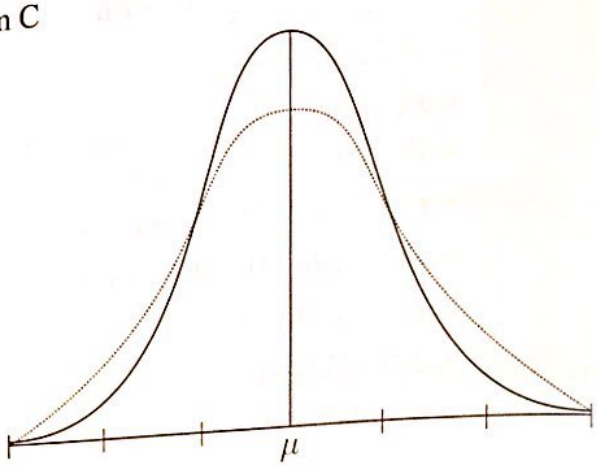
Hormone C

The effect of hormone C was to increase the number of small plants and the number of tall plants. The mean was unchanged.

Diagram C

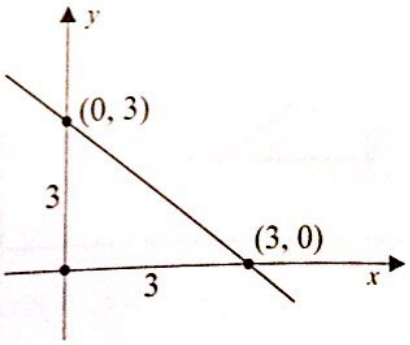


QUESTION 3 (25 MARKS)

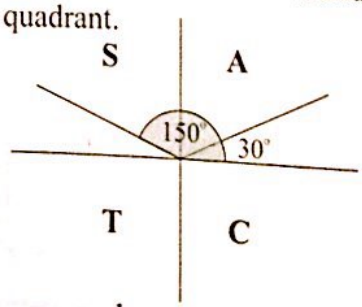
Question 3 (a)

Line	Equation	Slope	Intercepts
h	$x = 3 - y$	-1	$(0, 3), (3, 0)$
i	$2x - 4y = 3$	$\frac{1}{2}$	$(0, -\frac{3}{4}), (\frac{3}{2}, 0)$
k	$y = -\frac{1}{4}(2x - 7)$	$-\frac{1}{2}$	$(0, \frac{7}{4}), (\frac{7}{2}, 0)$
l	$4x - 2y - 5 = 0$	2	$(0, -\frac{5}{2}), (\frac{5}{4}, 0)$
m	$x + \sqrt{3}y - 10 = 0$	$-\frac{1}{\sqrt{3}}$	$\left(0, \frac{10}{\sqrt{3}}\right), (10, 0)$
n	$\sqrt{3}x + y - 10 = 0$	$-\sqrt{3}$	$(0, 10), \left(\frac{10}{\sqrt{3}}, 0\right)$

The line h makes equal intercepts with the x-axis cutting it at 3 units from the origin.



The slope is the tan of the angle with the positive x-axis. Tan is negative in the second quadrant.



$$\tan\theta = \frac{1}{\sqrt{3}} \Rightarrow \tan^{-1}\frac{1}{\sqrt{3}} = 30^\circ$$

$$\therefore \theta = 180^\circ - 30^\circ = 150^\circ$$

Lines k and l are perpendicular as the product of their slopes is -1.

Slope of i: $m_1 = \frac{1}{2}$

Slope of k: $m_2 = -\frac{1}{2}$

$$m_1 \times m_2 = \tfrac{1}{2} \times -\tfrac{1}{2} = -1$$

Description	Line(s)
A line with a slope of 2.	l
A line which intersects the y-axis at $(0, -2\frac{1}{2})$.	l
A line which makes equal intercepts on the axes.	h
A line which makes an angle of 150° with the positive sense of the x-axis.	m
Two lines which are perpendicular to each other.	k & l

Question 3 (b)

Slope of m: $m_1 = -\dfrac{1}{\sqrt{3}}$

Slope of n: $m_2 = -\sqrt{3}$

$$\tan\theta = \frac{m_1 - m_2}{1 + m_1 m_2}$$

$$\tan\theta = \frac{-\frac{1}{\sqrt{3}} + \sqrt{3}}{1 - \frac{1}{\sqrt{3}}(-\sqrt{3})} = \frac{-\frac{1}{\sqrt{3}} + \sqrt{3}}{1+1}$$

$$= \frac{\left(-\frac{1}{\sqrt{3}} + \sqrt{3}\right)}{1+1} \times \frac{\sqrt{3}}{\sqrt{3}}$$

$$= \frac{-1+3}{2\sqrt{3}} = \frac{2}{2\sqrt{3}}$$

$$= \frac{1}{\sqrt{3}}$$

$$\therefore \theta = \tan^{-1}\frac{1}{\sqrt{3}} = 30^\circ$$

Question 4 (25 marks)

Question 4 (a)

Circle: Centre (h, k), radius r

$$(x-h)^2 + (y-k)^2 = r^2$$

$c_1 : (h, k) = (-3, -2),\ r = 2$

$(x-(-3))^2 + (y-(-2))^2 = 2^2$

$(x+3)^2 + (y+2)^2 = 4$

Circle: Centre $(-g, -f)$, radius $r = \sqrt{g^2 + f^2 - c}$

$$x^2 + y^2 + 2gx + 2ky + c = 0$$

$c_2 : x^2 + y^2 - 2x - 2y - 7 = 0$

$(-g, -f) = \left(-\dfrac{-2}{2}, -\dfrac{-2}{2}\right) = (1, 1)$

$r = \sqrt{1^2 + 1^2 - (-7)} = \sqrt{9} = 3$

Circle	Centre	Radius	Equation
c_1	$(-3, -2)$	2	$(x+3)^2 + (y+3)^2 = 4$
c_2	$(1, 1)$	3	$x^2 + y^2 - 2x - 2y - 7 = 0$

Set B Paper 2