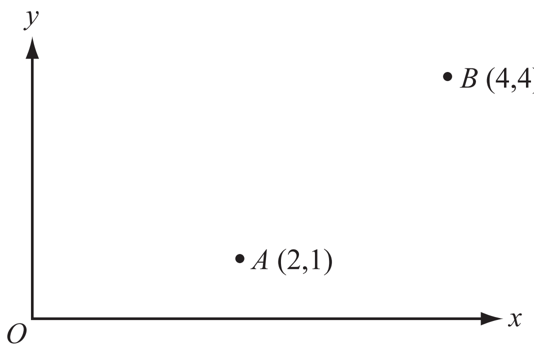
# Vectors 2 IGCSE

1)




NOT TO SCALE

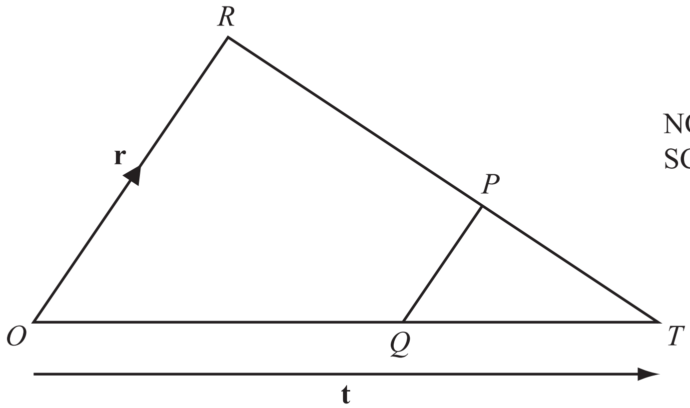
**(i)** Write down $\overrightarrow{AB}$ as a column vector.

*Answer(b)*(i) $\overrightarrow{AB} = \begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

**(ii)** $\overrightarrow{AC} = \begin{pmatrix} 0 \\ 7 \end{pmatrix}$.

Work out $\overrightarrow{BC}$ as a column vector.

*Answer(b)*(ii) $\overrightarrow{BC} = \begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [2]




NOT TO SCALE

$\overrightarrow{OR} = \mathbf{r}$ and $\overrightarrow{OT} = \mathbf{t}$.

$P$ is on $RT$ such that $RP : PT = 2 : 1$.

$Q$ is on $OT$ such that $OQ = \frac{2}{3}OT$.

Write the following in terms of **r** and/or **t**.
Simplify your answers where possible.

**(i)** $\overrightarrow{QT}$

*Answer(c)*(i) $\overrightarrow{QT} =$ [1]

**(ii)** $\overrightarrow{TP}$

*Answer(c)*(ii) $\overrightarrow{TP} =$ [2]

**(iii)** $\overrightarrow{QP}$

*Answer(c)*(iii) $\overrightarrow{QP} =$ [2]

**(iv)** Write down two conclusions you can make about the line segment $QP$.

*Answer(c)*(iv)

[2]

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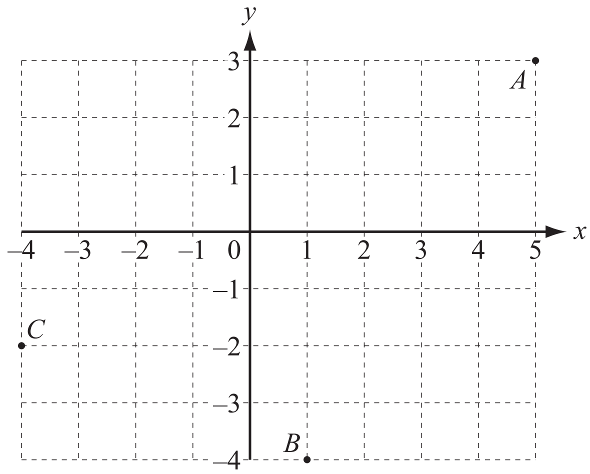
2)

**(a)**




The points $A$ (5, 3), $B$ (1, –4) and $C$ (–4, –2) are shown in the diagram.

**(i)** Write $\overrightarrow{CA}$ as a column vector.

*Answer(a)*(i) $\overrightarrow{CA} = \begin{pmatrix} \\ \end{pmatrix}$ [1]

**(ii)** Find $\overrightarrow{CA} - \overrightarrow{CB}$ as a single column vector.

*Answer(a)*(ii) $\begin{pmatrix} \\ \end{pmatrix}$ [2]

**(iii)** Complete the following statement.

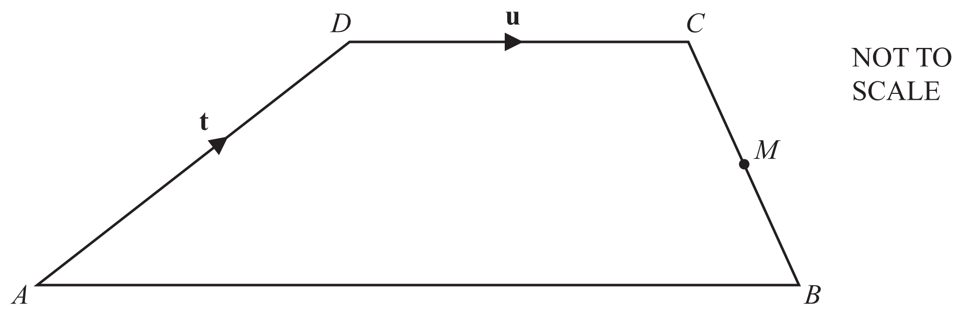
$\overrightarrow{CA} - \overrightarrow{CB} =$ [1]

**(iv)** Calculate $|\overrightarrow{CA}|$.

*Answer(a)*(iv) [2]

2 continued)

**(b)**




*ABCD* is a trapezium with *DC* parallel to *AB* and $DC = \frac{1}{2}AB$.

*M* is the midpoint of *BC*.

$\overrightarrow{AD} = \mathbf{t}$ and $\overrightarrow{DC} = \mathbf{u}$.

Find the following vectors in terms of **t** and / or **u**.

Give each answer in its simplest form.

**(i)** $\overrightarrow{AB}$

*Answer(b)*(i) $\overrightarrow{AB}$ = [1]

**(ii)** $\overrightarrow{BM}$

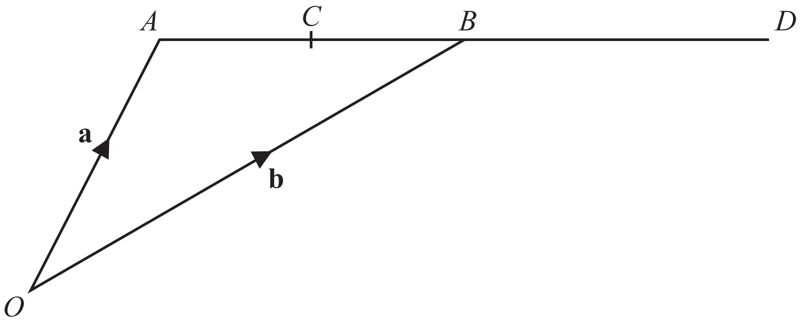
*Answer(b)*(ii) $\overrightarrow{BM}$ = [2]

**(iii)** $\overrightarrow{AM}$

*Answer(b)*(iii) $\overrightarrow{AM}$ = [2]

## Vectors 2 IGCSE

3)




*A* and *B* have position vectors **a** and **b** relative to the origin *O*.
*C* is the midpoint of *AB* and *B* is the midpoint of *AD*.

Find, in terms of **a** and **b**, in their simplest form

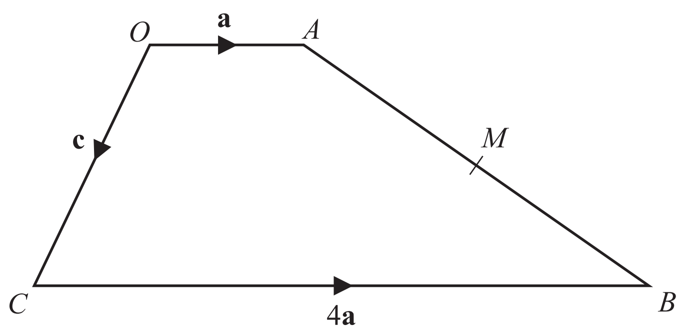
**(a)** the position vector of *C*,

*Answer(a)* [2]

**(b)** the vector $\overrightarrow{CD}$.

*Answer(b)* [2]

4)




*O* is the origin, $\overrightarrow{OA} = \mathbf{a}$, $\overrightarrow{OC} = \mathbf{c}$ and $\overrightarrow{CB} = 4\mathbf{a}$.
*M* is the midpoint of *AB*.

**(a)** Find, in terms of **a** and **c**, in their simplest form

**(i)** the vector $\overrightarrow{AB}$,

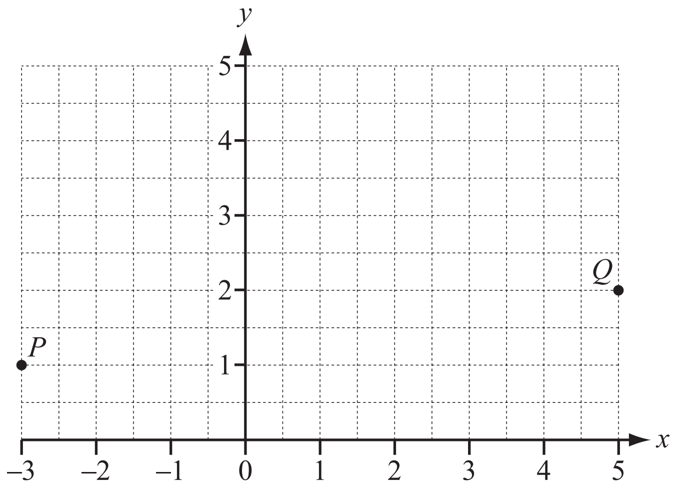
*Answer(a)*(i) $\overrightarrow{AB} =$ [2]

**(ii)** the position vector of *M*.

*Answer(a)*(ii) [2]

**(b)** Mark the point *D* on the diagram where $\overrightarrow{OD} = 3\mathbf{a} + \mathbf{c}$. [2]

5) **(a)**




The points $P$ and $Q$ have co-ordinates (–3, 1) and (5, 2).

**(i)** Write $\overrightarrow{PQ}$ as a column vector.

*Answer(a)*(i) $\overrightarrow{PQ} = \begin{pmatrix} \\ \end{pmatrix}$ [1]

**(ii)** $\overrightarrow{QR} = 2\begin{pmatrix} -1 \\ 1 \end{pmatrix}$

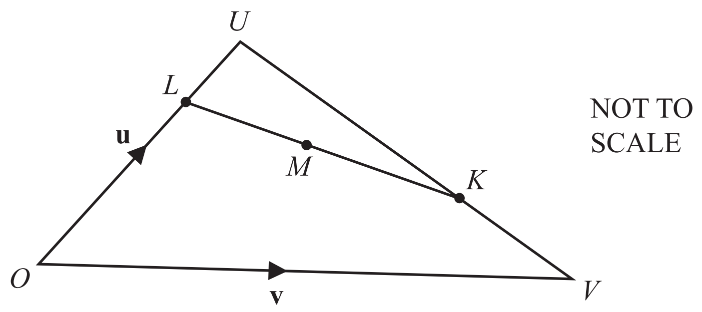
Mark the point $R$ on the grid. [1]

**(iii)** Write down the position vector of the point $P$.

*Answer(a)*(iii) $\begin{pmatrix} \\ \end{pmatrix}$ [1]

5 continued)

**(b)**




In the diagram, $\overrightarrow{OU} = \mathbf{u}$ and $\overrightarrow{OV} = \mathbf{v}$.

$K$ is on $UV$ so that $\overrightarrow{UK} = \frac{2}{3}\overrightarrow{UV}$ and $L$ is on $OU$ so that $\overrightarrow{OL} = \frac{3}{4}\overrightarrow{OU}$.

$M$ is the midpoint of $KL$.

Find the following in terms of **u** and **v**, giving your answers in their simplest form.

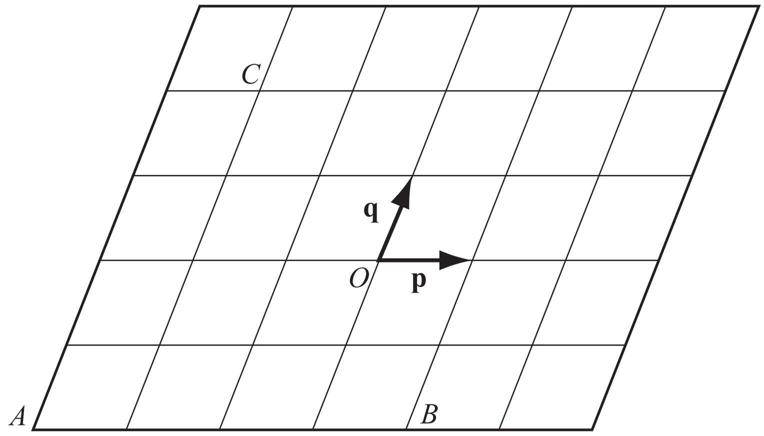
**(i)** $\overrightarrow{LK}$

*Answer(b)*(i) $\overrightarrow{LK} =$ [4]

**(ii)** $\overrightarrow{OM}$

*Answer(b)*(ii) $\overrightarrow{OM} =$ [2]

6)




$O$ is the origin. Vectors **p** and **q** are shown in the diagram.

**(a)** Write down, in terms of **p** and **q**, in their simplest form

**(i)** the position vector of the point $A$,

*Answer(a)*(i) [1]

**(ii)** $\overrightarrow{BC}$,

*Answer(a)*(ii) [1]

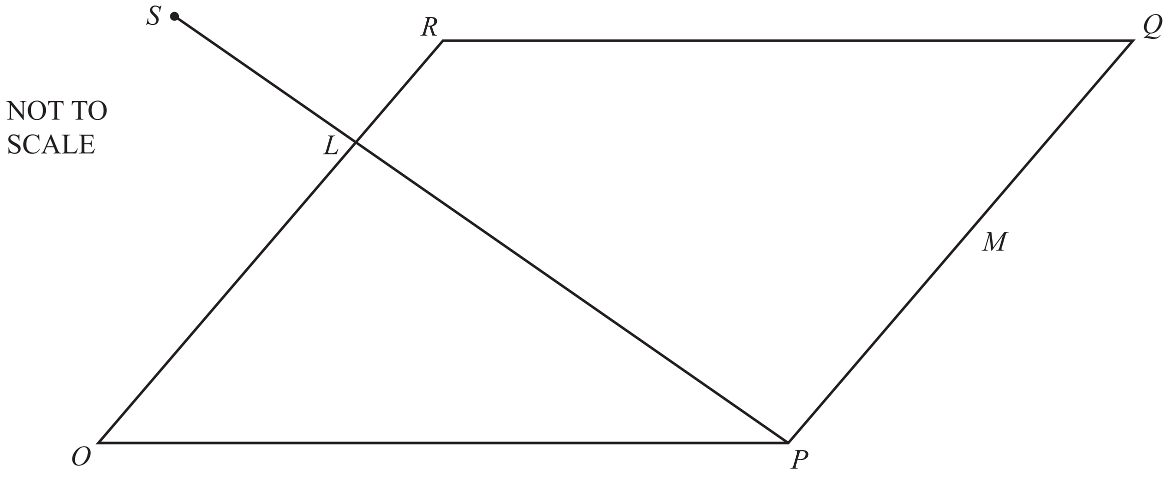
**(iii)** $\overrightarrow{BC} - \overrightarrow{AC}$.

*Answer(a)*(iii) [2]

**(b)** If $|\mathbf{p}| = 2$, write down the value of $|\overrightarrow{AB}|$.

*Answer(b)* [1]

7)




*OPQR* is a parallelogram.
*O* is the origin.
$\overrightarrow{OP} = \mathbf{p}$ and $\overrightarrow{OR} = \mathbf{r}$.
*M* is the mid-point of *PQ* and *L* is on *OR* such that $OL : LR = 2 : 1$.
The line *PL* is extended to the point *S*.

**(a)** Find, in terms of **p** and **r**, in their simplest forms,

**(i)** $\overrightarrow{OQ}$, [1]

**(ii)** $\overrightarrow{PR}$, [1]

**(iii)** $\overrightarrow{PL}$, [1]

**(iv)** the position vector of *M*. [1]

**(b)** *PLS* is a straight line and $PS = \frac{3}{2}PL$.

Find, in terms of **p** and/or **r**, in their simplest forms,

**(i)** $\overrightarrow{PS}$, [1]

**(ii)** $\overrightarrow{QS}$. [2]

**(c)** What can you say about the points *Q*, *R* and *S*? [1]

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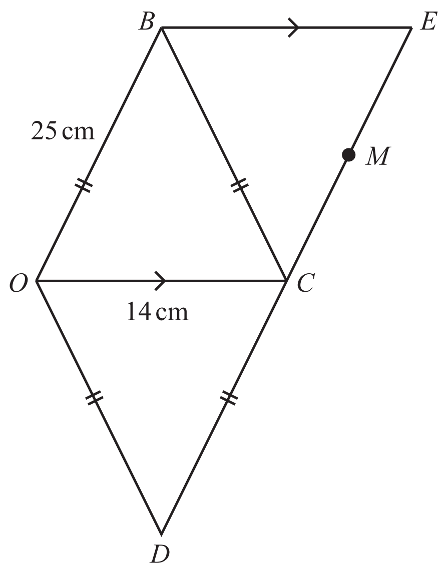
8)




NOT TO SCALE

*OBCD* is a rhombus with sides of 25 cm. The length of the diagonal *OC* is 14 cm.

**(a)** Show, **by calculation**, that the length of the diagonal *BD* is 48 cm. [3]

**(b)** Calculate, correct to the nearest degree,

**(i)** angle *BCD*, [2]

**(ii)** angle *OBC*. [1]

**(c)** $\overrightarrow{DB} = 2\mathbf{p}$ and $\overrightarrow{OC} = 2\mathbf{q}$.
Find, in terms of **p** and **q**,

**(i)** $\overrightarrow{OB}$, [1]

**(ii)** $\overrightarrow{OD}$. [1]

**(d)** *BE* is parallel to *OC* and *DCE* is a straight line.
Find, in its simplest form, $\overrightarrow{OE}$ in terms of **p** and **q**. [2]

**(e)** *M* is the mid-point of *CE*.
Find, in its simplest form, $\overrightarrow{OM}$ in terms of **p** and **q**. [2]

**(f)** *O* is the origin of a co-ordinate grid. *OC* lies along the *x*-axis and $\mathbf{q} = \begin{pmatrix} 7 \\ 0 \end{pmatrix}$.

($\overrightarrow{DB}$ is vertical and $|\overrightarrow{DB}| = 48$.)
Write down as column vectors

**(i)** **p**, [1]

**(ii)** $\overrightarrow{BC}$. [2]

**(g)** Write down the value of $|\overrightarrow{DE}|$. [1]