	BCM SCHOOL BASNT AVENUE DUGRI ROAD LUDHINANA ANSWER KEY OF STRAIGHT LINES ASSIGNMENT CLASS XI
1	C
2	B
3	D
4	A
5	D

6	Equation of line having a and b intercepts on the axis is $\frac{x}{a}+\frac{y}{b}=1$ .....(i) Given that a + b = 14 $\Rightarrow b = 14 - a$ $\Rightarrow \frac{x}{a}+\frac{y}{14-a}=1$ If equation (ii) passes through the point (3, 4) then $\frac{3}{a}+\frac{4}{14-a}=1$ $\Rightarrow \frac{3(14-a)+4a}{a(14-a)}=1$ $\Rightarrow 42 + a = 14a - a^2$ $\Rightarrow a^2 + a - 14a + 42 = 0$ $\Rightarrow a^2 - 13a + 42 = 0$ $\Rightarrow a^2 - 7a - 6a + 42 = 0$ $\Rightarrow a(a-7) - 6(a-7) = 0$ $\Rightarrow (a-6)(a-7) = 0$ $\Rightarrow a = 6, 7$ $\therefore b = 14 - 6 = 8, b = 14 - 7 = 7$ Hence, the required equation of lines are $\frac{x}{6}+\frac{y}{8}=1$ $\Rightarrow 4x + 3y = 24$ And $\frac{x}{7}+\frac{y}{7}=1$ $\Rightarrow x + y = 7$

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Step 1: Determine the equation of the Line

Let A = ($\cos\theta$, $\sin\theta$) and

B = ($\cos\phi$, $\sin\phi$) be the given points.

Then equation of AB is of the form,

$y - y_1 = \frac{y_2 - y_1}{x_2 - x_1}(x - x_1)$

$y - \sin\theta = \frac{\sin\phi - \sin\theta}{\cos\phi - \cos\theta}(x - \cos\theta)$

$y(\cos\phi - \cos\theta) - \sin\theta(\cos\phi - \cos\theta) = x(\sin\phi - \sin\theta) - \cos\theta(\sin\phi - \sin\theta)$

$y(\cos\phi - \cos\theta) - \sin\theta\cos\phi + \sin\theta\cos\theta = x(\sin\phi - \sin\theta) - \cos\theta\sin\phi + \sin\theta\cos\theta$

$x(\sin\phi - \sin\theta) - y(\cos\phi - \cos\theta) + \sin\theta\cos\phi - \cos\theta\sin\phi = 0$

$x(\sin\phi - \sin\theta) - y(\cos\phi - \cos\theta) + \sin(\theta - \phi) = 0$

$[\because \sin(\theta - \phi) = \sin\theta\cos\phi - \cos\theta\sin\phi]$

Step 2: Determine the distance

We know that distance of this line from the origin,

$D = \left|\frac{0 - 0 + \sin(\theta - \phi)}{\sqrt{(\sin\phi - \sin\theta)^2 + (\cos\phi - \cos\theta)^2}}\right|$

$= \left|\frac{\sin(\theta - \phi)}{\sqrt{2 - 2(\cos\theta\cos\phi + \sin\theta\sin\phi)}}\right|$

$= \left|\frac{\sin(\theta - \phi)}{\sqrt{2}\sqrt{1 - \cos(\theta - \phi)}}\right|$

$= \left|\frac{\sin(\theta - \phi)}{\sqrt{2}\cdot\sqrt{2\sin^2\left(\frac{\theta - \phi}{2}\right)}}\right|$

$[\because 1 - \cos x = 2\sin^2\frac{x}{2}, \sin x = 2\sin\frac{x}{2}\cos\frac{x}{2}]$

$= \left|\frac{2\sin\left(\frac{\theta - \phi}{2}\right)\cdot\cos\left(\frac{\theta - \phi}{2}\right)}{\sqrt{2}\sqrt{2}\cdot\sin\left(\frac{\theta - \phi}{2}\right)}\right|$

$= \left|\cos\left(\frac{\theta - \phi}{2}\right)\right|$

$= \left|\cos\left(\frac{\theta - \phi}{2}\right)\right|$

Hence, the required perpendicular distance is $\left|\cos\left(\frac{\theta - \phi}{2}\right)\right|$.

8	$y = m_1x + c_1 \quad \ldots(1)$ $y = m_2x + c_2 \quad \ldots(2)$ $y = m_3x + c_3 \quad \ldots(3)$ On subtracting equation (1) from (2), we obtain $0 = (m_2 - m_1)x + (c_2 - c_1)$ $= (m_1 - m_2)x = c_2 - c_1$ $= x = \dfrac{c_2 - c_1}{m_1 - m_2}$ On substituting this value of x in (1), we obtain $y = m_1\left(\dfrac{c_2 - c_1}{m_1 - m_2}\right) + c_1$ $y = \dfrac{m_1c_2 - m_1c_1 + m_1c_1 - m_2c_1}{m_1 - m_2}$ $y = \dfrac{m_1c_2 - m_2c_1}{m_1 - m_2}$ $\therefore \left(\dfrac{c_2 - c_1}{m_1 - m_2}, \dfrac{m_1c_2 - m_2c_1}{m_1 - m_2}\right)$ is the point of intersection of lines (1) and (2). It is given that lines (1), (2), and (3) are concurrent. Hence, the point of intersection of lines (1) and (2) will also satisfy equation (3). $= \dfrac{m_1c_2 - m_2c_1}{m_1 - m_2} = m_3\left(\dfrac{c_2 - c_1}{m_1 - m_1}\right) + c_3$ $= \dfrac{m_1c_2 - m_2c_1}{m_1 - m_2} = \dfrac{m_3c_2 - m_3c_1 + c_3m_1 - c_3m_2}{m_1 - m_2}$ $= m_1c_2 - m_2c_1 - m_3c_2 + m_3c_1 - c_3m_1 + c_3m_2 = 0$ $= m_1(c_2 - c_3) + m_2(c_3 - c_1) + m_3(c_1 - c_2) = 0$
9	Equation of the required line passing through (1, 5) and (α_1, β_1) is $y - 5 = \frac{\beta_1 - 5}{\alpha_1 - 1}(x - 1)$ or $y - 5 = \frac{\frac{222}{23} - 5}{\frac{26}{23} - 1}(x - 1)$ or $107x - 3y - 92 = 0$ which is the equation of required line.

10	· Let P_1 and P_2 be the length of perpendiculars from $\left(\sqrt{a^2-b^2}, 0\right)$ and $\left(-\sqrt{a^2-b^2}, 0\right)$to the li $\frac{x}{a}\cos\theta + \frac{y}{b}\sin\theta = 1.$ $\therefore P_1 = \left\lvert \frac{\frac{\sqrt{a^2-b^2}\cos\theta}{a} + \frac{0\times\sin\theta}{b} - 1}{\sqrt{\left(\frac{\cos\theta}{a}\right)^2 + \left(\frac{\sin\theta}{b}\right)^2}} \right\rvert$ $= \left\lvert \frac{\frac{\sqrt{a^2-b^2}\cos\theta - 1}{a}}{\sqrt{\frac{\cos^2\theta}{a^2} + \frac{\sin^2\theta}{b^2}}} \right\rvert$ $P_2 = \left\lvert \frac{\frac{-\sqrt{a^2-b^2}\cos\theta}{a} + \frac{0\times\sin\theta}{b} - 1}{\sqrt{\left(\frac{\cos\theta}{a}\right)^2 + \left(\frac{\sin\theta}{b}\right)^2}} \right\rvert$ $= \left\lvert \frac{\frac{-\sqrt{a^2-b^2}\cos\theta}{a} - 1}{\sqrt{\frac{\cos^2\theta}{a^2} + \frac{\sin^2\theta}{b^2}}} \right\rvert$ Now $P_1 P_2 = \left\lvert \frac{\frac{\sqrt{a^2-b^2}\cos\theta}{a} - 1}{\sqrt{\frac{\cos^2\theta}{a^2} + \frac{\sin^2\theta}{b^2}}} \right\rvert \left\lvert \frac{\frac{-\sqrt{a^2-b^2}\cos\theta}{a} - 1}{\sqrt{\frac{\cos^2\theta}{a^2} + \frac{\sin^2\theta}{b^2}}} \right\rvert$ $= \frac{\left\lvert \left[\frac{\sqrt{a^2-b^2}\cos}{a} - 1\right]\left[\frac{\sqrt{a^2-b^2}\cos\theta}{a} + 1\right] \right\rvert}{\frac{\cos^2\theta}{a^2} + \frac{\sin^2\theta}{b^2}}$ $= \frac{\left\lvert \left[\frac{(a^2-b^2)\cos^2\theta}{a^2} - 1\right] \right\rvert}{\frac{\cos^2\theta}{a^2} + \frac{1-\cos^2\theta}{b^2}} = \frac{\left\lvert \left[\frac{(a^2-b^2)\cos^2\theta}{a^2} - 1\right] \right\rvert}{\frac{b^2\cos^2\theta + a^2 - a^2\cos^2\theta}{a^2 b^2}}$ $= \frac{\lvert a^2-(a^2-b^2)\cos^2\theta \rvert}{\frac{a^2-(a^2-b^2)\cos^2\theta}{b^2}}$ $= a^2 - (a^2 - b^2)\cos^2\theta \times \frac{b^2}{a^2-(a^2-b^2)\cos^2\theta}$ = b^2.