

Matrices

Question Paper 6

Level	IGCSE
Subject	Maths (0580)
Exam Board	Cambridge International Examinations (CIE)
Paper Type	Extended
Topic	Matrices and Transformations
Sub-Topic	Matrices
Booklet	Question Paper 6

Time Allowed: 53 minutes

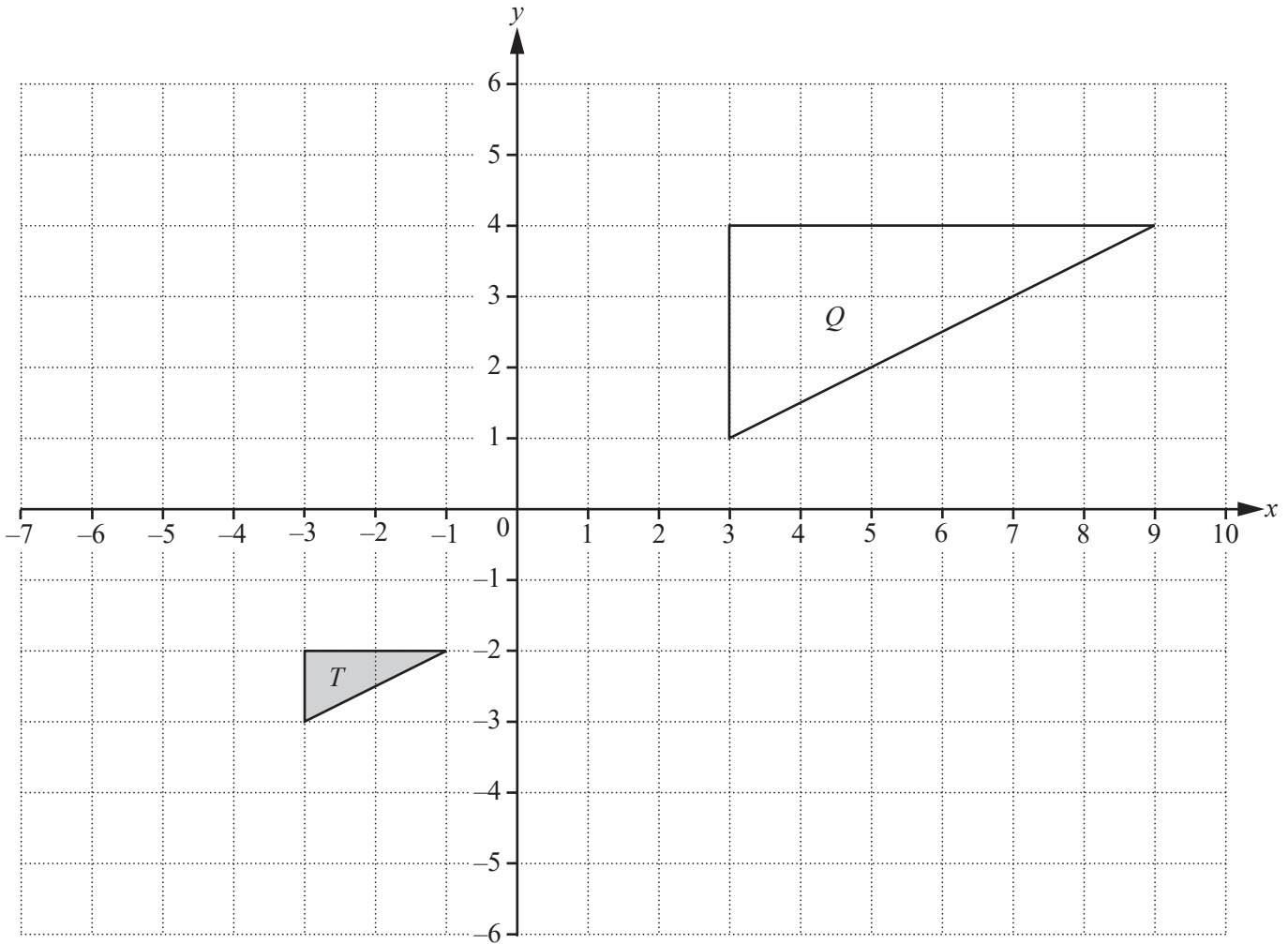
Score: /44

Percentage: /100

Grade Boundaries:

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

1 (a)



(i) Draw the image of triangle T after a translation by the vector $\begin{pmatrix} 5 \\ -2 \end{pmatrix}$. [2]

(ii) Draw the image of triangle T after a reflection in the line $y = 1$. [2]

(iii) Describe fully the **single** transformation that maps triangle T onto triangle Q .

.....

..... [3]

(b) $\mathbf{M} = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ $\mathbf{N} = \begin{pmatrix} 4 & 3 \\ 1 & k \end{pmatrix}$ $\mathbf{P} = \begin{pmatrix} 1 & 3 \\ 0 & 6 \end{pmatrix}$

(i) Work out $\mathbf{M} + \mathbf{P}$.

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

(ii) Work out \mathbf{PM} .

$$\begin{pmatrix} & \\ & \end{pmatrix} \quad [2]$$

(iii) $|\mathbf{M}| = |\mathbf{N}|$

Find the value of k .

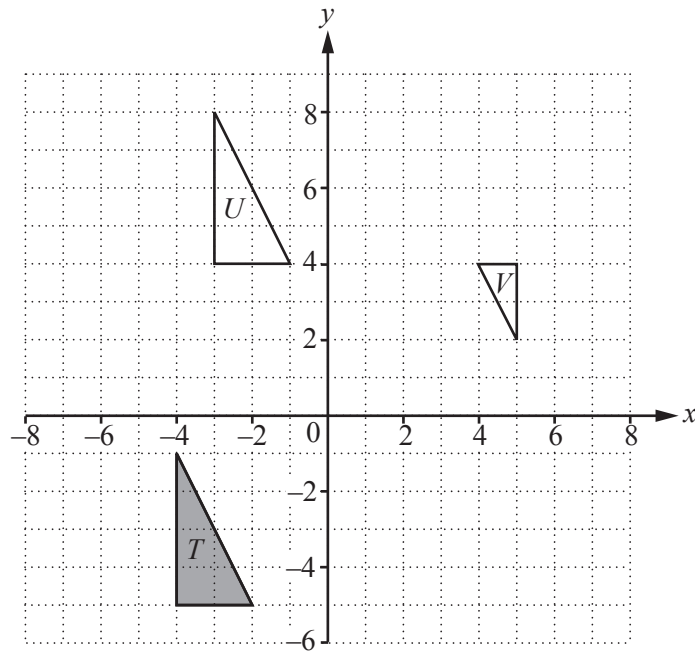
$$k = \dots\dots\dots [3]$$

(c) (i) Describe fully the **single** transformation represented by the matrix $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$.

.....
 [3]

(ii) Find the matrix which represents a reflection in the line $y = x$.

$$\begin{pmatrix} & \\ & \end{pmatrix} \quad [2]$$



(a) (i) Draw the image of triangle T after a reflection in the line $x = 0$. [2]

(ii) Draw the image of triangle T after a rotation through 90° clockwise about $(-2, -1)$. [2]

(iii) Describe fully the **single** transformation that maps triangle T onto triangle U .

.....
 [2]

(iv) Describe fully the **single** transformation that maps triangle T onto triangle V .

.....
 [3]

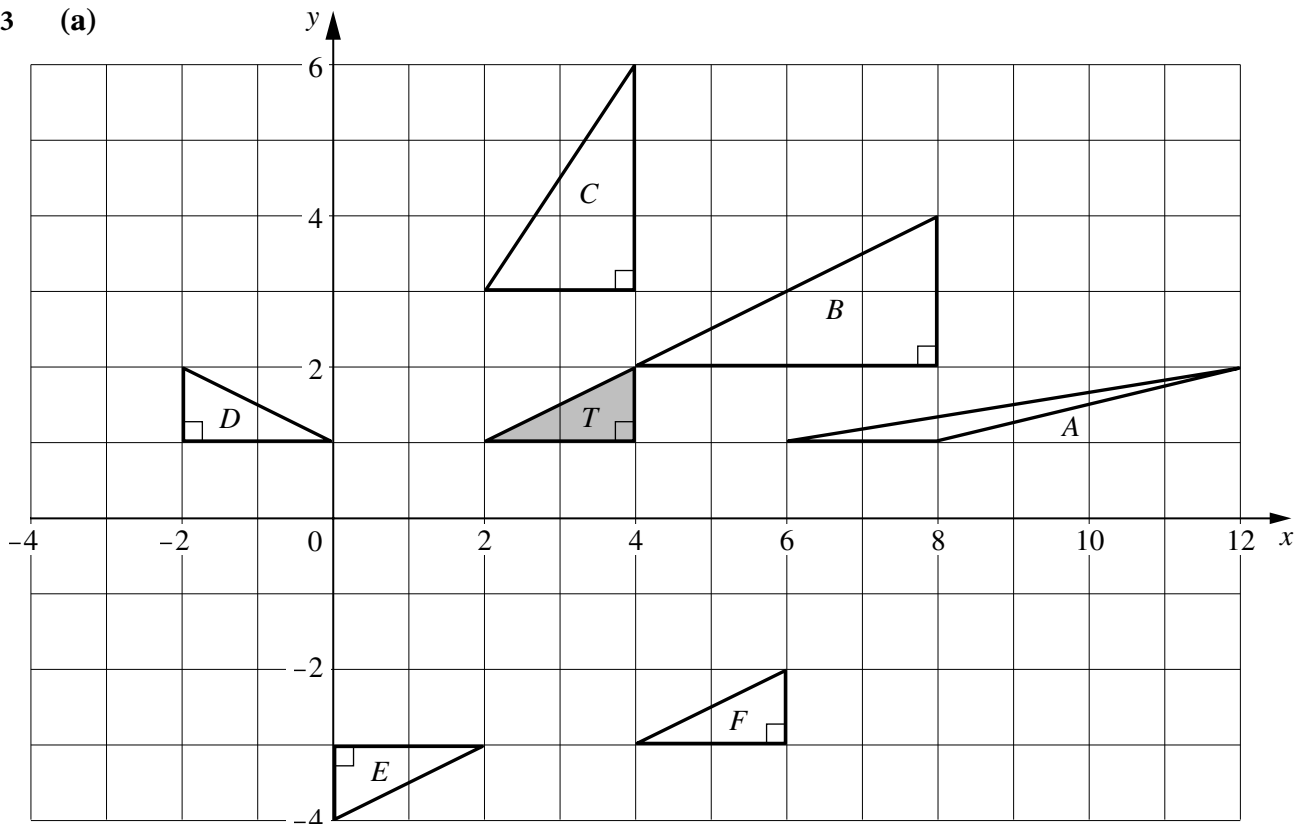
(b) (i) Find the matrix that represents the transformation in **part (a)(i)**.

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

(ii) Describe fully the **single** transformation represented by the inverse of the matrix in **part (b)(i)**.

.....
 [2]

3 (a)



Use one of the letters *A, B, C, D, E* or *F* to answer the following questions.

- (i) Which triangle is *T* mapped onto by a **translation**? Write down the translation vector. [2]
- (ii) Which triangle is *T* mapped onto by a **reflection**? Write down the equation of the mirror line. [2]
- (iii) Which triangle is *T* mapped onto by a **rotation**? Write down the coordinates of the centre of rotation. [2]
- (iv) Which triangle is *T* mapped onto by a **stretch** with the *x*-axis invariant? Write down the scale factor of the stretch. [2]
- (v) $\mathbf{M} = \begin{pmatrix} 1 & 4 \\ 0 & 1 \end{pmatrix}$. Which triangle is *T* mapped onto by **M**?

Write down the name of this transformation. [2]

(b) $\mathbf{P} = \begin{pmatrix} 1 & 3 \\ 5 & 7 \end{pmatrix}$, $\mathbf{Q} = \begin{pmatrix} -1 & -2 \end{pmatrix}$, $\mathbf{R} = \begin{pmatrix} 1 & 2 & 3 \end{pmatrix}$, $\mathbf{S} = \begin{pmatrix} -1 \\ 2 \\ 3 \end{pmatrix}$.

Only some of the following matrix operations are possible with matrices **P, Q, R** and **S** above.

PQ, QP, P + Q, PR, RS

Write down and calculate each matrix operation that is possible. [6]