

8. The coordinates of the points P and Q are $(2, -5)$ and $(-3, 7)$ respectively.

(a) Express each of the following as a column vector.

- (i) $3\overrightarrow{OP}$
- (ii) $-2\overrightarrow{OQ}$
- (iii) $3\overrightarrow{OP} - 2\overrightarrow{OQ}$
- (iv) \overrightarrow{PQ}

(b) Hence, find the magnitudes of the vectors in (a).

9. It is given that A is the point $(8, -1)$, $\overrightarrow{AB} = \begin{pmatrix} -4 \\ 7 \end{pmatrix}$ and $\overrightarrow{CA} = \begin{pmatrix} 3 \\ -2 \end{pmatrix}$.

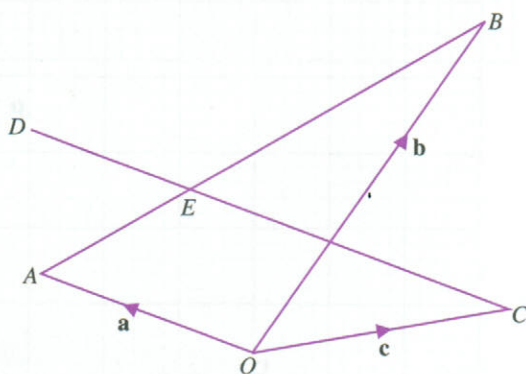
- (a) Find the coordinates of B and C .
- (b) (i) Express \overrightarrow{BC} as a column vector.
- (ii) Find the magnitude of \overrightarrow{BC} .

10. In the diagram, the lines AB and CD intersect at E . $AE : EB = DE : EC = 1 : 2$. The position vectors of A , B and C with respect to the point O are \mathbf{a} , \mathbf{b} and \mathbf{c} respectively.

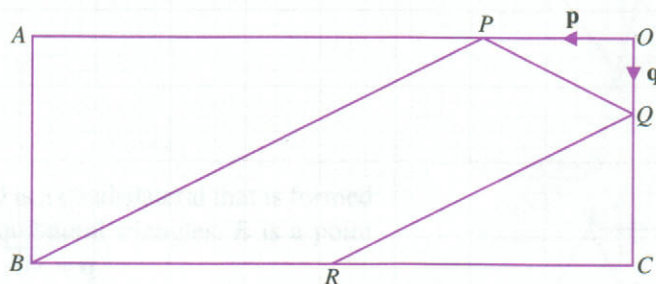
(a) Express and simplify the following vectors in terms of \mathbf{a} , \mathbf{b} and/or \mathbf{c} .

- (i) \overrightarrow{OE}
- (ii) \overrightarrow{CE}
- (iii) \overrightarrow{ED}
- (iv) \overrightarrow{OD}
- (v) \overrightarrow{AD}

(b) Is $AD \parallel CB$? Explain your answer.



11. In the diagram, $OABC$ is a rectangle, R is the midpoint of BC , $\overrightarrow{OA} = 4\overrightarrow{OP}$, $\overrightarrow{OC} = 3\overrightarrow{OQ}$, $\overrightarrow{OP} = \mathbf{p}$ and $\overrightarrow{OQ} = \mathbf{q}$.



(a) Express each of the following vectors in terms of \mathbf{p} and/or \mathbf{q} .

- (i) \overrightarrow{PA}
- (ii) \overrightarrow{RC}
- (iii) \overrightarrow{BA}
- (iv) \overrightarrow{RQ}
- (v) \overrightarrow{BP}

(b) (i) Show that $RQ \parallel BP$.
 (ii) Find the ratio $RQ : BP$.