



- 1** The point A is at $(2, 5)$. It is translated by the vector $(3, -2)$, that is 3 to the right and 2 down.

Write down the coordinates of the image of A .

(1 mark)

$$x: 2 + 3 = 5$$

$$y: 5 - 2 = 3$$

$$(5, 3)$$

- 2** The point P is at $(-1, 4)$. It is translated by the vector $(-3, -5)$, that is 3 to the left and 5 down.

Write down the coordinates of the image of P .

(1 mark)

$$x: -1 - 3 = -4$$

$$y: 4 - 5 = -1$$

$$(-4, -1)$$

- 3** Rhys says that a translation by the vector $(3, -2)$ moves a shape 3 to the left and 2 up.

Rhys is wrong. Describe the movement correctly.

(2 marks)

top number 3: 3 to the right

bottom number -2: 2 down

3 right, 2 down

- 4** A point A at $(3, 2)$ is translated to A' at $(8, -1)$.

Write down the vector of the translation, in the form (a, b) .

(2 marks)

$$x: 8 - 3 = 5$$

$$y: -1 - 2 = -3$$

$$(5, -3)$$

- 5 A triangle has vertices at $(2, 3)$, $(5, 3)$ and $(2, 7)$.

The triangle is translated by the vector $(4, -2)$, that is 4 units to the right and 2 units down.

Write down the coordinates of the vertices of the image.

(2 marks)

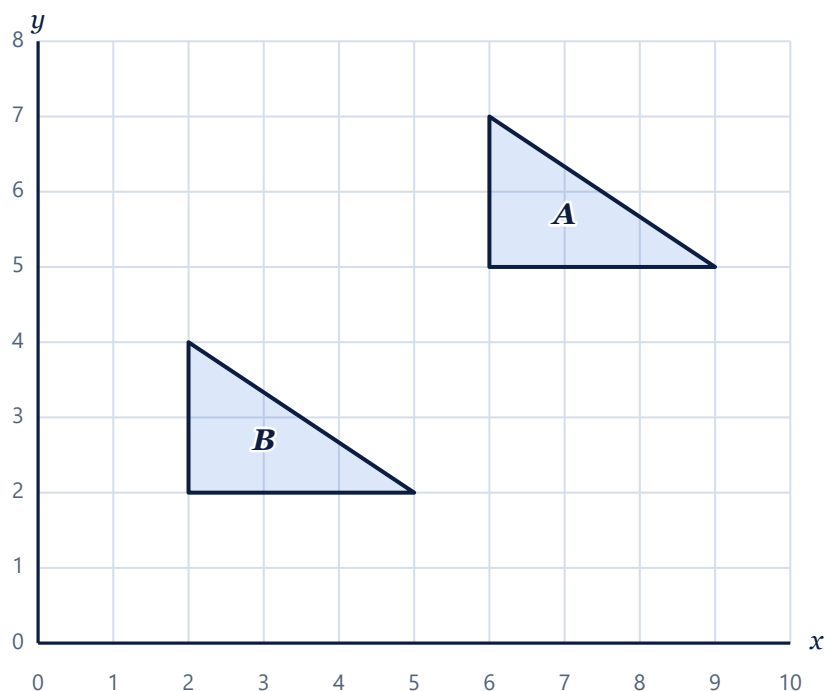
Add 4 to each x -coordinate and subtract 2 from each y -coordinate

$(2, 3)$ maps to $(6, 1)$; $(5, 3)$ maps to $(9, 1)$; $(2, 7)$ maps to $(6, 5)$

$(6, 1), (9, 1), (6, 5)$

- 6 Triangle B is a translation of triangle A .

Write down the vector of the translation that maps triangle A onto triangle B .



(2 marks)

Follow the same corner from A to B

$(6, 5) \rightarrow (2, 2)$

4 left: -4

3 down: -3

Vector $(-4, -3)$

7 Triangle P has vertices at $(1, 1)$, $(4, 1)$ and $(1, 3)$. It is translated by the vector $(-2, 3)$ to give triangle Q .

a. Write down the coordinates of the vertices of triangle Q .

b. Write down the vector that translates triangle Q back to triangle P .

(3 marks)

a)

$$x - 2, y + 3$$

$$(1, 1) \rightarrow (-1, 4)$$

$$(4, 1) \rightarrow (2, 4)$$

$$(1, 3) \rightarrow (-1, 6)$$

b)

go back: reverse the signs

$$(2, -3)$$

8 Square $ABCD$ has vertices $A(0, 0)$, $B(2, 0)$, $C(2, 2)$ and $D(0, 2)$. The square is translated so that the image of A is at $(-3, 4)$.

a. Write down the vector of the translation.

b. Work out the coordinates of the image of C .

(3 marks)

a)

$$(0, 0) \rightarrow (-3, 4)$$

$$(-3, 4)$$

b)

$$x: 2 - 3 = -1$$

$$y: 2 + 4 = 6$$

$$(-1, 6)$$

9 Triangle A has vertices at $(1, 1)$, $(3, 1)$ and $(1, 4)$.

Triangle B has vertices at $(5, -1)$, $(7, -1)$ and $(5, 2)$.

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

(2 marks)

Compare matching vertices

$(1, 1)$ maps to $(5, -1)$. The x -change is $5 - 1 = +4$ and the y -change is $-1 - 1 = -2$

Check with $(3, 1)$ to $(7, -1)$: $+4$ and -2 . Check with $(1, 4)$ to $(5, 2)$: $+4$ and -2 .

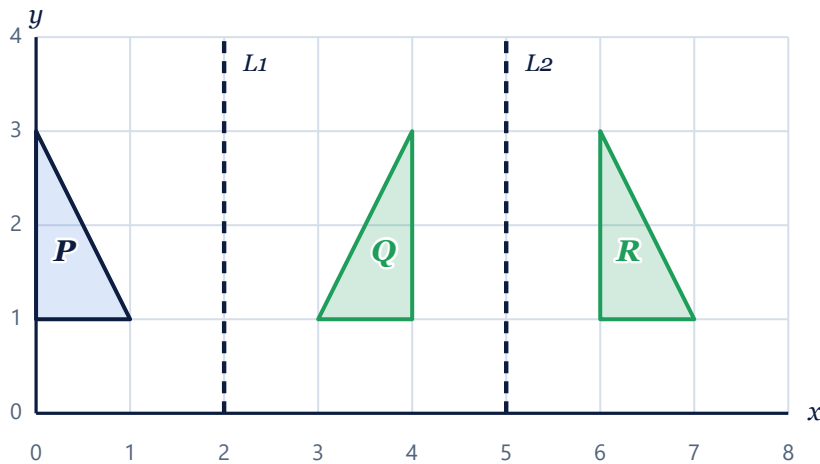
Consistent

The single transformation is a translation by the vector $(4, -2)$

- 10 Triangle P is reflected in the line L_1 ($x = 2$) to give triangle Q .

Triangle Q is then reflected in the line L_2 ($x = 5$) to give triangle R .

- On the grid, draw triangle Q and triangle R .
- Describe the single transformation that maps triangle P onto triangle R .



(3 marks)

a) Reflect P in $x = 2$ to get Q

$$(0, 1) \rightarrow (4, 1) \quad (1, 1) \rightarrow (3, 1) \quad (0, 3) \rightarrow (4, 3)$$

Reflect Q in $x = 5$ to get R

$$(4, 1) \rightarrow (6, 1) \quad (3, 1) \rightarrow (7, 1) \quad (4, 3) \rightarrow (6, 3)$$

b) Compare P and R : same way round, 6 to the right

Translation by vector $(6, 0)$

- 11 A shape is translated by the vector $(2, 3)$ and then by the vector $(-5, 1)$.

- Write down the single vector that gives the same translation.
- Write down the vector that moves the shape back to its starting position.

(3 marks)

a)

$$\text{top: } 2 + -5 = -3$$

$$\text{bottom: } 3 + 1 = 4$$

$(-3, 4)$

b)

reverse both signs

$(3, -4)$

12

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

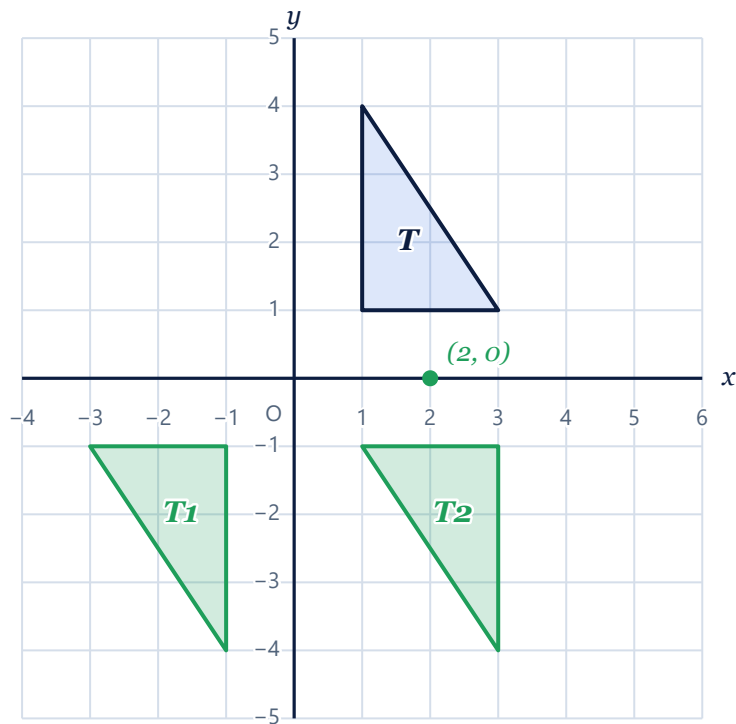
The translation vector is $(1, -3)$

13

Triangle T is rotated 180° about the origin O to give triangle T_1 .

Triangle T_1 is then translated by the vector $(4, 0)$ to give triangle T_2 .

- On the grid, draw triangle T_1 and triangle T_2 .
- Describe fully the single transformation that maps triangle T onto triangle T_2 .



(4 marks)

a) Rotate 180° about O : $(x, y) \rightarrow (-x, -y)$

T_1 : $(-1, -1)$ $(-3, -1)$ $(-1, -4)$

Translate $(4, 0)$: add 4 to each x

T_2 : $(3, -1)$ $(1, -1)$ $(3, -4)$

b) T_2 is upside down, so a 180° rotation

Centre is the middle of matching points

$(1, 1)$ and $(3, -1)$: middle is $(2, 0)$

Rotation 180° about $(2, 0)$