Vectors
Difficulty: Medium

Question Paper 4

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

Time allowed: **92 minutes**

Score: **/80**

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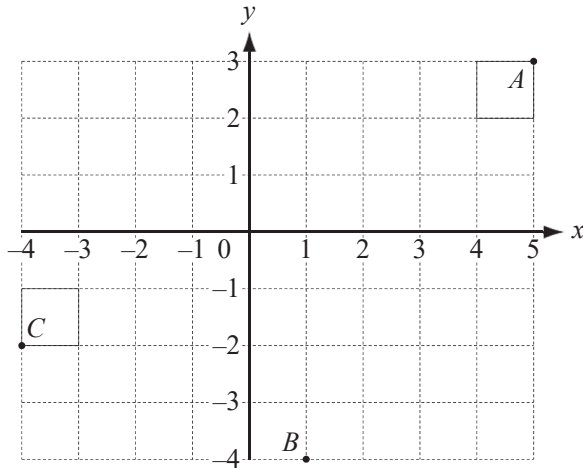
The points A (5, 3), B (1, –4) and C (–4, –2) are shown in the diagram.

(i)   Write $\overrightarrow{CA}$ as a column vector.   [1]

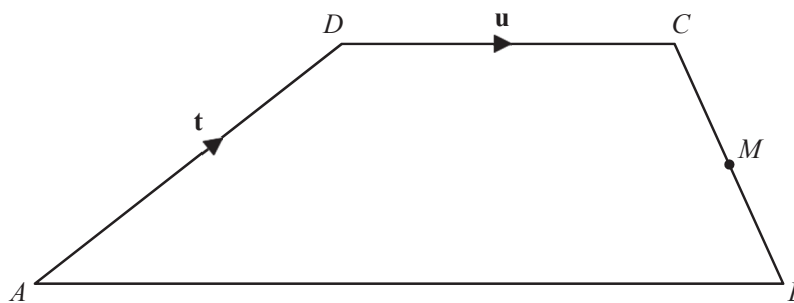(ii)   Find $\overrightarrow{CA} - \overrightarrow{CB}$ as a single column vector.   [2]

(iii) Complete the following statement.   [1]

(iv)   Calculate $\left|\overrightarrow{CA}\right|$.   [2]

(b)

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

M is the midpoint of BC.

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

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

Give each answer in its simplest form.

(i) $\overrightarrow{AB}$ [1]

(ii) $\overrightarrow{BM}$ [2]

(iii) $\overrightarrow{AM}$ [2]
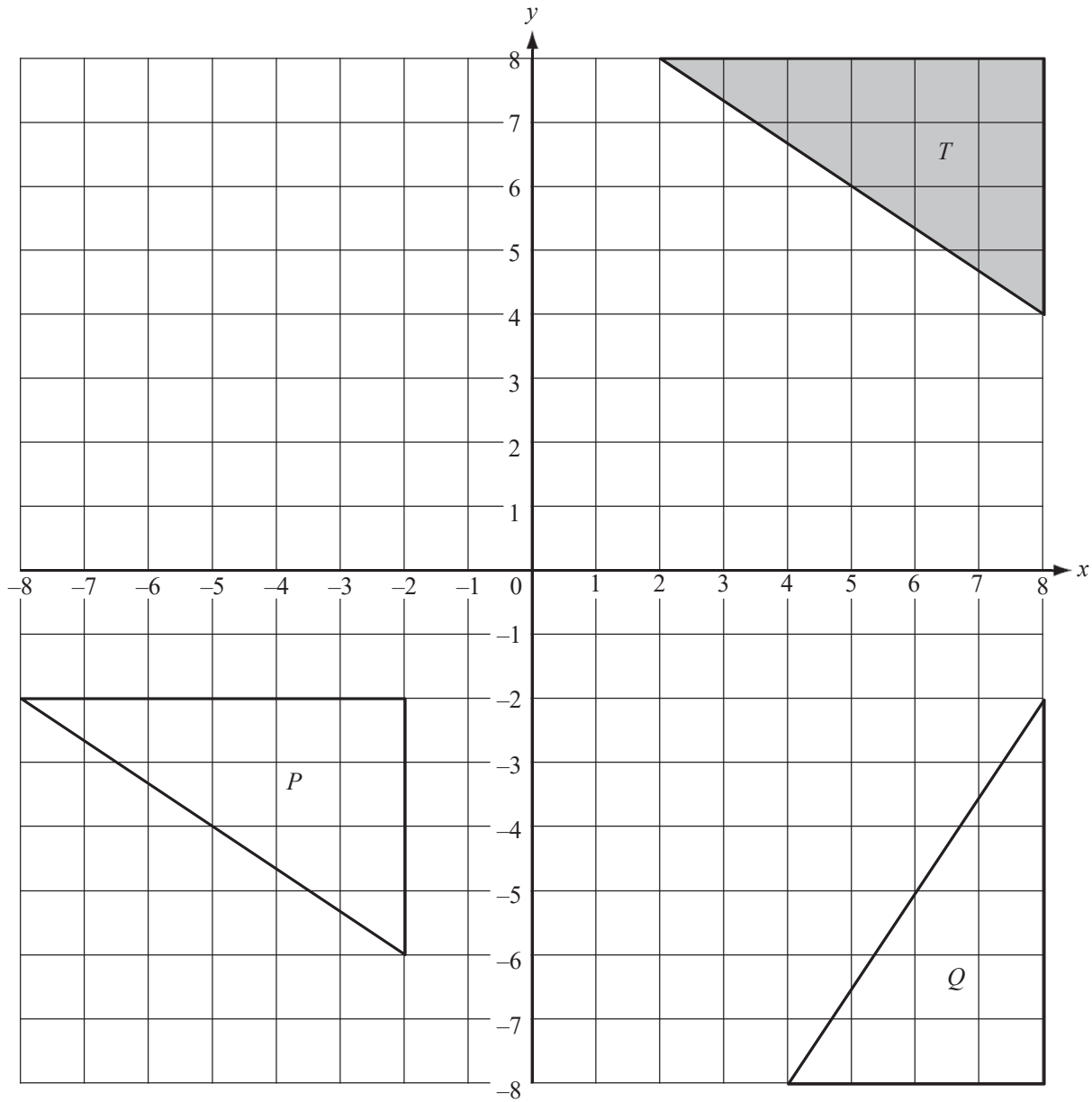
(a) On the grid, draw the enlargement of the triangle *T*, centre (0, 0), scale factor $\frac{1}{2}$.   [2]

(b) The matrix $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$ represents a transformation.

(i) Calculate the matrix product $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}\begin{pmatrix} 8 & 8 & 2 \\ 4 & 8 & 8 \end{pmatrix}$.   [2]

(ii) On the grid, draw the image of the triangle T under this transformation.   [2]

(iii) Describe fully this **single** transformation.   [2]

(c) Describe fully the **single** transformation which maps

(i) triangle T onto triangle P,   [2]

(ii) triangle T onto triangle Q.   [3]

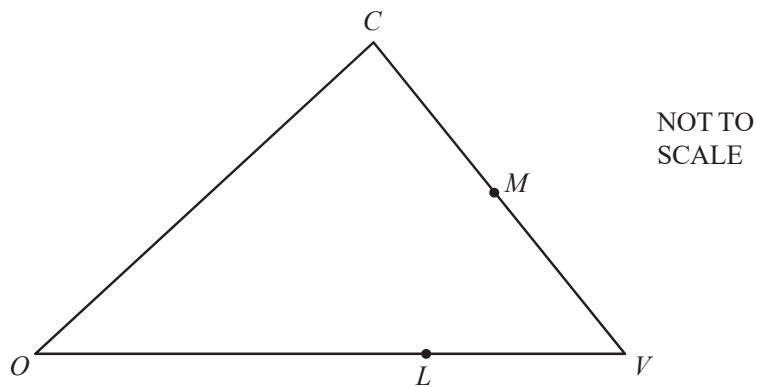(d) Find the 2 by 2 matrix which represents the transformation in **part (c)(ii).**   [2]

(a) $\mathbf{p} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$ and $\mathbf{q} = \begin{pmatrix} 6 \\ 3 \end{pmatrix}$.

    (i)   Find, as a single column vector, $\mathbf{p} + 2\mathbf{q}$.   [2]

    (ii) Calculate the value of $|\,\mathbf{p} + 2\mathbf{q}\,|$.   [2]

(b)

NOT TO SCALE

In the diagram, $CM = MV$ and $OL = 2LV$.
O is the origin. $\overrightarrow{OC} = \mathbf{c}$ and $\overrightarrow{OV} = \mathbf{v}$.

Find, in terms of c and v, in their simplest forms

    (i) $\overrightarrow{CM}$,   [2]

    (ii) the position vector of M,   [2]

    (iii) $\overrightarrow{ML}$.   [2]
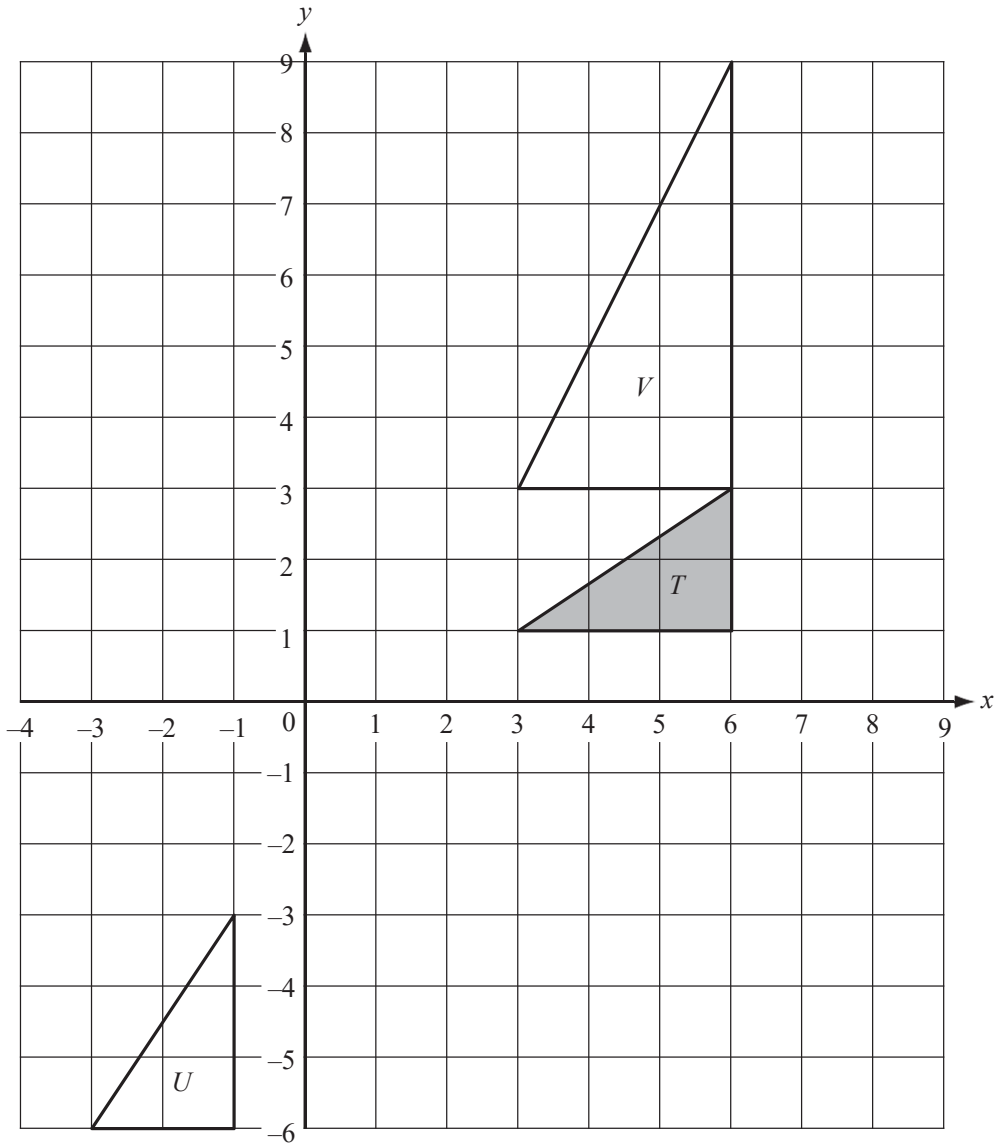
(a) On the grid, draw

    (i)   the translation of triangle T by the vector $\begin{pmatrix} -7 \\ 3 \end{pmatrix}$,   [2]

    (ii) the rotation of triangle T about (0, 0), through 90° clockwise.   [2]

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

    (i)   triangle T onto triangle U,   [2]
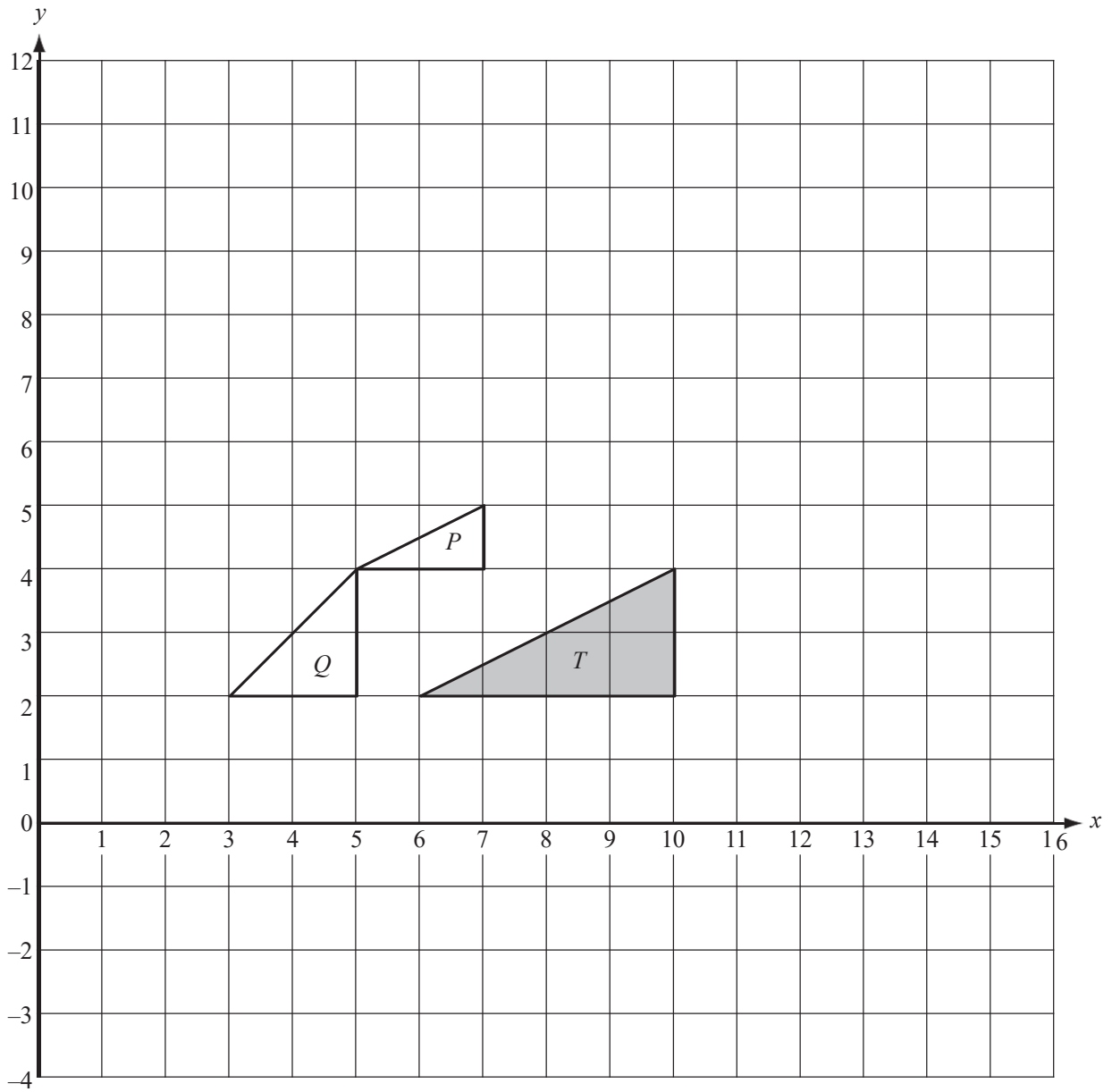
    (ii) triangle T onto triangle V.   [3]

(c) Find the 2 by 2 matrix which represents the transformation that maps

(i) triangle *T* onto triangle *U*, [2]

(ii) triangle *T* onto triangle *V*, [2]

(iii) triangle *V* onto triangle *T*. [1]

(a) Draw the reflection of triangle *T* in the line *y* = 6.

Label the image *A*.   [2]

(b) Draw the translation of triangle *T* by the vector $\begin{pmatrix} -4 \\ 6 \end{pmatrix}$.

Label the image *B*.   [2]

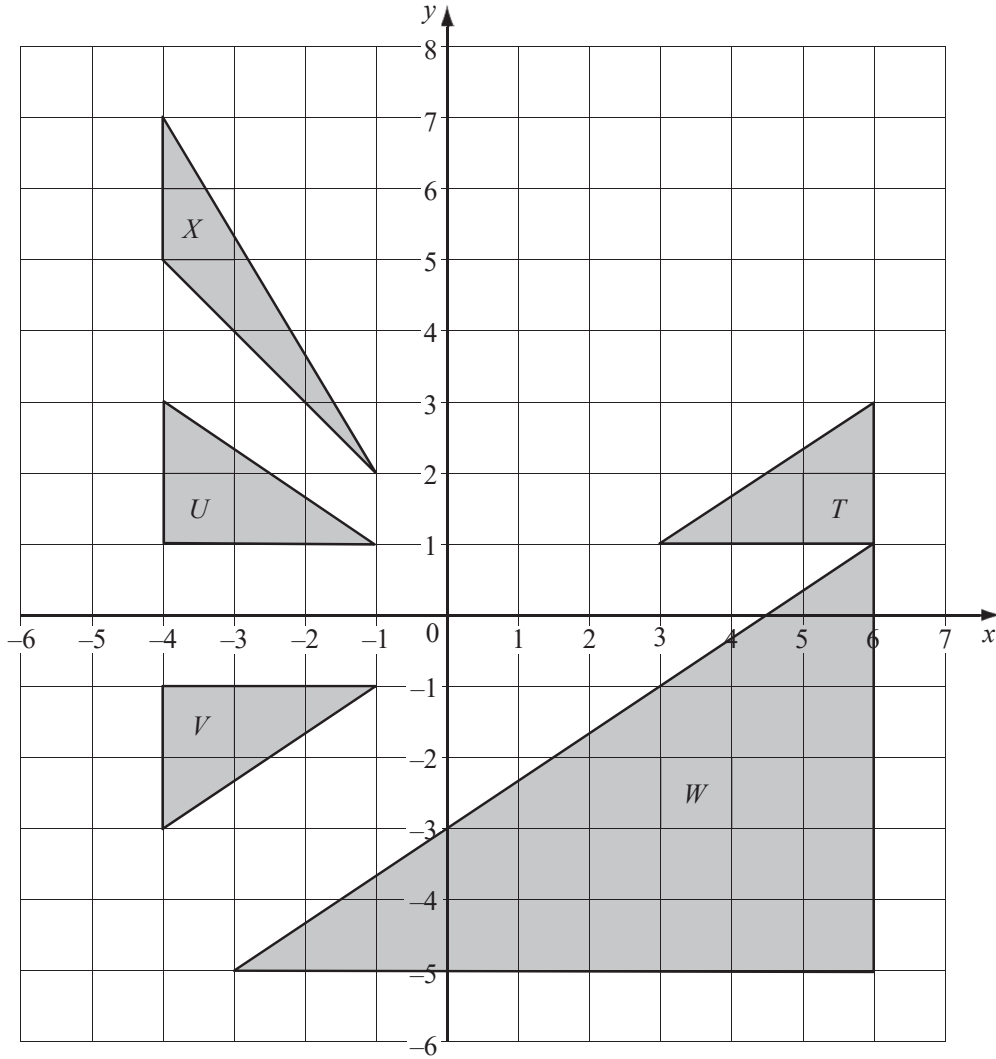(c) Describe fully the **single** transformation which maps triangle *B* onto triangle *T*.   [2]

(d) (i)   Describe fully the **single** transformation which maps triangle *T* onto triangle *P*.

[3]

(ii) Complete the following statement.   [1]

(e) (i)   Describe fully the **single** transformation which maps triangle *T* onto triangle *Q*.   [3]

(ii) Find the 2 by 2 matrix which represents the transformation mapping triangle *T* onto triangle *Q*.

[2]

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

(i)   triangle *T* onto triangle *U*,   [2]

(ii) triangle *T* onto triangle *V*,   [3]

(iii) triangle T onto triangle W,

[3]

(iv) triangle U onto triangle X.

[3]

(b)   Find the matrix representing the transformation which maps

(i)   triangle U onto triangle V,

[2]

(ii)   triangle U onto triangle X.

[2]