Vectors and transformations – 2023 IGCSE 0580

1. March/2023/Paper_0580/12/No.8// March/2023/Paper_0580/22/No.2

$$\mathbf{v} = \begin{pmatrix} -1 \\ 3 \end{pmatrix} \qquad \mathbf{y} = \begin{pmatrix} 2 \\ 5 \end{pmatrix}$$

Find

(a) $\mathbf{v} - \mathbf{y}$

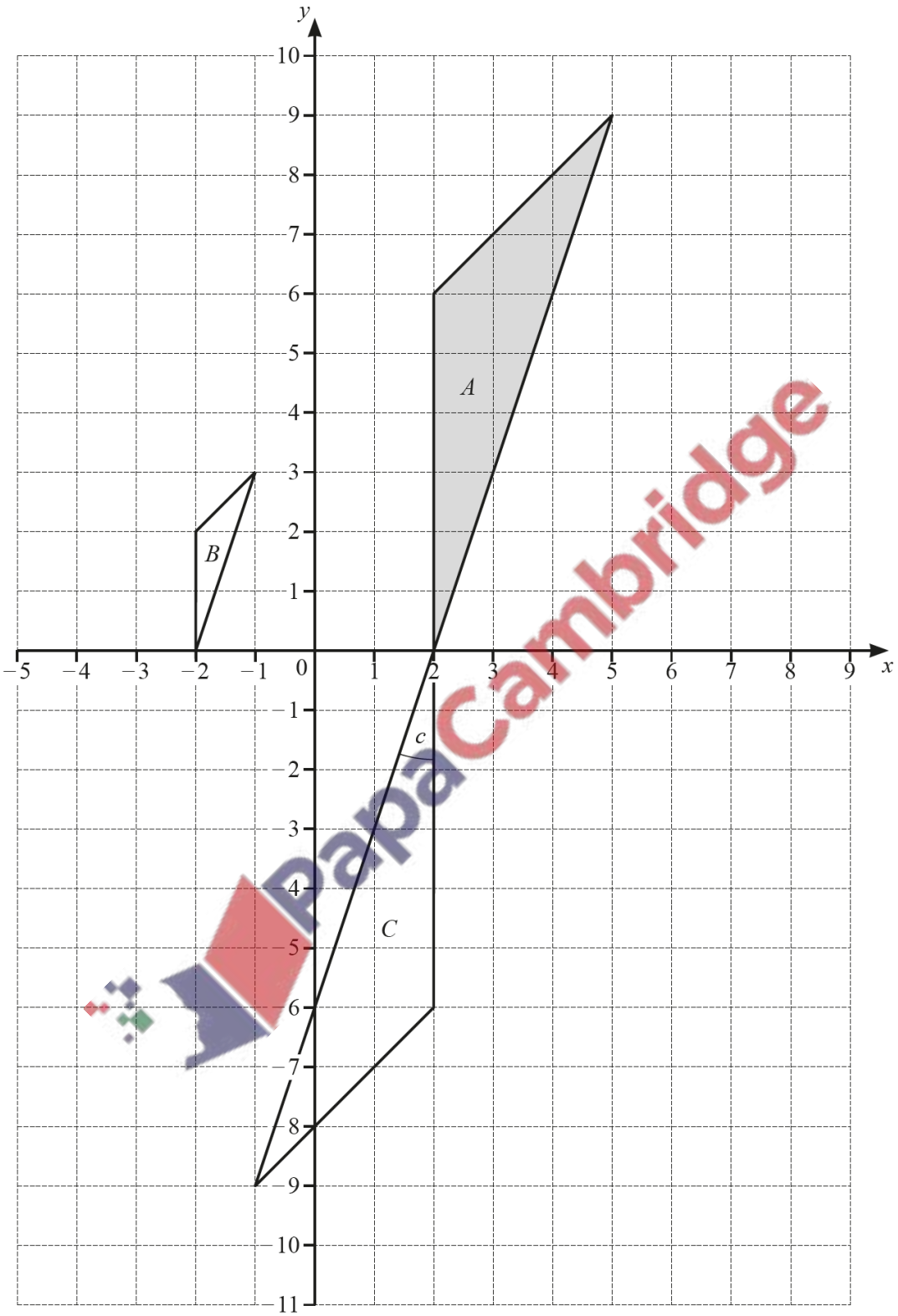
( ) [1]

(b) $2\mathbf{v}$.

( ) [1]

2. March/2023/Paper_0580/32/No.5

The diagram shows three triangles, A, B and C, on a 1 cm^2 grid.



(a) Measure angle c.

Angle c = ... [1]

(b)

hypotenuse	equilateral	isosceles
acute	congruent	obtuse
trigonometry	cosine	reflex

Complete these statements using two different words from the box.

(i) Angle c is ..... [1]

(ii) Triangles A and C are ..... [1]

(c) Work out the area of triangle A.
Give the units of your answer.

.... [3]

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

(i) triangle A onto triangle B

.....

..... [3]

(ii) triangle A onto triangle C.

.....

..... [3]

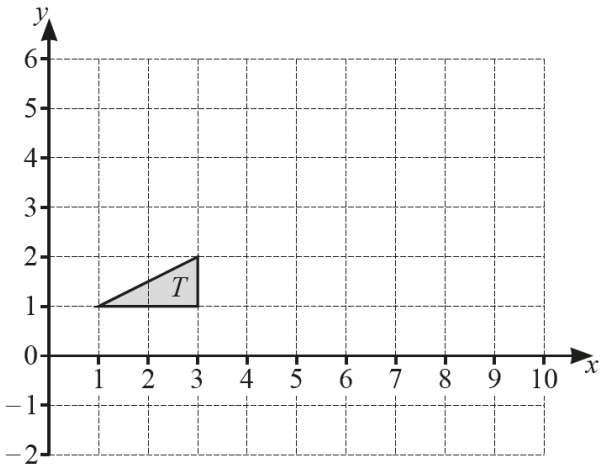
(e) On the grid, draw the image of

(i) triangle A after a translation by the vector $\begin{pmatrix} 3 \\ -10 \end{pmatrix}$ [2]

(ii) triangle A after a reflection in the line $x = 4$. [2]

3. March/2023/Paper_0580/42/No.4

(a)



(i) Enlarge triangle T by scale factor 3, centre (0, 2). [2]

(ii) **(a)** Rotate triangle T about (4, 2) by 90° clockwise.
Label the image P. [2]

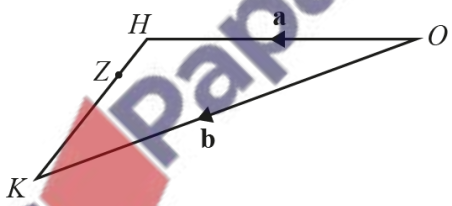
(b) Reflect triangle T in the line $x + y = 6$.
Label the image Q. [3]

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

.....

..... [2]

(b)



NOT TO SCALE

The diagram shows triangle OHK, where O is the origin.
The position vector of H is **a** and the position vector of K is **b**.
Z is the point on HK such that $HZ : ZK = 2 : 5$.

Find the position vector of Z, in terms of **a** and **b**.
Give your answer in its simplest form.

..... [3]

4. June/2023/Paper_0580/11/No.11

$$\mathbf{a} = \begin{pmatrix} 3 \\ 7 \end{pmatrix} \qquad \mathbf{b} = \begin{pmatrix} -2 \\ 5 \end{pmatrix}$$

Work out $\mathbf{a} - 2\mathbf{b}$.

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

5. June/2023/Paper_0580/12/No.15

F is the point $(1, -4)$, $\overrightarrow{FG} = \begin{pmatrix} 8 \\ -3 \end{pmatrix}$ and $\overrightarrow{GH} = \begin{pmatrix} -12 \\ 35 \end{pmatrix}$.

Find

(a) $3\overrightarrow{FG}$

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

(b) $\overrightarrow{FG} + \overrightarrow{GH}$

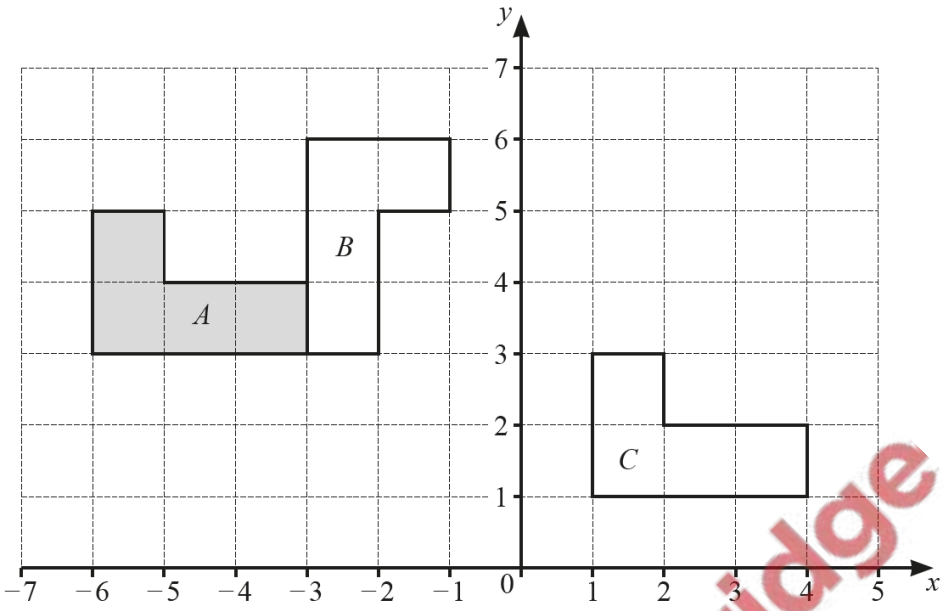
$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(c) the coordinates of the point G.

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

6. June/2023/Paper_0580/13/No.23

The diagram shows three shapes, A, B and C, on a 1 cm^2 grid.



Describe fully the **single** transformation that maps

(a) shape A onto shape B

.....

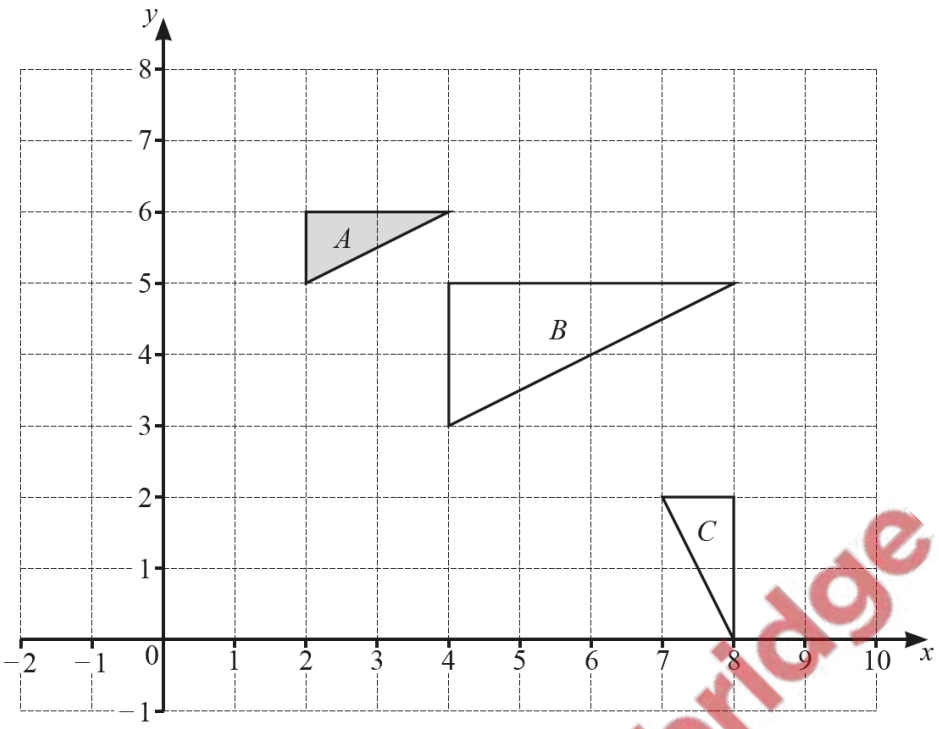
..... [3]

(b) shape A onto shape C.

.....

..... [2]

7. June/2023/Paper_0580/21/No.11



Describe the **single** transformation that maps

(a) triangle A onto triangle B

.....

..... [3]

(b) triangle A onto triangle C.

.....

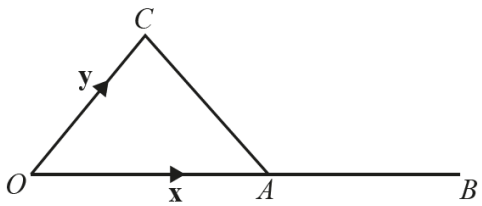
..... [3]

8. June/2023/Paper_0580/21/No.16

(a) Find the magnitude of the vector $\begin{pmatrix} -4 \\ 5 \end{pmatrix}$.

..... [2]

(b)



NOT TO SCALE

The diagram shows a triangle OAC.
A is the midpoint of the straight line OB.
$\overrightarrow{OA} = \mathbf{x}$ and $\overrightarrow{OC} = \mathbf{y}$.

Find $\overrightarrow{CB}$ in terms of $\mathbf{x}$ and $\mathbf{y}$.

$\overrightarrow{CB}$ = ... [1]

9. June/2023/Paper_0580/22/No.9

F is the point $(1, -4)$, $\overrightarrow{FG} = \begin{pmatrix} 8 \\ -3 \end{pmatrix}$ and $\overrightarrow{GH} = \begin{pmatrix} -12 \\ 35 \end{pmatrix}$.

Find

(a) $3\overrightarrow{FG}$

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

(b) $\overrightarrow{FG} + \overrightarrow{GH}$

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

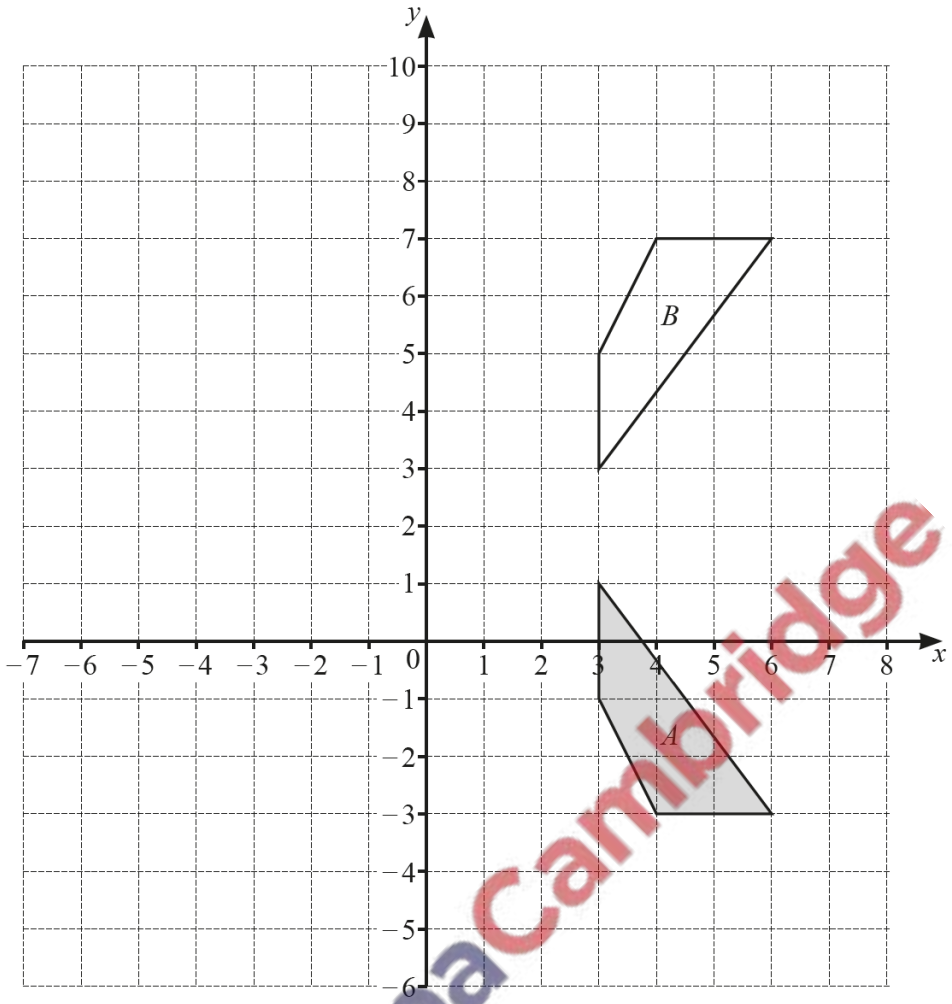
(c) the coordinates of the point G

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

(d) the magnitude of vector $\overrightarrow{GH}$.

..... [2]

10. June/2023/Paper_0580/22/No.10



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

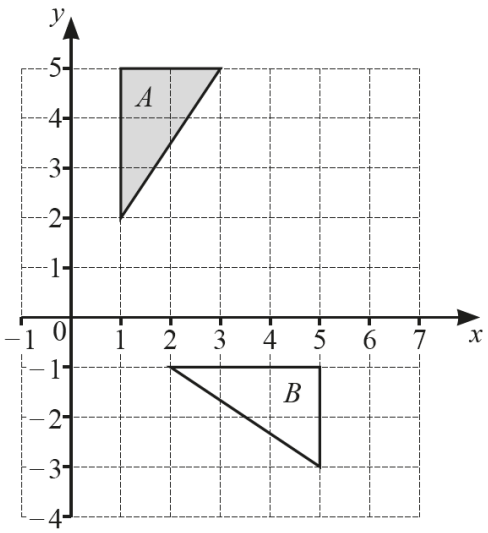
.....

..... [2]

(b) Rotate shape A 90° clockwise about the point $(-1, 2)$. [2]

(c) Enlarge shape A by scale factor -2, centre $(2, 0)$. [2]

11. June/2023/Paper_0580/23/No.8



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

.....

..... [3]

12. June/2023/Paper_0580/23/No.12

The position vector of A is $\begin{pmatrix} 5 \\ 3 \end{pmatrix}$ and $\overrightarrow{BA} = \begin{pmatrix} 4 \\ 8 \end{pmatrix}$.

Show that $\left|\overrightarrow{OB}\right| = 5.1$, correct to 1 decimal place.

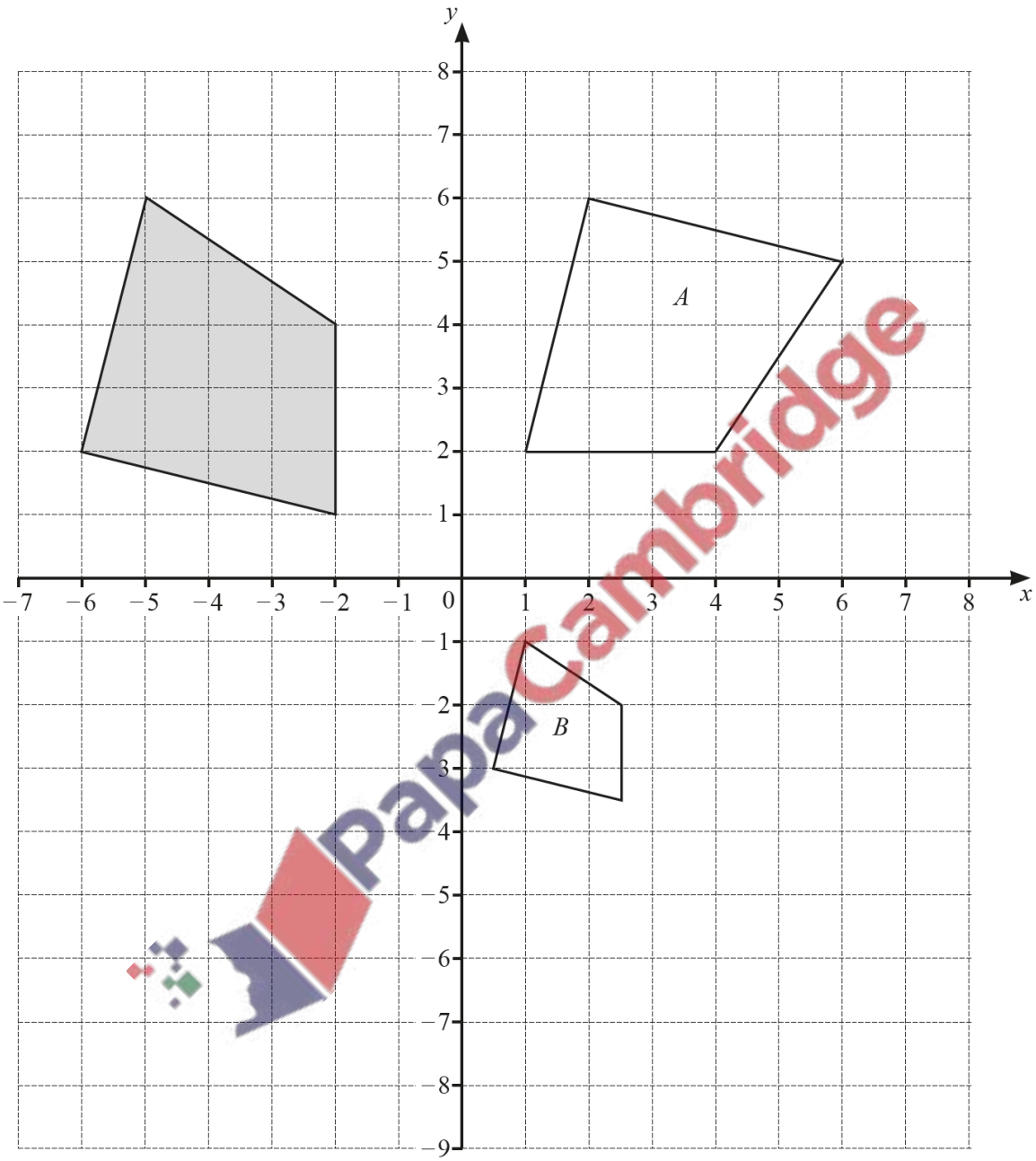
[3]

13. June/2023/Paper_0580/31/No.2

(a) Complete this statement.

The mathematical name of any polygon with 4 sides is a ..... [1]

(b) Three of these shapes are shown on the grid.



Describe fully the **single** transformation that maps

(i) the shaded shape onto shape A

.....

..... [3]

(ii) the shaded shape onto shape B.

.....

..... [3]

(c) On the grid, draw the image of

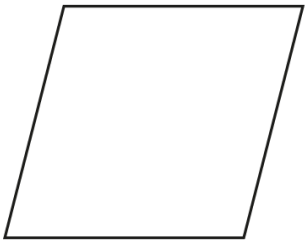
(i) the shaded shape after a translation by the vector $\begin{pmatrix} 9 \\ -6 \end{pmatrix}$ [2]

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

14. June/2023/Paper_0580/32/No.6

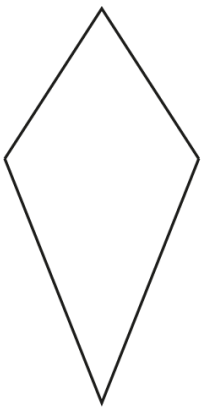
(a) For each quadrilateral, draw any lines of symmetry and write down its mathematical name.

(i)



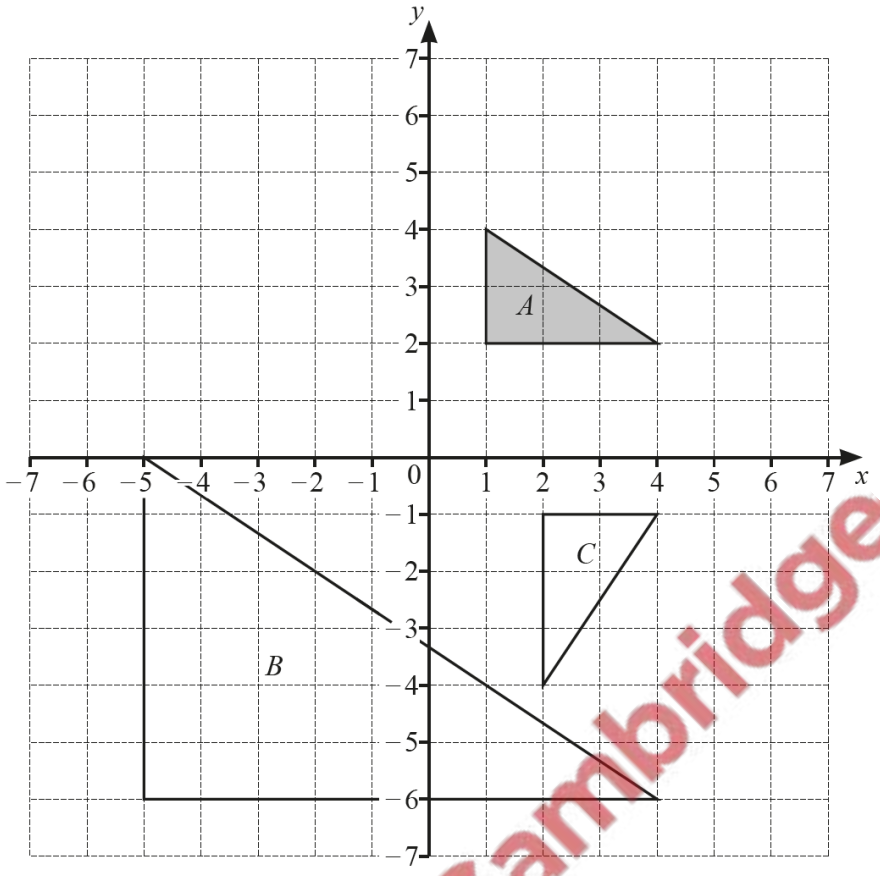
Name ..... [3]

(ii)



Name ..... [2]

(b) The diagram shows three triangles A, B and C, on a grid.



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

(a) triangle A onto triangle B.

.....

..... [3]

(b) triangle A onto triangle C.

.....

..... [3]

(ii) On the grid, reflect triangle A in the line $x = -1$. [2]