}C$ $\Rightarrow X = B^{-1}C = \left(\frac{1}{8}A\right)C = \frac{1}{8} \begin{bmatrix} -4 & 4 & 4 \\ -7 & 1 & 3 \\ 5 & -3 & -1 \end{bmatrix} \begin{bmatrix} 4 \\ 9 \\ 1 \end{bmatrix} = \frac{1}{8} \begin{bmatrix} 24 \\ -16 \\ -8 \end{bmatrix} = \begin{bmatrix} 3 \\ -2 \\ -1 \end{bmatrix}$ <p>Hence <math>x = 3, y = -2, z = -1</math> OR 33(b)</p> <p>SOL: Given <math>A = \begin{bmatrix} 1 &amp; -1 &amp; 1 \\ 2 &amp; 1 &amp; -3 \\ 1 &amp; 1 &amp; 1 \end{bmatrix}</math></p> <p>hence <math> A  = \begin{vmatrix} 1 &amp; -1 &amp; 1 \\ 2 &amp; 1 &amp; -3 \\ 1 &amp; 1 &amp; 1 \end{vmatrix} = 10 \neq 0</math></p> <p style="text-align: center;"><i>Hence <math>A^{-1}</math> exists</i></p> $\text{adj}(A) = \begin{bmatrix} A_{11} = 4 & A_{12} = -5 & A_{13} = 1 \\ A_{21} = 2 & A_{22} = 0 & A_{23} = -2 \\ A_{31} = 2 & A_{32} = 5 & A_{33} = 3 \end{bmatrix}^T$ $= \begin{bmatrix} 4 & 2 & 2 \\ -5 & 0 & 5 \\ 1 & -2 & 3 \end{bmatrix}$ $A^{-1} = \frac{1}{10} \begin{bmatrix} 4 & 2 & 2 \\ -5 & 0 & 5 \\ 1 & -2 & 3 \end{bmatrix}$ <p>Now, the system of equations is  <math>x + 2y + z = 4, -x + y + z = 0; x - 3y + z = 2</math>  The system of given linear can be written as</p> $\begin{bmatrix} 1 & 2 & 1 \\ -1 & 1 & 1 \\ 1 & -3 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 4 \\ 0 \\ 2 \end{bmatrix} \quad A^T X = B \text{ where } A = \begin{bmatrix} 1 & -1 & 1 \\ 2 & 1 & -3 \\ 1 & 1 & 1 \end{bmatrix}$ <p>Now, <math>(A^T)^{-1}(A^T X) = (A^T)^{-1}B \Rightarrow IX = (A^{-1})^T B</math></p> $\Rightarrow X = \frac{1}{10} \begin{bmatrix} 4 & 2 & 2 \\ -5 & 0 & 5 \\ 1 & -2 & 3 \end{bmatrix}^T \begin{bmatrix} 4 \\ 0 \\ 2 \end{bmatrix} = \frac{1}{10} \begin{bmatrix} 4 & -5 & 1 \\ 2 & 0 & -2 \\ 2 & 5 & 3 \end{bmatrix} \begin{bmatrix} 4 \\ 0 \\ 2 \end{bmatrix} = \begin{bmatrix} 18/10 \\ 4/10 \\ 14/10 \end{bmatrix}$ <p>Hence <math>x = \frac{9}{5}; y = \frac{2}{5}; z = \frac{7}{5}</math></p>	<p>1</p> <p>1</p> <p>1</p> <p>1 ½</p> <p>2</p> <p>1</p> <p>1/2</p>
34	$x dy = \left[ y - x \sin^2 \left( \frac{y}{x} \right) \right] dx$ $\frac{dy}{dx} = \frac{y - x \sin^2 \left( \frac{y}{x} \right)}{x}$ $\frac{dy}{dx} = \frac{y}{x} \cdot \sin^2 \left( \frac{y}{x} \right) \quad \text{-----(1)}$ <p>put <math>y = vx</math></p>	<p>1</p> <p>1</p>

	$\frac{dy}{dx} = v + x \frac{dv}{dx}$ $v + x \frac{dv}{dx} = v - \sin^2 v$ $\therefore \int \frac{dv}{\sin^2 v} = \int \frac{-dx}{x}$ $\int \operatorname{cosec}^2 v dv = \int \frac{-dx}{x}$ $-\cot v = -\log x - \log C$ $\Rightarrow \cot v = \log Cx$ $\cot\left(\frac{y}{x}\right) = \log Cx$ $\Rightarrow \cot\left(\frac{\pi}{4}\right) = \log C$ $\therefore \log C = 1$ <p>Particular Solution is <math>\cot y = \log x + 1</math></p>	<p>1/2</p> <p>1</p> <p>1/2</p> <p>1</p>
35	<p>let given point be <math>P(1, -1, -10)</math>  equ of line <math>PQ</math> passing through <math>(1, -1, -10)</math> and parallel to line <math>l_2</math> is</p> $\frac{x-1}{2} = \frac{y+1}{-3} = \frac{z+10}{8} = \lambda$ <p><math>(2\lambda + 1, -3\lambda - 1, 8\lambda - 10)</math> be any point on line <math>PQ</math>  equ of given line <math>l_1</math> be <math>\frac{x-4}{1} = \frac{y+3}{-4} = \frac{z+1}{7} = \mu</math>  <math>(\mu + 4, 4\mu - 3, 7\mu - 1)</math> be any point on line <math>l_1</math>  let this point be point of intersection of <math>PQ \&amp; l_1</math>, say <math>Q</math></p> $2\lambda + 1 = \mu + 4 \Rightarrow 2\lambda - \mu = 3 \dots \dots \dots (i)$ $-3\lambda - 1 = -4\mu - 3 \Rightarrow -3\lambda + 4\mu = -2 \dots \dots \dots (ii)$ $8\lambda - 10 = 7\mu - 1 \Rightarrow 8\lambda - 7\mu = 9 \dots \dots \dots (iii)$ <p>Solving (1) &amp; (ii) we have.</p> $8\lambda - 4\mu = 12$ $\underline{-3\lambda + 4\mu = -2}$ $5\lambda = 10 \Rightarrow \lambda = 2$ <p>put <math>\lambda = 2</math> in equ (i)</p>	<p>1/2</p> <p>1/2</p> <p>1</p>

	$4 - \mu = 3 \Rightarrow \mu = 1$ Sub value of $\lambda = 2$ & $\mu = 1$ in equ (iii) $LHS = 8\lambda - 4\mu = 16 - 7 = 9 = RHS$ hence line intersect and co-ordinate of Q (5, -7,6) Distance $PQ = \sqrt{(5 - 1)^2 + (7 + 1)^2 + (6 + 10)^2} = \sqrt{16 + 36 + 256} = \sqrt{308}$	1  1
	<b>SECTION E</b> <b>Question nos.36 to 38 are case study questions of 4 marks eac</b>	
36	Case Study -1 <ul style="list-style-type: none"> <li>• <b>Original Readers:</b> 10,000</li> <li>• <b>Original Price:</b> ₹ 4,000</li> <li>• <b>Increase per reader:</b> ₹x (for every ₹5 increase, 10 readers lost)</li> <li>• <b>Number of Readers Lost:</b> The number of ₹5 increases is <math>x/5</math>. The number of readers lost is <math>(x/5) * 10 = 2x</math>.</li> <li>• <b>New Number of Readers:</b> 10,000 - 2x</li> <li>• <b>New Price:</b> 4,000 + x</li> </ul> <b><math>R(x) = (\text{New Price}) * (\text{New Number of Readers}) = (4000 + x) * (10000 - 2x)</math></b> (i) $R(x) = (4000 + x)(10000 - 2x)$ (ii) $\frac{d}{dx}(R(x)) = (4000 + x)(-2) + (10000 - 2x) \cdot$ $= -8000 - 2x + 10000 - 2x$ $= 2000 - 4x$ (iii)(a) $\frac{d}{dx}(R(x)) = 0 \Rightarrow 2000 - 4x = 0 \Rightarrow x = 500$ Now $\frac{d^2(R(x))}{dx^2} = -4 < 0$ So, R is maximum at $x = 500$ OR (iii)(b) $\frac{d}{dx}(R(x)) = 0 \Rightarrow 2000 - 4x = 0 \Rightarrow x = 500$ $\frac{d^2(R(x))}{dx^2} = -4 < 0$ So, R is maximum at $x = 500$ Maximum Value of $R(x) = (4000 + 500)(10000 - 1000)$ $= 4500 \times 9000$ $= ₹4,05,00,000$	1  1  1  1  1  1/2  1/2

37	<p>Case Study -II</p> <p>(i) <math>x + 2y \geq 10, x + y \geq 6, 3x + y \geq 8, x \geq 0, y \geq 0</math></p> <p>(ii) <math>Z = 4x + 5y</math></p> <p>(iii) Min <math>Z = 28</math> at <math>x=2</math> and <math>y=4</math></p> <p>OR</p> <p>(iii) Min <math>Z = 112</math> at <math>x=2</math> and <math>y=4</math></p>	1 1 2
38	<p>Case Study -II</p> <p>Let <math>E_1, E_2, A</math> be events defined as</p> <p><math>E_1</math> = treatment of heart attack with Yoga and meditation</p> <p><math>E_2</math> = treatment of heart attack with certain drugs.</p> <p><math>A</math> = Person getting heart attack.</p> <p><math>P(E_1) = \frac{1}{2}, P(E_2) = \frac{1}{2}</math></p> <p><math>P(A/E_1) = 40\% - \left(40 \times \frac{30}{100}\right)\% = 40\% - 12\% = 28\% = \frac{28}{100}</math></p> <p><math>P(A/E_2) = 40\% - \left(40 \times \frac{25}{100}\right)\% = 40\% - 10\% = 30\% = \frac{30}{100}</math></p> <p>(i) By using Total Probability:</p> <p><math>P(A) = P(E_1)P(A/E_1) + P(E_2)P(A/E_2)</math></p> <p><math>= \frac{1}{2} \times \frac{28}{100} + \frac{1}{2} \times \frac{30}{100} = \frac{58}{200} = \frac{29}{100}</math></p> <p>(ii) By using Baye's theorem, we have</p> <p><math>P(E_1/A) = \frac{P(E_1)P(A/E_1)}{P(E_1)P(A/E_1) + P(E_2)P(A/E_2)}</math></p> <p><math>= \frac{\frac{1}{2} \times \frac{28}{100}}{\frac{1}{2} \times \frac{28}{100} + \frac{1}{2} \times \frac{30}{100}} = \frac{28}{28 + 30} = \frac{28}{58} = \frac{14}{29}</math></p>	1  1  1

\*\*\*\*\*END OF PAPER\*\*\*\*\*