Vectors
Difficulty: Hard

Question Paper 4

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Vectors
Paper	Paper 4
Difficulty	Hard
Booklet	Question Paper 4

Time allowed: **87 minutes**

Score: **/76**

Percentage: **/100**

Grade Boundaries:

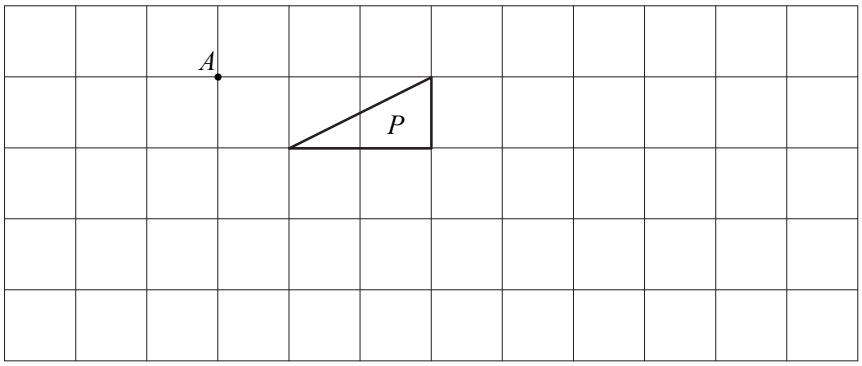
CIE IGCSE Maths (0580)

A*	A	B	C	D
>83%	67%	51%	41%	31%

CIE IGCSE Maths (0980)

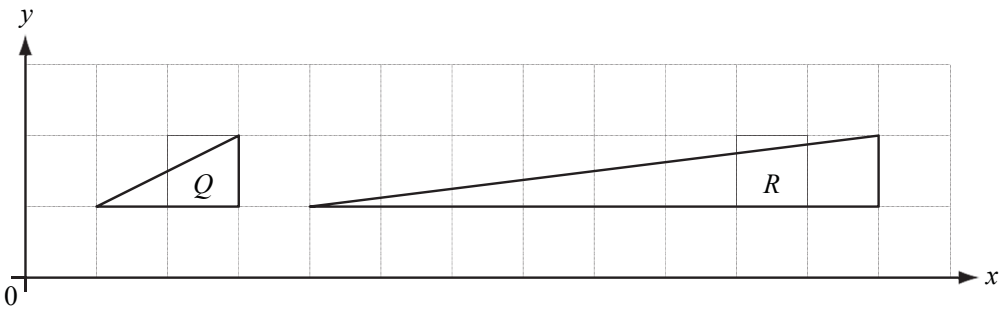
9	8	7	6	5	4
>95%	87%	80%	69%	58%	46%

(a)



Draw the enlargement of triangle P with centre A and scale factor 2. [2]

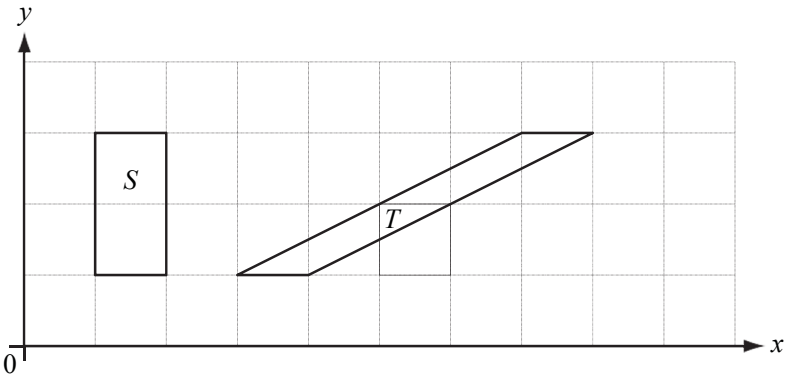
(b)



(i) Describe fully the **single** transformation which maps shape Q onto shape R. [3]

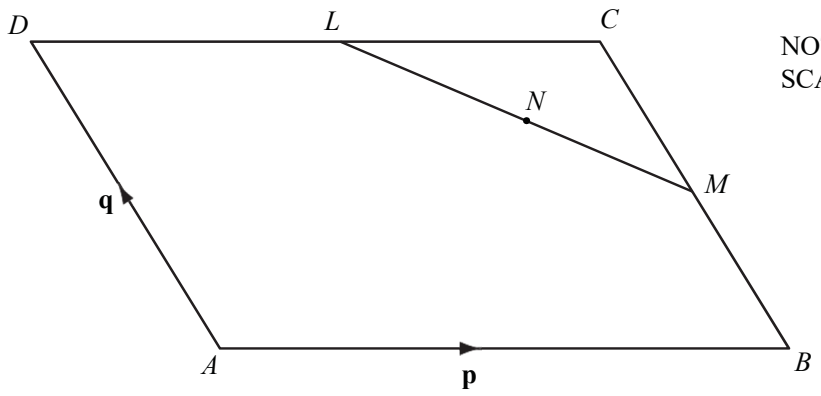
(ii) Find the matrix which represents this transformation. [2]

(c)



Describe fully the **single** transformation which maps shape S onto shape T. [3]

(a)



NOT TO SCALE

$ABCD$ is a parallelogram.
L is the midpoint of DC, M is the midpoint of BC and N is the midpoint of LM.
$\overrightarrow{AB} = \mathbf{p}$ and $\overrightarrow{AD} = \mathbf{q}$.

(i) Find the following in terms of $\mathbf{p}$ and $\mathbf{q}$, in their simplest form.

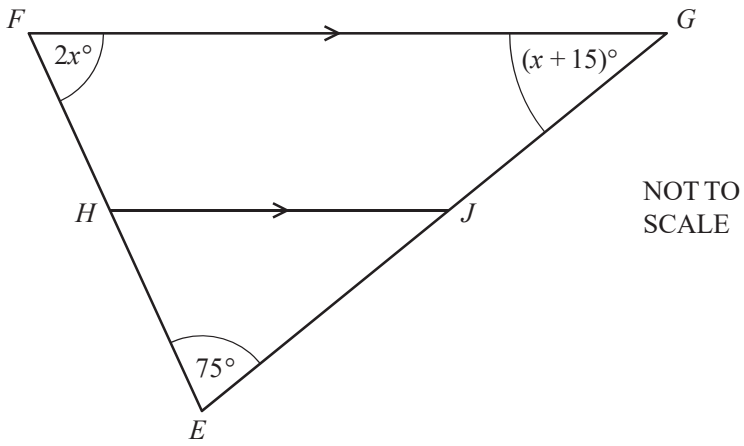
(a) $\overrightarrow{AC}$ [1]

(b) $\overrightarrow{LM}$ [2]

(c) $\overrightarrow{AN}$ [2]

(ii) Explain why your answer for $\overrightarrow{AN}$ shows that the point N lies on the line AC. [1]

(b)

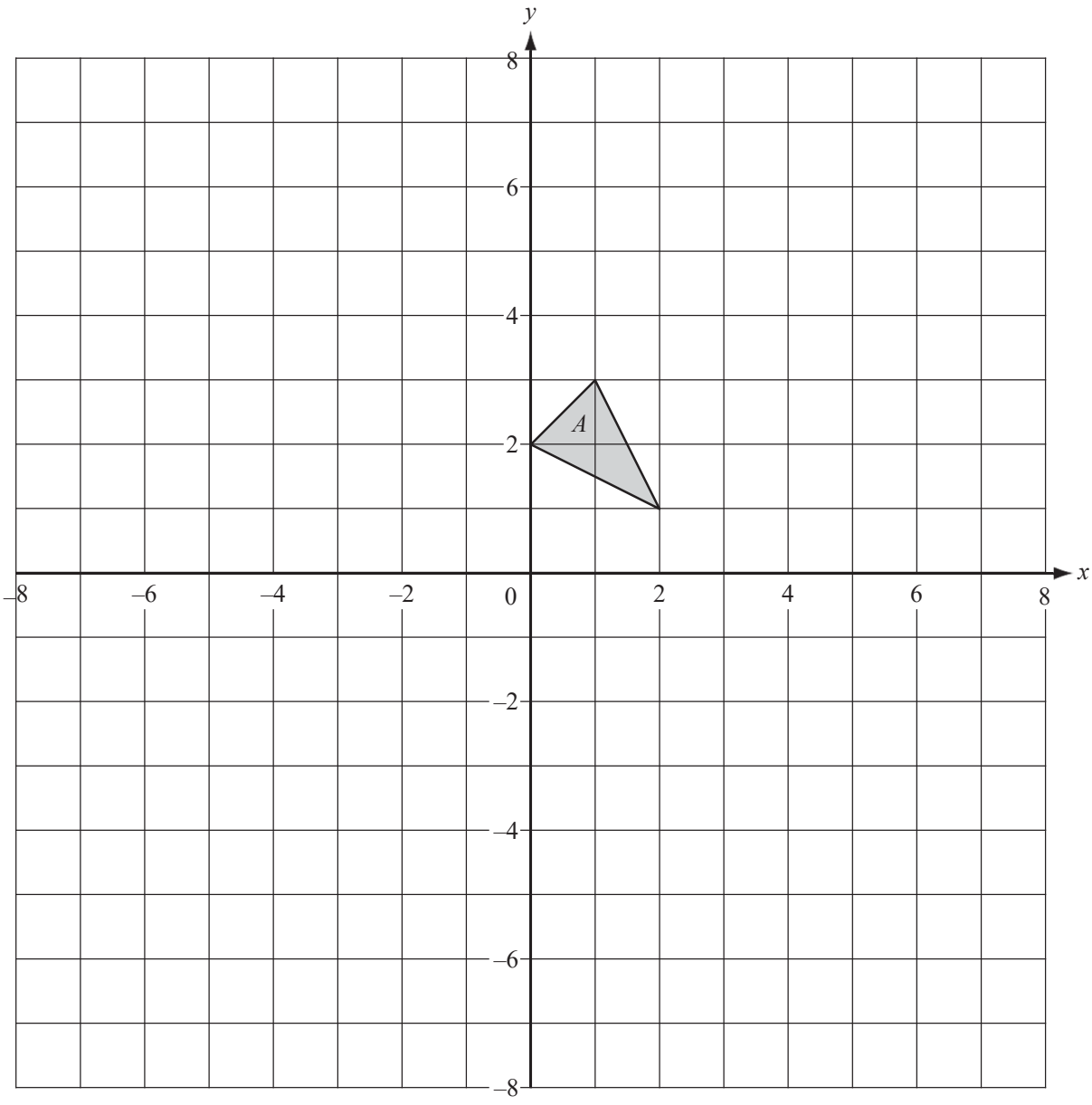


EFG is a triangle.
HJ is parallel to *FG*.
Angle *FEG* = 75°.
Angle *EFG* = 2*x*° and angle *FGE* = (*x* + 15)°.

(i) Find the value of *x*. [2]

(ii) Find angle *HJG*. [1]

(a)



Draw the images of the following transformations on the grid above.

(i) Translation of triangle A by the vector $\begin{pmatrix} 3 \\ -7 \end{pmatrix}$. Label the image B. [2]

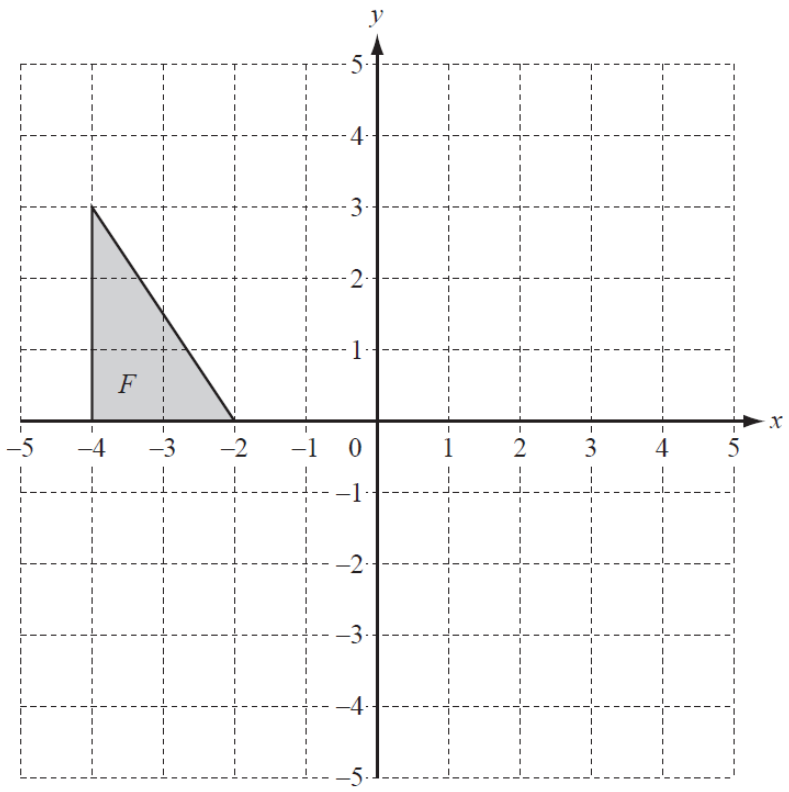
(ii) Reflection of triangle A in the line $x = 3$. Label the image C. [2]

(iii) Rotation of triangle A through 90° anticlockwise around the point (0, 0). Label the image D. [2]

(iv) Enlargement of triangle A by scale factor –4, with centre (0, 1). Label the image E. [2]

(b) The area of triangle E is $k \times$ area of triangle A.
Write down the value of k. [1]

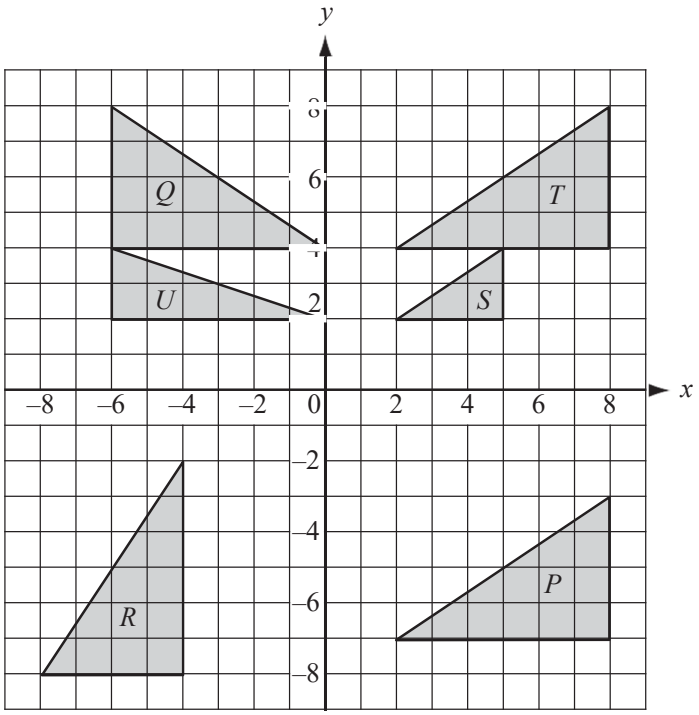
(c)



(i) Draw the image of triangle F under the transformation represented by the matrix $\mathbf{M} = \begin{pmatrix} 1 & 3 \\ 0 & 1 \end{pmatrix}$. [3]

(ii) Describe fully this single transformation. [3]

(iii) Find $\mathbf{M}^{-1}$, the inverse of the matrix $\mathbf{M}$. [2]



The diagram shows triangles P, Q, R, S, T and U.

(a) Describe fully the **single** transformation which maps triangle

(i) T onto P, [2]

(ii) Q onto T, [2]

(iii) T onto R, [2]

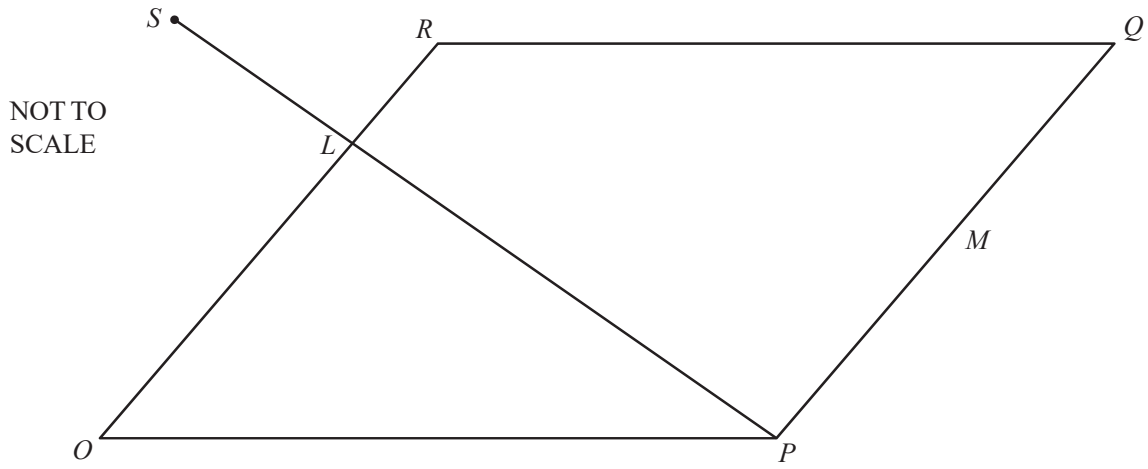
(iv) T onto S, [3]

(v) U onto Q. [3]

(b) Find the 2 by 2 matrix representing the transformation which maps triangle

(i) T onto R, [2]

(ii) U onto Q. [2]



$OPQR$ 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 $\mathbf{p}$ and $\mathbf{r}$, in their simplest forms,

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

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

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

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

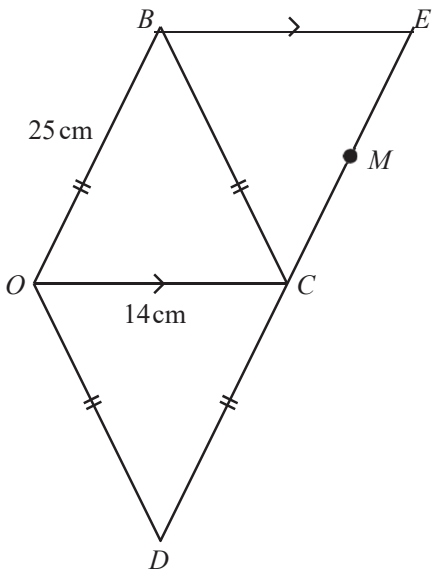
(b) PLS is a straight line and $PS = \frac{3}{2}PL$.

Find, in terms of $\mathbf{p}$ and/or $\mathbf{r}$, 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]



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 $\mathbf{p}$ and $\mathbf{q}$,

(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 $\mathbf{p}$ and $\mathbf{q}$. [2]

(e) *M* is the mid-point of *CE*.
Find, in its simplest form, $\overrightarrow{OM}$ in terms of $\mathbf{p}$ and $\mathbf{q}$. [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) $\mathbf{p}$, [1]

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

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