5-Aug-24

Objective: **Complete iGCSE questions on performing transformations.**

8/5/2024

8/5/2024

8/5/2024

3	(a)	(i)	Quadrilateral drawn at (–1, –1), (–1, –2), (–3, –1), (–3, –3)	3	**M2** for 3 pts correct or **M1** for correct reflection of *A* in *y*-axi
		(ii)	Reflection $y = -x$ oe	1 1	
	(b)	(i)	Quadrilateral drawn at (3, 1), (6, 1), (3, 3), (9, 3)	2	**B1** for any stretch with *y*-axis invariant o stretch factor 3
		(ii)	Stretch, *y*-axis oe invariant (stretch factor) $\frac{1}{3}$	2	**B1** for any 2 correct

8/5/2024

8/5/2024

8/5/2024

8/5/2024

8/5/2024

9	**(a)**	[*QR* =] *P* [*PQR* =] *Q* [*ST* =] *Q* [*SQ* =] *T* [*PTP* =] *T* [*TPP* =] *S*	**6**	**B1** for each
	(b) (i)	Points (2, 2) (2, 1) (5, 1)	**2**	**B1** for (2, 1) or (5, 1) correct
	(ii)	Points (2, –2) (2, –1) (5, –1)	**1FT**	**FT** their *B* reflected in *x*-axis
	(iii)	Rotation 90 [anticlockwise] oe [Centre] (0, 0) oe	**1** **1** **1**	

8/5/2024

8/5/2024

8/5/2024

4(a)	Correct triangle (2, 1) (3, 1) (2, 4)	**2**	**B1** for translation $\begin{pmatrix} k \\ -4 \end{pmatrix}$ or $\begin{pmatrix} 0 \\ k \end{pmatrix}$
4(b)	Correct triangle (–5, 2) (–5, 3) (–8, 2)	**2**	**B1** for correct rotation, incorrect centre or for rotation 90° clockwise, correct centre
4(c)	Rotation [Centre] (0, 0) 90° clockwise oe	**2**	**B1** for each
4(d)	Correct triangle (–5, –2) (–5, –3) (–8, –2)	**3**	**B1** for $y = -x$ soi **M1** for correct shape, incorrect location
4(e)	Reflection x-axis oe	**2**	**B1** for each

2 **(a)** **(i)** Reflection in the line $y = x$ maps triangle A onto triangle B.

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

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.....

(ii) Enlargement, with centre (2, 1) and scale factor 4, maps triangle C onto triangle D.

Describe fully the **single** transformation that maps triangle D onto triangle C.

.....

.....

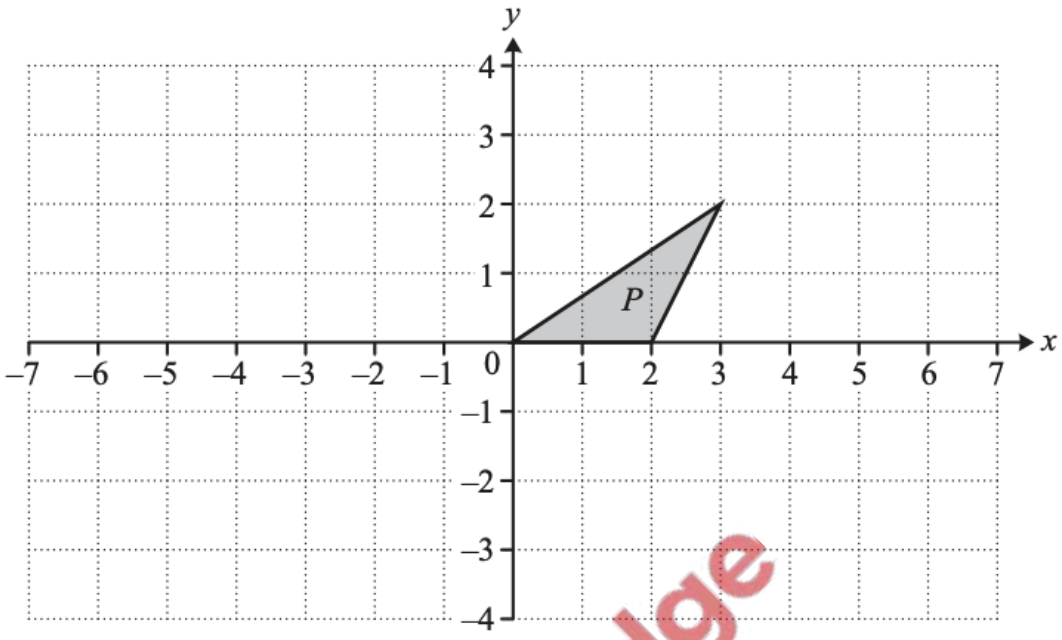
(iii) Translation by the vector $\begin{pmatrix} -3 \\ 5 \end{pmatrix}$ maps triangle E onto triangle F.

Describe fully the **single** transformation that maps triangle F onto triangle E.

.....

.....

(b)



(i) Rotate triangle P through 90° anticlockwise about (0, 0).
Label the image Q.

(ii) Stretch triangle P with stretch factor 2 and the y-axis invariant.
Label the image R.

2(a)(i)	Reflection, $y = x$	**1**	
2(a)(ii)	Enlargement [with centre] (2, 1) [scale factor] $\frac{1}{4}$ oe	**2**	**B1** for each
2(a)(iii)	Translation $\begin{pmatrix} 3 \\ -5 \end{pmatrix}$	**2**	**B1** for each
2(b)(i)	Correct triangle (0, 0), (0, 2), (–2, 3)	**2**	**SC1** for rotation 90° clockwise about (0, 0) or rotation 90° anti-clockwise about different c
2(b)(ii)	Correct triangle (0, 0), (4, 0), (6, 2)	**2**	**SC1** for stretch with s.f. = 2, x-axis invariant or stretch with y-axis invariant with different scale factor.

Question	Answer	Marks	Part Marks
1(a)	Image at (0, 5), (3, 5), (3, 3)	**2**	**SC1** for translation $\begin{pmatrix}-2\\k\end{pmatrix}$ or $\begin{pmatrix}k\\7\end{pmatrix}$
1(b)(i)	Image at (2, 2), (5, 2), (5, 4)	**1**	
1(b)(ii)	Image at (– 4, – 2), (– 7, – 2), (– 7, – 4)	**1**	
1(b)(iii)	Rotation 180 [centre] (– 1 , 0)	**3**	**B1** for each
1(c)	Stretch [factor]2 *x*-axis oe invariant	**3**	**B1** for each

6(a)	Correct triangle. (–6, –1), (–4, –1), (–6, 3)	**2**	**B1** for $\begin{pmatrix}-7\\k\end{pmatrix}$ or $\begin{pmatrix}k\\-3\end{pmatrix}$

6(b)	Correct triangle. (–1, 4), (–1, 6), (–5, 4)	**2**	**B1** for correct rotation about any centre or for correct centre but 90° clockwise
6(c)	Rotation 90° clockwise oe [Centre] (–6, 4)	**3**	**B1** for each
6(d)	Correct triangle. (3, –1), (7, –1), (7, –9)	**2**	**B1** for correct enlargement with wrong c
6(e)	Enlargement [centre] (3, 1) [SF] –0.5	**2**	**B1** for each

8/5/2024

8/5/2024

3(a)	Triangle at (4, –4), (5, –4), (5, –6)	**2**	**B1** for translation $\begin{pmatrix}3\\k\end{pmatrix}$ or $\begin{pmatrix}k\\-1\end{pmatrix}$
3(b)	Triangle at (5, 0), (7, 0), (7, 3)	**2**	**B1** for any stretch in with x-axis inva or correct stretch translated vertically
3(c)	Rotation 90° clockwise oe (3, –1)	**3**	**B1** for each

8/5/2024

8/5/2024

8/5/2024

8/5/2024

6(a)	Correct reflection at (1, –1), (4, –1), (4, –3), (3, –3)	**1**	
6(b)	Correct translation at (5, –4), (2, –4), (2, –6), (3, –6)	**2**	**B1** for translation $\begin{pmatrix}6\\k\end{pmatrix}$ or $\begin{pmatrix}k\\-3\end{pmatrix}$
6(c)	Rotation 90[°] clockwise oe (0, 1)	**3**	**B1** for each
6(d)	Correct stretch at (–1, –2), (–4, –2), (–4, –6), (–3, –6)	**2**	**B1** for stretch factor 2 displaced ver

8/5/2024

8/5/2024

8/5/2024

6(a)(i)	(1, 5)	**1**	
6(a)(ii)	$(-y, -x)$	**2**	**B1** for each co-ordinate
6(a)(iii)	Reflection $y = -x$	**2**	**B1** for each
6(b)	Enlargement Scale factor 2 Centre (0, 0)	**3**	**B1** for each
6(c)	Stretch x-axis invariant SF 0.5	**2**	**B1** for each

8/5/2024

8/5/2024

8/5/2024

8/5/2024

8/5/2024

5 **(a)** **(i)** A reflection in the line $y = 3$ maps triangle A onto triangle B.

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

.....

.....

(ii) A translation using the vector $\begin{pmatrix} 5 \\ -4 \end{pmatrix}$ maps triangle C onto triangle D.

Describe fully the **single** transformation that maps triangle D onto triangle C.

.....

.....

(iii) An enlargement, centre $(2, -1)$, scale factor 3, maps triangle G onto triangle H.

Describe fully the **single** transformation that maps triangle H onto triangle G.

.....

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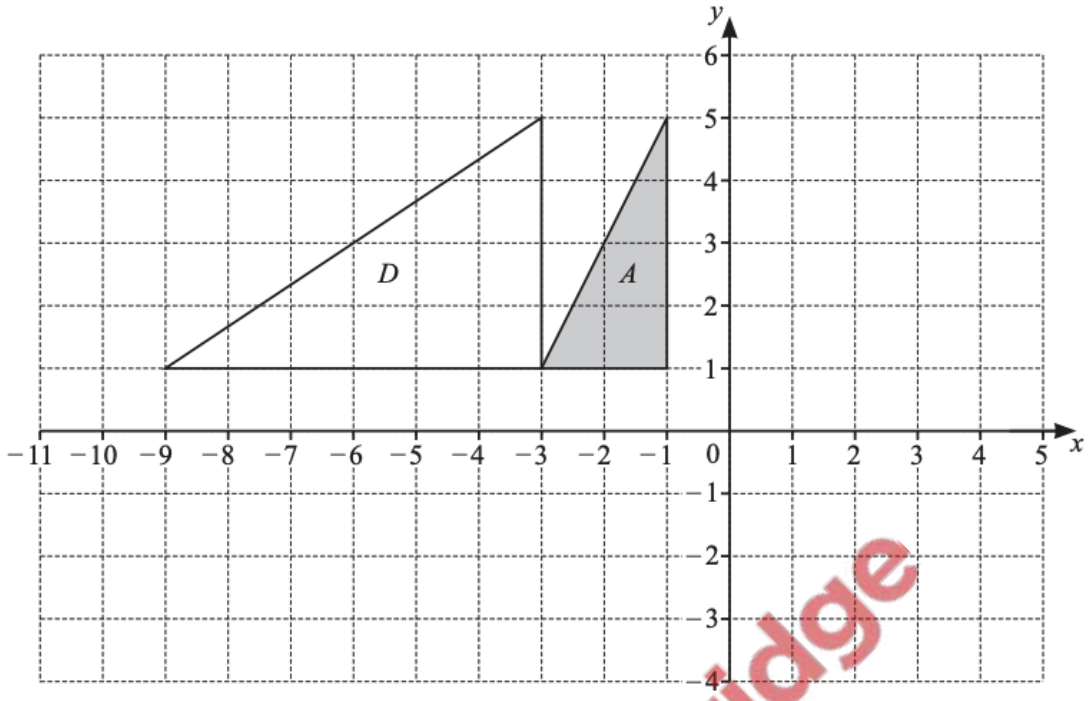
8/5/2024

5(a)(i)	Reflection in the line $y = 3$	**1**	
5(a)(ii)	Translation $\begin{pmatrix} -5 \\ 4 \end{pmatrix}$	**2**	**B1** for each
5(a)(iii)	Enlargement [centre] (2, –1) [scale factor] $\frac{1}{3}$	**2**	**B1** for each
5(b)(i)	Triangle at (–6, 0), (–2, 0), (–2, – 2)	**2**	**B1** for rotation 90° clockwise a (–1, 0) or 90° anticlockwise about anoth centre
5(b)(ii)	Triangle at (2, 2), (2, 4), (3, 4)	2	**B1** for enlargement scale factor wrong centre or scale factor $\frac{1}{2}$, centre (1, 3)
5(b)(iii)	Stretch [Stretch factor] 3 Invariant line y-axis oe	**3**	**B1** for each

(b)



(i) Rotate triangle A through 90° anticlockwise, centre $(-1, 0)$.
Label the image B. [2]

(ii) Enlarge triangle A with scale factor $-\frac{1}{2}$, centre $(1, 3)$.
Label the image C. [2]

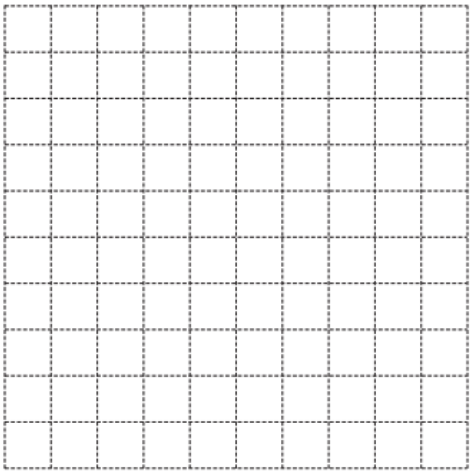
(iii) Describe fully the **single** transformation that maps triangle A onto triangle D.

.....

..... [3]

2(a)(i)	Translation $\begin{pmatrix} -6 \\ -10 \end{pmatrix}$	**2**	**B1** for each
2(a)(ii)	Enlargement SF 2 Centre (0, 9)	**3**	**B1** for each
2(b)(i)	(–2, –5)	**1**	
2(b)(ii)	(2, –5)	**1**	
2(b)(iii)	Reflection *x*-axis oe	**2**	**B1** for each
2(b)(iv)	Reflection *y*-axis oe	**2**	**B1** for each

(b) You may use the grid to help you in answering this question.



The transformation P is a rotation of 90° clockwise about the origin.
The transformation Q is a reflection in the line $y = -x$.

(i) Find the image of the point $(5, -2)$ under the transformation P.

(....., ...) [1]

(ii) Find the image of the point $(5, -2)$ under the transformation Q.

(....., ...) [1]

(iii) Describe fully the **single** transformation equivalent to P followed by Q.

.....

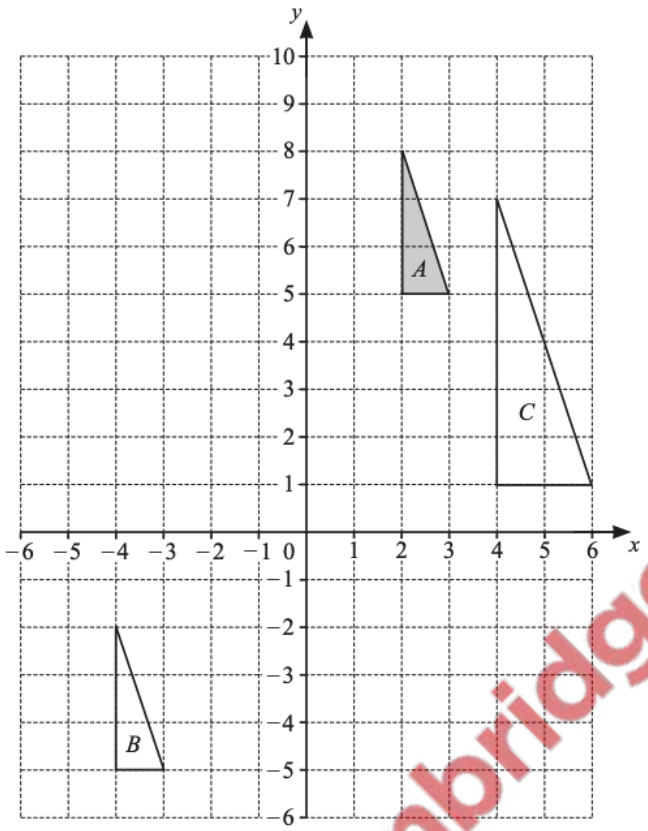
..... [2]

(iv) Describe fully the **single** transformation equivalent to Q followed by P.

.....

..... [2]

2 (a)



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

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..... [2]

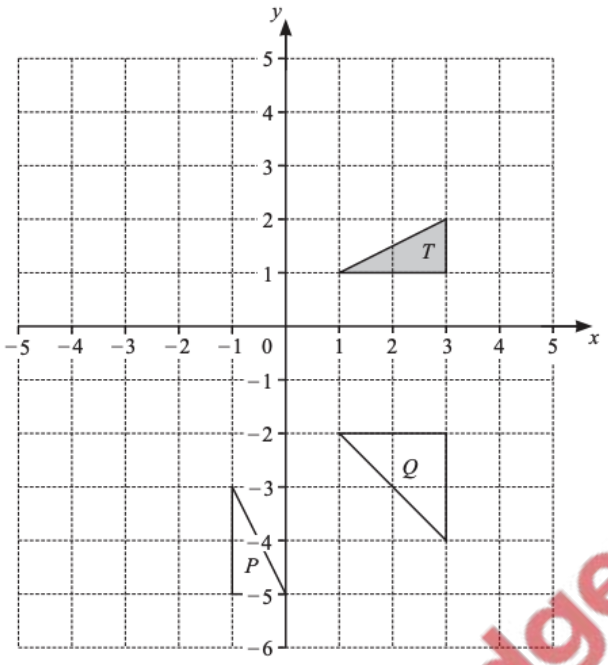
(ii) Describe fully the **single** transformation that maps triangle A onto triangle C.

.....

..... [3]

Question	Answer	Marks	Partial Marks
1(a)(i)	Image at (–1, 1), (–3, 1), (–3, 2)	**1**	
1(a)(ii)	Image at (–4, 4), (–2, 4), (–2, 5)	**2**	**B1** for translation $\begin{pmatrix} -5 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 3 \end{pmatrix}$
1(a)(iii)	Image at (0, 2), (4, 2), (4, 4)	**2**	**B1** for enlargement factor 2, c centre
1(b)(i)	Rotation (–2, 0) 90° clockwise oe	**3**	**B1** for each
1(b)(ii)	Stretch –2 *x*-axis oe invariant	**3**	**B1** for each

1



(a) **(i)** Reflect shape T in the y-axis. [1]

(ii) Translate shape T by the vector $\begin{pmatrix} -5 \\ 3 \end{pmatrix}$. [2]

(iii) Enlarge shape T by scale factor 2, centre (2, 0). [2]

(b) Describe fully the **single** transformation that maps shape T onto

(i) shape P,

.....

..... [3]

(ii) shape Q.

.....

..... [3]

(a) **(i)** Find the co-ordinates of the image of the point (5, 1) under the transformation P.

(..... , ...

(ii) Find the co-ordinates of the image of the point (x, y) under the transformation P followed b transformation Q.

(..... , ...

(iii) Describe fully the **single** transformation equivalent to P followed by Q.

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(b) Describe fully the **single** transformation equivalent to R followed by S.

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(c) Describe fully the **single** transformation equivalent to the inverse of R.

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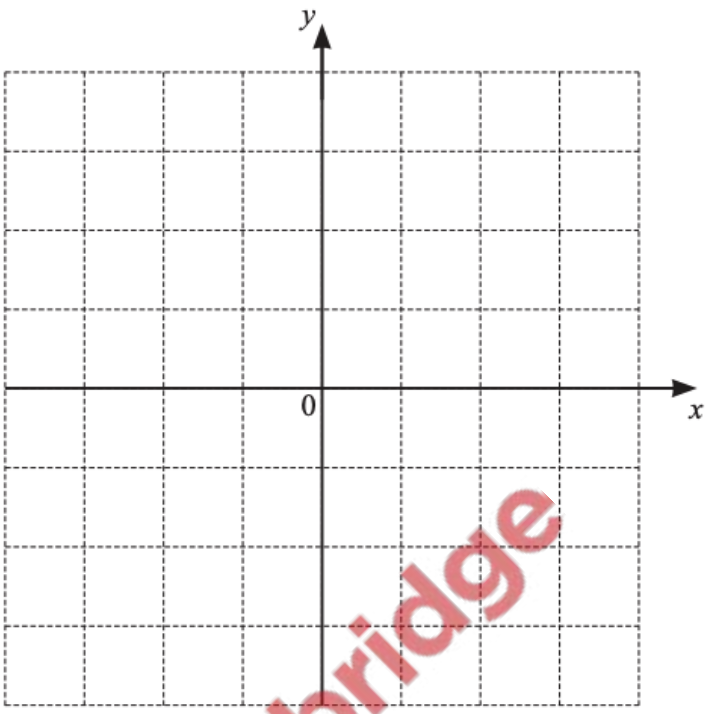
6 You may use this grid to help you answer this question.



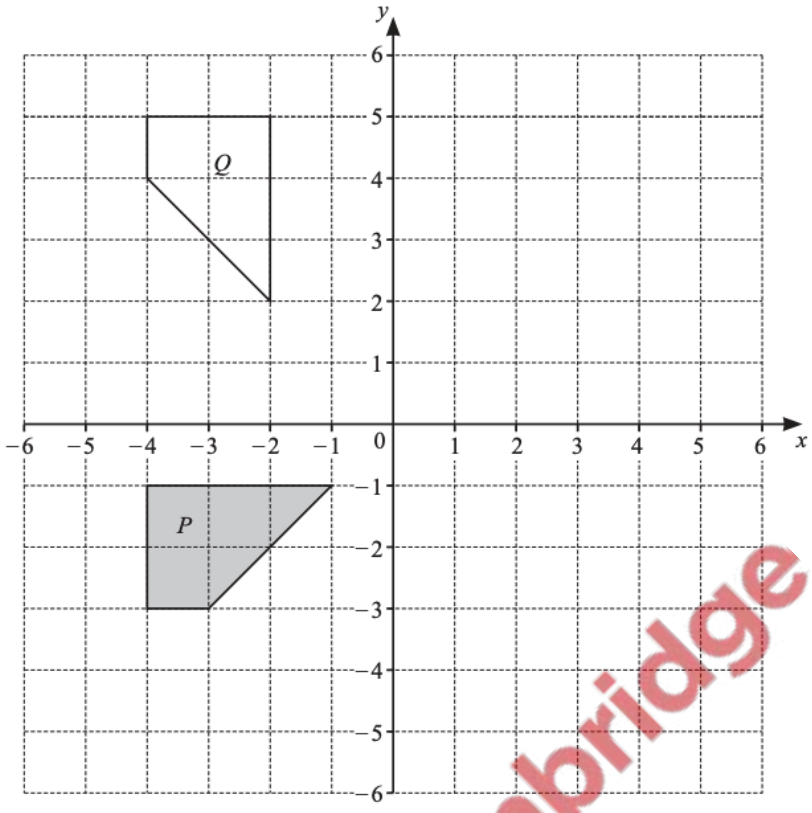
The transformation P is a reflection in the line $y = x$.

The transformation Q is a rotation of 180° about the origin.

The transformation R is a stretch, scale factor 2 with x-axis invariant.

The transformation S is a stretch, scale factor 2 with y-axis invariant.

6



(a) Reflect shape P in the y-axis. [1]

(b) Translate shape P by the vector $\begin{pmatrix} 6 \\ -3 \end{pmatrix}$. [2]

(c) Describe fully the **single** transformation that maps shape P onto shape Q.

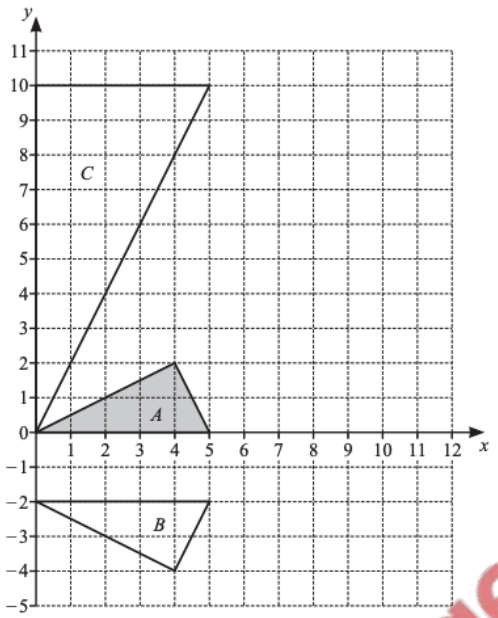
.....

..... [3]

(d) Stretch shape P with stretch factor 2 and the x-axis invariant. [2]

2(a)	Reflection $y = -1$	**2**	**B1** for each
2(b)	Triangle at (6, –3), (11, –3), (10, –1)	**2**	**B1** for translation $\begin{pmatrix} k \\ -3 \end{pmatrix}$ or $\begin{pmatrix} 6 \\ k \end{pmatrix}$
2(c)(i)	63.4 or 63.43 to 63.44	**3**	**B2** for $\tan[\theta] = \frac{4}{2}$ oe or **B1** for correct angle clearly identifie no other angle seen.
2(c)(ii)	5	**3**	**M2** for $\frac{\sqrt{125}}{5}$ or $\frac{10}{\sqrt{20}}$ or $\frac{5}{\sqrt{5}}$ or **M1** for $\sqrt{10^2+5^2}$ or $\sqrt{4^2+2^2}$ or $\sqrt{1^2+2^2}$ or $\sqrt{125}$ or $\sqrt{20}$ or $\sqrt{5}$

2



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

.....

[2]

(b) Translate triangle A by the vector $\begin{pmatrix} 6 \\ -3 \end{pmatrix}$.

[2]

(c) Triangle A can be mapped onto triangle C by a rotation followed by an enlargement.

(i) Use trigonometry to calculate the angle of rotation.

.....

[3]

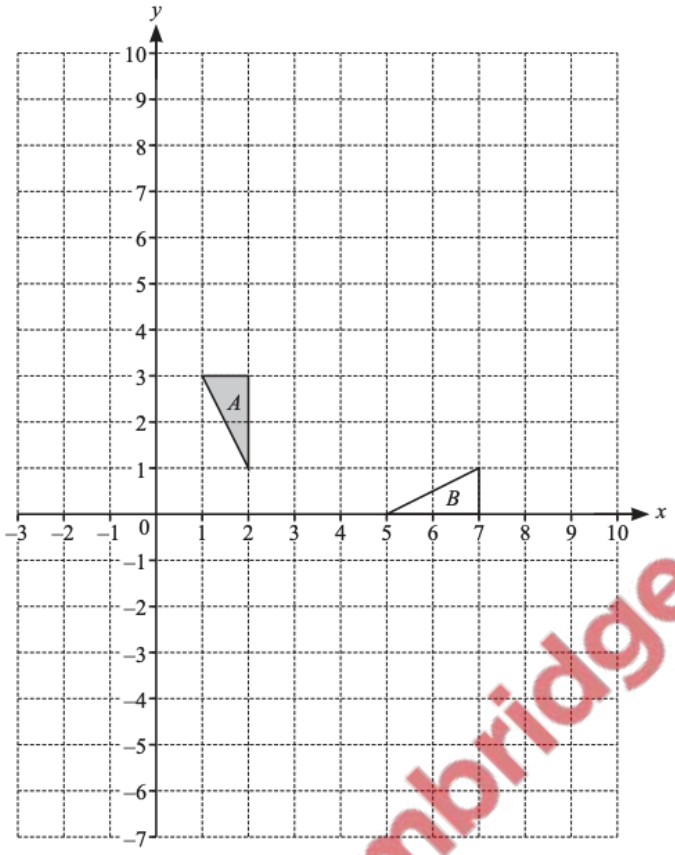
(ii) The scale factor of the enlargement is $\sqrt{a}$ where a is an integer.

Find the value of a.

$a =$ .....

[3]

3



(a) Draw the image of triangle A after a translation by the vector $\begin{pmatrix} 3 \\ -7 \end{pmatrix}$. [2]

(b) Draw the image of triangle B after a stretch, factor 3 and the x-axis invariant. [2]

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

.....

..... [3]

(a) Translate triangle A with vector $\begin{pmatrix} -7 \\ -3 \end{pmatrix}$. Label the image B.

(b) Rotate triangle A through 90° anti-clockwise about $(-1, 2)$. Label the image C.

(c) Describe fully the **single** transformation that maps triangle C onto triangle B.

.....

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(d) Enlarge triangle A scale factor -2 with centre $(3, 1)$. Label the image D.

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

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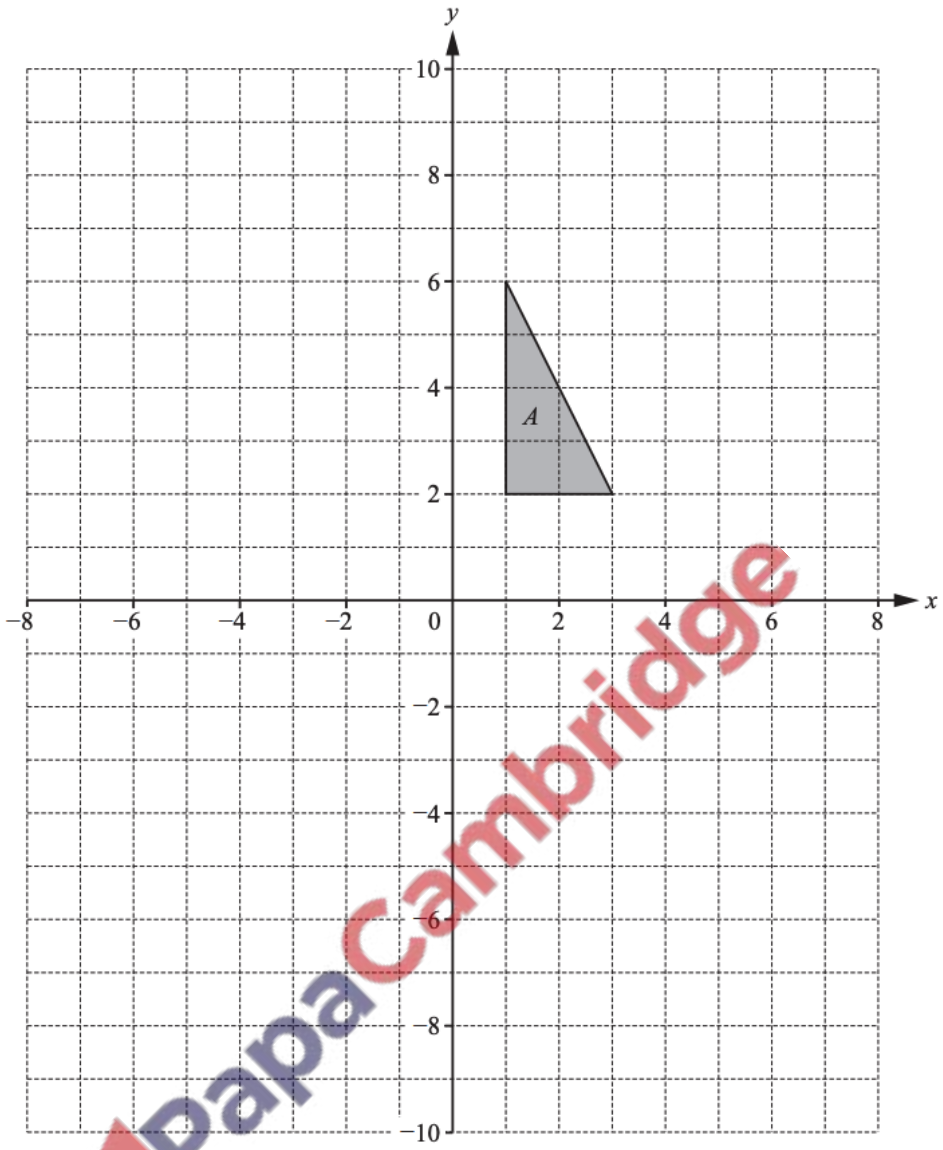
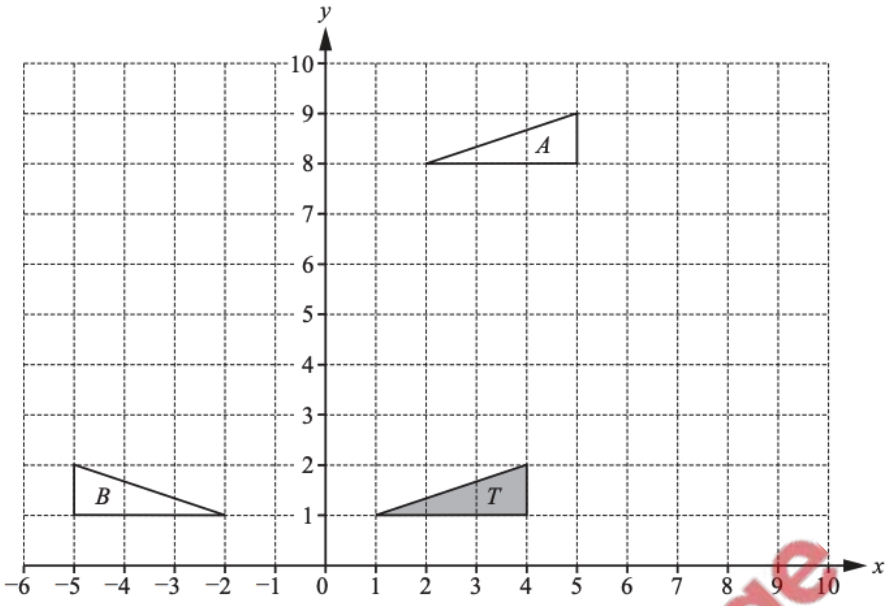
6



Question	Answer	Marks	Partial Marks
1(a)(i)	Translation $\begin{pmatrix}1\\7\end{pmatrix}$	**2**	**B1** for each
1(a)(ii)	Reflection $x=-\frac{1}{2}$ oe	**2**	**B1** for each
1(b)	Triangle drawn at (3, 2), (3, 4), (–3, 2)	**2**	**B1** for enlargement factor 2 with wr centre, or correct centre with wrong positiv (not 1)
1(c)	Triangle drawn at (2, 1), (8, 1), (8, 2)	**2**	**B1** for stretch factor 2 with x-axis in or stretch factor 2 translated horizon

1



(a) Describe fully the **single** transformation that maps

(i) triangle T onto triangle A,

.....

..... [2]

(ii) triangle T onto triangle B.

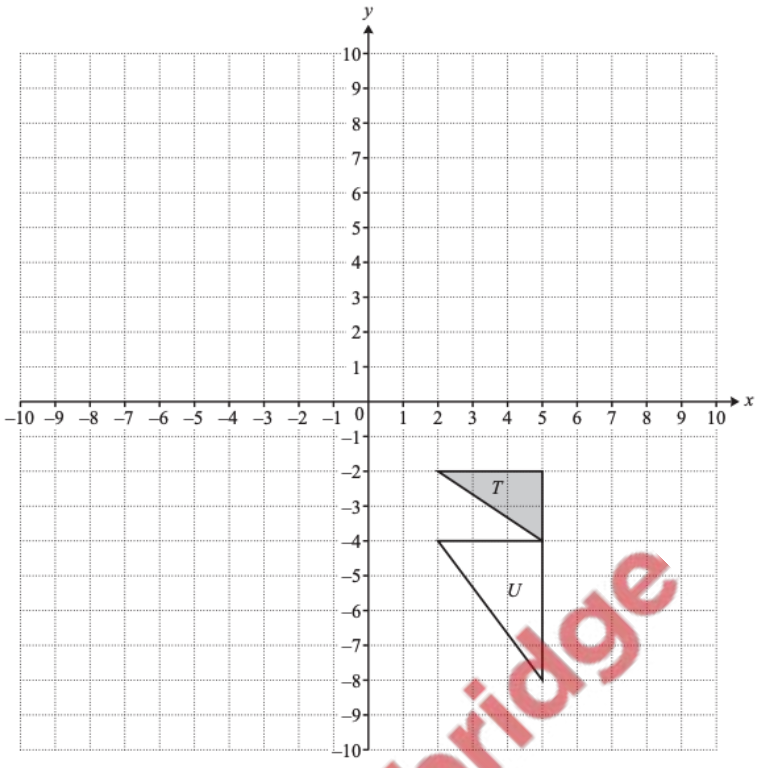
.....

..... [2]

(b) Enlarge triangle T with centre (5, 0) and scale factor 2. [2]

(c) Stretch triangle T with the y-axis invariant and factor 2. [2]

1



(a) Translate triangle T by the vector $\begin{pmatrix} -2 \\ 7 \end{pmatrix}$. [2]

(b) **(i)** Reflect triangle T in the x-axis. Label the image P. [1]

(ii) Reflect triangle T in the line $x = -1$. Label the image Q. [1]

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

.....

..... [3]

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

.....

..... [3]

(a) Translate triangle A with vector $\begin{pmatrix} 0 \\ -4 \end{pmatrix}$. Label the image B.

(b) Rotate triangle A through 90° anticlockwise about (0, 0). Label the image C.

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

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(d) Reflect triangle A in the line $y = -x$. Label the image D.

(e) Describe fully the **single** transformation that maps triangle C onto triangle D.

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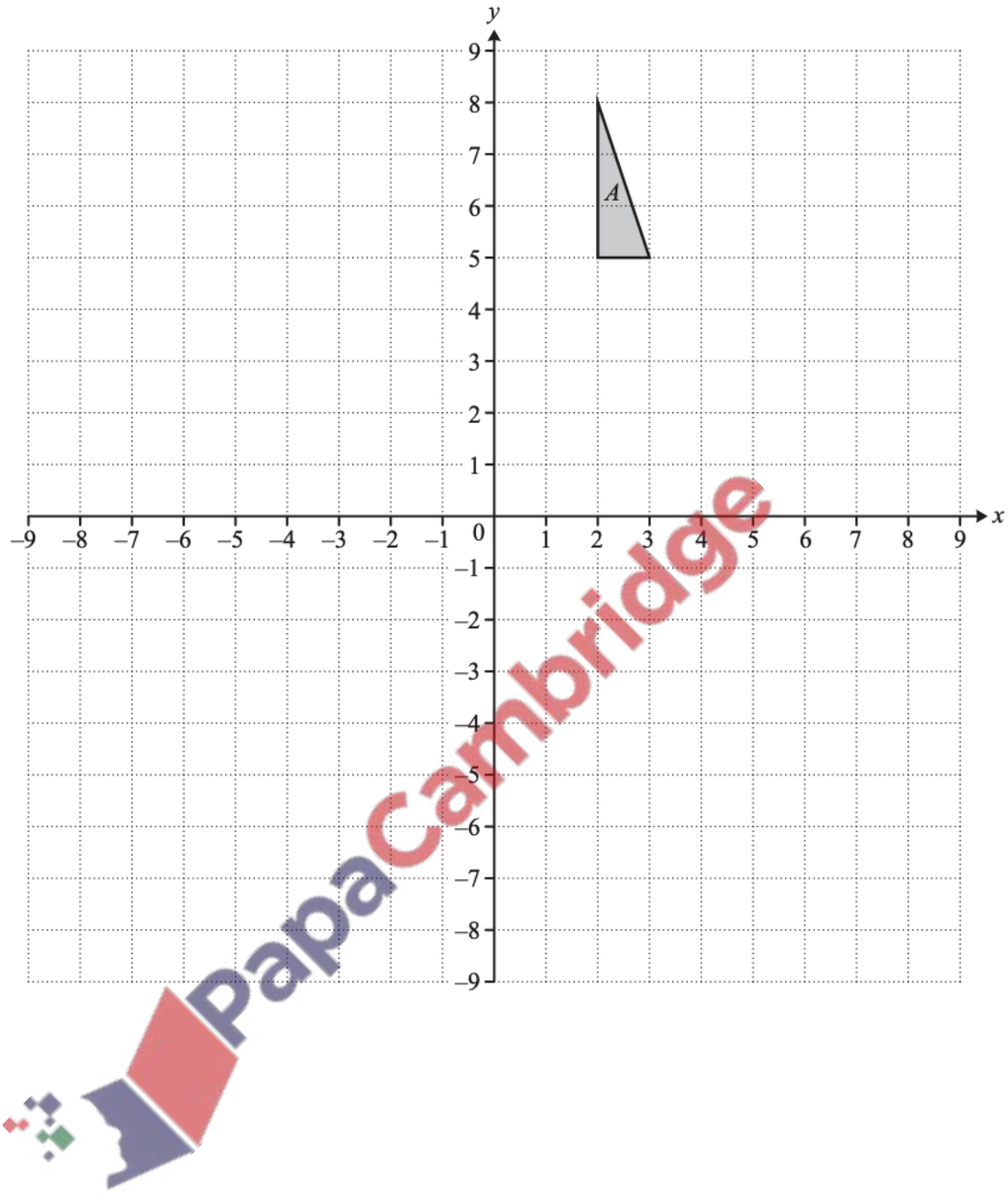
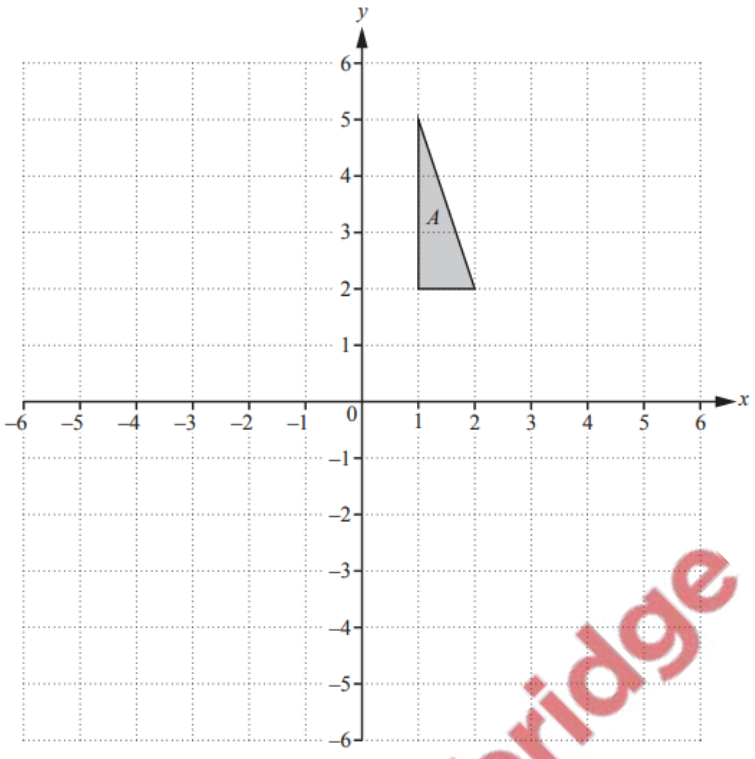
4



(b)



(i) Draw the image of triangle A after a reflection in the line $y = x$.
Label this image B.

[2]

(ii) Draw the image of **triangle *B*** after a reflection in the x-axis.
Label this image C.

[1]

(iii) Describe fully the **single** transformation that maps **triangle *C*** onto **triangle *A***.

.....

..... [3]

9 The transformation **AB** means transformation **B** followed by transformation **A**.

(a) The transformation **P** is a rotation through 90° clockwise about the origin.
The transformation **Q** is a rotation through 180° about the origin.
The transformation **R** is a rotation through 270° clockwise about the origin.
The transformation **S** is a reflection in the y-axis.
The transformation **T** is a reflection in the x-axis.

Write down the letter of the **single** transformation, **P**, **Q**, **R**, **S** or **T**, that is equivalent to each of the transformations **QR**, **PQR**, **ST**, **SQ**, **PTP** and **TPP**.

QR = ...

PQR = ...

ST = ...

SQ = ...

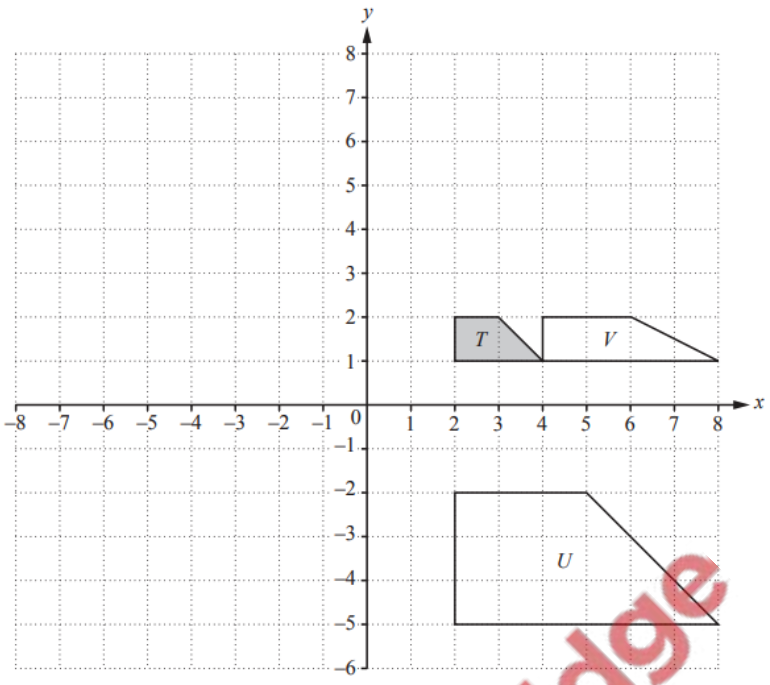
PTP = ...

TPP = ...

[6]

Question	Answer	Mark	Part Marks
1 (a)	Image at (5, 5), (7, 5), (6, 6), (5, 6)	2	If 0 scored **SC1** for translation $\begin{pmatrix}3\\k\end{pmatrix}$ o
(b)	Image at (–1, –2), (–1, –4), (–2, –3), (–2, –2)	2	If 0 scored **SC1** for reflection in l
(c)	Image at (–2, 5), (–2, 7), (–3, 5), (–3, 6)	3	If 0 scored **SC2** for 90° clockwise about (or **SC1** for 90° anticlockwise abou centre
(d) (i)	Enlargement [scale factor] 3 [centre] (2, 4)	**B1** **B1** **B1**	If combined transformations, all th marks lost
(ii)	Stretch [factor] 2 *y*-axis oe invariant	**B1** **B1** **B1**	If combined transformations, all th marks lost

1



(a) Translate shape T by the vector $\begin{pmatrix} 3 \\ 4 \end{pmatrix}$. [2]

(b) Reflect shape T in the line $y = -x$. [2]

(c) Rotate shape T by 90° anticlockwise about (–2, 1). [3]

(d) Describe fully the **single** transformation that maps

(i) shape T onto shape U,

.....

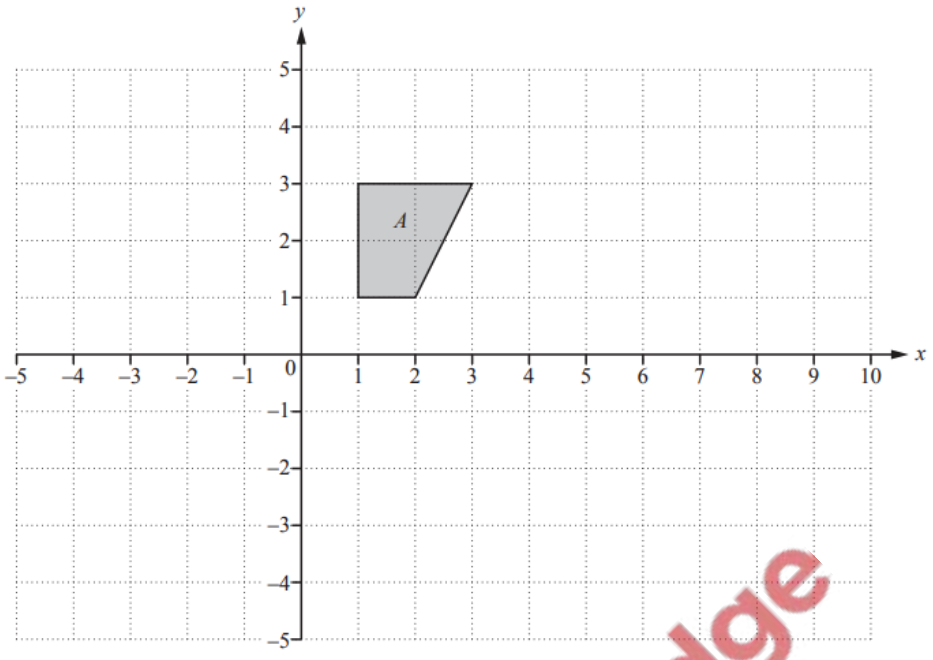
..... [3]

(ii) shape T onto shape V.

.....

..... [3]

3



(a) **(i)** Draw the image of quadrilateral A after it has been reflected in the y-axis and then rotated through 90° anti-clockwise about the origin. [3]

(ii) Describe fully the **single** transformation equivalent to reflection in the y-axis followed by rotation 90° anti-clockwise about the origin.

.....

..... [2]

(b) **(i)** Draw the image of quadrilateral A after a stretch, factor 3 with the y-axis invariant. Label the image B. [2]

(ii) Describe fully the **single** transformation that maps the quadrilateral B back onto quadrilateral A.

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..... [2]