QUESTION PAPER CODE 65/1/1
EXPECTED ANSWER/VALUE POINTS
SECTION A

Q.NO.		MARKS
1.	$A_{23} = -7$	1
2.	$\frac{dy}{dx} = -2x \cdot \cos x^2 \cdot \sin(\sin x^2)$	1
3.	Order = 2, Degree = 1	$\frac{1}{2}+\frac{1}{2}$
4.	Required length $= \sqrt{3^2+(-4)^2} = 5$	$\frac{1}{2}+\frac{1}{2}$
	OR	
	$\hat{n} = \frac{1}{3}(2\hat{i}-\hat{j}+2\hat{k})$	$\frac{1}{2}$
	Equation of plane is $\vec{r}\cdot\hat{n}=d$ i.e. $\vec{r}\cdot\frac{1}{3}(2\hat{i}-\hat{j}+2\hat{k})=5$ or $\vec{r}\cdot(2\hat{i}-\hat{j}+2\hat{k})=15$	$\frac{1}{2}$
	SECTION B	
5.	$fof(x) = f(f(x)) = f((3-x^3)^{1/3})$	$\frac{1}{2}$
	$= [3-\{(3-x^3)^{1/3}\}^3]^{1/3} = x$	$1\frac{1}{2}$
6.	$A^{-1} = \begin{bmatrix} 2 & 3 \\ 3 & 5 \end{bmatrix}$	$\frac{1}{2}$
	$(AB)^{-1} = B^{-1}.A^{-1}$	
	$= \begin{bmatrix} 3 & 2 \\ 0 & -1 \end{bmatrix}\begin{bmatrix} 2 & 3 \\ 3 & 5 \end{bmatrix} = \begin{bmatrix} 12 & 19 \\ -3 & -5 \end{bmatrix}$	$1\frac{1}{2}$
7.	$I = \int \frac{1}{\sqrt{1-(x-1)^2}}dx$	1
	$= \sin^{-1}(x-1) + C$	1

8.	$I = \int \frac{\sec^2 x}{(1-\tan x)^2} dx$	
	Put $1 - \tan x = t \Rightarrow \sec^2 x\, dx = -dt$	$\frac{1}{2}$
	$I = -\int \frac{dt}{t^2} = \frac{1}{t} + C = \frac{1}{1-\tan x} + C$	$1\frac{1}{2}$
	OR	
	$I = \int_0^1 x(1-x)^n dx$	
	$= \int_0^1 (1-x)\cdot x^n dx = \int_0^1 (x^n - x^{n+1}) dx$	$\frac{1}{2}+\frac{1}{2}$
	$= \left[\frac{x^{n+1}}{n+1} - \frac{x^{n+2}}{n+2}\right]_0^1$	$\frac{1}{2}$
	$= \frac{1}{n+1} - \frac{1}{n+2}$ or $\frac{1}{(n+1)(n+2)}$	$\frac{1}{2}$
9.	$y = b\cos(x+a)$	
	$\Rightarrow \frac{dy}{dx} = -b\sin(x+a)$	$\frac{1}{2}$
	$\frac{d^2y}{dx^2} = -b\cos(x+b)$	1
	$\Rightarrow \frac{d^2y}{dx^2} = -y$ or $\frac{d^2y}{dx^2} + y = 0$	$\frac{1}{2}$
10.	$\vec{a}\times\vec{b} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 4 & -1 & 8 \\ 0 & -1 & 1 \end{vmatrix} = 7\hat{i} - 4\hat{j} - 4\hat{k}$	1
	Required unit vector $= \frac{(\vec{a}\times\vec{b})}{\lvert\vec{a}\times\vec{b}\rvert}$	

	$= \frac{1}{9}(7\hat{i}-4\hat{j}-4\hat{k})$	1
	OR	
	$(\vec{a}+\lambda\vec{b})\perp\vec{c} \Rightarrow (\vec{a}+\lambda\vec{b})\cdot\vec{c} = 0$	$\frac{1}{2}$
	$\Rightarrow \quad [(2-\lambda)\hat{i}+(2+2\lambda)\hat{j}+(3+\lambda)\hat{k}]\cdot(3\hat{i}+\hat{j}) = 0$	$\frac{1}{2}$
	$\Rightarrow \quad 3(2-\lambda)+1.(2+2\lambda) = 0 \Rightarrow \lambda = 8$	1
11.	$P(A/B) = \frac{P(A\cap B)}{P(B)} = \frac{P(A)\ \cancel{P(B)}}{\cancel{P(B)}}$	1
	$= 0.3$	1
	OR	
	Required probability $= \frac{3}{5}\times\frac{3}{7}+\frac{2}{5}\times\frac{4}{7} = \frac{17}{35}$	1+1
12.	Required probability = 1 – P(problem is not solved)	
	$= 1 - P(A' \cap B' \cap C')$	1
	$= 1 - P(A')\cdot P(B')\cdot P(C')$	$\frac{1}{2}$
	$= 1 - \frac{1}{2}\times\frac{2}{3}\times\frac{3}{4} = \frac{3}{4}$	$\frac{1}{2}$
	SECTION C	
13.	For reflexive: As ab = ba $\Rightarrow$ (a, b) R(a, b) $\quad\therefore$ R is reflexive	1
	For symmetric: Let (a, b,) R (c, d) $\Rightarrow$ ad = bc $\Rightarrow$ cb = da $\Rightarrow$ (c, d) R(a, b) $\quad\therefore$ R is symmetric	1

	For transitive: Let a, b, c, d, e, f $\in$ N Let (a, b) R(c, d) and (c, d) R(e, f) $\Rightarrow$ ad = bc and cf = de $\Rightarrow \quad d = \frac{cf}{e}$ $\therefore \quad a\left(\frac{cf}{e}\right) = bc$ $\Rightarrow$ acf = bce $\Rightarrow$ af = be $\Rightarrow$ (a, b) R(e, f) $\quad \therefore$ R is transitive	$1\frac{1}{2}$
	Since R is reflexive, symmetric and transitive $\therefore$ R is an equivalence relation.	$\frac{1}{2}$
	OR	
	Let $x_1, x_2 \in R - \{2\}$ Let $f(x_1) = f(x_2)$ $\Rightarrow \frac{x_1}{x_1 - 2} = \frac{x_2}{x_2 - 2} \Rightarrow x_1(x_2 - 2) = x_2(x_1 - 2)$ $\Rightarrow x_1 = x_2$ $\Rightarrow$ f is one-one.	2
	Now, gof(x) = g(f(x)), $\quad x \in \mathbb{R} - \{2\}$ $= g\left(\frac{x}{x-2}\right)$ $= \frac{2\left(\frac{x}{x-2}\right)}{\frac{x}{x-2} - 1} = x$	2
14.	Put $x = \cos 2\theta \Rightarrow \theta = \frac{1}{2}\cos^{-1} x$	1
	LHS $= \tan^{-1}\left(\frac{\sqrt{1+\cos 2\theta} + \sqrt{1-\cos 2\theta}}{\sqrt{1+\cos 2\theta} - \sqrt{1-\cos 2\theta}}\right)$	$\frac{1}{2}$

	$= \tan^{-1}\left(\frac{\cos\theta+\sin\theta}{\cos\theta-\sin\theta}\right)$	1
	$= \tan^{-1}\left(\frac{1+\tan\theta}{1-\tan\theta}\right) = \tan^{-1}\left(\tan\left(\frac{\pi}{4}+\theta\right)\right)$	$\frac{1}{2}$
	$= \frac{\pi}{4}+\theta = \frac{\pi}{4}+\frac{1}{2}\cos^{-1}x = \text{RHS}$	1
15.	LHS: $R_1 \to R_1 - R_2,\ R_2 \to R_2 - R_3$	
	$= \begin{vmatrix} 0 & x-y & x^2-y^2 \\ 0 & y-z & y^2-z^2 \\ 1 & z & z^2 \end{vmatrix}$	2
	$= (x-y)(y-z)\begin{vmatrix} 0 & 1 & x+y \\ 0 & 1 & y+z \\ 1 & z & z^2 \end{vmatrix}$	1
	Expanding along C_1	
	$= (x-y)\ (y-z)\ (z-x) = \text{RHS}$	1
16.	$x^y \cdot y^x = x^x$	
	$\Rightarrow\ y\log x + x\log y = x\log x$	1
	differentiate both sides w.r.t. x,	
	$\left(y\cdot\frac{1}{x}+\log x\cdot\frac{dy}{dx}\right)+\left(x\cdot\frac{1}{y}\cdot\frac{dy}{dx}+\log y\cdot 1\right) = x\cdot\frac{1}{x}+\log x\cdot 1$	2
	$\Rightarrow\ \frac{y}{x}+\log\left(\frac{y}{x}\right)-1 = -\left(\log x+\frac{x}{y}\right)\cdot\frac{dy}{dx}$	
	$\Rightarrow\ \frac{dy}{dx} = \frac{1-\frac{y}{x}-\log\left(\frac{y}{x}\right)}{\log x+\frac{x}{y}}$ or $\frac{y}{x}\left[\frac{x+x\log x-y-x\log y}{y\log x+x}\right]$	1
	OR	
	$\frac{dx}{d\theta} = 3a\sec^2\theta\cdot\sec\theta\tan\theta$	1

	$\frac{dy}{d\theta} = 3a\tan^2\theta \cdot \sec^2\theta$	1
	$\frac{dy}{dx} = \frac{\left(\frac{dy}{d\theta}\right)}{\left(\frac{dx}{d\theta}\right)} = \sin\theta$	1
	Also, $\frac{d^2y}{dx^2} = \cos\theta \cdot \frac{d\theta}{dx}$	
	$= \frac{\cos\theta}{3a\tan\theta\sec^3\theta}$ or $\frac{\cos^5\theta}{3a\sin\theta}$	1
17.	$y = a\cos(\log x) + b\sin(\log x)$	
	$\frac{dy}{dx} = \frac{-a\sin(\log x)}{x} + \frac{b\cos(\log x)}{x}$	1
	$\Rightarrow \quad x \cdot \frac{dy}{dx} = -a\sin(\log x) + b\cos(\log x)$	$\frac{1}{2}$
	differentiate both sides again w.r.t x,	
	$x \cdot \frac{d^2y}{dx^2} + \frac{dy}{dx} \cdot 1 = \frac{-a\cos(\log x)}{x} - \frac{b\sin(\log x)}{x}$	$1\frac{1}{2}$
	$\Rightarrow \quad x\frac{d^2y}{dx^2} + \frac{dy}{dx} = -\frac{y}{x}$	$\frac{1}{2}$
	$\Rightarrow \quad x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = 0$	$\frac{1}{2}$
18.	Given $ay^2 = x^3$	
	differentiate both sides wrt x	
	$a \cdot 2y\frac{dy}{dx} = 3x^2 \Rightarrow \frac{dy}{dx} = \frac{3x^2}{2ay}$	1
	$\therefore$ Slope of tangent at $(am^2, am^3) = \frac{3(am^2)^2}{2a(am^3)} = \frac{3}{2}m$	1

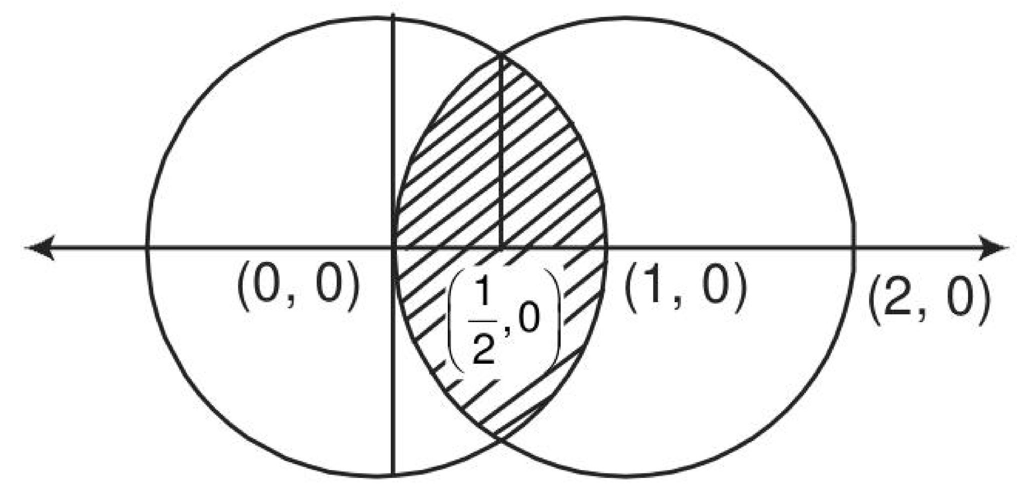
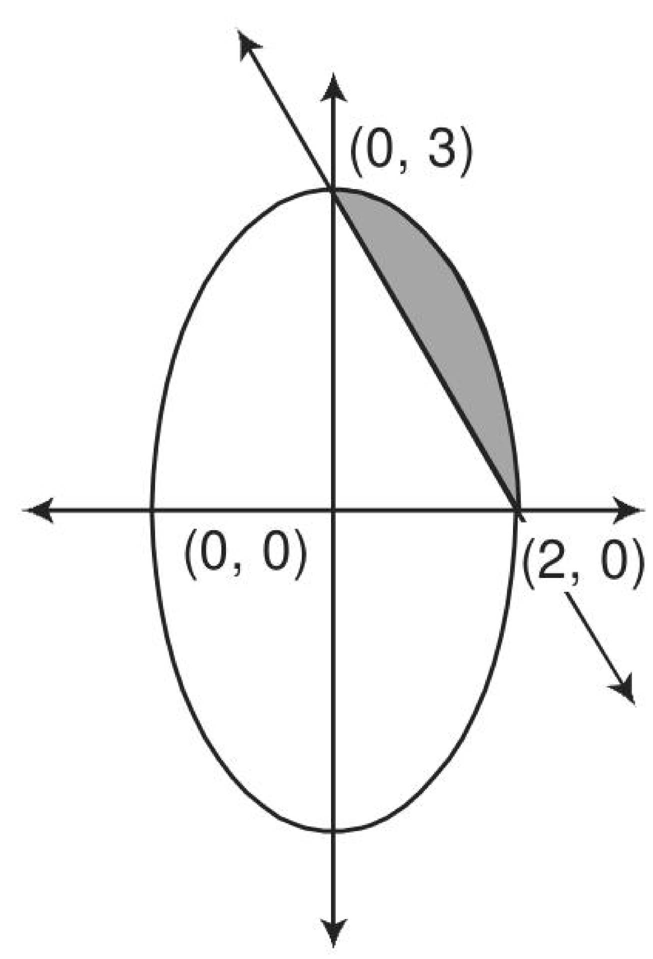
	Equation of tangent is $y - am^3 = \frac{3}{2}m(x - am^2)$ $\Rightarrow \quad 3mx - 2y = am^3$	2
19.	Put $\sin x = t \Rightarrow \cos x\, dx = dt$	1
	$I = \int \frac{dt}{(t+1)(t+2)}$	
	$= \int \left(\frac{1}{t+1} - \frac{1}{t+2}\right) dt$	1
	$= \log\|t + 1\| - \log\|t + 2\| + C$	$1\frac{1}{2}$
	$= \log\|\sin x + 1\| - \log\|\sin x + 2\| + C$ or $\log\left\|\frac{\sin x + 1}{\sin x + 2}\right\| + C$	$\frac{1}{2}$
20.	$I = \int_0^{\pi} \frac{x \sin x}{1+\cos^2 x} dx$ ...(1)	
	$I = \int_0^{\pi} \frac{(\pi - x)\cdot \sin x}{1+\cos^2 x} dx$ ...(2)	1
	Adding (1) and (2)	
	$2I = \int_0^{\pi} \frac{\pi \sin x}{1+\cos^2 x} dx$	
	$I = \frac{\pi}{2}\int_0^{\pi} \frac{\sin x}{1+\cos^2 x} dx$	$\frac{1}{2}$
	Put $\cos x = t \Rightarrow -\sin x\, dx = dt$	$\frac{1}{2}$
	$\therefore \quad I = \frac{\pi}{2}\int_{-1}^{1} \frac{dt}{1+t^2}$	1
	$= \frac{\pi}{2}[\tan^{-1} t]_{-1}^{1} = \frac{\pi^2}{4}$	$\frac{1}{2}+\frac{1}{2}$

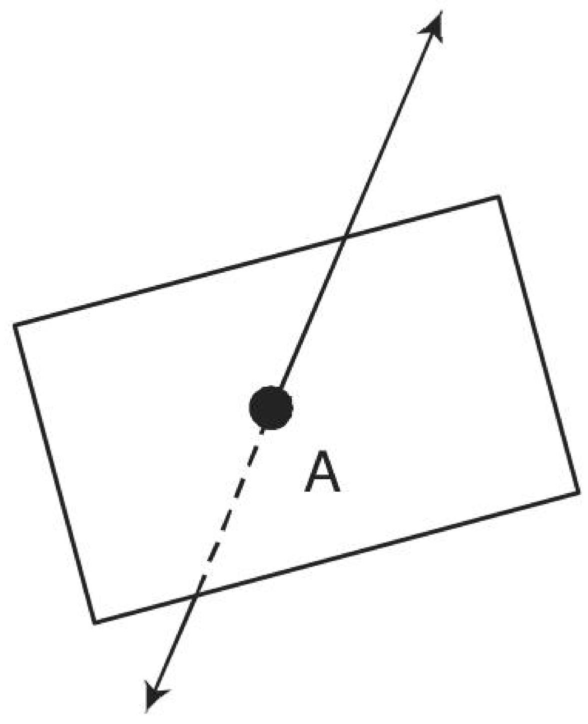
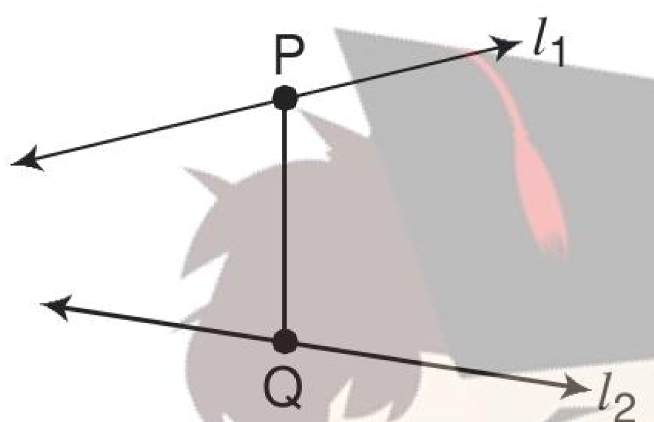
21.	Given equation can be written as $x\ dx = ye^y\sqrt{1+x^2}\ dy$ $\Rightarrow \int \frac{x}{\sqrt{1+x^2}}dx = \int y \cdot e^y dy$	1
	$\Rightarrow \sqrt{1+x^2} = e^y\ (y-1) + C$	1+1
	when $y = 1,\ x = 0 \Rightarrow C = 1$	$\frac{1}{2}$
	$\therefore$ Required solution is $\sqrt{1+x^2} = e^y(y-1)+1$	$\frac{1}{2}$
	OR	
	Given differential equation can be written as $\frac{dy}{dx} = \frac{y}{x} + \frac{1}{\cos\left(\frac{y}{x}\right)}$	$\frac{1}{2}$
	Put $\frac{y}{x} = v$ i.e. $y = vx$ $\Rightarrow \frac{dy}{dx} = v + x \cdot \frac{dv}{dx}$	1
	Given equation becomes $v + x\frac{dv}{dx} = v + \frac{1}{\cos v}$	$\frac{1}{2}$
	$\Rightarrow \int \cos v\ dv = \int \frac{dx}{x}$	$\frac{1}{2}$
	$\Rightarrow \sin v = \log \lvert x \rvert + c$	1
	$\Rightarrow \sin\left(\frac{y}{x}\right) = \log \lvert x \rvert + c$	$\frac{1}{2}$
22.	$A(1,\ 2,\ -1),\ B(3,\ -1,\ 0),\ C(2,\ 3,\ 2),\ D(4,\ 0,\ 3)$	
	$\overrightarrow{AB} = 2\hat{i} - 3\hat{j} + \hat{k},\ \overrightarrow{AC} = \hat{i} + \hat{j} + 3\hat{k},\ \overrightarrow{AD} = 3\hat{i} - 2\hat{j} + 4\hat{k}$	$1\frac{1}{2}$

	Consider $= [\overrightarrow{AB}\ \overrightarrow{AC}\ \overrightarrow{AD}] = \begin{vmatrix} 2 & -3 & 1 \\ 1 & 1 & 3 \\ 3 & -2 & 4 \end{vmatrix} = 2(10) + 3(-5) + 1(-5) = 0$	1+1
	$\Rightarrow$ A, B, C and D are coplanar	$\frac{1}{2}$
23.	Let equation of line is $\vec{r} = (2\hat{i} + 3\hat{j} - \hat{k}) + \lambda(a\hat{i} + b\hat{j} + c\hat{k})$	1
	here, $3a + 4b + 2c = 0$ ...(1) $3a - 2b - 2c = 0$ ...(2)	1
	Solving (1) and (2) $\frac{a}{-8+4} = \frac{-b}{-6-6} = \frac{c}{-6-12} = \mu$	
	$\Rightarrow \frac{a}{2} = \frac{b}{-6} = \frac{c}{9} = -2\mu$	1
	$\therefore$ Requried equation of line is $\vec{r} = (2\hat{i} + 3\hat{j} - \hat{k}) + \lambda(2\hat{i} - 6\hat{j} + 9\hat{k})$	1
	SECTION D	
24.	$\lvert A\rvert = -2 \neq 0 \Rightarrow A^{-1}$ exists	$\frac{1}{2}$
	Now, $A_{11} = -1, A_{12} = 8, A_{13} = -5$ $A_{21} = 1, A_{22} = -6, A_{23} = 3$ $A_{31} = -1, A_{32} = 2, A_{33} = -1$	$2\frac{1}{2}$
	adj $A = \begin{bmatrix} -1 & 1 & -1 \\ 8 & -6 & 2 \\ -5 & 3 & -1 \end{bmatrix}$	
	$A^{-1} = \frac{1}{\lvert A\rvert} \cdot \text{adj } A = \frac{-1}{2}\begin{bmatrix} -1 & 1 & -1 \\ 8 & -6 & 2 \\ -5 & 3 & -1 \end{bmatrix}$	1
	Given system of equations can be written as AX = B,	

	where $X = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$ and $B = \begin{bmatrix} 5 \\ 10 \\ 9 \end{bmatrix}$	
	Now $AX = B \Rightarrow X = A^{-1}B$	1
	$= \frac{-1}{2}\begin{bmatrix} -1 & 1 & -1 \\ 8 & -6 & 2 \\ -5 & 3 & -1 \end{bmatrix}\begin{bmatrix} 5 \\ 10 \\ 9 \end{bmatrix}$	
	$= \frac{-1}{2}\begin{bmatrix} -4 \\ -2 \\ -4 \end{bmatrix} = \begin{bmatrix} 2 \\ 1 \\ 2 \end{bmatrix}$	$\frac{1}{2}$
	$\therefore \quad x = 2, y = 1, z = 2$	$\frac{1}{2}$
	OR	
	$A = IA$	
	$\Rightarrow \begin{bmatrix} 3 & -1 & 1 \\ -15 & 6 & -5 \\ 5 & -2 & 2 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \cdot A$	1
	$R_1 \to \frac{R_1}{3}$	
	$\Rightarrow \begin{bmatrix} 1 & \frac{-1}{3} & \frac{1}{3} \\ -15 & 6 & -5 \\ 5 & -2 & 2 \end{bmatrix} = \begin{bmatrix} \frac{1}{3} & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \cdot A$	
	$R_2 \to R_2 + 15R_1,\ R_3 \to R_3 - 5R_1$	
	$\Rightarrow \begin{bmatrix} 1 & \frac{-1}{3} & \frac{1}{3} \\ 0 & 1 & 0 \\ 0 & \frac{-1}{3} & \frac{1}{3} \end{bmatrix} = \begin{bmatrix} \frac{1}{3} & 0 & 0 \\ 5 & 1 & 0 \\ \frac{-5}{3} & 0 & 1 \end{bmatrix} \cdot A$	
	$R_1 \to R_1 + \frac{1}{3}R_2,\ R_3 \to R_3 + \frac{1}{3}R_2$	

	$\Rightarrow \begin{bmatrix} 1 & 0 & \frac{1}{3} \\ 0 & 1 & 0 \\ 0 & 0 & \frac{1}{3} \end{bmatrix} = \begin{bmatrix} 2 & \frac{1}{3} & 0 \\ 5 & 1 & 0 \\ 0 & \frac{1}{3} & 1 \end{bmatrix} \cdot A$ $R_3 \to 3R_3$ $\Rightarrow \begin{bmatrix} 1 & 0 & \frac{1}{3} \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 2 & \frac{1}{3} & 0 \\ 5 & 1 & 0 \\ 0 & 1 & 3 \end{bmatrix} \cdot A$ $R_1 \to R_1 - \frac{1}{3}R_3$ $\Rightarrow \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 2 & 0 & -1 \\ 5 & 1 & 0 \\ 0 & 1 & 3 \end{bmatrix} \cdot A$	4
	$\Rightarrow \quad A^{-1} = \begin{bmatrix} 2 & 0 & -1 \\ 5 & 1 & 0 \\ 0 & 1 & 3 \end{bmatrix}$	1
25.	Let Q(x, y) be the nearest point to P(1, 2)	
	Minimize $s = \sqrt{(x-1)^2 + (y-2)^2}$	1
	Let $l = s^2 = (x-1)^2 + (y-2)^2$	
	$\Rightarrow \quad l = x^2 + y^2 - 2x - 4y + 5 \qquad ...(1)$	1
	Also, $x^2 + y^2 = 80 \qquad ...(2)$	
	from (1) and (2), $l = 85 - 2x - 4\sqrt{80 - x^2}$	
	$\frac{dl}{dx} = -2 - 4 \cdot \frac{1}{2\sqrt{80 - x^2}}(-2x) = -2 + \frac{4x}{\sqrt{80 - x^2}}$	1
	$\frac{dl}{dx} = 0 \Rightarrow x = 4, -4$ (rejected)	1

	$\dfrac{d^2l}{dx^2} = \dfrac{4\sqrt{80-x^2} + \dfrac{4x^2}{\sqrt{80-x^2}}}{80-x^2} > 0 \text{ at } x = 4$	1
	$\therefore$ (4, 8) is the nearest point.	1
26.	x-coordinate of the point of intersection of given cicles is $\dfrac{1}{2}$.	1
	Correct Figure	1
	Required Area $= 4\cdot\displaystyle\int_0^{1/2}\sqrt{1-(x-1)^2}\,dx$ 	1
	$= 4\left[\dfrac{x-1}{2}\cdot\sqrt{1-(x-1)^2} + \dfrac{1}{2}\sin^{-1}(x-1)\right]_0^{\frac{1}{2}}$	2
	$= 4\left[\dfrac{-1}{4}\times\dfrac{\sqrt{3}}{2} + \dfrac{1}{2}\sin^{-1}\left(\dfrac{-1}{2}\right) - \dfrac{1}{2}\sin^{-1}(-1)\right]$	
	$= \dfrac{2\pi}{3} - \dfrac{\sqrt{3}}{2}$	1
	OR	
	Given equation of ellipse $\dfrac{x^2}{4} + \dfrac{y^2}{9} = 1$ Correct Figure	1
	and equation of line $\dfrac{x}{2} + \dfrac{y}{3} = 1$ 	
	Point of intersection (2, 0) and (0, 3)	1
	Required Area $= \displaystyle\int_0^2 \frac{3}{2}\sqrt{4-x^2}\,dx - \int_0^2 \frac{3}{2}(2-x)\,dx$	1
	$= \dfrac{3}{2}\left[\dfrac{x}{2}\sqrt{4-x^2} + 2\sin^{-1}\left(\dfrac{x}{2}\right)\right]_0^2 + \dfrac{3}{2}\cdot\left[\dfrac{(2-x)^2}{2}\right]_0^2$	2
	$= \dfrac{3}{2}(2\sin^{-1}1) + \dfrac{3}{4}(-4)$	
	$= \dfrac{3\pi}{2} - 3$	1

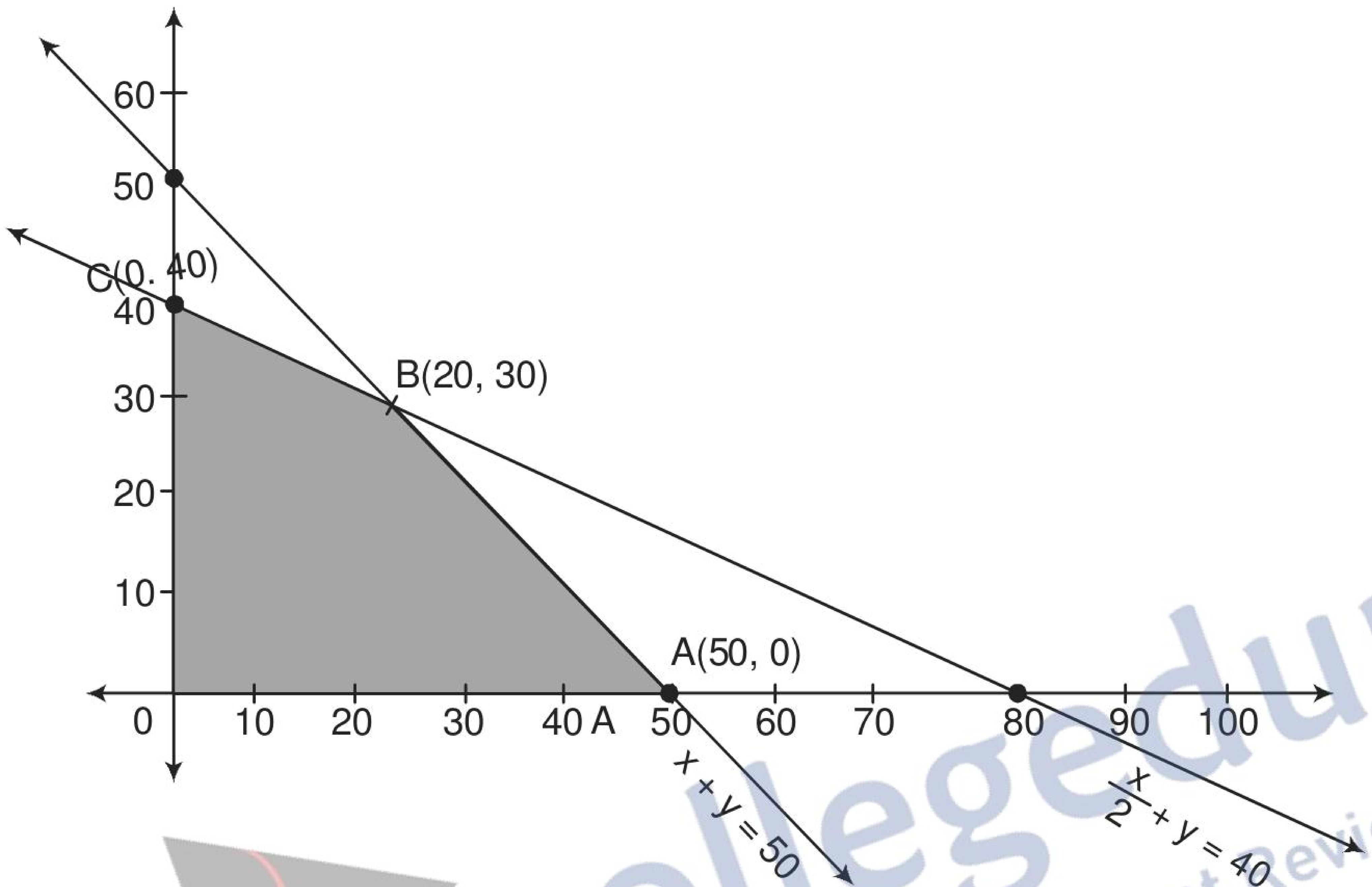
27.	 Given line $\frac{x-8}{4}=\frac{y-1}{1}=\frac{z-3}{8}=\lambda$	
	Any point on it is $(4\lambda + 8, \lambda + 1, 8\lambda + 3)$	1
	Let A $(4\lambda + 8, \lambda + 1, 8\lambda + 3)$	
	A lies on plane $2x + 2y + z = 3$	
	$\therefore 2(4\lambda + 8) + 2(\lambda + 1) + (8\lambda + 3) = 3$	2
	$\Rightarrow \lambda = -1$	
	$\therefore A(4, 0, -5)$	1
	II part: Let angle between line and plane be θ.	
	Then, $\sin\theta = \frac{4(2)+1(2)+8(1)}{\sqrt{16+1+64}\sqrt{4+4+1}}=\frac{2}{3}$	$1\frac{1}{2}$
	$\Rightarrow \theta = \sin^{-1}\left(\frac{2}{3}\right)$	$\frac{1}{2}$
	OR	
	 Let $P(3\lambda + 7, 2\lambda + 5, \lambda + 3)$ and	$\frac{1}{2}$
	$Q(2\mu + 1, 4\mu - 1, 3\mu - 1)$	$\frac{1}{2}$
	Now, d.r′.s. of PQ $= 3\lambda - 2\mu + 6, 2\lambda - 4\mu + 6, \lambda - 3\mu + 4$	1
	According to question,	
	$\frac{3\lambda-2\mu+6}{2}=\frac{2\lambda-4\mu+6}{2}=\frac{\lambda-3\mu+4}{1}$	1
	$\Rightarrow \lambda + 2\mu = 0$ and $2\mu = 2 \Rightarrow \mu = 1$	
	$\Rightarrow \lambda = -2\mu$	
	$\therefore \mu = 1, \lambda = -2$	1
	$\therefore P(1, 1, 1)$ and $Q(3, 3, 2)$	
	$PQ = \sqrt{(3-1)^2+(3-1)^2+(2-1)^2}=\sqrt{4+4+1}=3$	1
	Equation of PQ is $\frac{x-1}{2}=\frac{y-1}{2}=\frac{z-1}{1}$	1
28.	Let number of chairs be x and number of tables be y.	
	Maximize $z = 40x + 60y$	1

Subject to following constratins:

$x + y \leq 50$

$\frac{x}{2} + y \leq 40$

$x \geq 0,\ y \geq 0$ } 2



2

Corner point	z = 40x + 60y
A(50, 0)	2000
B(20, 30)	2600
C(0, 40)	2400

Number of chairs manufactured = 20

Number of tables manufactured = 30

Maximum profit = ₹ 2,600 } 1

29. Let E_1: Transferred ball is green

E_2: Transferred ball is red } 1

A: Green ball is found

Here, $P(E_1) = \frac{2}{6}, P(E_2) = \frac{4}{6}$ 1

$P(A/E_1) = \frac{6}{9}, P(A/E_2) = \frac{5}{9}$ 1

	Using Baye's theorem.	
	$P(E_1/A) = \dfrac{P(E_1)\cdot P(A/E_1)}{P(E_1)\cdot P(A/E_1)+P(E_2)\cdot P(A/E_2)}$	
	$= \dfrac{\frac{2}{6}\times\frac{6}{9}}{\frac{2}{6}\times\frac{6}{9}+\frac{4}{6}\times\frac{5}{9}}$	2
	$= \dfrac{12}{12+20}=\dfrac{3}{8}$	1