

Transformations

(Reflection, Enlargement, Rotation, Translation)

Question Paper 9

Level	IGCSE
Subject	Maths (0580)
Exam Board	Cambridge International Examinations (CIE)
Paper Type	Extended
Topic	Matrices and Transformations
Sub-Topic	Transformations (Reflection, Enlargement, Rotation, Translation)
Booklet	Question Paper 9

Time Allowed: 68 minutes

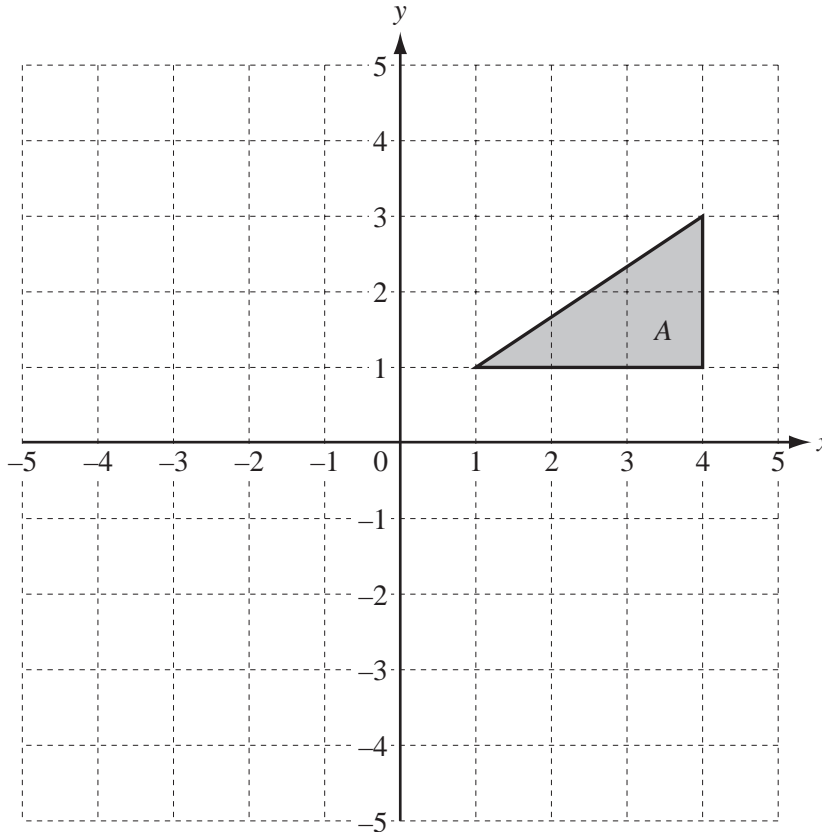
Score: /56

Percentage: /100

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	75%	60%	45%	35%	25%	<25%

1 (a)



(i) Draw the image when triangle A is reflected in the line $y = 0$.
Label the image B . [2]

(ii) Draw the image when triangle A is rotated through 90° anticlockwise about the origin.
Label the image C . [2]

(iii) Describe fully the **single** transformation which maps triangle B onto triangle C .

Answer(a)(iii) [2]

(b) Rotation through 90° anticlockwise about the origin is represented by the matrix $\mathbf{M} = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$.

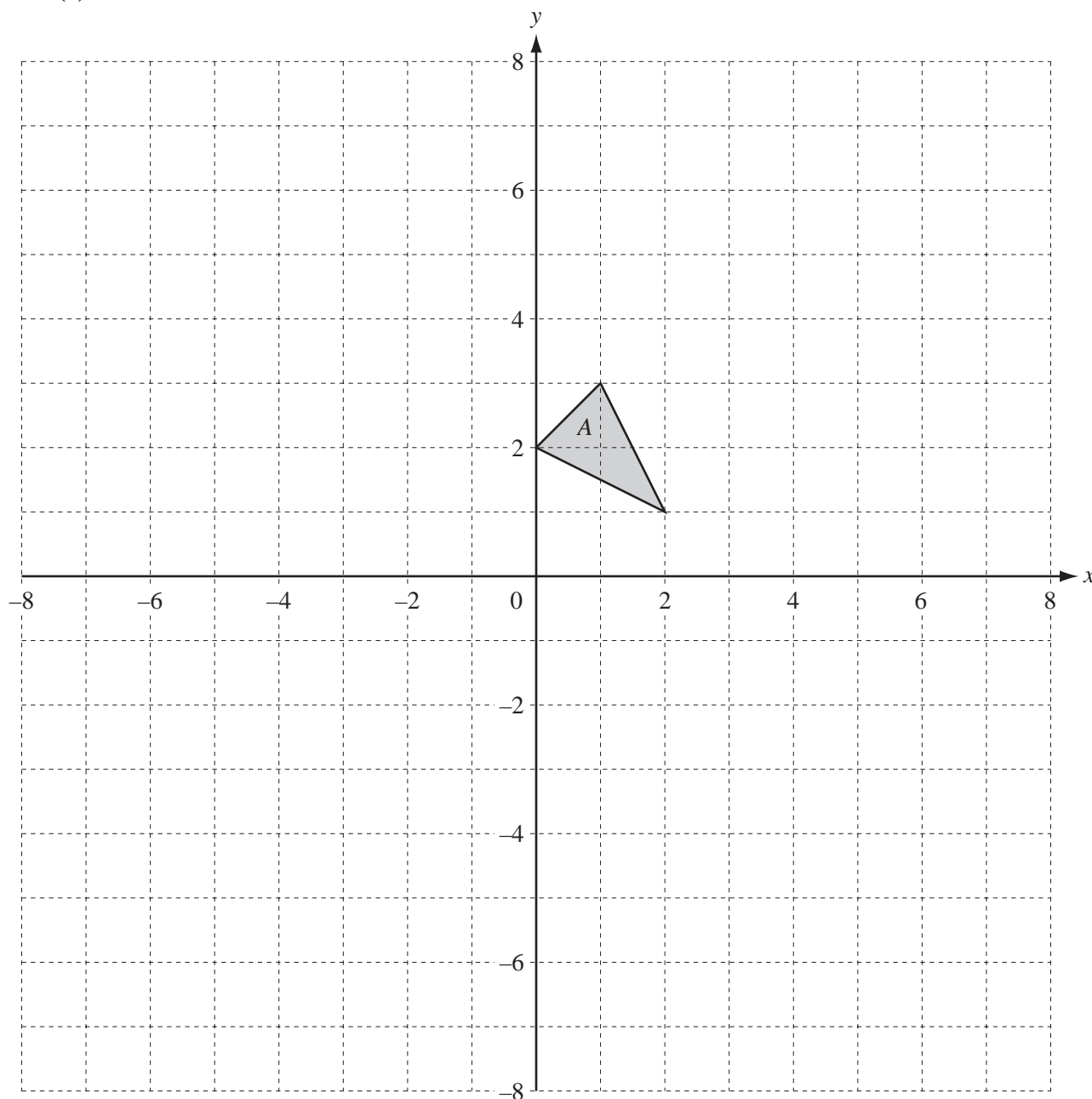
(i) Find \mathbf{M}^{-1} , the inverse of matrix \mathbf{M} .

Answer(b)(i) $\mathbf{M}^{-1} = \begin{pmatrix} & \\ & \end{pmatrix}$ [2]

(ii) Describe fully the **single** transformation represented by the matrix \mathbf{M}^{-1} .

Answer(b)(ii) [2]

2 (a)



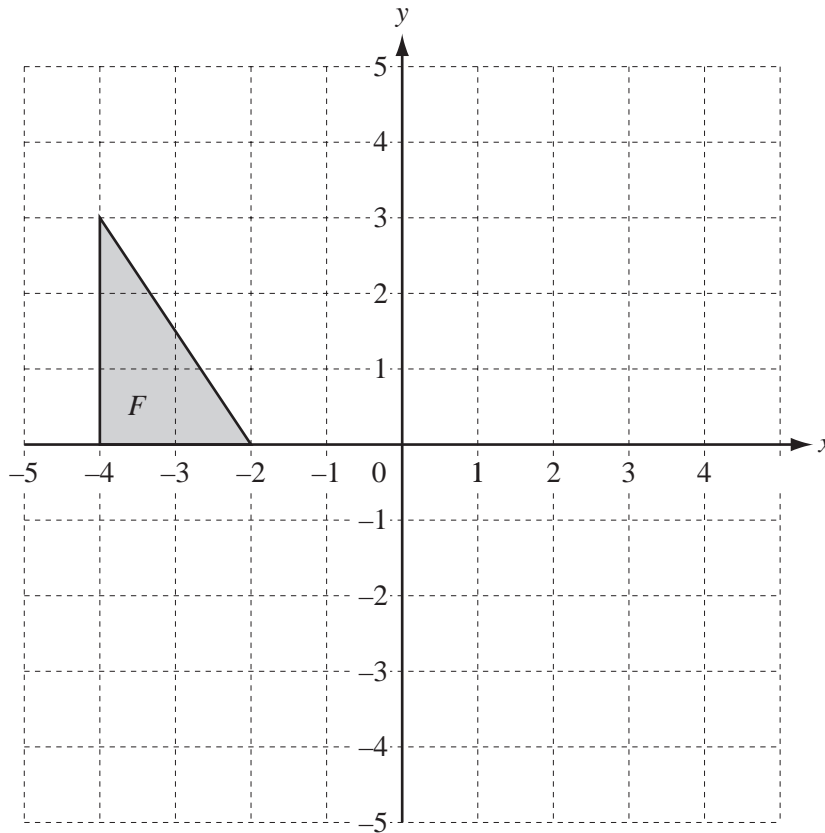
Draw the images of the following transformations on the grid above.

- (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 .

Answer(b) $k =$ [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]

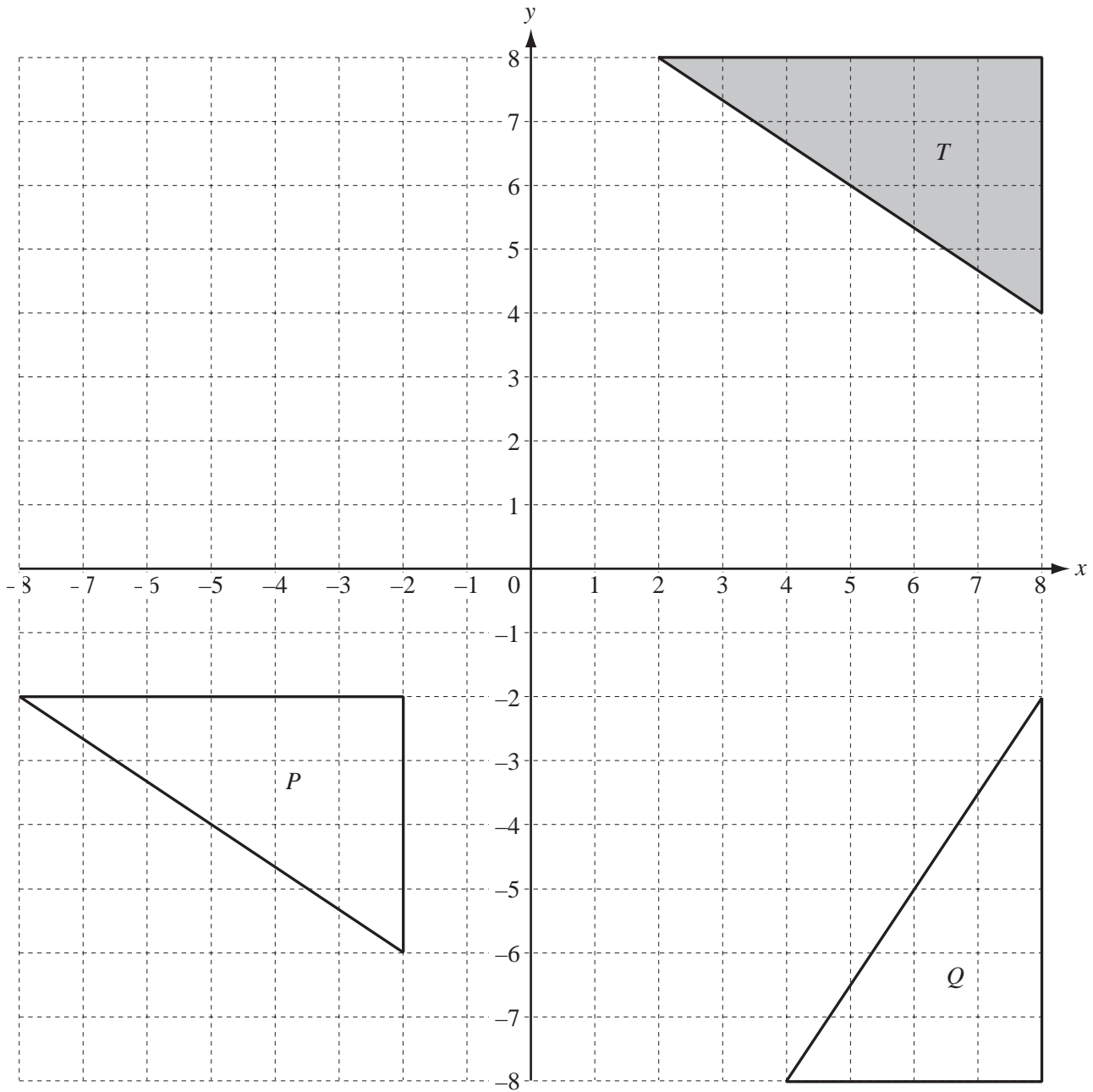
- (ii) Describe fully this single transformation.

Answer(c)(ii) [3]

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

Answer(c)(iii) $\left(\begin{array}{c} \\ \end{array} \right)$ [2]

3



- (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 $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} 8 & 8 & 2 \\ 4 & 8 & 8 \end{pmatrix}$.

Answer(b)(i) [2]

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

(iii) Describe fully this **single** transformation.

Answer(b)(iii) [2]

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

(i) triangle T onto triangle P ,

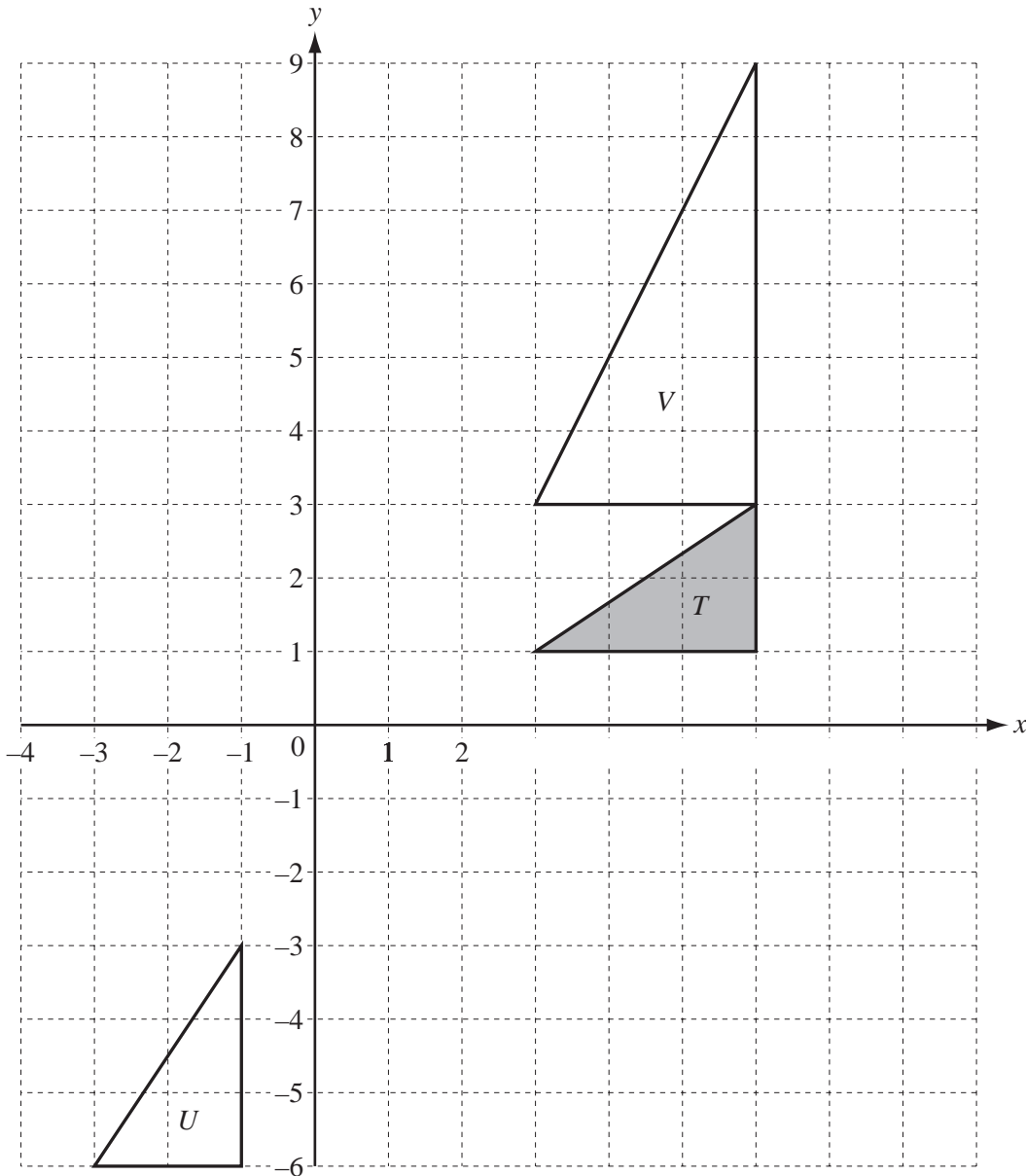
Answer(c)(i) [2]

(ii) triangle T onto triangle Q .

Answer(c)(ii) [3]

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

Answer(d) $\begin{pmatrix} & \\ & \end{pmatrix}$ [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 ,

Answer(b)(i) [2]

(ii) triangle T onto triangle V .

Answer(b)(ii) [3]

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

(i) triangle T onto triangle U ,

Answer(c)(i) $\left(\begin{array}{cc} & \\ & \end{array} \right)$ [2]

(ii) triangle T onto triangle V ,

Answer(c)(ii) $\left(\begin{array}{cc} & \\ & \end{array} \right)$ [2]

(iii) triangle V onto triangle T .

Answer(c)(iii) $\left(\begin{array}{cc} & \\ & \end{array} \right)$ [1]