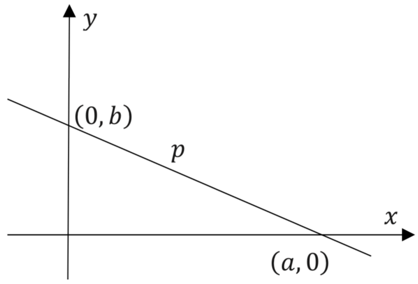
Question 2 **(25 marks)**

(a) The line p makes an intercept on the x-axis at $(a, 0)$ and on the y-axis at $(0, b)$, where $a, b \neq 0$.

Show that the equation of p can be written as $\frac{x}{a} + \frac{y}{b} = 1$.



(b) The line l has a slope m, and contains the point $A(6, 0)$.

(i) Write the equation of the line l in terms of m.

(ii) The line l cuts the line k: $4x + 3y = 25$ at P.
Find the co-ordinates of P in terms of m.
Give each co-ordinate as a fraction in its simplest form.

<table>
<tr><th>Q2</th><th>Model Solution – 25 Marks</th><th>Marking Notes</th></tr>
<tr><td>(a)</td><td>
$m = \frac{b-0}{0-a} = \frac{-b}{a}$
$y - 0 = \frac{-b}{a}(x - a)$
$ay = -bx + ab$
$bx + ay = ab$
Now divide across by ab
$$\frac{x}{a} + \frac{y}{b} = 1$$
Or
$$m = \frac{b-0}{0-a} = \frac{-b}{a}$$
$$y = mx + c \ \ => \ y = \frac{-b}{a}x + c\ .$$
But (o, b) is on this line, thus
$$b = \ \frac{-b}{a}(o) + c$$
$$\therefore \ b = c$$
Equation $y = \frac{-b}{a}x + b$
$ay = -bx + ab$
$bx + ay = ab$
Now divide across by ab
$$\frac{x}{a} + \frac{y}{b} = 1$$
Or
$(a, 0) \ \in \ y = mx + c => 0 = ma + c$
$=> -ma = c$
$(0, b) \ \in \ y = mx + c => b = c$
$\therefore -ma = b => m = \frac{-b}{a}$
Equation $y = \frac{-b}{a}x + b$
$ay = -bx + ab$
$bx + ay = ab$
Now divide across by ab
$$\frac{x}{a} + \frac{y}{b} = 1$$
Or
$$\frac{x}{a} + \frac{y}{b} = 1$$
LHS: $\frac{x}{a} + \frac{y}{b}$
$(a, 0)$: $\frac{a}{a} + \frac{0}{b}$ = 1=1 or RHS
$(0, b)$: $\frac{0}{a} + \frac{b}{b}$ = 1=1 or RHS
</td><td>
Scale 10C (0, 4, 7, 10)
Low Partial Credit:
Slope formula with some substitution
High Partial Credit:
Equation of line formula fully substituted
Low Partial Credit:
Slope formula with some substitution
High Partial Credit:
m expressed in terms of a and b, and c in terms of b
Low Partial Credit:
$(a, 0)$ or (($0, b)$ correctly substituted e.g. $\frac{a}{a} + \frac{0}{b}$
High Partial Credit:
$(a, 0)$ and $(0, b)$ correctly substituted
</td></tr>
</table>

(b) **(i)**	$y - 0 = m(x - 6)$ <u>or</u> $y = m(x - 6)$ Or $y = mx - 6m$ Or $y = mx + c$ $\therefore 0 = 6m + c \;\Rightarrow\; c = -6m$	**Scale 5B (0, 2, 5)** *Mid Partial Credit:* Equation of line formula with some relevant substitution
(b) **(ii)**	$y = m(x - 6)$ $4x + 3y = 25$ => $4x + 3m(x - 6) = 25$ =>$x = \frac{25+18m}{3m+4}$ Substitute this into $y = m(x - 6)$ $y = m\left(\frac{25 + 18m}{3m + 4}\right) - 6m$ $= \frac{25m + 18m^2 - 18m^2 - 24m}{3m + 4}$ $= \frac{m}{3m + 4}$ Or $4x + 3y = 25 \;\cap mx - y = 6m$ $4x + 3y = 25$ $\underline{3mx - 3y = 18m}$ $4x + 3mx = 18m + 25$ $x = \frac{25+18m}{3m+4}$ $4mx + 3my = 25m$ $\underline{4mx - 4y = 24m}$ $(3m + 4)y = m$ $\therefore\; y = \frac{m}{3m + 4}$	**Scale 10D (0, 4, 5, 8, 10)** *Low Partial Credit:* Indication of use of simultaneous equations *Mid Partial Credit* One relevant substitution *High Partial Credit:* x or y value found *Low Partial Credit:* Indication of use of simultaneous equations *Mid Partial Credit* One successful elimination in equations *High Partial Credit:* x or y value found