Exercise walk-through

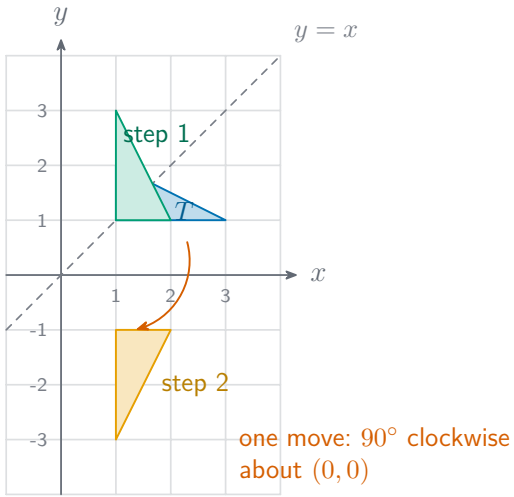
5.3
Transformations: rotation, reflection, translation

Pearson Edexcel · International GCSE · Mathematics A

Transformations: rotation, reflection, translation

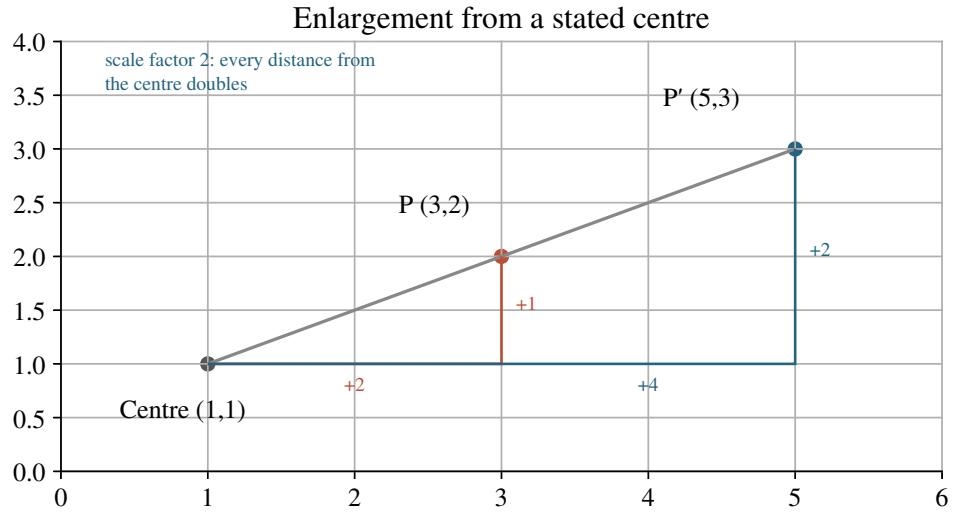
- A **reflection** flips the shape in a **mirror line**, such as $x = 1$, $y = 2$ or $y = x$. Each point and its **image** are the same distance from the line.
- A **rotation** turns the shape about a centre through an angle, **clockwise** or **anticlockwise**.
- A **translation** slides the shape without turning it. Describe it with a **column vector**: $\begin{pmatrix} 3 \\ -2 \end{pmatrix}$ means 3 right and 2 down.

Figure: Transformations: rotation, reflection, translation



- Reflect in y = x, then in the x-axis
- Same as a 90° **clockwise rotation** about (0, 0)

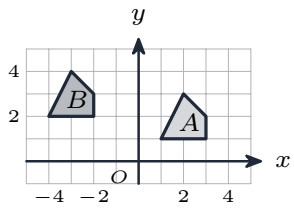
Figure: Enlargement and describing transformations



- **Scale factor** 2 from (1, 1): P(3, 2) $\rightarrow$ (5, 3)
- The **image** is twice as far from the centre

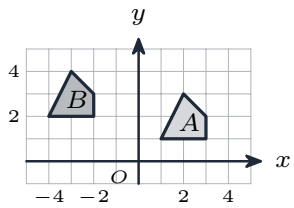
Exercise 2.1

2.1 Describe fully the single transformation that maps shape A onto shape B. [2]



Exercise 2.1

2.1 Describe fully the single transformation that maps shape A onto shape B. [2]

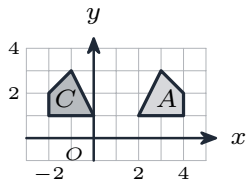


2.1

- translation
- by $\begin{pmatrix} -5 \\ 1 \end{pmatrix}$

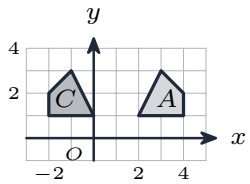
Exercise 2.2

2.2 Describe fully the single transformation that maps shape A onto shape C. [2]



Exercise 2.2

2.2 Describe fully the single transformation that maps shape A onto shape C. [2]

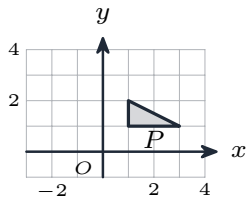


2.2

- reflection
- in the line $x = 1$

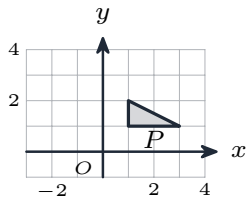
Exercise 3.1

3.1 Triangle P has corners $(1,\ 1)$, $(3,\ 1)$ and $(1,\ 2)$. It is rotated $90°$ anticlockwise about O. Write down the coordinates of the corners of the image. [3]



Exercise 3.1

3.1 Triangle P has corners $(1,\ 1)$, $(3,\ 1)$ and $(1,\ 2)$. It is rotated $90°$ anticlockwise about O. Write down the coordinates of the corners of the image. [3]



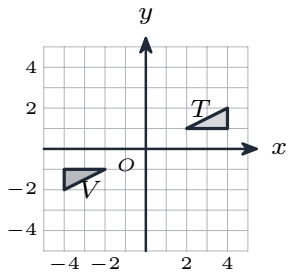
3.1

- $(-1,\ 1)$
- $(-1,\ 3)$
- $(-2,\ 1)$

Exercise 3.2 (a)

3.2 Triangle T has corners $(2,\ 1)$, $(4,\ 1)$ and $(4,\ 2)$. Triangle V is also shown.

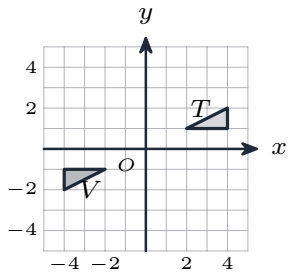
(a) T is reflected in the y-axis to give triangle U. Write down the coordinates of the corners of U. [2]



Exercise 3.2 (a)

3.2 Triangle T has corners $(2,\ 1)$, $(4,\ 1)$ and $(4,\ 2)$. Triangle V is also shown.

(a) T is reflected in the y-axis to give triangle U. Write down the coordinates of the corners of U. [2]



(a) $(-2,\ 1)$, $(-4,\ 1)$, $(-4,\ 2)$

Exercise 3.2 (b)

3.2 Triangle T has corners $(2,\ 1)$, $(4,\ 1)$ and $(4,\ 2)$. Triangle V is also shown.

(b) Describe fully the single transformation that maps T onto V. [3]

Exercise 3.2 (b)

3.2 Triangle T has corners $(2,\ 1)$, $(4,\ 1)$ and $(4,\ 2)$. Triangle V is also shown.

(b) Describe fully the single transformation that maps T onto V. [3]

(b) rotation; 180°; about $(0,\ 0)$

Exercise 3.2 (c)

3.2 Triangle T has corners $(2,\ 1)$, $(4,\ 1)$ and $(4,\ 2)$. Triangle V is also shown.

(c) T is reflected in the line $y = x$ to give triangle W. Find the corners of W. Is W the same as the image of T after a rotation of $90°$ clockwise about O? Show how you decide. [4]

Exercise 3.2 (c)

3.2 Triangle T has corners $(2,\ 1)$, $(4,\ 1)$ and $(4,\ 2)$. Triangle V is also shown.

(c) T is reflected in the line $y = x$ to give triangle W. Find the corners of W. Is W the same as the image of T after a rotation of $90°$ clockwise about O? Show how you decide. [4]

(c) W: $(1,\ 2)$, $(1,\ 4)$, $(2,\ 4)$; rotation gives $(1,\ -2)$, $(1,\ -4)$, $(2,\ -4)$; so they are **not** the same

Exercise 3.2 (d)

3.2 Triangle T has corners $(2,\ 1)$, $(4,\ 1)$ and $(4,\ 2)$. Triangle V is also shown.

(d) Describe fully the single transformation that maps U onto V. Find the column vector of the translation that maps V onto the triangle with corners $(3,\ 4)$, $(1,\ 4)$ and $(1,\ 3)$. [5]

Exercise 3.2 (d)

3.2 Triangle T has corners $(2,\ 1)$, $(4,\ 1)$ and $(4,\ 2)$. Triangle V is also shown.

(d) Describe fully the single transformation that maps U onto V. Find the column vector of the translation that maps V onto the triangle with corners $(3,\ 4)$, $(1,\ 4)$ and $(1,\ 3)$. [5]

(d) reflection in the x-axis, $y = 0$; $(-2,\ -1) \rightarrow (3,\ 4)$; $\begin{pmatrix} 5 \\ 5 \end{pmatrix}$