Matrices Transformations

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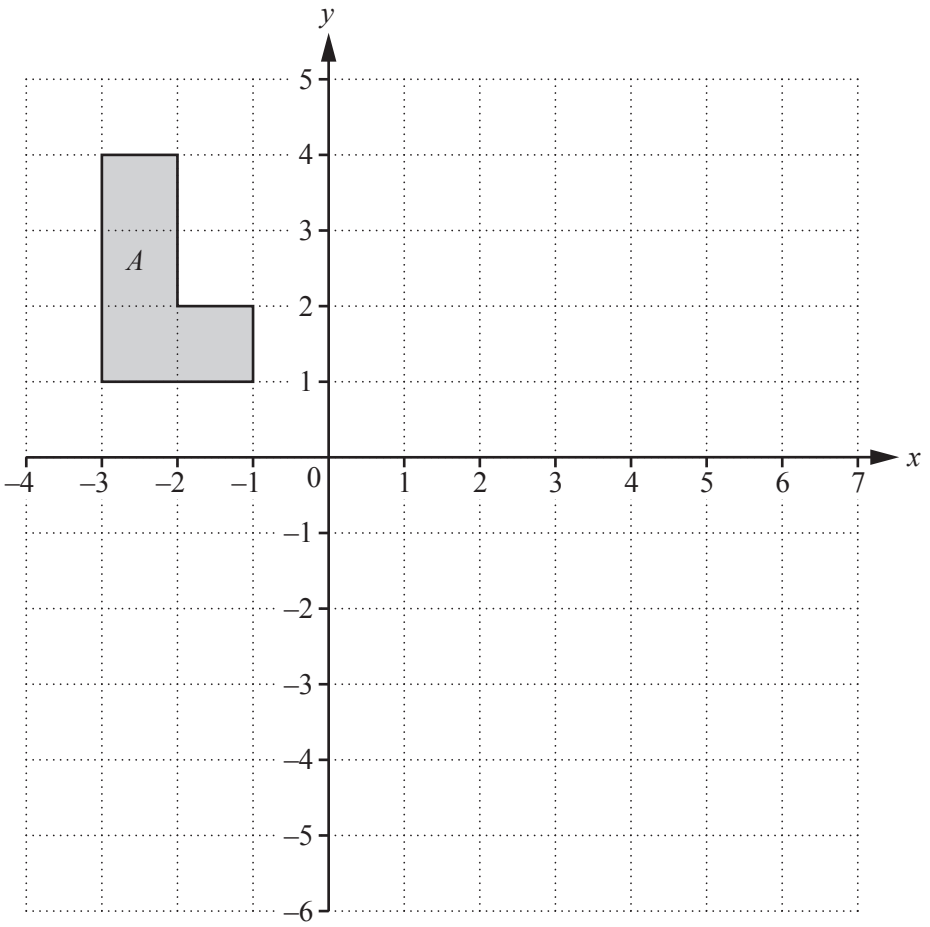
3 (a)



On the grid, draw the image of

(i) shape A after a reflection in the line $x = 1$, [2]

(ii) shape A after an enlargement with scale factor -2, centre $(0, 1)$, [2]

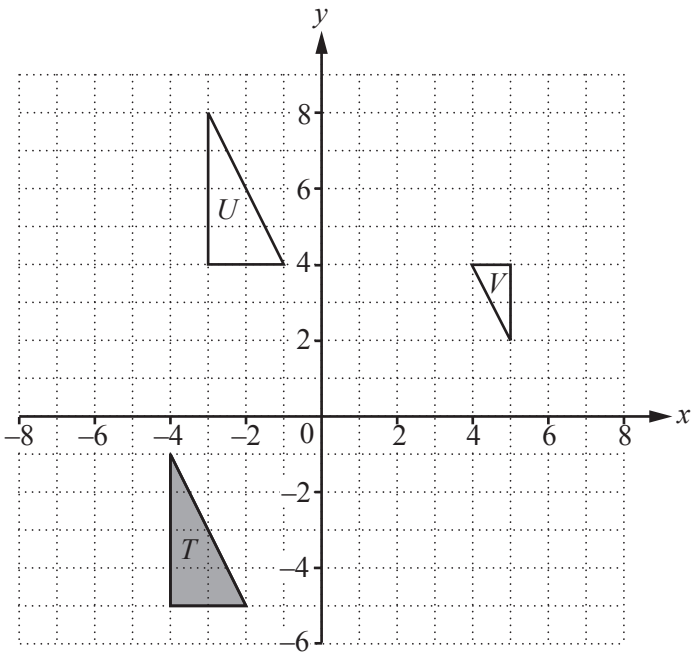
(iii) shape A after the transformation represented by the matrix $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$. [3]

(b) Describe fully the **single** transformation represented by the matrix $\begin{pmatrix} 3 & 0 \\ 0 & 3 \end{pmatrix}$.

.....

..... [3]

6



(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)**.

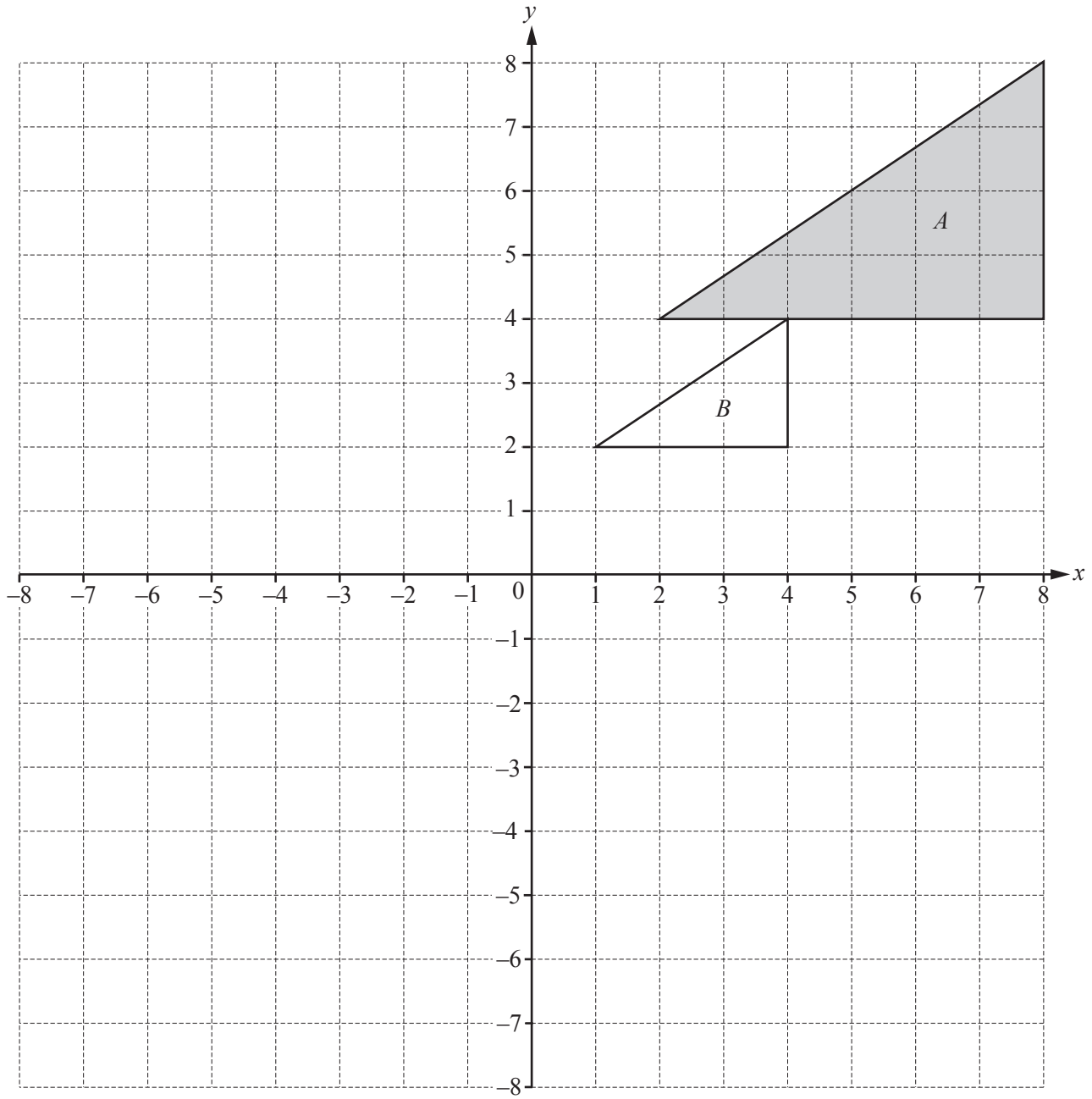
$\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

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

.....

..... [2]

5



(a) $\mathbf{v} = \begin{pmatrix} -4 \\ -8 \end{pmatrix}$

(i) Draw the image of triangle *A* after the translation by vector **v**. [2]

(ii) Calculate $|\mathbf{v}|$.

..... [2]

(b) (i) Describe fully the **single** transformation that maps triangle *A* onto triangle *B*.

.....

..... [3]

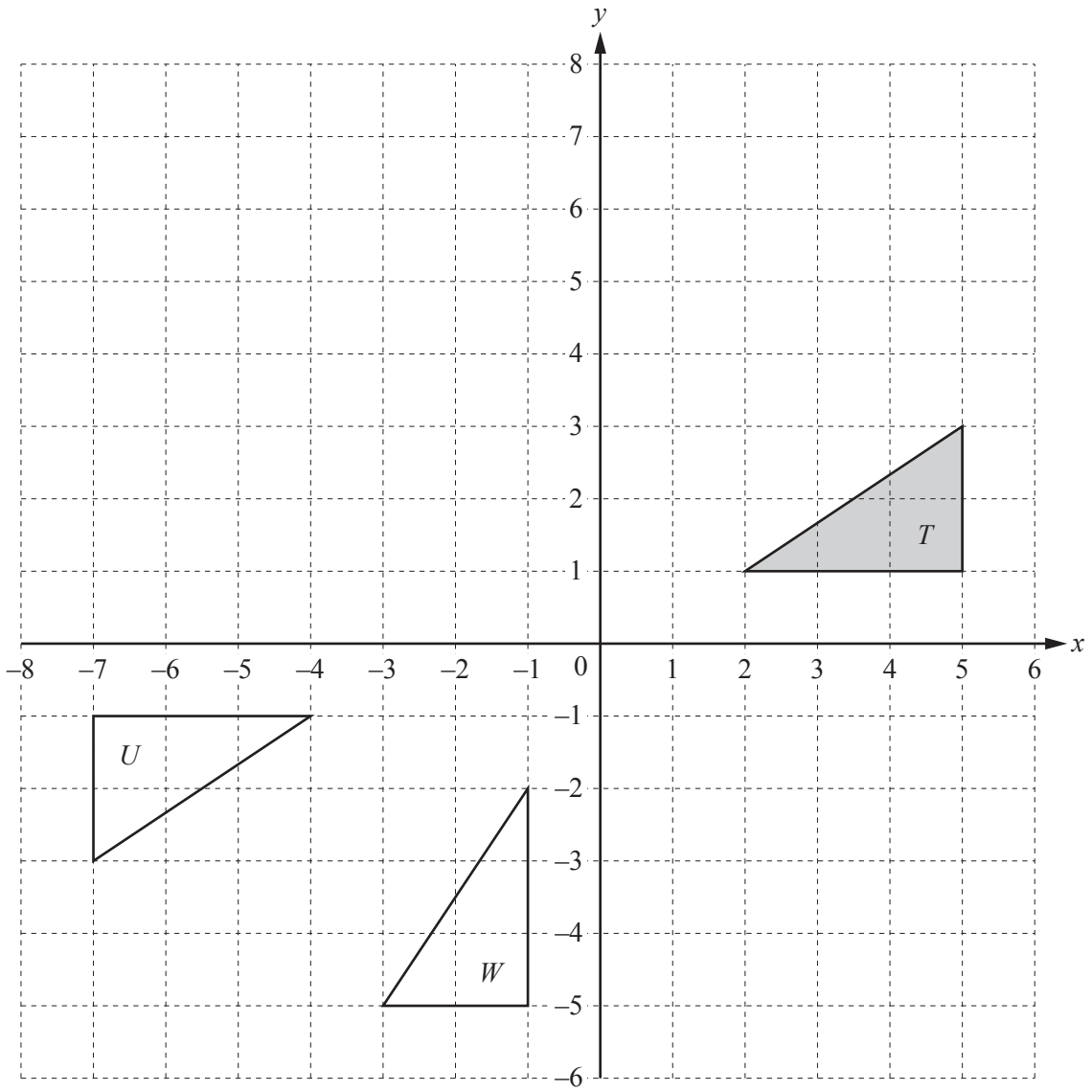
(ii) Find the matrix that represents the transformation that maps triangle *A* onto triangle *B*.

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

(iii) Calculate the determinant of the matrix in **part (b)(ii)**.

..... [1]

2



(a) On the grid, draw the image of

(i) triangle T after a translation by the vector $\begin{pmatrix} -4 \\ 4 \end{pmatrix}$, [2]

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

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

Answer(b) .....

..... [3]

(c) **(i)** Describe fully the **single** transformation that maps triangle *T* onto triangle *W*.

Answer(c)(i) .....

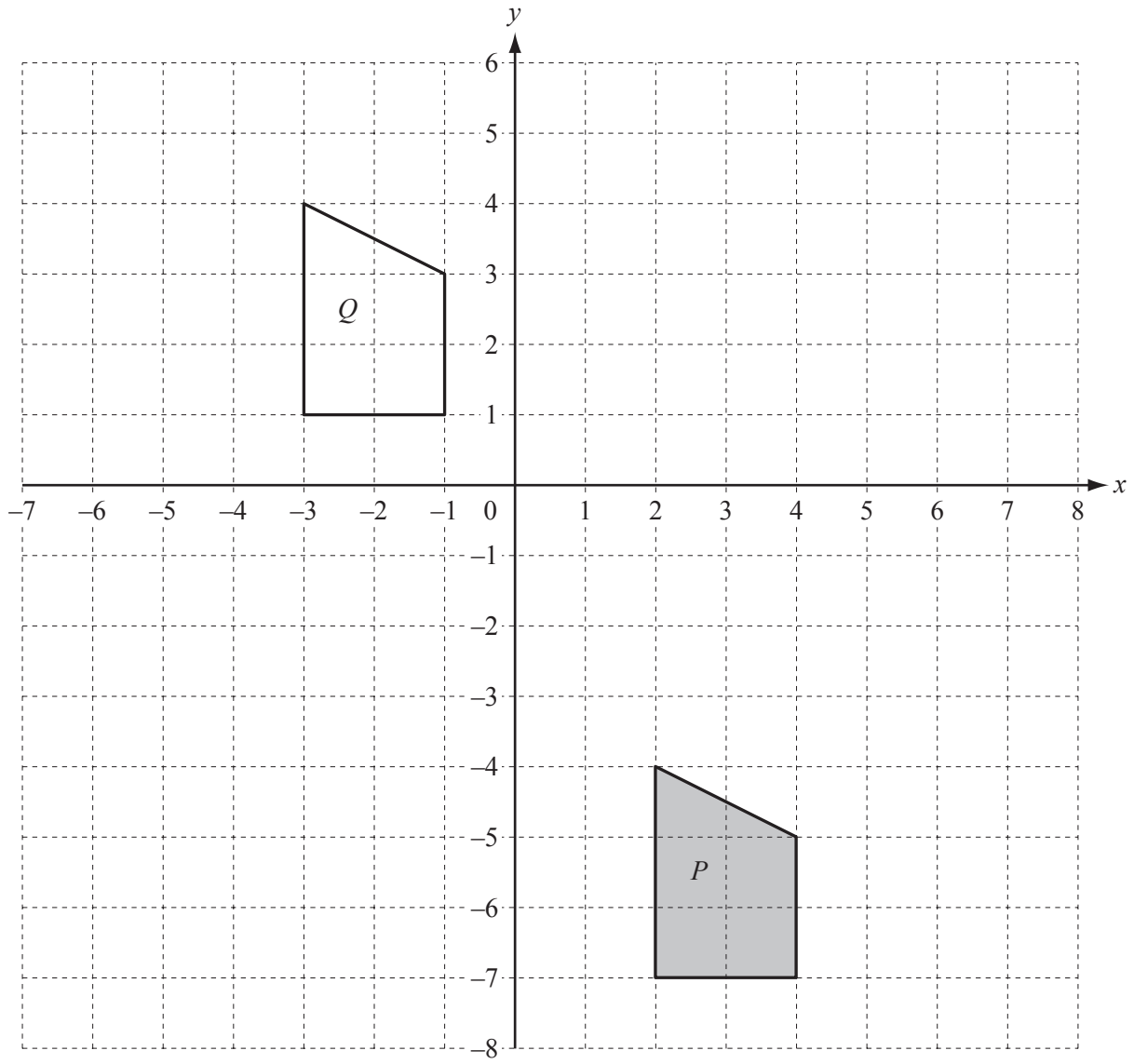
..... [2]

(ii) Find the 2 × 2 matrix that represents the transformation in **part (c)(i)**.

Answer(c)(ii) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

For Examiner's Use

2 (a)



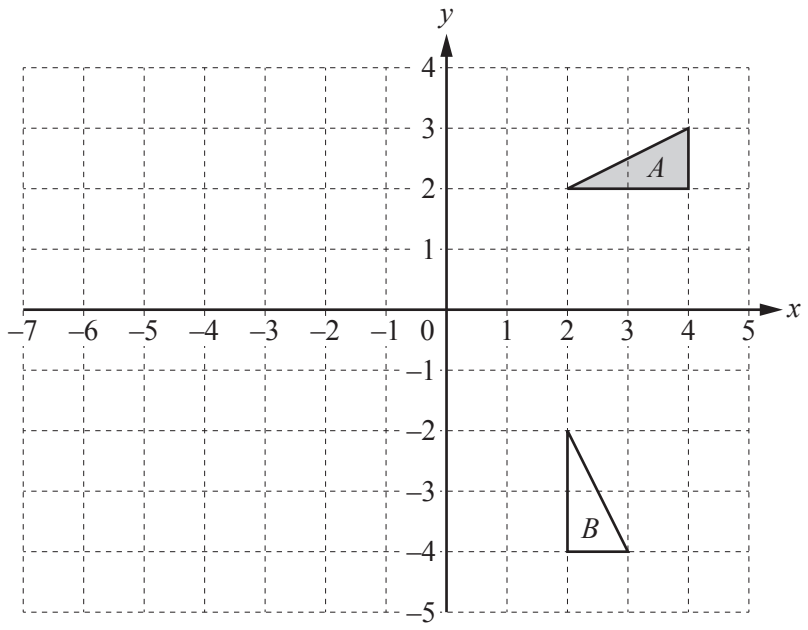
(i) Describe fully the **single** transformation which maps shape *P* onto shape *Q*.

Answer(a)(i) ..... [2]

(ii) On the grid above, draw the image of shape *P* after reflection in the line $y = -1$. [2]

(iii) On the grid above, draw the image of shape *P* under the transformation represented by the matrix $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$. [3]

(c)



(i) On the grid, draw the image of triangle A after the transformation represented by the matrix $\begin{pmatrix} -1.5 & 0 \\ 0 & -1.5 \end{pmatrix}$. [3]

(ii) Find the 2 × 2 matrix which represents the transformation that maps triangle A onto triangle B.

Answer(c)(ii) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

Question 11 is printed on the next page.

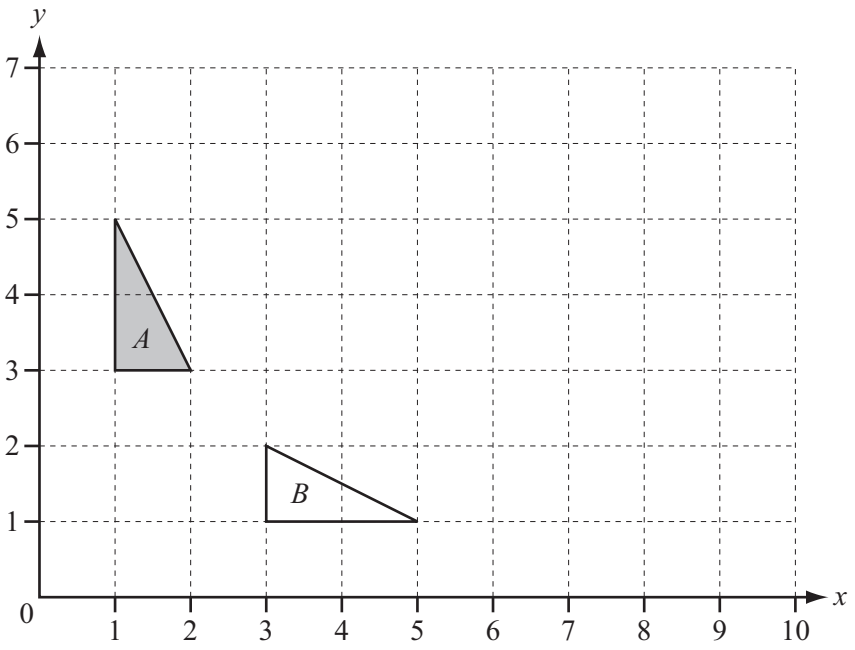
19 (a) $\mathbf{N} = \begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$

Describe fully the **single** transformation represented by **N**.

Answer(a) .....

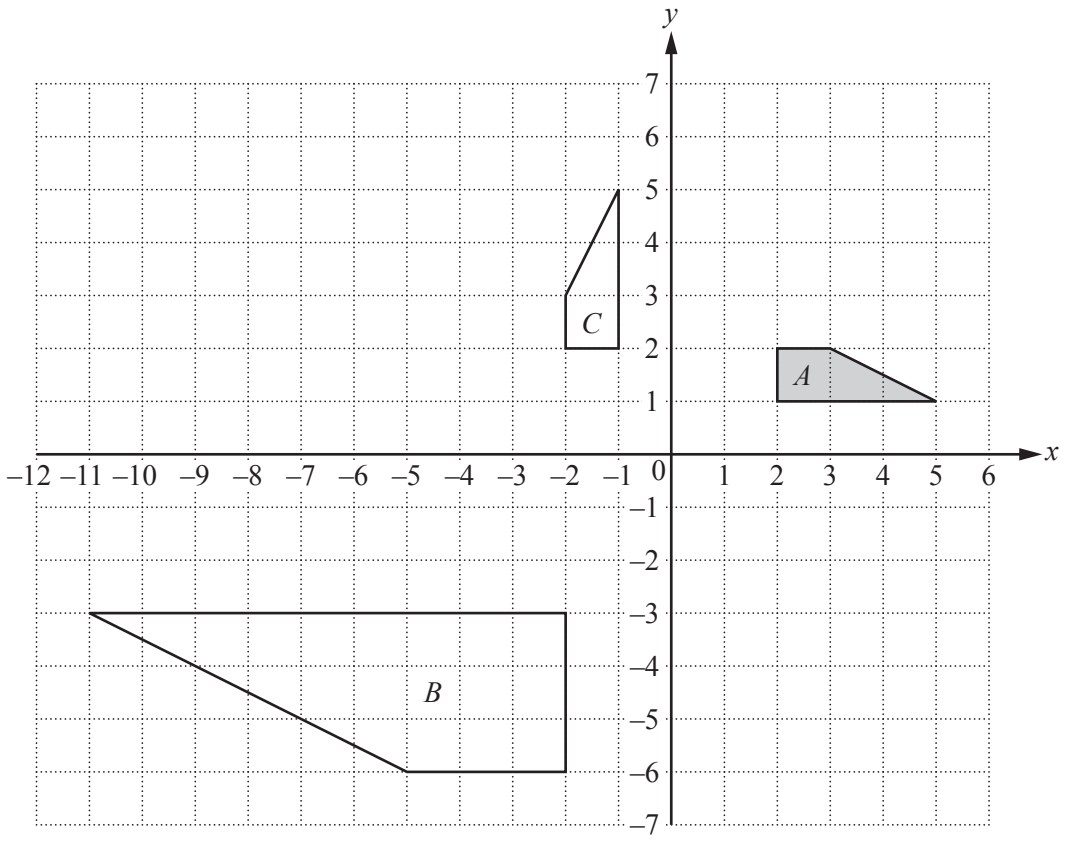
..... [3]

(b) Find the matrix which represents the **single** transformation that maps triangle *A* onto triangle *B*.



Answer(b) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

3



(a) Draw the image of

(i) shape A after a translation by $\begin{pmatrix} -1 \\ 3 \end{pmatrix}$, [2]

(ii) shape A after a rotation through 180° about the point (0, 0), [2]

(iii) shape A after the transformation represented by the matrix $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$. [3]

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

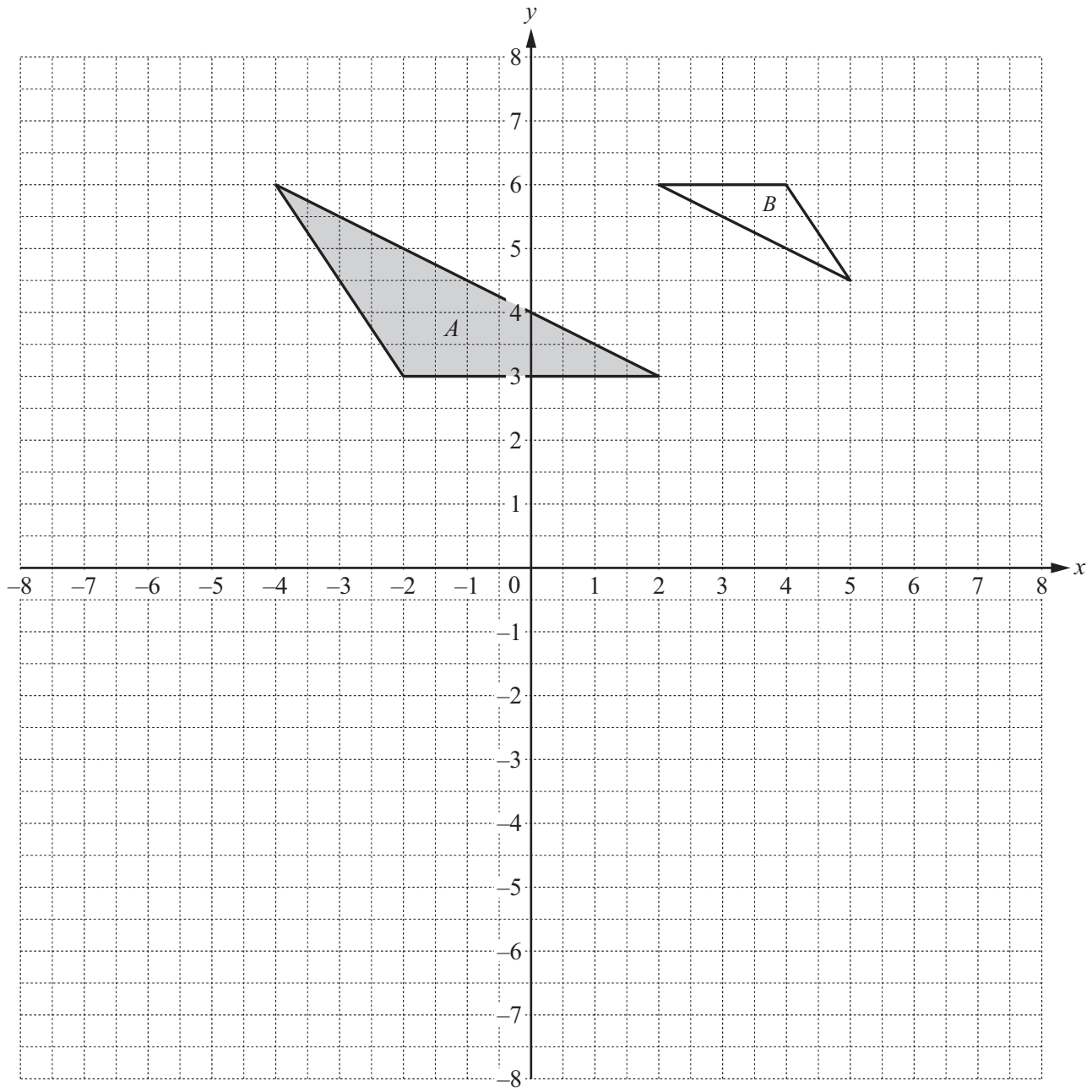
Answer(b) .....

..... [3]

(c) Find the matrix which represents the transformation that maps shape A onto shape C.

Answer(c) $\begin{pmatrix} \quad & \quad \\ \quad & \quad \end{pmatrix}$ [2]

4



(a) Describe fully the **single** transformation that maps triangle *A* onto triangle *B*.

Answer(a) .....

..... [3]

(b) On the grid, draw the image of

(i) triangle A after a reflection in the line $x = -3$, [2]

(ii) triangle A after a rotation about the origin through 270° anticlockwise, [2]

(iii) triangle A after a translation by the vector $\begin{pmatrix} -1 \\ -5 \end{pmatrix}$. [2]

(c) **M** is the matrix that represents the transformation in **part (b)(ii)**.

(i) Find **M**.

Answer(c)(i) **M** = $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

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

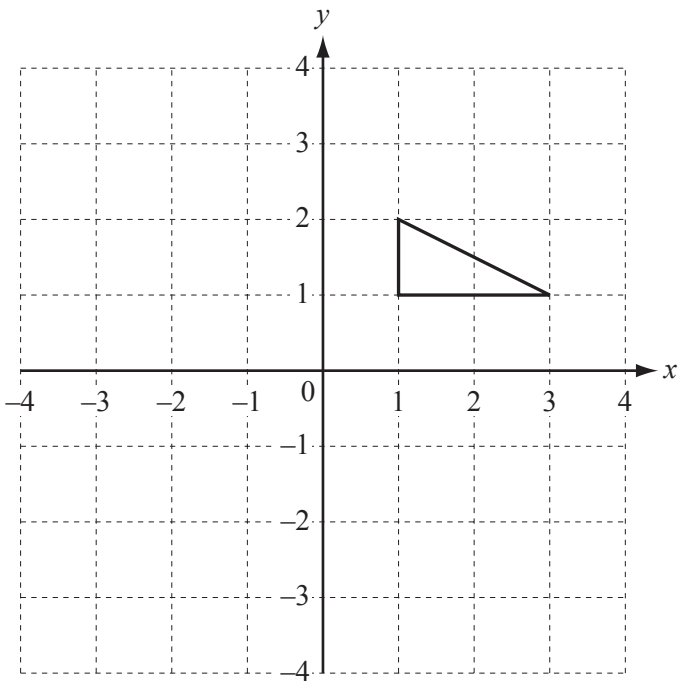
Answer(c)(ii) .....

..... [2]

17 (p, q) is the image of the point (x, y) under this combined transformation.

$$\begin{pmatrix} p \\ q \end{pmatrix} = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} + \begin{pmatrix} 3 \\ 2 \end{pmatrix}$$

(a) Draw the image of the triangle under the combined transformation.



[3]

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

Answer (b) ..... [2]