

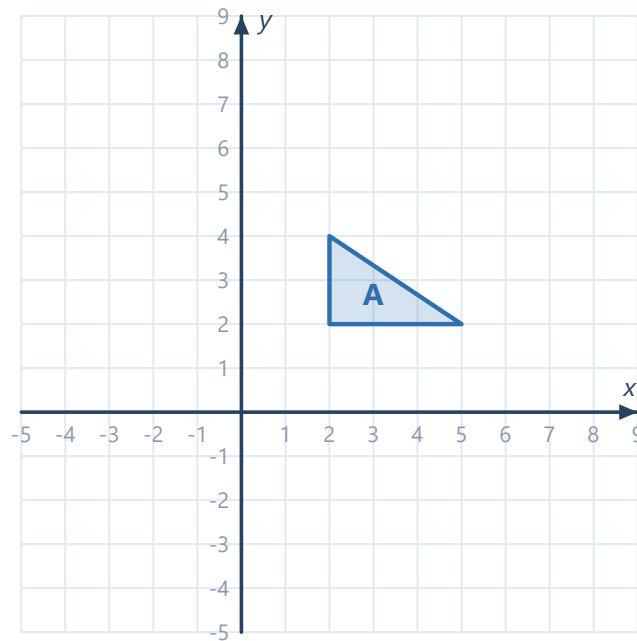
GCSE Maths: Translation (Higher): answers

GCSE Maths - Transformations and Similarity - Higher - Lesson 21.3

Answers. Final answers to the worksheet questions. Full step-by-step solutions for every question are free at websink.site/gcse/maths/ch21-transformations-congruence-similarity/higher/translation/

Exercise 21C Translation Non-calculator

- 1 Shape A has vertices at (2, 2), (5, 2), (2, 4). Translate A by each vector and write down the vertices of the image.



(a) $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$

Answer: B: (5, 4), (8, 4), (5, 6)

(b) $\begin{pmatrix} -4 \\ 0 \end{pmatrix}$

Answer: B: (-2, 2), (1, 2), (-2, 4)

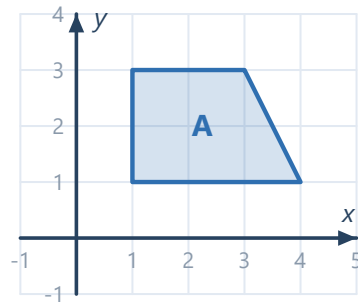
(c) $\begin{pmatrix} 0 \\ -5 \end{pmatrix}$

Answer: B: (2, -3), (5, -3), (2, -1)

(d) $\begin{pmatrix} -3 \\ 4 \end{pmatrix}$

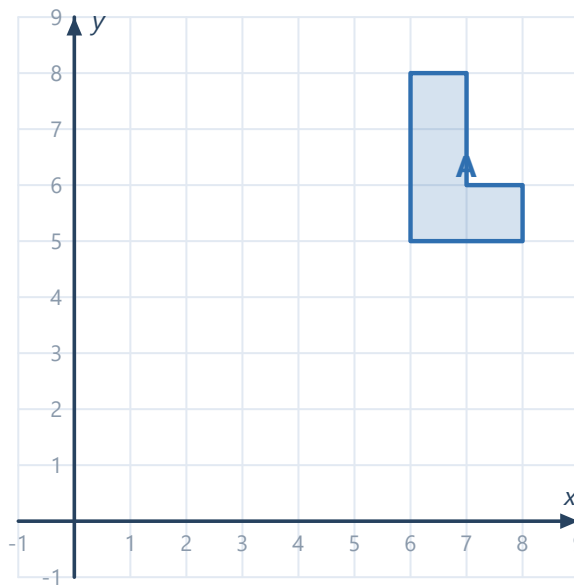
Answer: B: (-1, 6), (2, 6), (-1, 8)

- 2 Translate shape A by the vector $\begin{pmatrix} 3 \\ -4 \end{pmatrix}$. Write down the coordinates of the vertices of the image B. A has vertices at (1, 1), (4, 1), (3, 3), (1, 3).



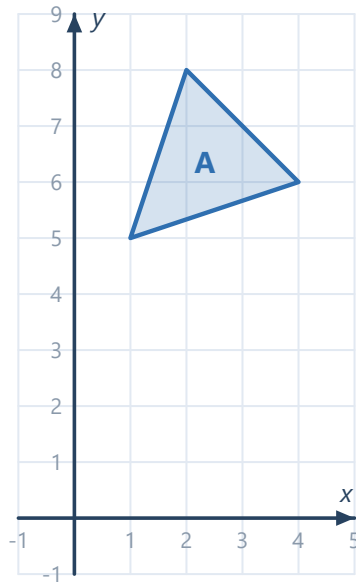
Answer: B: (4, -3), (7, -3), (6, -1), (4, -1)

- 3 Translate shape A by the vector $\begin{pmatrix} -4 \\ -5 \end{pmatrix}$. Write down the coordinates of the vertices of the image B. A has vertices at (6, 5), (8, 5), (8, 6), (7, 6), (7, 8), (6, 8).



Answer: B: (2, 0), (4, 0), (4, 1), (3, 1), (3, 3), (2, 3)

- 4 Translate shape A by the vector $\begin{pmatrix} 6 \\ -5 \end{pmatrix}$. Write down the coordinates of the vertices of the image B. A has vertices at (1, 5), (4, 6), (2, 8).



Answer: B: (7, 0), (10, 1), (8, 3)

5 Write down the image of the point (2, -1) after a translation by:

(a) $\begin{pmatrix} 3 \\ 4 \end{pmatrix}$

Answer: (5, 3)

(b) $\begin{pmatrix} -5 \\ 2 \end{pmatrix}$

Answer: (-3, 1)

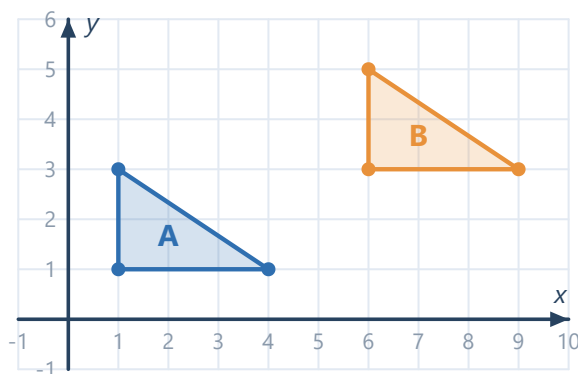
(c) $\begin{pmatrix} 0 \\ -6 \end{pmatrix}$

Answer: (2, -7)

(d) $\begin{pmatrix} -2 \\ -3 \end{pmatrix}$

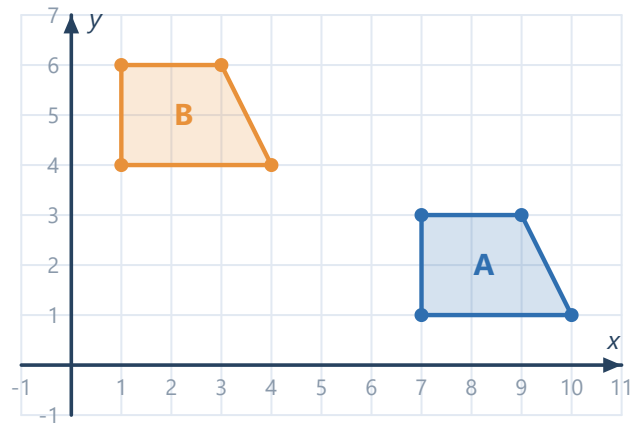
Answer: (0, -4)

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



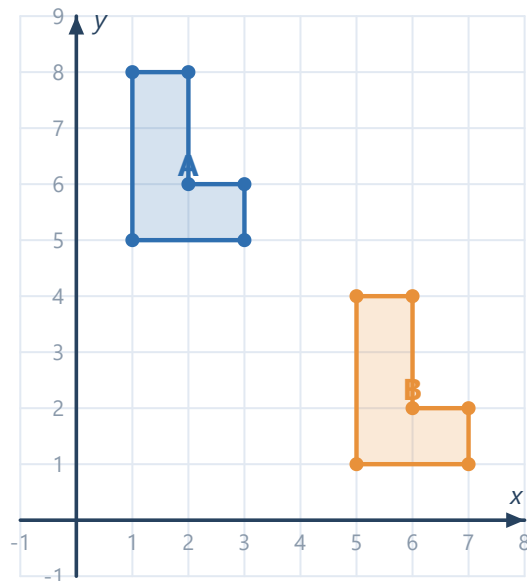
Answer: Translation by $\begin{pmatrix} 5 \\ 2 \end{pmatrix}$

- 7 Describe fully the single transformation that maps shape A onto shape B.



Answer: Translation by $\begin{pmatrix} -6 \\ 3 \end{pmatrix}$

- 8 Describe fully the single transformation that maps shape A onto shape B.



Answer: Translation by $\begin{pmatrix} 4 \\ -4 \end{pmatrix}$

- 9 Write down the column vector of the translation that takes each point to its image.

- (a) P(1, 2) to P'(4, 6)

Answer: $\begin{pmatrix} 3 \\ 4 \end{pmatrix}$

- (b) Q(5, 3) to Q'(2, 3)

Answer: $\begin{pmatrix} -3 \\ 0 \end{pmatrix}$

- (c) R(-2, 4) to R'(1, -1)

Answer: $\begin{pmatrix} 3 \\ -5 \end{pmatrix}$

- 10** Shape A is translated by $\begin{pmatrix} 4 \\ -3 \end{pmatrix}$ to give shape B. What is the column vector of the translation that takes B back to A?

Answer: $\begin{pmatrix} -4 \\ 3 \end{pmatrix}$

- 11** Tom says: "The vector $\begin{pmatrix} 2 \\ 3 \end{pmatrix}$ moves a shape 3 to the right and 2 up." Explain what is wrong with Tom's answer.

Answer: The top number is across: 2 right and 3 up

- 12** A robot on a grid starts at (1, 1). It moves by $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$ and then by $\begin{pmatrix} -5 \\ 1 \end{pmatrix}$. Work out where the robot finishes, and the single translation vector from the start to the finish.

Answer: (-1, 4); $\begin{pmatrix} -2 \\ 3 \end{pmatrix}$

- 13** A translation maps the point (2, 1) onto the point (7, -3). Work out the image of the point (-1, 4) under the same translation.

Answer: (4, 0)

- 14** Show that a translation by $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$ followed by a translation by $\begin{pmatrix} -1 \\ 4 \end{pmatrix}$ gives the same final position as the translations done in the opposite order. Start at (0, 0).

Answer: Both finish at (2, 6)

- 15 Challenge.** Is it possible for a translation to map a shape onto itself? Give a reason.

Answer: Only if the vector is $\begin{pmatrix} 0 \\ 0 \end{pmatrix}$, which means no move at all