## Vectors and transformations – 2022 Nov IGCSE 0580 Math

**1.** Nov/2022/Paper_0580_12/No.9

Work out.

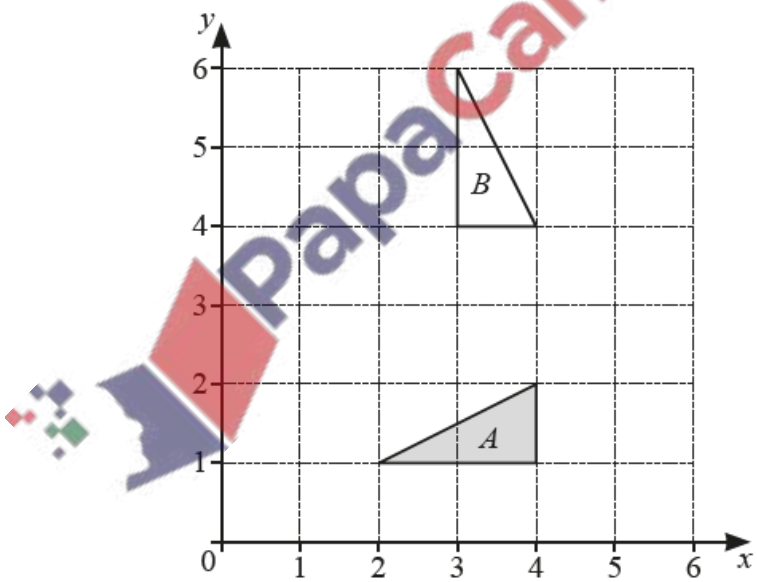
**(a)** $\begin{pmatrix} 6 \\ -3 \end{pmatrix} + \begin{pmatrix} 4 \\ -5 \end{pmatrix}$

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

**(b)** $6\begin{pmatrix} 3 \\ -2 \end{pmatrix}$

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

**2.** Nov/2022/Paper_0580_21/No.14



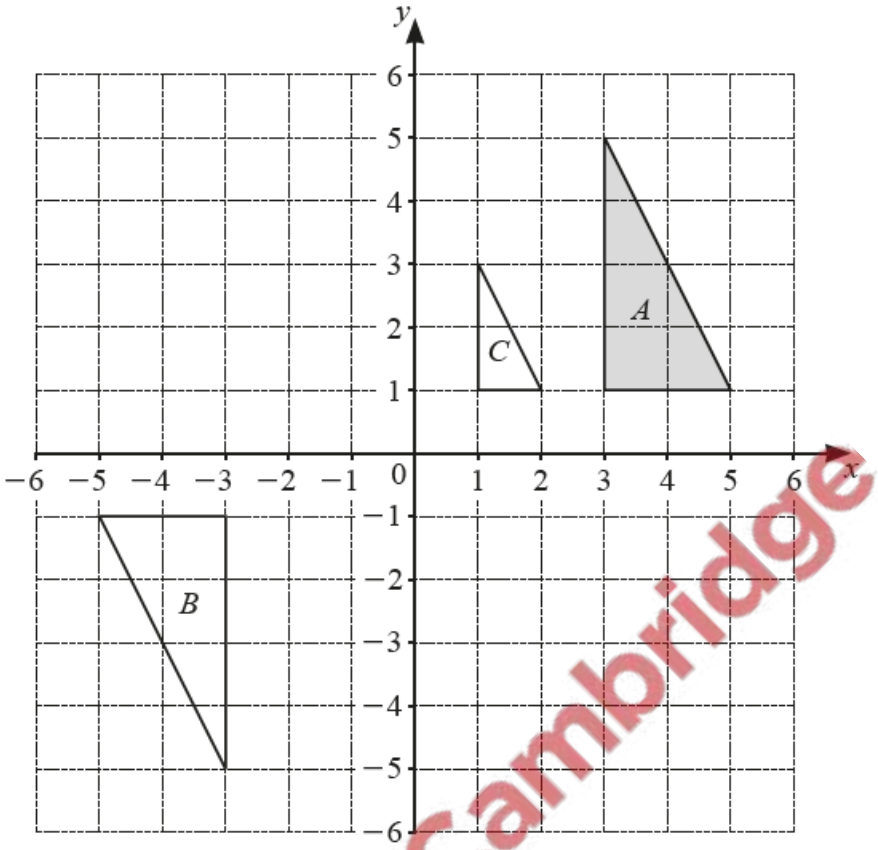

Describe fully the **single** transformation that maps triangle $A$ onto triangle $B$.

.....

..... [3]

**3.** Nov/2022/Paper_0580_31/No.2

Triangles $A$, $B$ and $C$ are shown on the grid.




**(a)** Describe fully the **single** transformation that maps

**(i)** triangle $A$ onto triangle $B$.

.....

..... [3]

**(ii)** triangle $A$ onto triangle $C$.

.....

..... [3]

**(b)** On the grid,

**(i)** reflect triangle $A$ in the line $y = 0$, [2]

**(ii)** translate triangle $A$ by the vector $\begin{pmatrix} -7 \\ 1 \end{pmatrix}$. [2]

**4.** Nov/2022/Paper_0580_31/No.8

**(a)** $\mathbf{a} = \begin{pmatrix} -3 \\ 5 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} 7 \\ -4 \end{pmatrix}$

Work out.

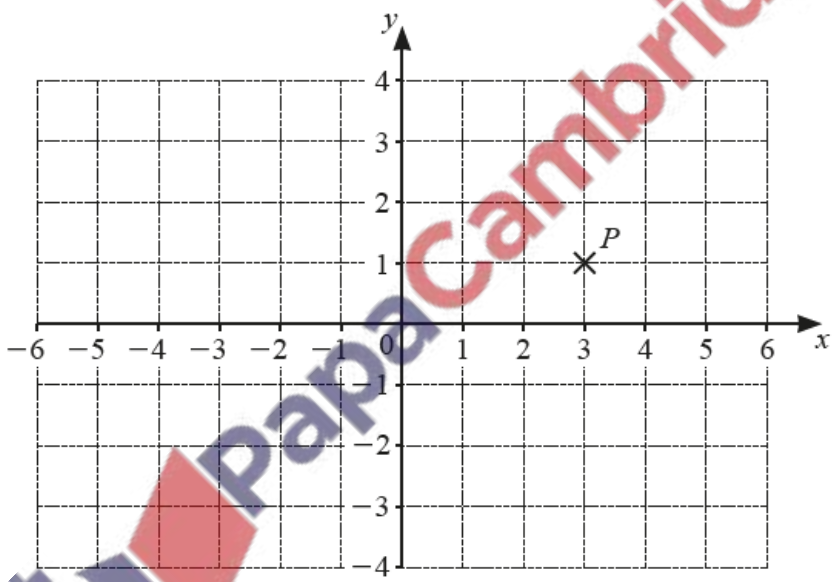
**(i)** $4\mathbf{a}$

( ) [1]

**(ii)** $2\mathbf{a} - \mathbf{b}$

( ) [2]

**(b)**




**(i)** Write down the coordinates of point $P$.

(..... , .....) [1]

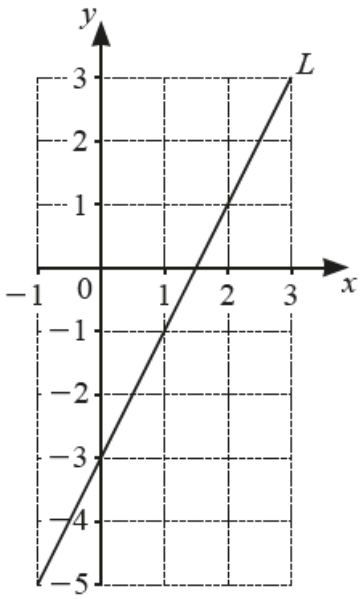
**(ii)** On the grid, plot point $Q$ at $(-4, 2)$. [1]

**(iii)** $\overrightarrow{PR} = \begin{pmatrix} -2 \\ 1 \end{pmatrix}$

On the grid, plot point $R$. [1]

**(iv)** On the grid, draw the line $y = 3$. [1]

**(c)**




Line $L$ is shown on the grid.

**(i)** Find the equation of line $L$ in the form $y = mx + c$.

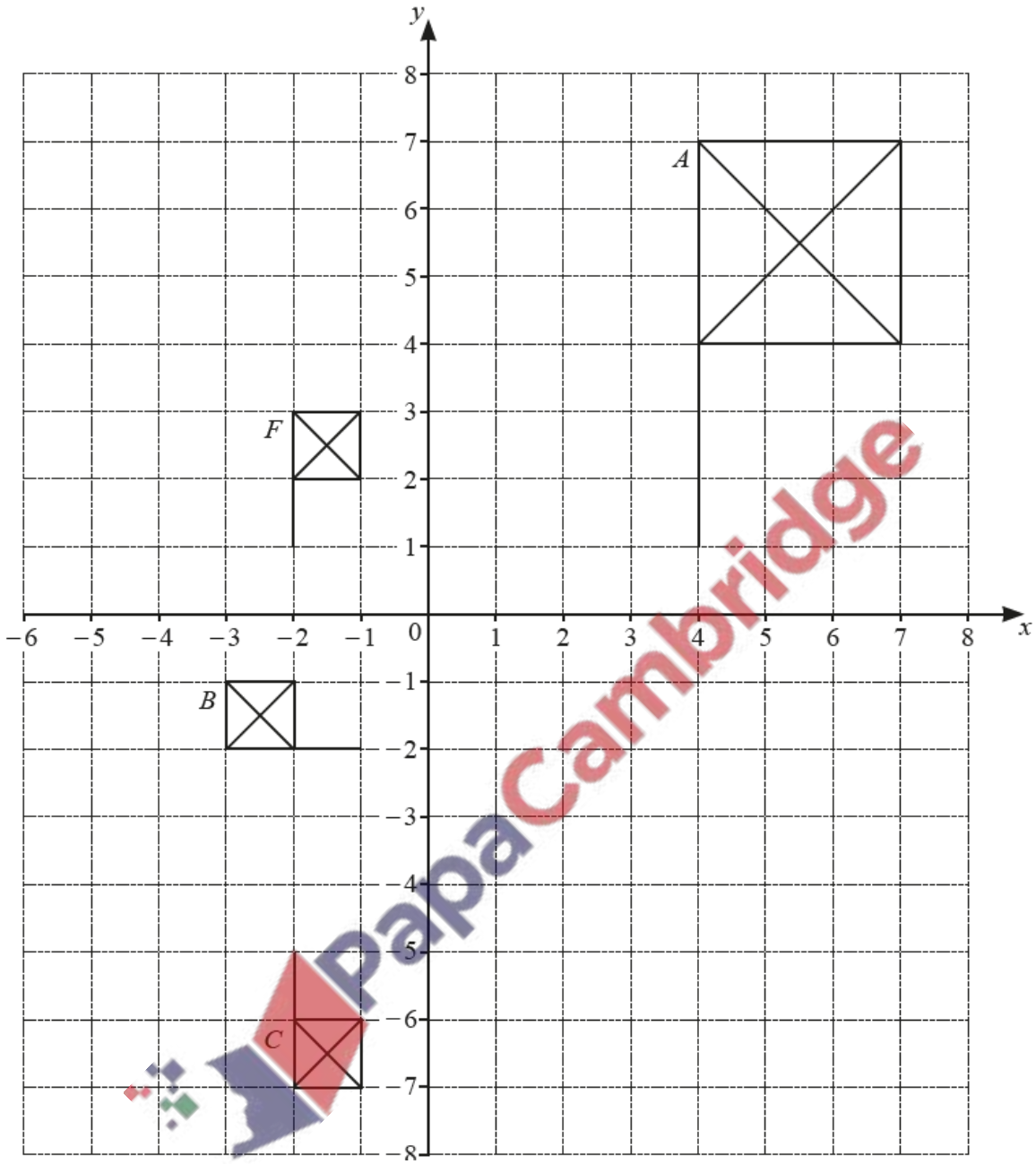
$y =$ ..... [2]

**(ii)** Write down the equation of a line parallel to line $L$.

$y =$ ..... [1]

**5.** Nov/2022/Paper_0580_32/No.6

The diagram shows four flags, $F$, $A$, $B$ and $C$, on a grid.



**(a)** Describe fully the **single** transformation that maps

**(i)** flag $F$ onto flag $A$,

.....

..... [3]

**(ii)** flag $F$ onto flag $B$,

.....

..... [3]

**(iii)** flag $F$ onto flag $C$.

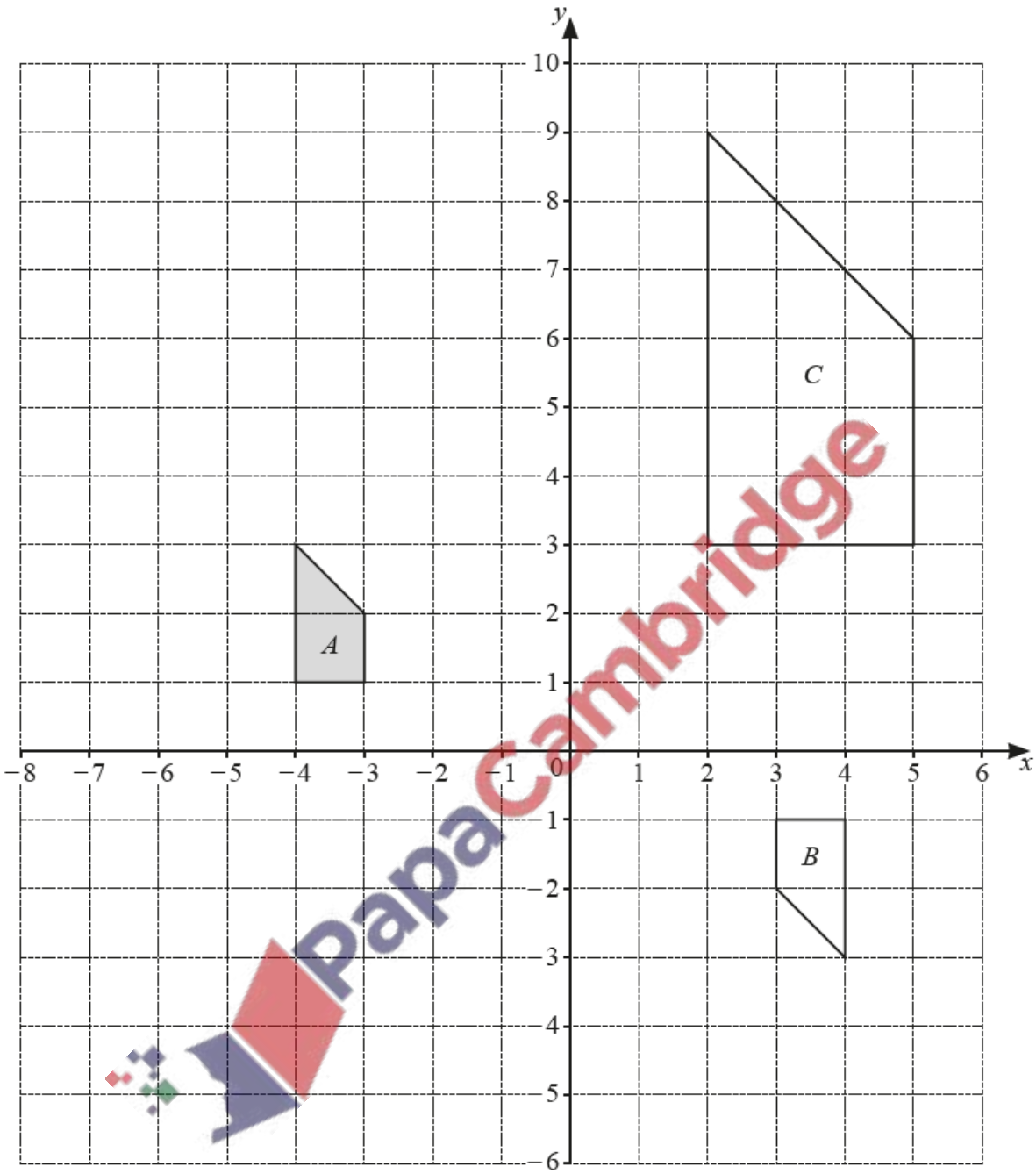
.....

..... [2]

**(b)** On the grid, draw the image of flag $F$ after a translation by the vector $\begin{pmatrix} 3 \\ -4 \end{pmatrix}$. [2]

**6.** Nov/2022/Paper_0580_33/No.8

**(a)**






**(i)** Draw the image of shape $A$ after a reflection in the line $y = -1$. [2]

**(ii)** Describe fully the **single** transformation that maps shape $A$ onto shape $B$.

.....

..... [3]

**(iii)** Describe fully the **single** transformation that maps shape $A$ onto shape $C$.

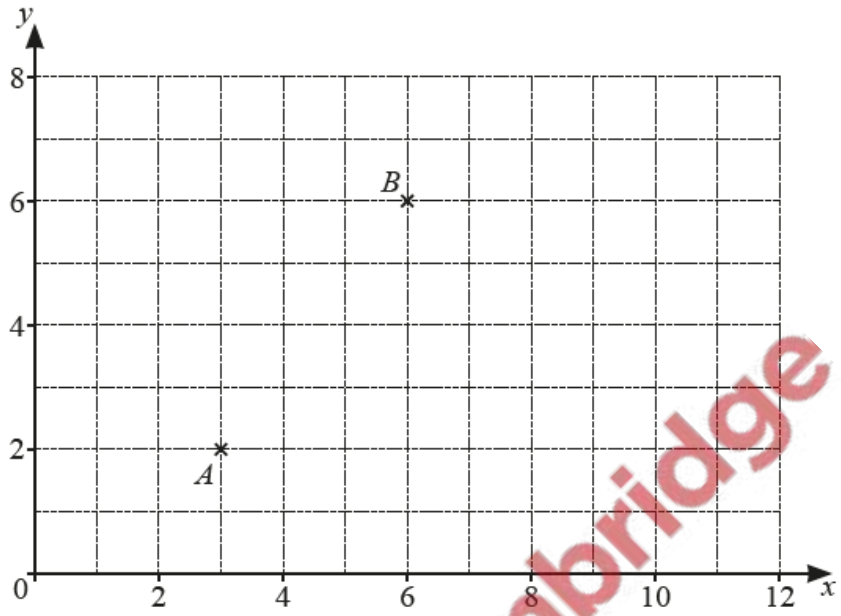
.....

..... [3]

**(iv)** Complete this statement.

The area of shape $C$ is ..... times bigger than the area of shape $A$. [2]

**(b)**




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

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

**(ii)** $\overrightarrow{BC} = \begin{pmatrix} 4 \\ -5 \end{pmatrix}$

On the grid, plot point $C$. [1]

**(c)** $\mathbf{p} = \begin{pmatrix} 5 \\ -12 \end{pmatrix}$ $\mathbf{t} = \begin{pmatrix} 4 \\ 7 \end{pmatrix}$

Work out

**(i)** $3\mathbf{p}$,

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

**(ii)** $\mathbf{t} - \mathbf{p}$.

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

**7.** Nov/2022/Paper_0580_41/No.6

**(a)** $\mathbf{p} = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$ $\mathbf{q} = \begin{pmatrix} -1 \\ 1 \end{pmatrix}$

Find

**(i)** $3\mathbf{q}$,

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

**(ii)** $\mathbf{p} - \mathbf{q}$,

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

**(iii)** $|\mathbf{p}|$.

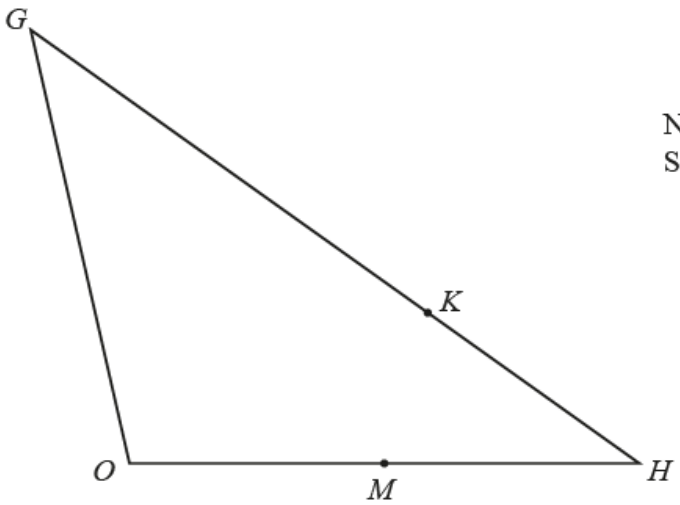
..... [2]

**(b)** $B$ is the point (2, 7) and $\overrightarrow{AB} = \begin{pmatrix} -4 \\ 6 \end{pmatrix}$.

Find the coordinates of $A$.

(..... , .....) [2]

**(c)**




NOT TO SCALE

In triangle $OGH$, $M$ is the midpoint of $OH$ and $K$ divides $GH$ in the ratio $5 : 2$.

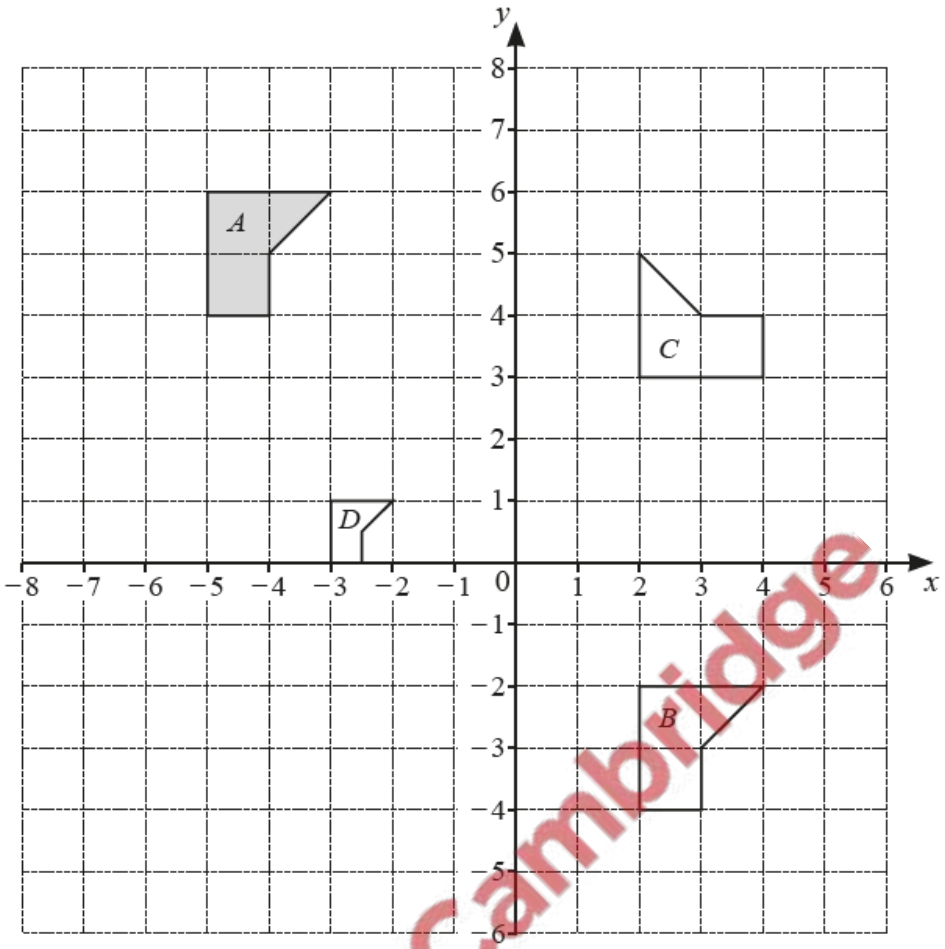
$\overrightarrow{OG} = \mathbf{g}$ and $\overrightarrow{OH} = \mathbf{h}$.

Find $\overrightarrow{MK}$ in terms of $\mathbf{g}$ and $\mathbf{h}$.
Give your answer in its simplest form.



$\overrightarrow{MK} =$ ..... [4]

**8.** Nov/2022/Paper_0580_42/No.4




**(a)** Describe fully the **single** transformation that maps

**(i)** shape $A$ onto shape $B$,

.....

..... [2]

**(ii)** shape $A$ onto shape $C$,

.....

..... [3]

**(iii)** shape $A$ onto shape $D$.

.....

..... [3]

**(b)** On the grid, draw the image of shape $A$ after a reflection in the line $y = x + 8$. [2]

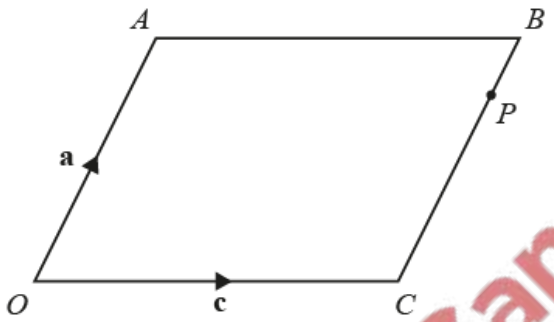
**9.** Nov/2022/Paper_0580_42/No.11

**(a)** $\left|\begin{pmatrix} 9m \\ 40m \end{pmatrix}\right| = \frac{205}{2}$

Find the two possible values of $m$.

$m =$ ..... or ..... [3]

**(b)**




NOT TO SCALE

$OABC$ is a parallelogram.
$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OC} = \mathbf{c}$.
$P$ is the point on $CB$ such that $CP : PB = 3 : 1$.

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

**(a)** $\overrightarrow{AC}$,

$\overrightarrow{AC} =$ ..... [1]

**(b)** $\overrightarrow{CP}$,

$\overrightarrow{CP} =$ ..... [1]

**(c)** $\overrightarrow{OP}$.

$\overrightarrow{OP} =$ ..... [1]

**(ii)** $OP$ and $AB$ are extended to meet at $Q$.

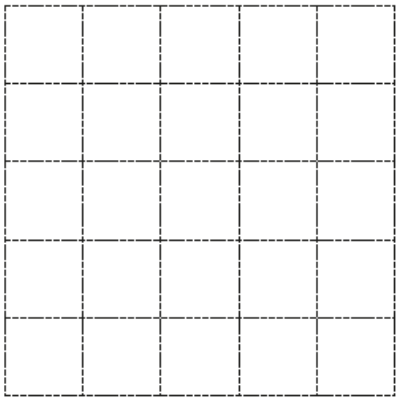
Find the position vector of $Q$.

..... [2]

**10.** Nov/2022/Paper_0580_43/No.10

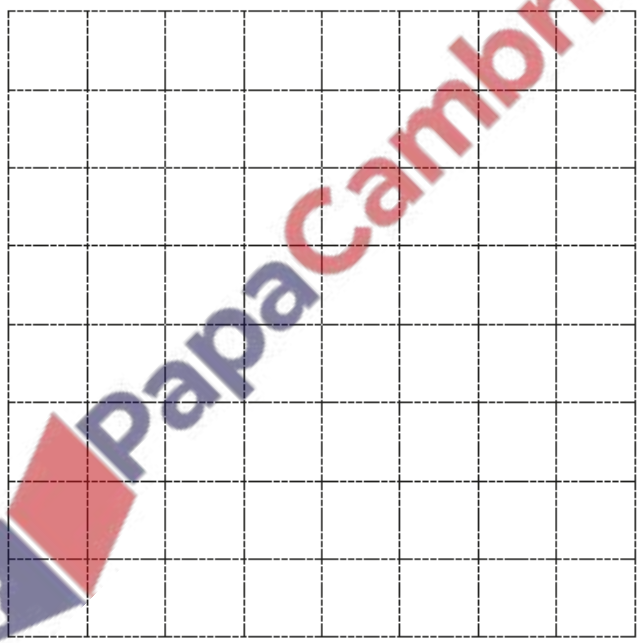
**(a)** $\mathbf{a} = \begin{pmatrix} 1 \\ 2 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} -3 \\ 5 \end{pmatrix}$

**(i)** On the grid, draw and label vector $2\mathbf{a}$.



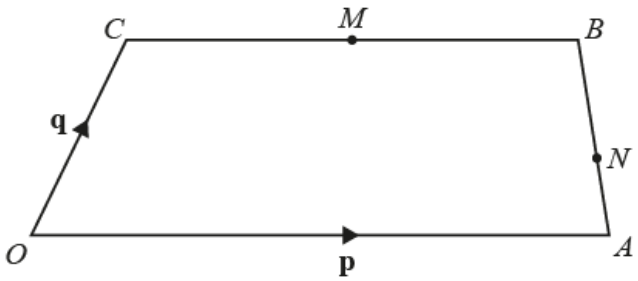
[1]

**(ii)** On the grid, draw and label vector $(\mathbf{a} - \mathbf{b})$.



[2]

**(b)**




NOT TO SCALE

$OABC$ is a trapezium with $OA$ parallel to $CB$.
$M$ is the midpoint of $CB$ and $N$ is the point on $AB$ such that $AN : NB = 1 : 2$.
$O$ is the origin, $\overrightarrow{OA} = \mathbf{p}$, $\overrightarrow{OC} = \mathbf{q}$ and $\overrightarrow{CB} = \frac{3}{4}\mathbf{p}$.

**(i)** Find, in terms of **p** and/or **q**, in its simplest form

**(a)** $\overrightarrow{OB}$

$\overrightarrow{OB} =$ ..... [1]

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

$\overrightarrow{AB} =$ ..... [2]

**(c)** $\overrightarrow{MN}$.

$\overrightarrow{MN} =$ ..... [3]

**(ii)** $OA$ and $MN$ are extended to meet at $G$.

Find the position vector of $G$ in terms of **p**.

..... [2]