



- 1** The point (3, 2) is reflected in the y -axis.
Write down the coordinates of the image.

(1 mark)

y-axis: x changes sign

(-3, 2)

- 2** The point (4, 1) is reflected in the x -axis.
Write down the coordinates of the image.

(1 mark)

x-axis: y changes sign

(4, -1)

- 3** The point P has coordinates (3, 5).
 P is reflected in the y -axis to give the point P' .
Write down the coordinates of P' .

(1 mark)

Reflecting in the y -axis changes the sign of the x -coordinate and leaves the y -coordinate unchanged

So (3, 5) maps to (-3, 5)

(-3, 5)

- 4** The point (2, 5) is reflected in the line $y = 3$.
Write down the coordinates of the image.

(2 marks)

5 is 2 above $y = 3$

Image is 2 below: $3 - 2 = 1$

(2, 1)

- 5** A triangle has vertices at (1, 1), (4, 1) and (1, 3).
The triangle is reflected in the x -axis.
Write down the coordinates of the vertices of the image.

(2 marks)

*Reflecting in the x -axis changes the sign of each y -coordinate
(1, 1) maps to (1, -1); (4, 1) maps to (4, -1); (1, 3) maps to (1, -3)*

(1, -1), (4, -1), (1, -3)

- 6 Triangle ABC has vertices A(1, 1), B(4, 1) and C(1, 3).
The triangle is reflected in the line $x = 5$.
Write down the coordinates of the image of each vertex.

(2 marks)

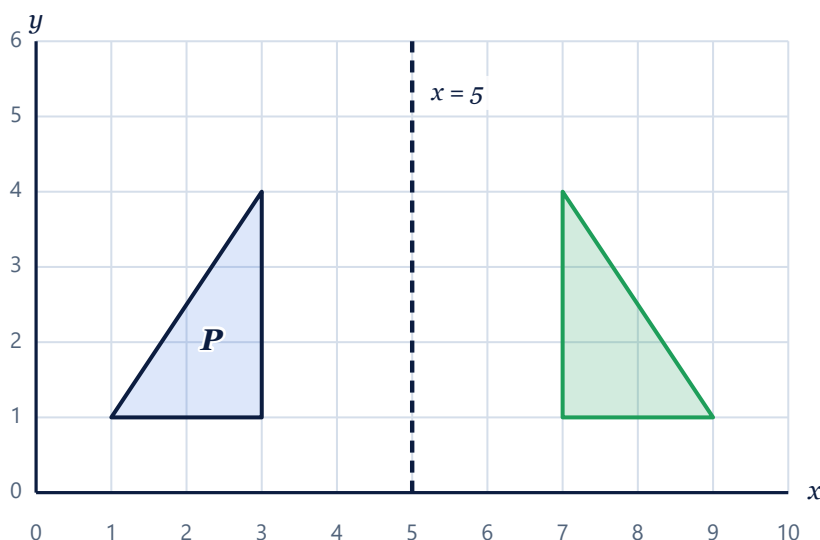
$$A: 5 - 1 = 4, \text{ so } 5 + 4 = 9$$

$$B: 5 - 4 = 1, \text{ so } 5 + 1 = 6$$

$$C: \text{ same distance as A, so } x = 9$$

$$A'(9, 1) \ B'(6, 1) \ C'(9, 3)$$

- 7 On the grid, reflect triangle P in the mirror line $x = 5$.



(2 marks)

Count the distance from each corner to the line $x = 5$

$$(1, 1) \text{ is } 4 \text{ away, image } (9, 1)$$

$$(3, 1) \text{ is } 2 \text{ away, image } (7, 1)$$

$$(3, 4) \text{ is } 2 \text{ away, image } (7, 4)$$

$$\text{Triangle at } (9, 1), (7, 1), (7, 4)$$

- 8 Reflect each point in the line $y = x$.

a. (3, 2)

b. (-1, 4)

(2 marks)

$y = x$: swap the coordinates

a)

$$(2, 3)$$

b)

$$(4, -1)$$

- 9 A triangle has vertices at (1, 2), (3, 2) and (3, 5).

The triangle is reflected in the line $x = 4$.

Write down the coordinates of the vertices of the image.

(2 marks)

Reflecting in the line $x = 4$ maps (x, y) to $(8 - x, y)$, because the image is the same distance from the line on the other side

(1, 2) is 3 left of the line, so its image is 3 right of the line: (7, 2)

(3, 2) maps to (5, 2) and (3, 5) maps to (5, 5)

$(7, 2), (5, 2), (5, 5)$

- 10 The point P(2, 3) is reflected to the point P'(2, -5).

Write down the equation of the mirror line.

(2 marks)

x unchanged - horizontal line

Halfway: $(3 + -5) \div 2$

$= -2 \div 2 = -1$

$y = -1$

- 11 Triangle P has vertices at (2, 1), (5, 1) and (5, 3).

Triangle Q has vertices at (2, -1), (5, -1) and (5, -3).

Describe fully the single transformation that maps triangle P onto triangle Q.

(2 marks)

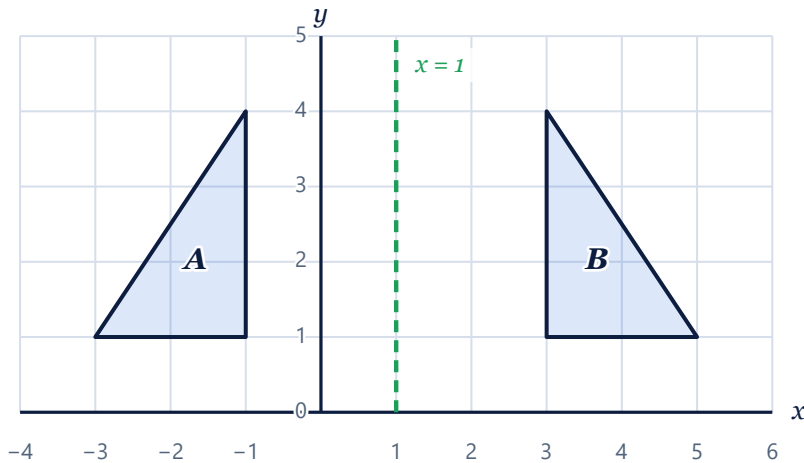
Each vertex of Q has the same x -coordinate as the matching vertex of P, with the y -coordinate's sign changed

This is a reflection in the x -axis (the line $y = 0$)

Reflection in the x -axis.

- 12 Triangle B is the image of triangle A after a single transformation.

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



(2 marks)

Same size, flipped over: a reflection

Find the middle of two matching points

$$(-1, 1) \text{ and } (3, 1): \text{middle is } x = \frac{2}{2} = 1$$

Reflection in the line $x = 1$

- 13 Sam says the image of the point $(2, 4)$ after a reflection in the line $y = x$ is $(-4, -2)$.

Sam is wrong. Write down the correct image and say which mirror line gives Sam's answer.

(3 marks)

$y = x$: swap coordinates

$(4, 2)$

Sam swapped and changed both signs

That is $y = -x$

- 14 Triangle A has vertices at $(2, 1)$, $(5, 1)$ and $(2, 3)$.

Triangle A is reflected in the y -axis to give triangle B .

- Write down the coordinates of the vertices of triangle B .
- Triangle C has vertices at $(-1, -2)$, $(-4, -2)$ and $(-1, 0)$. Find the vector of the translation that maps triangle B onto triangle C .

(3 marks)

Reflecting in the y -axis changes the sign of each x -coordinate: $(2, 1)$ maps to $(-2, 1)$, $(5, 1)$ maps to $(-5, 1)$, $(2, 3)$ maps to $(-2, 3)$

Compare matching vertices of B and C : $(-2, 1)$ maps to $(-1, -2)$, a change of $+1$ in x and -3 in y

Check with $(-5, 1)$ to $(-4, -2)$: $+1$ and -3 . Check with $(-2, 3)$ to $(-1, 0)$: $+1$ and -3

The translation vector is $(1, -3)$

15 The point $A(1, 2)$ is reflected in the line $x = 3$ to give A' .

A' is then reflected in the line $x = 6$ to give A'' .

- Write down the coordinates of A'' .
- Describe the single transformation that maps A to A'' .

(3 marks)

a)

$$A' = (5, 2)$$

$$A'' = (7, 2)$$

$$(7, 2)$$

b)

$(1, 2)$ to $(7, 2)$: 6 right

Translation by $(6, 0)$

16 Triangle T has vertices at $(1, 1)$, $(3, 1)$ and $(1, 2)$.

Triangle T is reflected in the y -axis to give triangle T_1 .

Triangle T_1 is then reflected in the x -axis to give triangle T_2 .

Describe fully the single transformation that maps triangle T onto triangle T_2 .

(3 marks)

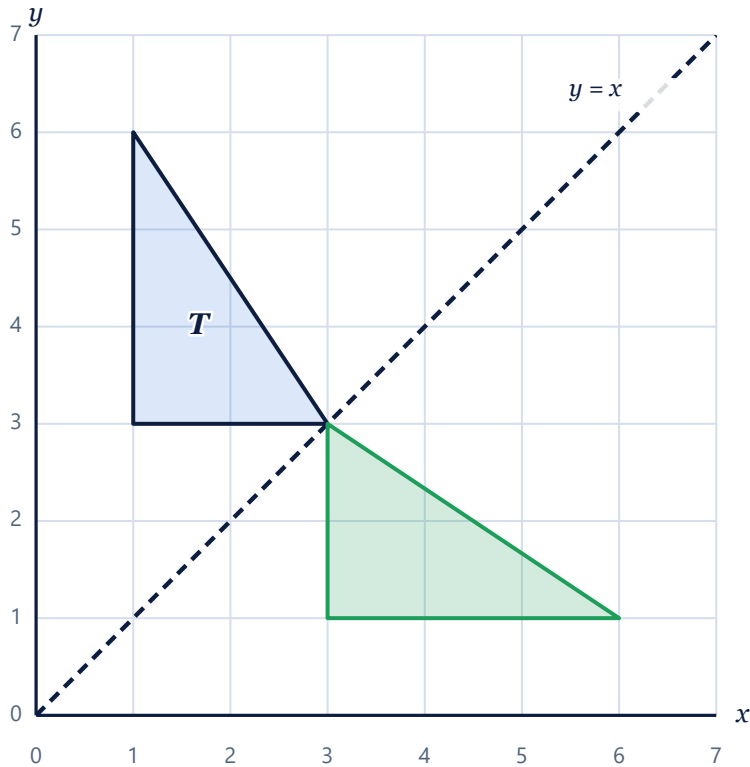
Reflecting in the y -axis maps (x, y) to $(-x, y)$, so T_1 has vertices $(-1, 1)$, $(-3, 1)$, $(-1, 2)$

Reflecting T_1 in the x -axis maps (x, y) to $(x, -y)$, so T_2 has vertices $(-1, -1)$, $(-3, -1)$, $(-1, -2)$

Overall (x, y) has mapped to $(-x, -y)$, which is a rotation of 180° about the origin

So the single transformation is a rotation of 180° , centre $(0, 0)$

- 17 On the grid, reflect triangle T in the line $y = x$.



(2 marks)

Reflection in $y = x$ swaps x and y

$$(1, 3) \rightarrow (3, 1)$$

$$(1, 6) \rightarrow (6, 1)$$

$$(3, 3) \rightarrow (3, 3), \text{ on the mirror line}$$

Triangle at $(3, 1), (6, 1), (3, 3)$

- 18 The point $(3, 2)$ is reflected in the line $y = -x$.

The image is then reflected in the line $y = x$.

- Write down the coordinates of the final image.
- Describe the single transformation that maps $(3, 2)$ to the final image.

(3 marks)

a)

$y = -x$: swap and change both signs

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

$y = x$: swap

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

$(-3, -2)$

b)

Rotation 180° about $(0, 0)$