

Matrix Transformations

For AQA Level 2 Certificate in Further Mathematics (8365)

Name _____

Total marks: **26**

Answer **all** questions in the spaces provided. Show your working: marks are given for correct method. You may use a calculator.

- 1** Which matrix represents a rotation of 180° about the origin?
Circle your answer.

[1 mark]

$$\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$$

$$\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$$

$$\begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$$

- 2** Write down the matrix that represents

(a) a reflection in the y -axis

[1 mark]

Answer $\begin{pmatrix} & \\ & \end{pmatrix}$

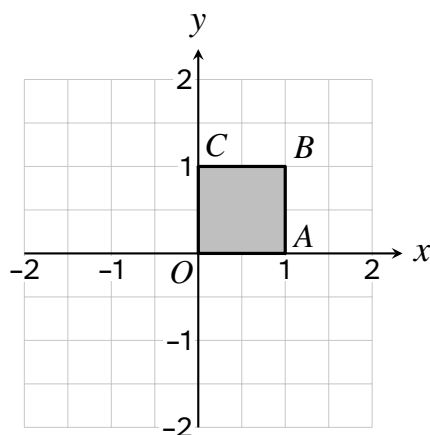
(b) an enlargement, scale factor 4, centre the origin

[1 mark]

Answer $\begin{pmatrix} & \\ & \end{pmatrix}$

- 3 $OABC$ is the unit square, with $A(1,0)$, $B(1,1)$ and $C(0,1)$

$$\mathbf{T} = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$$

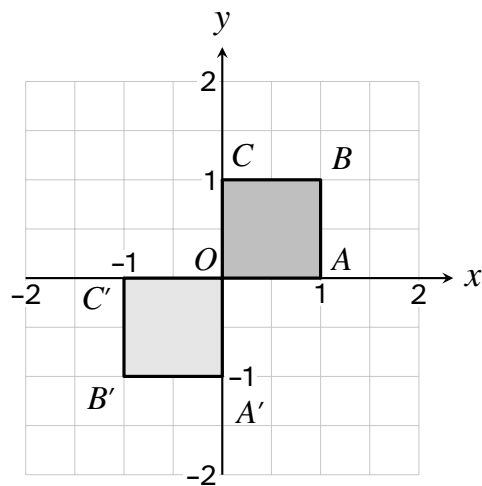


- (a) On the grid, draw the image of $OABC$ under the transformation represented by $\mathbf{T}$.
[2 marks]

- (b) Describe fully the single transformation represented by $\mathbf{T}$.

[1 mark]

- 4 The grid shows the unit square $OABC$ and its image $OA'B'C'$ under the transformation represented by matrix $\mathbf{M}$.



- (a) Write down matrix $\mathbf{M}$

[1 mark]

$$\mathbf{M} = \begin{pmatrix} & \\ & \end{pmatrix}$$

- (b) Describe fully the single transformation represented by $\mathbf{M}$.

[1 mark]

- 5** Triangle DEF has vertices $D(1, 2)$, $E(3, 2)$ and $F(3, -1)$
 DEF is transformed by the matrix $\mathbf{N} = \begin{pmatrix} 0 & 3 \\ 3 & 0 \end{pmatrix}$ to triangle $D'E'F'$.

(a) Work out the coordinates of D' , E' and F' .

[2 marks]

Answer _____

(b) Work out the area of triangle $D'E'F'$.

[2 marks]

Answer _____ square units

- 6** Matrix $\mathbf{D}$ represents a reflection in the x -axis.
 Matrix $\mathbf{E}$ represents a reflection in the line $y = x$

(a) Work out $\mathbf{DE}$

[2 marks]

Answer $\begin{pmatrix} & \\ & \end{pmatrix}$

(b) Describe fully the single transformation represented by $\mathbf{DE}$.

[1 mark]

- 7 A reflection in the y -axis is followed by a rotation of 90° anticlockwise about the origin. Use matrix multiplication to show that the combined transformation is a reflection in the line $y = -x$

[3 marks]

- 8 Matrix **A** represents a reflection in the line $y = -x$
B is a 2×2 matrix.
The matrix **BA** represents a rotation of 180° about the origin.

- (a) Work out matrix **B**

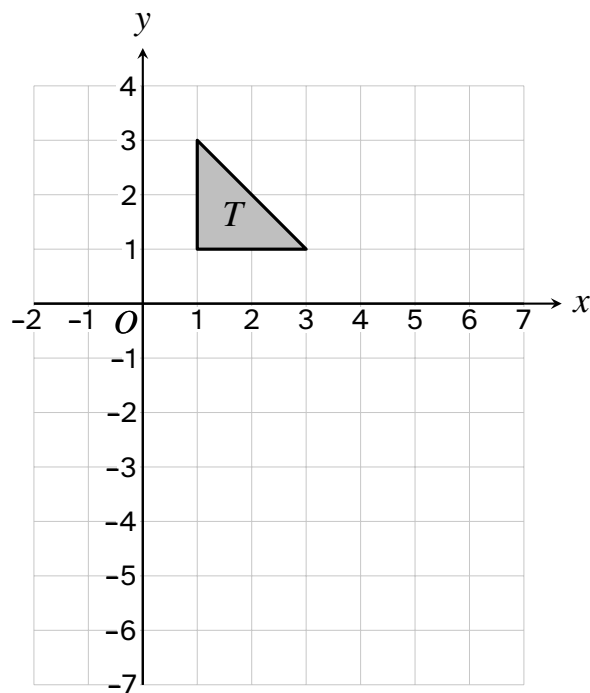
[3 marks]

$$\mathbf{B} = \begin{pmatrix} & \\ & \end{pmatrix}$$

- (b) Describe fully the single transformation represented by **B**.

[1 mark]

- 9 Triangle T is drawn on the grid.
 T is enlarged by scale factor 2, centre the origin.
The image is then rotated 90° clockwise about the origin.



- (a) Use matrix multiplication to find the single matrix that represents the combined transformation.

[2 marks]

Answer $\begin{pmatrix} & \\ & \end{pmatrix}$

- (b) On the grid, draw the image of triangle T under the combined transformation.

[2 marks]