

22	$\int e^x \left(\frac{\sqrt{1 + \sin 2x}}{1 + \cos 2x} \right) dx = \int e^x \left(\frac{\sqrt{\sin^2 x + \cos^2 x + 2 \sin x \cos x}}{2 \cos^2 x} \right) dx.$ $= \int e^x \left(\frac{\sqrt{(\sin x + \cos x)^2}}{2 \cos^2 x} \right) dx.$ $= \int e^x \left(\frac{\sin x + \cos x}{2 \cos^2 x} \right) dx.$ $= \int e^x \left(\frac{1}{2} \tan x \sec x + \frac{1}{2} \sec x \right) dx.$ $= \frac{1}{2} \int e^x (\sec x + \sec x \tan x) dx$ $= \frac{1}{2} e^x (\sec x) + c$	<p>1/2</p> <p>1/2</p> <p>1/2</p> <p>1/2</p>
23	<p>Given that the function is continuous everywhere. For the function to be continuous at $x = -\frac{\pi}{2}$, the left hand limit and right and limit must be equal.</p> <p>The left hand limit is , LHL = $\lim_{x \rightarrow -\frac{\pi}{2}^-} f(x) = \lim_{x \rightarrow -\frac{\pi}{2}^-} -2 \sin x$</p> $= 2$ <p>The right hand limit is , RHL = $\lim_{x \rightarrow -\frac{\pi}{2}^+} f(x) = \lim_{x \rightarrow -\frac{\pi}{2}^+} A \sin x + B$</p> $= -A + B$ $\therefore -A + B = 2 \text{ (1)}$ <p>Continuity at $x = \frac{\pi}{2}$</p> <p>LHL = $\lim_{x \rightarrow \frac{\pi}{2}^-} f(x) = \lim_{x \rightarrow \frac{\pi}{2}^-} A \sin x + B$</p> $= A + B$ <p>RHL = $\lim_{x \rightarrow \frac{\pi}{2}^+} f(x) = \lim_{x \rightarrow \frac{\pi}{2}^+} \cos x$</p> $= 0$ $\therefore A + B = 0 \text{ (2)}$ <p>From (1) & (2), $A = -1, B = 1$</p>	<p>1/2</p> <p>1/2</p> <p>1/2</p> <p>1/2</p>
24	<p>Let $\vec{a} = 3\hat{i} - 2\hat{j} + \hat{k}$ and $\vec{b} = 4\hat{i} + 3\hat{j} - 2\hat{k}$</p> <p>Vector \vec{c} perpendicular to both \vec{a} & $\vec{b} = \vec{a} \times \vec{b}$</p> $= \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 3 & -2 & 1 \\ 4 & 3 & -2 \end{vmatrix}$ $= \hat{i} + 10\hat{j} + 17\hat{k}$ <p>The unit vector \hat{c} in the direction of $\vec{c} = \frac{\vec{c}}{ \vec{c} }$</p>	1

	$= \frac{i+10j+17k}{\sqrt{390}}$ <p>Required vector = $5\hat{c} = 5\left(\frac{i+10j+17k}{\sqrt{390}}\right)$</p>	1
25	$y = (x + \sqrt{x^2 - 1})^2$ $\frac{dy}{dx} = 2(x + \sqrt{x^2 - 1})\left(1 + \frac{1}{2\sqrt{x^2 - 1}}2x\right)$ $= 2(x + \sqrt{x^2 - 1})\left(\frac{\sqrt{x^2 - 1} + x}{\sqrt{x^2 - 1}}\right)$ $= 2\frac{(x + \sqrt{x^2 - 1})^2}{\sqrt{x^2 - 1}}$ $= \frac{2y}{\sqrt{x^2 - 1}}$ $(x^2 - 1)\left(\frac{dy}{dx}\right)^2 = 4y^2$ <p>OR</p> <p>Let $u = \cos^{-1}(2x^2 - 1)$</p> <p>Then $u = \cos^{-1}(2\cos^2\theta - 1)$</p> $= 2\theta = 2\cos^{-1}x$ $\therefore \frac{du}{dx} = \frac{-2}{\sqrt{1 - x^2}}$ <p>Let $v = \cos^{-1}x$</p> $\therefore \frac{dv}{dx} = -\frac{1}{\sqrt{1 - x^2}}$ $\therefore \frac{du}{dv} = \frac{du}{dx} \times \frac{dx}{dv}$ $= 2$	<p>1/2</p> <p>1/2</p> <p>1/2</p> <p>1/2</p> <p>1/2</p> <p>1/2</p> <p>1/2</p> <p>1/2</p>
	SECTION C	
26	$ x + 1 = \begin{cases} x + 1, & \text{if } x \geq -1 \\ -x - 1, & \text{if } x < -1 \end{cases}$ $\int_{-4}^2 x + 1 dx = \int_{-4}^{-1} -(x + 1) dx + \int_{-1}^2 (x + 1) dx$ $= \left[-\frac{x^2}{2} - x\right]_{-4}^{-1} + \left[\frac{x^2}{2} + x\right]_{-1}^2$ $= 9$ <p>The value of the integral is 9. The integral represents the total area between the graph of $y = x + 1$ and the x-axis on the interval $[-4, 2]$.</p> <p>.OR</p> <p>To find the points where the parabola $y = x^2$ and the line $y = x$ intersect, set the equations equal to each other and solve for x.</p> $x^2 = x \Rightarrow x(x - 1) = 0$	<p>1</p> <p>1/2</p> <p>1/2</p> <p>1</p> <p>1</p>

	$\Rightarrow x = 0 \text{ or } x = 1$ \therefore The required area between the curves $y = x^2$ and $y = x$ is $A = \int_0^1 x - x^2 dx$ $= \left[\frac{x^2}{2} - \frac{x^3}{3} \right]_0^1$ $= \frac{1}{2} - \frac{1}{3}$ $= \frac{1}{6} \text{ sq. units}$	$\frac{1}{2}$ $\frac{1}{2}$ 1
27	E_1 : Female candidate E_2 : Male candidate A : Candidate have distinction $P(E_1) = \frac{2}{3}, P(E_2) = \frac{1}{3}$ $P\left(\frac{A}{E_1}\right) = 0.35, P\left(\frac{A}{E_2}\right) = 0.40$ $P(A) = P(E_1)P\left(\frac{A}{E_1}\right) + P(E_2)P\left(\frac{A}{E_2}\right)$ $= \frac{2}{3} \times 0.35 + \frac{1}{3} \times 0.40$ $= \frac{70 + 40}{300}$ $= \frac{11}{30}$	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$
28	Given that $\frac{dA}{dt} = 5 \text{ mm}^2/\text{s}$ & $r = 8 \text{ mm}$ ie, $\frac{d}{dt}(4\pi r^2) = 5 \Rightarrow 4\pi \times 2r \frac{dr}{dt} = 5$ $\Rightarrow \frac{dr}{dt} = \frac{5}{8\pi r}$ $\therefore \frac{dr}{dt} \text{ (at } r = 8) = \frac{5}{64\pi} \text{ mm/s}$ Therefore $\frac{dv}{dt} = \frac{d}{dt}\left(\frac{4}{3}\pi r^3\right) = \frac{4}{3}\pi \times \frac{3r^2 dr}{dt}$ $= 20 \text{ mm}^3/\text{s}$.	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$
29	Consider the given function $\sqrt{1-x^2} + \sqrt{1-y^2} = a(x-y)$ Let $x = \sin \theta$ and $y = \sin \phi$ Then the given equation becomes, $\sqrt{1-\sin^2 \theta} + \sqrt{1-\sin^2 \phi} = a(\sin \theta - \sin \phi)$ $\Rightarrow \sqrt{\cos^2 \theta} + \sqrt{\cos^2 \phi} = a(\sin \theta - \sin \phi)$ $\therefore \cos \theta + \cos \phi = a(\sin \theta - \sin \phi)$ $\Rightarrow 2 \cos \frac{\theta+\phi}{2} \cos \frac{\theta-\phi}{2} = 2a \cos \frac{\theta+\phi}{2} \sin \frac{\theta-\phi}{2}$ $\Rightarrow \frac{\tan(\theta - \phi)}{2} = \frac{1}{a}$ $\Rightarrow \frac{\theta - \phi}{2} = \tan^{-1}\left(\frac{1}{a}\right)$	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$

	$\Rightarrow \sin^{-1} x - \sin^{-1} y = 2 \tan^{-1} \left(\frac{1}{a} \right)$ <p>Differentiate both sides w.r.to x</p> $\frac{1}{\sqrt{1-x^2}} - \frac{1}{\sqrt{1-y^2}} = 0$ $\Rightarrow \frac{1}{\sqrt{1-y^2}} \frac{dy}{dx} = \frac{1}{\sqrt{1-x^2}} \Rightarrow \frac{dy}{dx} = \frac{\sqrt{1-y^2}}{\sqrt{1-x^2}}$ <p>OR</p> $e^y(x+1) = 1$ <p>Differentiate both sides w.r.t x</p> $e^y \left(\frac{dy}{dx} \right) \times (x+1) + e^y = 0$ <p>Dividing both sides by e^y, we get $(x+1) \frac{dy}{dx} + 1 = 0$ _____ (1)</p> <p>Differentiating again w.r.t x, $\frac{dy}{dx} + (x+1) \frac{d^2y}{dx^2} = 0$</p> $\Rightarrow (x+1) \frac{d^2y}{dx^2} = -\frac{dy}{dx}$ $\Rightarrow \frac{d^2y}{dx^2} = -\frac{1}{x+1} \frac{dy}{dx}$ $\Rightarrow \frac{d^2y}{dx^2} = \left(\frac{dy}{dx} \right)^2 \quad (\text{From(1)})$	<p>1/2</p> <p>1/2</p> <p>1/2</p> <p>1/2</p> <p>1/2</p> <p>1</p>
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30	$Z = 6x + 3y$ $4x + y \geq 80$ $x + 5y \geq 115$ $3x + 2y \leq 150$ $x, y \geq 0$	2
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	<table border="1"> <thead> <tr> <th>Corner Points</th> <th>coordinates</th> <th>Z = 6x + 3y</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>(15, 20)</td> <td>150 Minimum</td> </tr> <tr> <td>B</td> <td>(2, 72)</td> <td>228</td> </tr> <tr> <td>C</td> <td>(40, 15)</td> <td>285</td> </tr> </tbody> </table> <p>The minimum value of Z is 150 at (15,20)</p>	Corner Points	coordinates	Z = 6x + 3y	A	(15, 20)	150 Minimum	B	(2, 72)	228	C	(40, 15)	285	1
Corner Points	coordinates	Z = 6x + 3y												
A	(15, 20)	150 Minimum												
B	(2, 72)	228												
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31	<p>Given equation is $\frac{x+2}{3} = \frac{y+1}{2} = \frac{z-3}{2}$</p> <p>Let $\frac{x+2}{3} = \frac{y+1}{2} = \frac{z-3}{2} = \lambda$</p> <p>Any point on the given line is of the form $x = 3\lambda - 2, y = 2\lambda - 1, z = 2\lambda + 3$</p> <p>Therefore the point Q on the line is Q(3λ - 2, 2λ - 1, 2λ + 3)</p> <p>According to the problem the distance between P and Q is 5 units.</p> <p>Then we have, $(3\lambda - 3)^2 + (2\lambda - 4)^2 + (2\lambda)^2 = 5^2$</p> $17\lambda^2 - 34\lambda = 0 \Rightarrow \lambda = 0, 2$ <p>Therefore the points are (-2, -1, 3) & (4, 3, 7)</p> <p>OR</p> $\vec{r} = (\hat{i} + \hat{j} - \hat{k}) + \lambda(2\hat{i} - 2\hat{j} + \hat{k}), \hat{r} = (2\hat{i} - \hat{j} - 3\hat{k}) + \mu(\hat{i} + 2\hat{j} + 2\hat{k})$ $b_1 = (2\hat{i} - 2\hat{j} + \hat{k}) \& b_2 = (\hat{i} + 2\hat{j} + 2\hat{k})$ <p>The vector perpendicular to the given two lines is $b_1 \times b_2 = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2 & -2 & 1 \\ 1 & 2 & 2 \end{vmatrix}$</p> $= -6\hat{i} - 3\hat{j} + 6\hat{k}$ <p>Therefore vector equation of the required line is</p> $\vec{r} = 2\hat{i} - \hat{j} + 3\hat{k} + \lambda(2\hat{i} + \hat{j} - 2\hat{k})$	<p>1/2</p> <p>1/2</p> <p>1</p> <p>1</p> <p>1/2</p> <p>1/2</p> <p>1</p> <p>1</p>												
	SECTION D													
32.	<p>The given differential equation is $(1 + x^2) \frac{dy}{dx} + y = e^{\tan^{-1} x}$</p> <p>The given linear equation can be converted into the form</p> $\frac{dy}{dx} + Py = Q$ <p>Divide the equation by $1 + x^2$, we get</p> $\frac{dy}{dx} + \frac{y}{1+x^2} = \frac{e^{\tan^{-1} x}}{1+x^2}, \text{ where } P(x) = \frac{1}{1+x^2}, Q(x) = \frac{e^{\tan^{-1} x}}{1+x^2}$ <p>Integrating factor, IF = $e^{\int P dx}$</p> $= e^{\int \frac{1}{1+x^2} dx}$ $= e^{\tan^{-1} x}$ <p>Therefore solution is, $y(IF) = \int Q(x) \cdot (IF) dx + C$</p>	<p>1/2</p> <p>1</p> <p>1</p> <p>1</p>												

	$\therefore y \cdot e^{\tan^{-1} x} = \int \frac{e^{\tan^{-1} x}}{1+x^2} \cdot e^{\tan^{-1} x} dx$ $= \int \frac{e^{2 \tan^{-1} x}}{1+x^2} dx$ <p>Let $\tan^{-1} x = t$, then $\frac{1}{1+x^2} = dt$</p> $\therefore \int \frac{e^{2 \tan^{-1} x}}{1+x^2} dx = \int e^{2t} dt = \frac{e^{2t}}{2} + c$ $\therefore y \cdot e^{\tan^{-1} x} = \frac{1}{2} [e^{2 \tan^{-1} x}] + c$ <p>OR</p> <p>The given differential equation is $2xydy = (x^2 + y^2)dx$. _____(1)</p> <p>To solve this homogeneous equation, rewrite the equation into the form $\frac{dy}{dx} = f\left(\frac{y}{x}\right)$</p> <p>Divide both sides of eq(1) by dx & $2xy$, we get</p> $\frac{dy}{dx} = \frac{(x^2+y^2)}{2xy} \Rightarrow \frac{dy}{dx} = \frac{1+\left(\frac{y}{x}\right)^2}{2\left(\frac{y}{x}\right)} \text{ _____(2)}$ <p>Let $y = vx$ and differentiate both sides w.r. to x</p> $\frac{dy}{dx} = v + x \frac{dv}{dx} \text{ _____(3)}$ <p>Equate (2) & (3)</p> $v + x \frac{dv}{dx} = \frac{1+v^2}{2v} \Rightarrow x \frac{dv}{dx} = \frac{1+v^2}{2v} - v = \frac{1-v^2}{2v}$ $\frac{2v}{v^2-1} dv = -\frac{dx}{x}$ <p>Integrate both sides, we get</p> $\log(v^2-1) + \log x = \log C$ $\Rightarrow (v^2-1)x = C$ $\Rightarrow y^2 - x^2 = cx$	<p>1½</p> <p>1</p> <p>1</p> <p>1 ½</p> <p>1 ½</p>
33	<p>Let $I = \int_0^\pi \frac{4x \sin x}{1+\cos^2 x} dx$ _____(1)</p> <p>Using the property that $\int_0^a f(x) dx = \int_0^a f(a-x) dx$</p> <p>Therefore $I = \int_0^\pi \frac{4(\pi-x) \sin(\pi-x)}{1+\cos^2(\pi-x)} dx$</p> $I = \int_0^\pi \frac{4(\pi-x) \sin x}{1+\cos^2 x} dx \text{ _____(2)}$ $= \int_0^\pi \frac{4\pi \sin x}{1+\cos^2 x} dx - \int_0^\pi \frac{4x \sin x}{1+\cos^2 x} dx$ $= \int_0^\pi \frac{4\pi \sin x}{1+\cos^2 x} dx - I$ $2I = \int_0^\pi \frac{4\pi \sin x}{1+\cos^2 x} dx$ $I = \frac{1}{2} \times 4\pi \int_0^\pi \frac{\sin x}{1+\cos^2 x} dx$ <p>Let $\cos x = t$, $\sin x dx = -dt$</p>	<p>½</p> <p>2</p> <p>1</p> <p>1½</p>

	<p>If $x = 0, t = 1$ and if $x = \pi, t = -1$</p> <p>So the integral becomes, $2\pi \int_1^{-1} \frac{-dt}{1+t^2} = 2\pi \int_{-1}^1 \frac{dt}{1+t^2}$</p> $= 2\pi(\tan^{-1} t)_{-1}^1$ $= 2\pi \times \frac{\pi}{2} = \pi^2.$ <p>OR</p> <p>Let $I = \int \frac{1}{x[(\log x)^2 - 3\log x - 4]} dx$</p> <p>Let $\log x = t$, then $\frac{1}{x} dx = dt$</p> <p>Then $I = \int \frac{dt}{t^2 - 3t - 4}$</p> $= \int \frac{1}{(t - 4)(t + 1)} dt$ <p>Apply integration by partial fraction</p> $\frac{1}{(t - 4)(t + 1)} = \frac{A}{t - 4} + \frac{B}{t + 1}$ <p>To solve for A and B we get, $A = \frac{1}{5}$ & $B = -\frac{1}{5}$</p> $\therefore I = \int \frac{\frac{1}{5}}{t - 4} dt + \int \frac{-\frac{1}{5}}{t + 1} dt$ $= \frac{1}{5} \log(t - 4) - \frac{1}{5} \log(t + 1) + C$ $= \frac{1}{5} [\log(\log x - 4) - \log(\log x + 1)] + C$ $= \frac{1}{5} \left[\log \left \frac{\log x - 4}{\log x + 1} \right \right] + C$	<p>1</p> <p>1</p> <p>1</p> <p>2</p>
34	$A = \begin{bmatrix} 1 & 2 & -3 \\ 2 & 0 & -3 \\ 1 & 2 & 0 \end{bmatrix}$ <p>$\therefore A = -12 \neq 0$</p> <p>Therefore A is invertible.</p> $\text{Adj } A = \begin{bmatrix} 6 & -3 & 4 \\ -6 & 3 & 0 \\ -6 & -3 & -4 \end{bmatrix}^T$ $= \begin{bmatrix} 6 & -6 & 6 \\ -3 & 3 & -3 \\ 4 & 0 & -4 \end{bmatrix}$ $\therefore A^{-1} = -\frac{1}{12} \begin{bmatrix} 6 & -6 & 6 \\ -3 & 3 & -3 \\ 4 & 0 & -4 \end{bmatrix}$ <p>The given equations are</p>	<p>1</p> <p>1</p> <p>$\frac{1}{2}$</p>

	$x + 2y - 3z = 1$ $2x - 3z = 2$ $x + 2y = 3$ <p>Which can be written in matrix form as</p> $\begin{bmatrix} 1 & 2 & -3 \\ 2 & 0 & -3 \\ 1 & 2 & 0 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$ $\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 & 2 & -3 \\ 2 & 0 & -3 \\ 1 & 2 & 0 \end{bmatrix}^{-1} \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$ $\begin{bmatrix} x \\ y \\ z \end{bmatrix} = -\frac{1}{12} \begin{bmatrix} 6 & -6 & 6 \\ -3 & 3 & -3 \\ 4 & 0 & -4 \end{bmatrix} \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$ $= \begin{bmatrix} 2 \\ 1 \\ 2 \\ 2 \\ 3 \end{bmatrix}$ $\therefore x = 2, y = \frac{1}{2}, z = \frac{2}{3}$	<p>1/2</p> <p>1</p> <p>1</p>
35	<p>Given</p> <p>L_1: The line passing through $(2, -1, 1)$ and parallel to $\frac{x}{1} = \frac{y}{1} = \frac{z}{3}$</p> <p>$L_2$: $\vec{r} = \hat{i} + (2\mu + 1)\hat{j} - (\mu + 2)\hat{k}$</p> <p>The standard form of given equations of lines are</p> <p>L_1: $\vec{r} = (2\hat{i} - \hat{j} + \hat{k}) + \lambda(\hat{i} + \hat{j} + 3\hat{k})$</p> <p>$L_2$: $\vec{r} = (\hat{i} + \hat{j} - 2\hat{k}) + \mu(2\hat{j} - \hat{k})$</p> <p>$a_1 = (2\hat{i} - \hat{j} + \hat{k}), \quad b_1 = (\hat{i} + \hat{j} + 3\hat{k})$</p> <p>$a_2 = (\hat{i} + \hat{j} - 2\hat{k}), \quad b_2 = (2\hat{j} - \hat{k})$</p> <p>$b_1 \times b_2 = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & 1 & 3 \\ 0 & 2 & -1 \end{vmatrix}$</p> <p>$= -7\hat{i} + \hat{j} + 2\hat{k}$</p> <p>$b_1 \times b_2 = -7\hat{i} + \hat{j} + 2\hat{k}$</p> <p>$= \sqrt{(-7)^2 + 1^2 + 2^2}$</p> <p>$= \sqrt{54}$</p>	<p>1</p> <p>1</p> <p>1</p> <p>1/2</p>

$$a_2 - a_1 = (\hat{i} + \hat{j} - 2\hat{k}) - (2\hat{i} - \hat{j} + \hat{k})$$

$$= -\hat{i} + 2\hat{j} - 3\hat{k}$$

$$\text{Shortest distance} = \left| \frac{(b_1 \times b_2) \cdot (a_2 - a_1)}{|b_1 \times b_2|} \right|$$

$$= \left| \frac{(-7\hat{i} + \hat{j} + 2\hat{k}) \cdot (-\hat{i} + 2\hat{j} - 3\hat{k})}{\sqrt{54}} \right|$$

$$= \frac{3}{\sqrt{54}} \text{ units}$$

OR

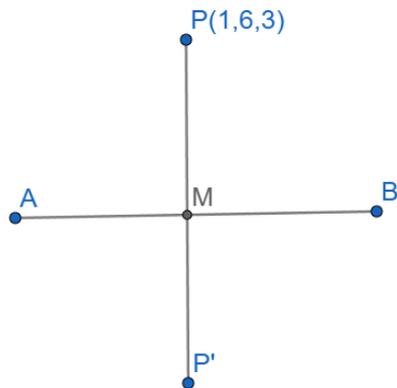
Let $P(1,6,3)$ be the given point.

Let M be the foot of the perpendicular from 'P' to the given line AB.

$$\vec{r} = (\hat{j} + 2\hat{k}) + \lambda(\hat{i} + 2\hat{j} + 3\hat{k}) \text{-----(1)}$$

$$\Rightarrow \frac{x-0}{1} = \frac{y-1}{2} = \frac{z-2}{3} = \lambda$$

Then the coordinates of M be $(\lambda, 2\lambda + 1, 3\lambda + 2)$, λ is a scalar.



The direction ratios of PM are :

$$\langle \lambda - 1, 2\lambda + 1 - 6, 3\lambda + 2 - 3 \rangle$$

$$\text{I.e., } \langle \lambda - 1, 2\lambda - 5, 3\lambda - 1 \rangle$$

And direction ratios of line (1) are $\langle 1, 2, 3 \rangle$

$$\text{Now, } PM \perp AB \Rightarrow (\lambda - 1) \cdot 1 + (2\lambda - 5) \cdot 2 + (3\lambda - 1) \cdot 3 = 0$$

$$\Rightarrow \lambda - 1 + 4\lambda - 10 + 9\lambda - 3 = 0$$

$$\Rightarrow 14\lambda - 14 = 0$$

$$\Rightarrow \lambda = 1.$$

$\therefore M$ is $(1, 3, 5)$

Let $P'(\alpha, \beta, \gamma)$ be the image of $P(1, 6, 3)$, then M is the midpoint of PP' .

$$\therefore \frac{\alpha + 1}{2} = 1, \frac{\beta + 6}{2} = 3, \frac{\gamma + 3}{2} = 5 \Rightarrow \alpha = 1, \beta = 0, \gamma = 7.$$

Hence the $(1, 0, 7)$ is the image of $P(1, 6, 3)$ in given line.

$$\text{Equation of line joining } P \text{ \& } P' \text{ is, } \frac{x-1}{0} = \frac{y-6}{-6} = \frac{z-3}{4}$$

	$P(E_2) = 1 - 0.001 = 0.999 = \frac{999}{1000}$ $P\left(\frac{A}{E_1}\right) = 0.99 = \frac{99}{100}, P\left(\frac{A}{E_2}\right) = 0.001 = \frac{1}{1000}$ <p>a) Number of persons out of 200,000 suffering from TB = $\frac{1}{1000} \times 200,000$ = 200</p> <p>b) Required probability = $P\left(\frac{A}{E_1}\right) = \frac{99}{100}$</p> <p>c) Required probability = $P\left(\frac{E_1}{A}\right) = \frac{P(E_1)P\left(\frac{A}{E_1}\right)}{P(E_1)P\left(\frac{A}{E_1}\right) + P(E_2)P\left(\frac{A}{E_2}\right)}$ $= \frac{\frac{1}{1000} \times \frac{99}{100}}{\frac{1}{1000} \times \frac{99}{100} + \frac{1}{1000} \times \frac{1}{1000}}$ $= \frac{110}{221}$ </p> <p>d) Required probability = $P\left(\frac{A}{E_2}\right) = 0.001$</p>	<p>1</p> <p>1</p> <p>1 ½</p> <p>½</p>
38	<p>Here $A = \{Nitya, Rohit\}, B = \{1,2,3,4,5,6\}$</p> <p>d) Number of relations from A to B = $2^{2 \times 6} = 2^{12}$</p> <p>e) Number of reflexive relations on B = $2^{6^2 - 6} = 2^{30}$</p> <p>f) I) $R = \{(1,1), (1,2), (1,3), (1,4), (1,5), (1,6), (2,2), (2,4), (2,6), (3,3), (4,4), (5,5), (6,6)\}$ R is not an equivalence relation as $(1,2) \in R$, but $(2,1) \notin R$</p> <p>OR</p> <p>II) $P = \{\}$, P is a null relation. Since null relation is not reflexive, p is not an equivalence relation.</p>	<p>1</p> <p>1</p> <p>2</p> <p>2</p>