

QUESTION 3 (25 MARKS)

Question 3 (a)

$$A(4, -1), B(7, t)$$

$$m = \frac{t - (-1)}{7 - 4} = \frac{t + 1}{3}$$

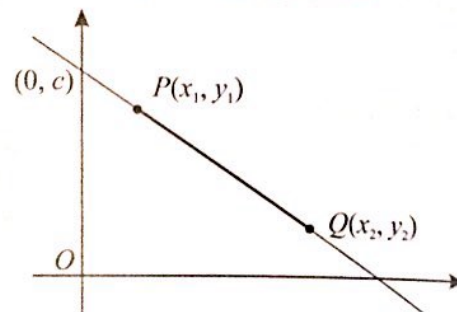
$$l_1 : 3x - 4y - 12 = 0 \Rightarrow m = \frac{3}{4}$$

$$\therefore m_{\perp} = -\frac{4}{3}$$

$$\therefore \frac{t + 1}{3} = -\frac{4}{3}$$

$$t + 1 = -4 \Rightarrow t = -5$$

FORMULAE AND TABLES BOOK
Co-ordinate geometry: Line
 Slope of PQ [page 18]



$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

MARKING SCHEME NOTES

Question 3 (a) [Scale 10D (0, 2, 5, 8, 10)]

- 2: • Slope AB or l_1
- 5: • Both slopes found
- 8: • Slopes linked to perpendicularity

Question 3 (b)

Call this distance d_1 .

$$l_1 : 3x - 4y - 12 = 0$$

$$P(10, k)$$

$$d_1 = \frac{|3(10) - 4k - 12|}{\sqrt{3^2 + (-4)^2}} = \frac{|18 - 4k|}{5}$$

Finding the slope from the equation of a line:

$$l : ax + by + c = 0$$

$$m = -\frac{a}{b} \Rightarrow m_{\perp} = \frac{b}{a}$$

MARKING SCHEME NOTES

Question 3 (b) [Scale 10C (0, 4, 8, 10)]

- 4: • Relevant formula with some correct substitution
- 8: • Substitution into formula fully correct

Question 3 (c) (i)

If $P(10, k)$ lies on the bisector of the angles between l_1 and l_2 , it is the same perpendicular distance from each line.

$$l_2: 5x + 12y - 20 = 0$$

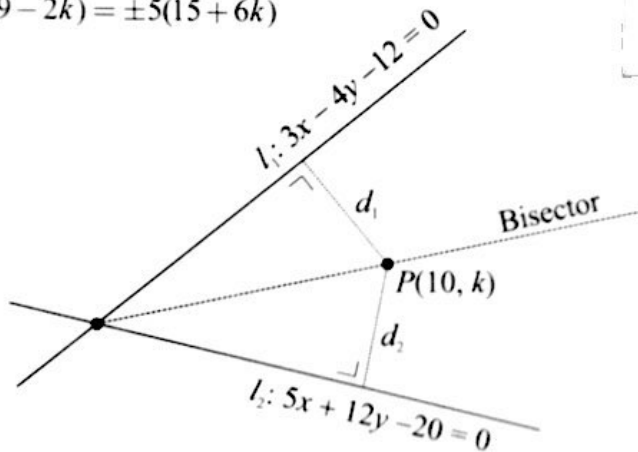
$$P(10, k)$$

$$d_2 = \frac{|5(10) + 12k - 20|}{\sqrt{5^2 + 12^2}} = \frac{|30 + 12k|}{13}$$

$$d_1 = d_2 \Rightarrow \frac{|18 - 4k|}{5} = \frac{|30 + 12k|}{13}$$

$$13(18 - 4k) = \pm 5(30 + 12k)$$

$$13(9 - 2k) = \pm 5(15 + 6k)$$



$$13(9 - 2k) = 5(15 + 6k)$$

$$117 - 26k = 75 + 30k$$

$$42 = 56k$$

$$\therefore k = \frac{42}{56} = \frac{3}{4}$$

$$13(9 - 2k) = -5(15 + 6k)$$

$$117 - 26k = -75 - 30k$$

$$192 = -4k$$

$$\therefore k = -48$$

Question 3 (c) (ii)

$$d_1 = \frac{|18 - 4(\frac{3}{4})|}{5} = \frac{|18 - 3|}{5} = \frac{15}{5} = 3$$

MARKING SCHEME NOTES

Question 3 (c) (i) (ii) [Scale 5D (0, 2, 3, 4, 5)]

- 2: • Relevant formula with some correct substitution
- 3: • One value for k found
• Work indicating two values for k
- 4: • Both values of k
• Positive value for k evaluated and distance calculated

FORMULAE AND TABLES BOOK
Co-ordinate geometry: Line
 Distance from (x_1, y_1) to the line
 $ax + by + c = 0$ [page 19]

The diagram shows a Cartesian coordinate system with origin O . A line is drawn in the second quadrant, intersecting the y-axis at $(0, c)$. A point $P(x, y)$ is located in the second quadrant. A perpendicular line segment is drawn from P to the line, meeting it at point $Q(x, y)$. Below the diagram, the formula for the perpendicular distance from a point to a line is given as $\frac{|ax_1 + by_1 + c|}{\sqrt{a^2 + b^2}}$.