Transformation

1. The grid opposite shows triangle A.

Triangle A is transformed to triangle B by a reflection in the line with equation $x = 1$

(a) On the grid, draw and label triangle B.

Triangle B is transformed to triangle C under the translation $\begin{pmatrix} 7 \\ -3 \end{pmatrix}$

(b) On the grid, draw and label triangle C.

Triangle C is transformed to triangle D under the transformation with matrix $\mathbf{M}$ where

$$\mathbf{M} = \begin{pmatrix} 2 & 0 \\ 0 & -2 \end{pmatrix}$$

(c) On the grid, draw and label triangle D.

(d) Describe fully the **single** transformation that maps triangle A onto triangle D.

c) $C_1 = (-2, 1)$

$C_2 = (2, 1)$

$C_3 = (-1, 3)$

$C_2 = (4, -2)$

$C_3 = (-2, -6)$

$$\begin{pmatrix} x' \\ y' \end{pmatrix} = \begin{pmatrix} 2 & 0 \\ 0 & -2 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$$

$x' = 2x$

$y' = -2y$

C_1 $x' = -2 \times 2 = -4$

$y' = 1 \times -2 = -2$

$(-4, -2)$

d) Enlargent

SF = 2

centre = (6, 2)

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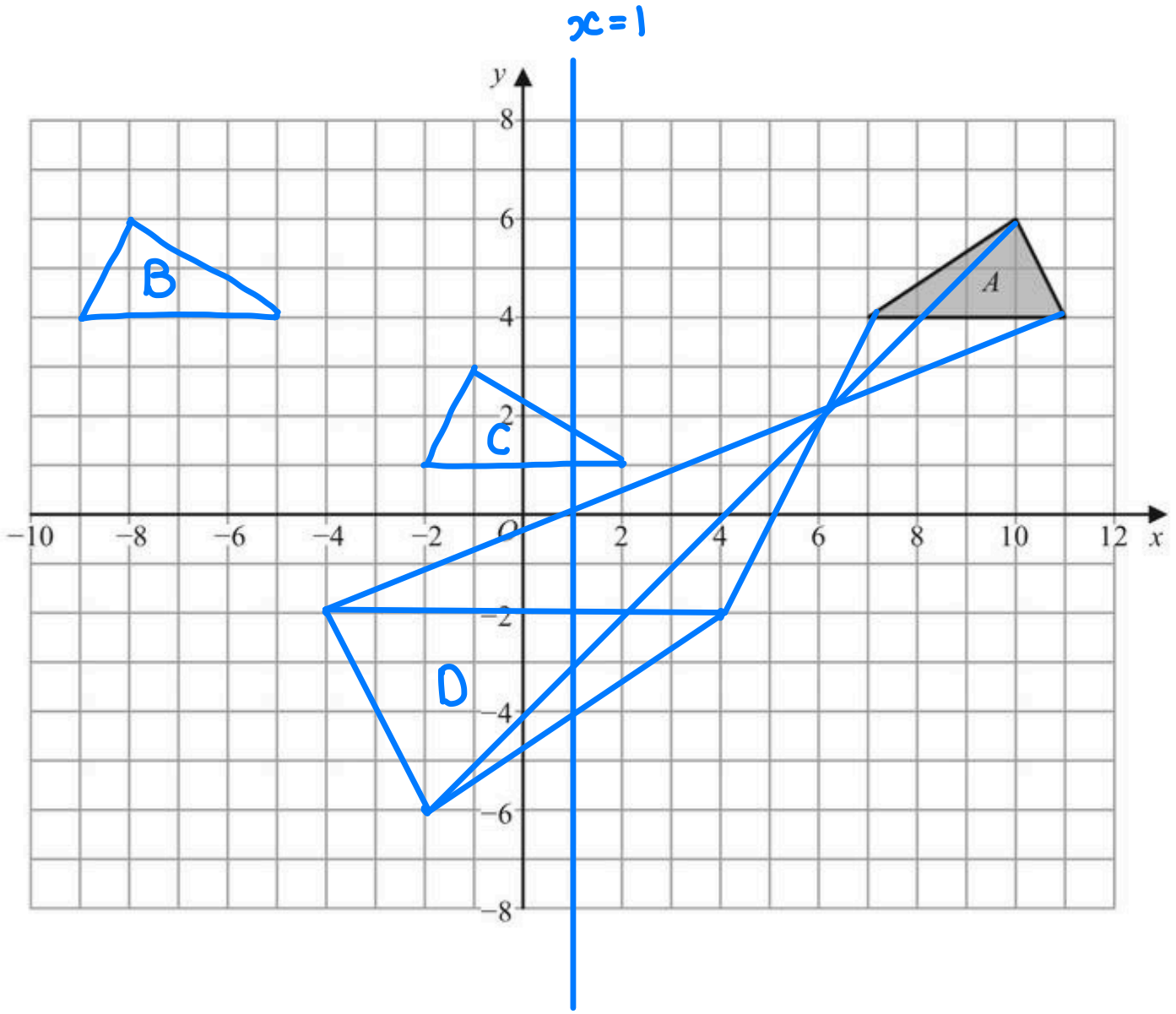

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2. On the grid opposite, trapezium B is the image of trapezium A under a single transformation.

(a) Describe fully the single transformation.

Trapezium C is the image of trapezium A under a reflection in the line with equation $x = -1$

(b) On the grid opposite, draw and label trapezium C.

Trapezium A is transformed to trapezium D under the transformation with matrix $\mathbf{M}$ where

$$\mathbf{M} = \begin{pmatrix} -2 & 0 \\ 0 & -1 \end{pmatrix}$$

(c) On the grid opposite, draw and label trapezium D.

Trapezium D is transformed to trapezium B under the transformation with matrix $\mathbf{N}$.

(d) Find matrix $\mathbf{N}$.

a) Enlargement, SF: 2 . centre (0,0)

c) A = (2,1) (2,3) (1,2) (1,3)

D = (-4,-1) (-4,-3) (-2,-2) (-2,-3)

d) B = (4,2) (4,6) (2,4) (2,6)

$N = \begin{pmatrix} -1 & 0 \\ 0 & -2 \end{pmatrix}$

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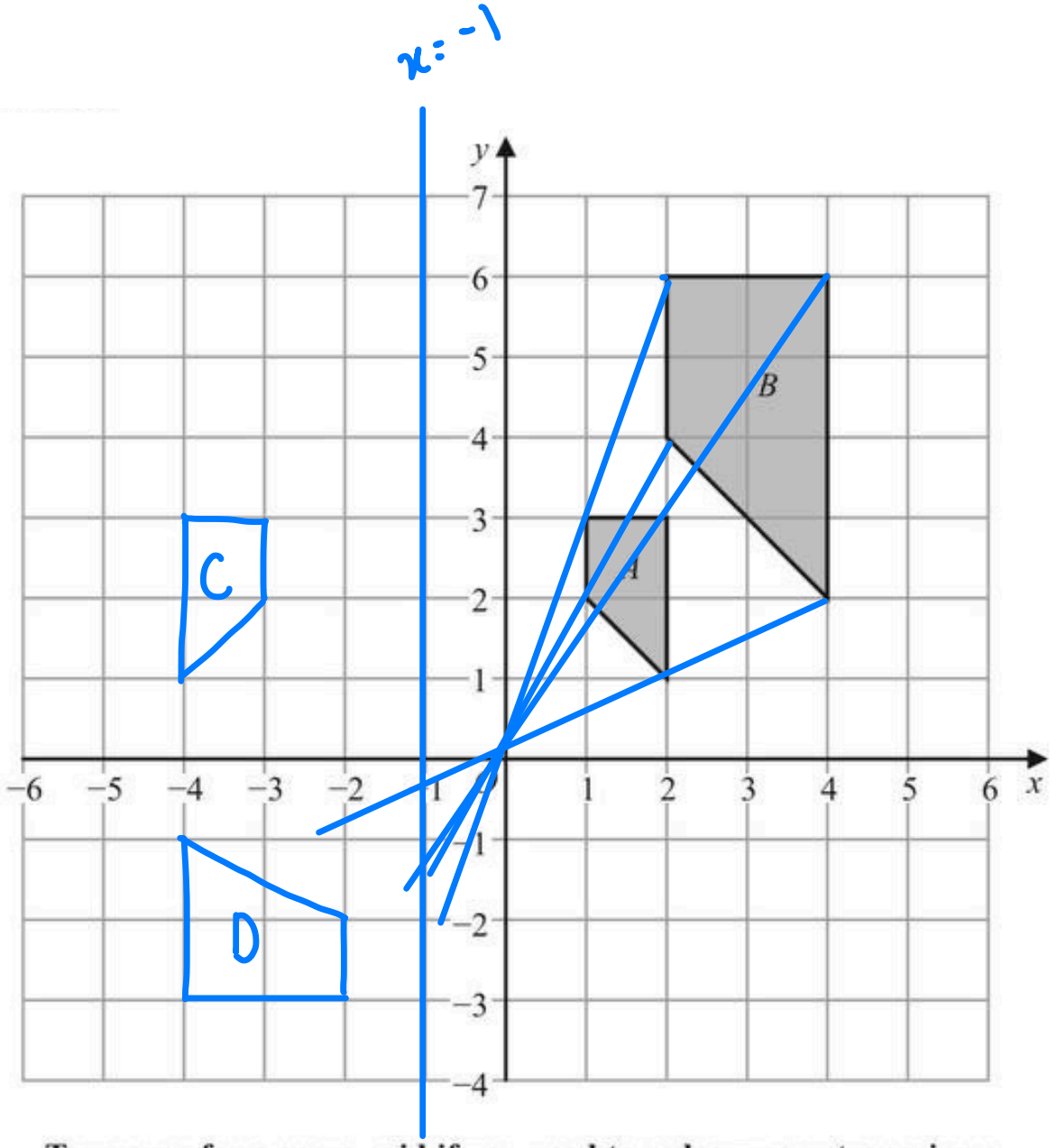

Turn over for a spare grid if you need to redraw your trapeziums.

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3. Triangle A is drawn on the grid opposite.

Triangle A is reflected in the line with equation $x = -1$ to give triangle B.

(a) On the grid, draw and label triangle B.

Triangle A is transformed to triangle C under a rotation of 90° clockwise about the point with coordinates (1, 0)

(b) On the grid, draw and label triangle C.

Triangle B is transformed to triangle D under the translation $\begin{pmatrix} 2 \\ -5 \end{pmatrix}$

(c) On the grid, draw and label triangle D.

Triangle A is transformed to triangle E under the transformation with matrix $\mathbf{M}$ where

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

(d) On the grid, draw and label triangle E.

Triangle E is the image of triangle C under a **single** transformation.

(e) Describe fully this transformation.

A = (1, 3) (2, 1) (3, 4)

E = (1, -3) (2, -1) (3, -4)

e) reflection

$x + y = 1$

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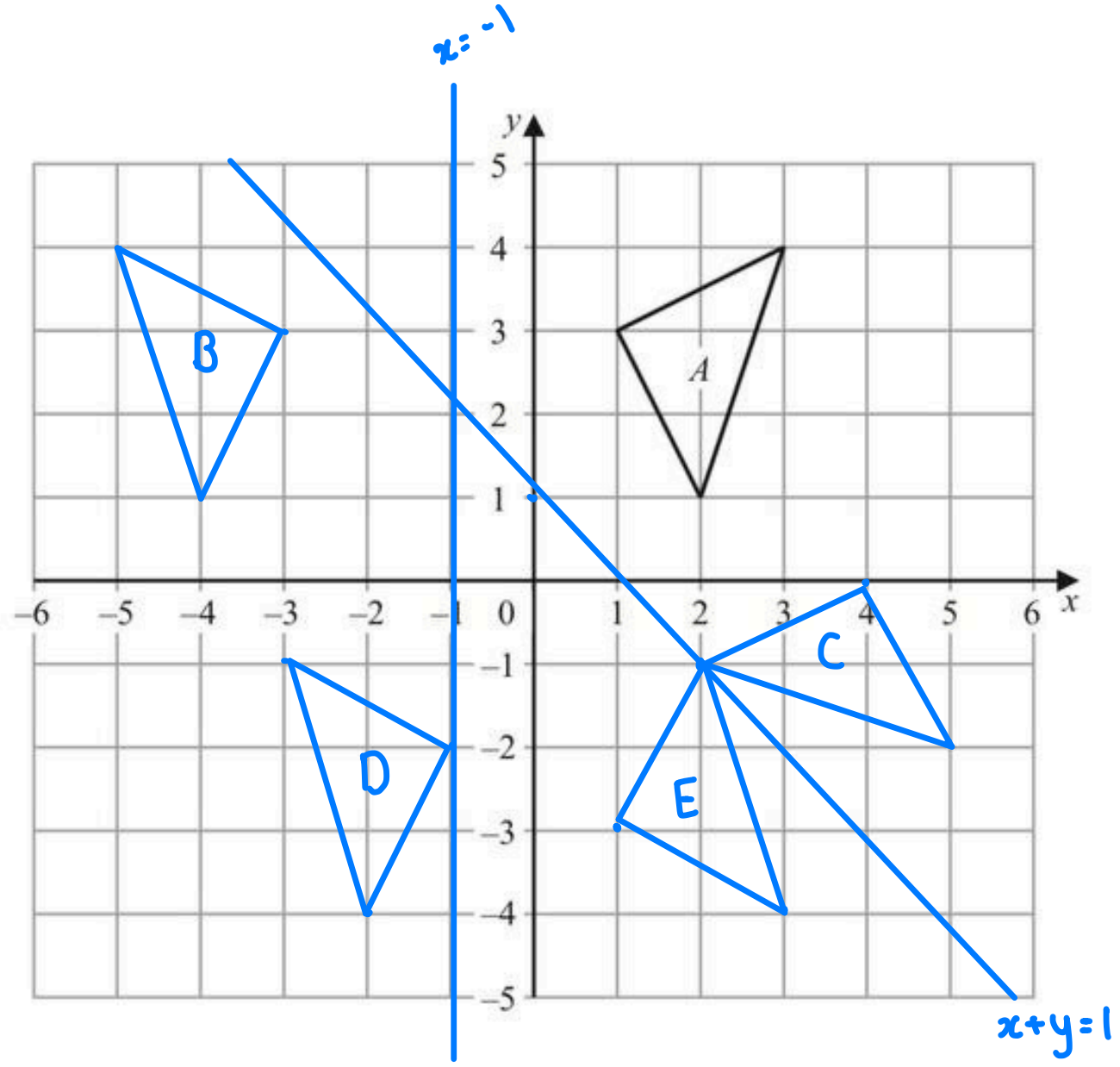

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4. Triangles A and D are drawn on the grid below.

Triangle B is the image of triangle A under a reflection in the line with equation $y = -x$

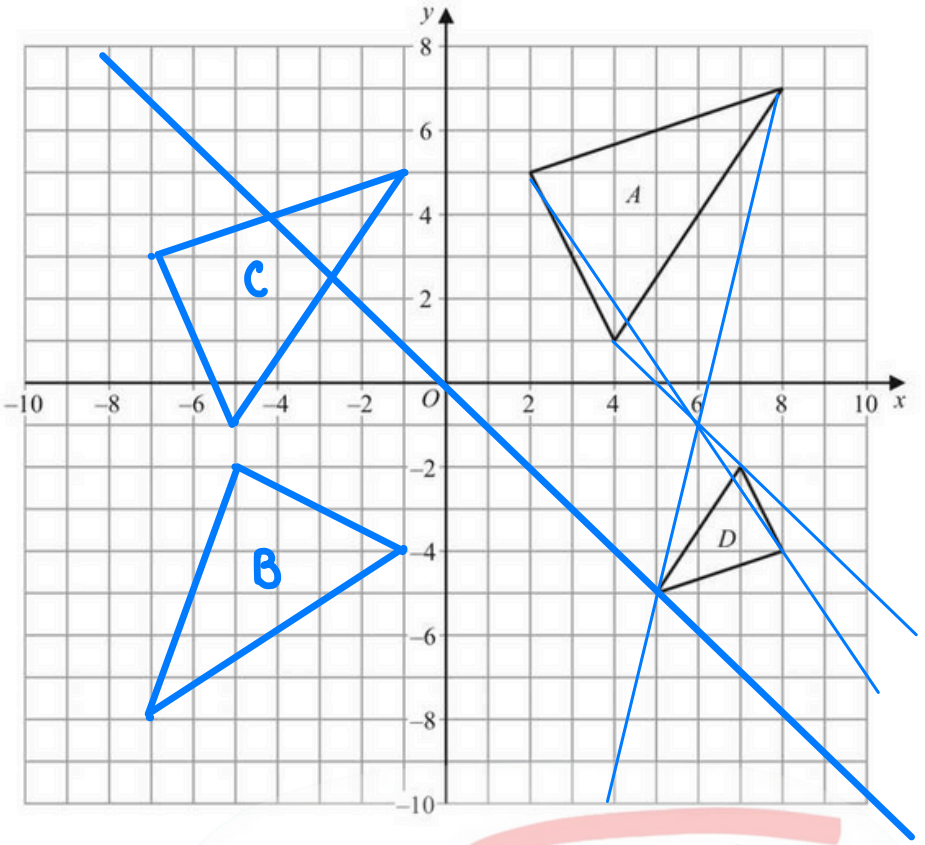
(a) On the grid below, draw and label triangle B.

Triangle A is transformed to triangle C under the translation $\begin{pmatrix} -9 \\ -2 \end{pmatrix}$

(b) On the grid, draw and label triangle C.

(c) Describe fully the **single** transformation that maps triangle A onto triangle D.

enlargement
SF = -0.5
centre = (6, -1)



A spare grid is on the next page if you need to redraw your triangles.

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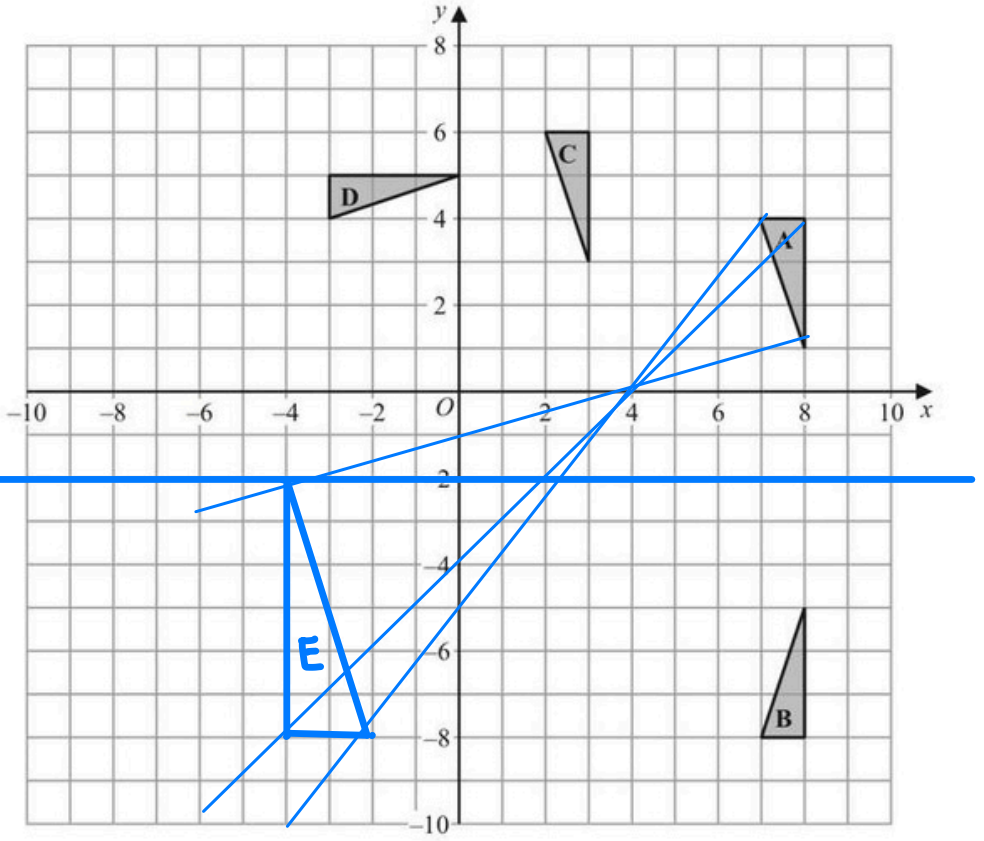
5.



Triangles A, B, C and D are drawn on the grid above.

Describe fully the single transformation that maps

(a) triangle A onto triangle B reflection at $y = -2$

(b) triangle A onto triangle C translation $\begin{pmatrix} -5 \\ 2 \end{pmatrix}$

(c) triangle A onto triangle D

rotation 90° anticlockwise at (2, -1)

Triangle E is the image of triangle A under an enlargement with scale factor -2 and centre of enlargement (4, 0)

(d) On the grid, draw and label triangle E

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6. Trapeziums P and Q are drawn on the grid opposite.

(a) Describe fully the single transformation that maps trapezium P onto trapezium Q

Enlargement
SF= 2
centre (6, -2)

Trapezium P is transformed to trapezium A under the translation $\begin{pmatrix} 2 \\ -3 \end{pmatrix}$

(b) On the grid, draw and label trapezium A

Trapezium P is transformed to trapezium B by a rotation of 90° clockwise about the point (5, 2)

(c) On the grid, draw and label trapezium B

Trapezium C is the image of trapezium Q under the transformation with matrix **M** where

$$\mathbf{M} = \begin{pmatrix} 0 & -\frac{1}{2} \\ \frac{1}{2} & 0 \end{pmatrix}$$

(d) On the grid, draw and label trapezium C

Q = (-4, 4)(4, 4)(0, 6)(-2, 6)

C = (-2, -2)(-2, 2)(-3, 0)(-3, -1)

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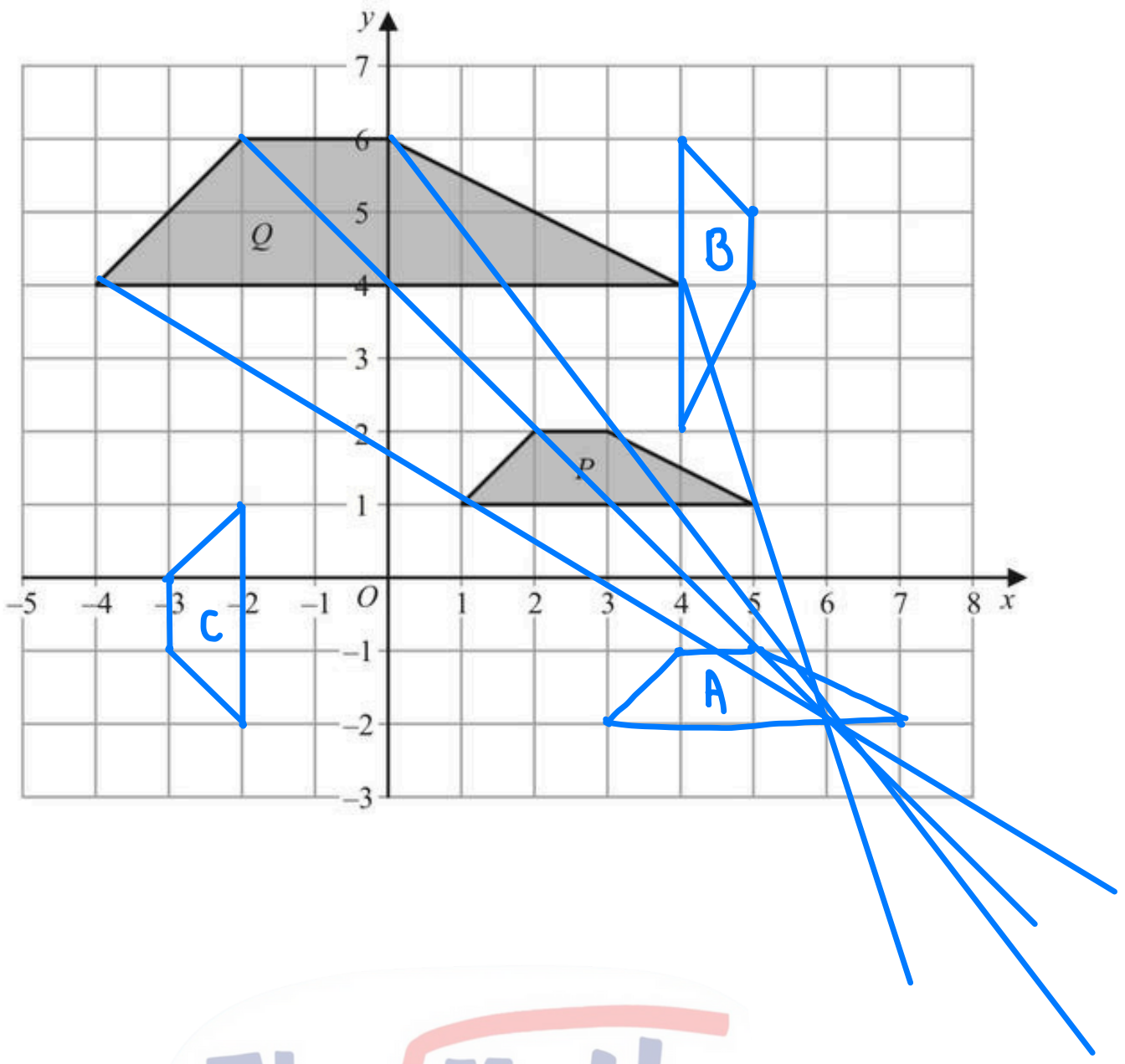

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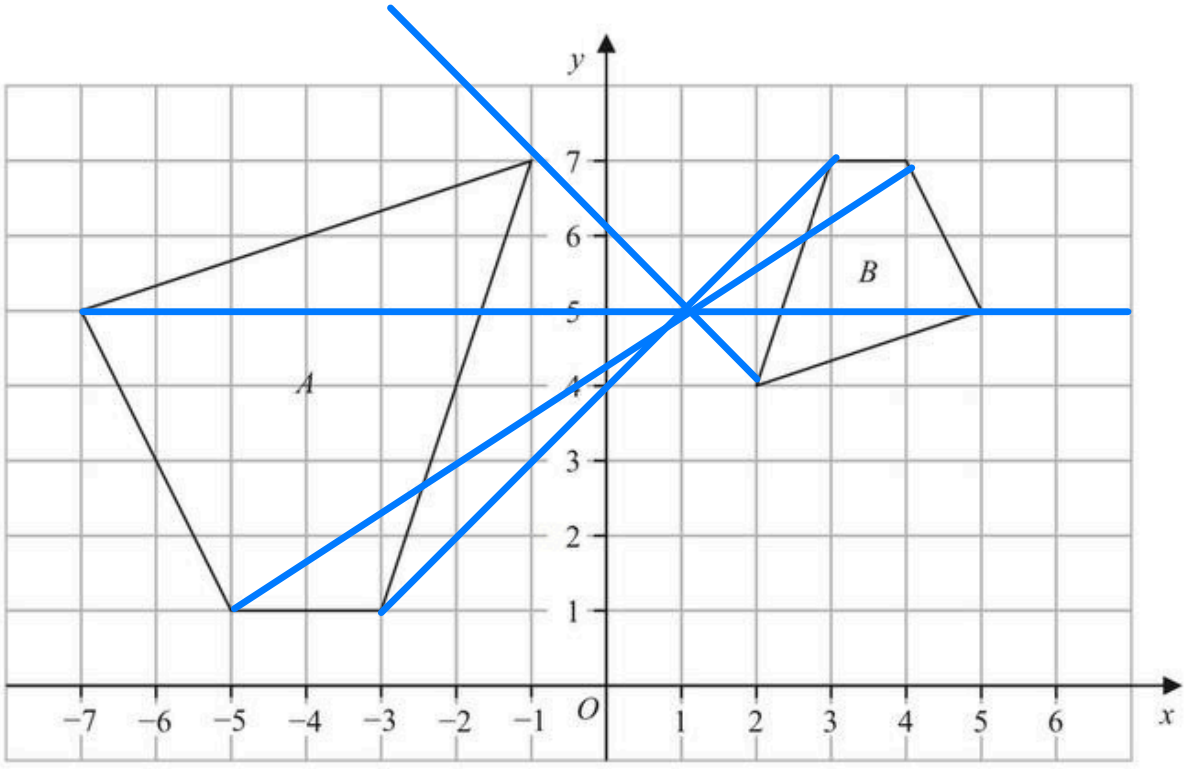
7.



Quadrilateral A and quadrilateral B are drawn on a grid.

Quadrilateral B is the **image** of quadrilateral A under a single transformation.

Describe fully this single transformation.

Enlargement

SF : -0.5

centre (1,5)

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