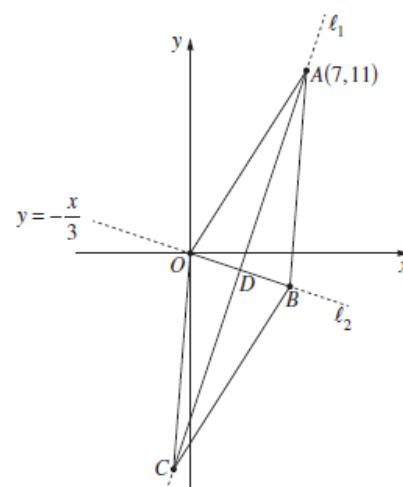




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- 2015 12** The diagram shows the rhombus $OABC$. The diagonal from the point $A(7, 11)$ to the point C lies on the line ℓ_1 . The other diagonal, from the origin O to the point B , lies on the line ℓ_2 which has equation $y = -\frac{x}{3}$.

- (i) Show that the equation of the line ℓ_1 is $y = 3x - 10$.
 (ii) The lines ℓ_1 and ℓ_2 intersect at the point D . Find the coordinates of D .



Not to scale

- (i) For $\ell_2: y = -\frac{x}{3}$, gradient is $-\frac{1}{3}$.

As diagonals of rhombus are perpendicular, then gradient of ℓ_1 is 3.

For line ℓ_1 , using $(7, 11)$ and $m = 3$:

$$y - y_1 = m(x - x_1)$$

$$y - 11 = 3(x - 7)$$

$$y - 11 = 3x - 21$$

$$y = 3x - 10$$

State Mean:
1.66

- (ii) $y = 3x - 10$

$$y = -\frac{x}{3} \dots\dots\dots \textcircled{2}$$

$$\text{Let } \textcircled{1} = \textcircled{2} : 3x - 10 = -\frac{x}{3}$$

$$9x - 30 = -x$$

$$10x = 30$$

$$x = 3$$

$$\text{Subs in } \textcircled{2} : y = -\frac{3}{3}$$

$$= -1 \quad \therefore D(3, -1)$$

State Mean:
1.68

* These solutions have been provided by [projectmaths](#) and are not supplied or endorsed by BOSTES.

Board of Studies: Notes from the Marking Centre

(b)(i) Most candidates used the fact that the diagonals are perpendicular and then applied the point-gradient formula to arrive at the required equation.

Common problems were:

- substituting the coordinates of the point $A(7,11)$ into the given equation for the line ℓ_1
- finding an incorrect gradient.

(b)(ii) The majority of candidates recognised the need to use simultaneous equations for this part. Some candidates who tried using the fact that D was the midpoint of AC , made little progress.

Common problems were:

- not using the correct equation for ℓ_1 provided in part (i)
- making arithmetical and algebraic errors when solving equations simultaneously.