GCSE Maths – Geometry and Measures

Translations as 2D Vectors

Notes

WORKSHEET

Translations

Translations are a type of transformation where the shape moves **parallel** to the **x** and **y axis**. Every **vertex** of the shape is translated in the **same direction** by the same **distance**.

Describing translations

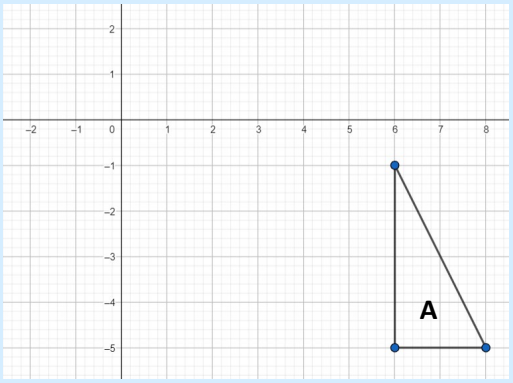
Column vectors can be used to describe the movement of a shape. A column vector is given in the form

$$\begin{pmatrix} x \\ y \end{pmatrix}$$

where x describes the **horizontal** movement and y describes the **vertical** movement.

- When x is positive, the shape moves x units in the positive x direction (to the right).
- When x is negative, the point moves x units in the negative x direction (to the left).
- When y is positive, the point moves y units in the positive y direction (upwards).
- When y is negative, the point moves y units in the negative y direction (downwards).
- If 0 is in place of x or y, the shape **does not** move parallel to the horizontal or vertical axis, respectively.

Example: Translate shape A by the vector $\begin{pmatrix} -3 \\ 5 \end{pmatrix}$ and label the shape A'.

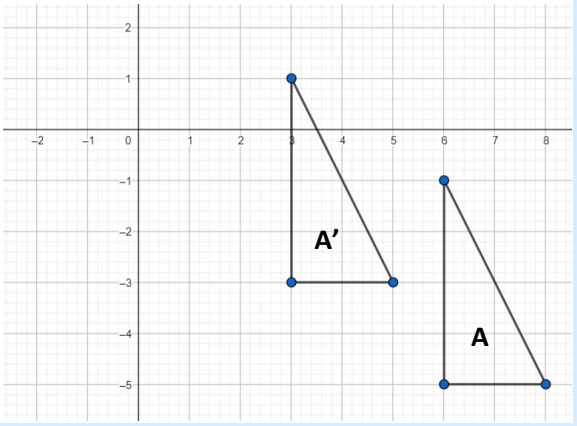


The given vector is $\begin{pmatrix} -3 \\ 2 \end{pmatrix}$*:*

- *The* -3 *represents the* x *value. Since* $-3 < 0$*, this means the shape moves* 3 *units to the left in the negative* x *direction.*
- *The* 2 *represents the* y *value. Since* $2 > 0$*, this means the shape moves* 2 *units upwards in the positive* y *direction.*

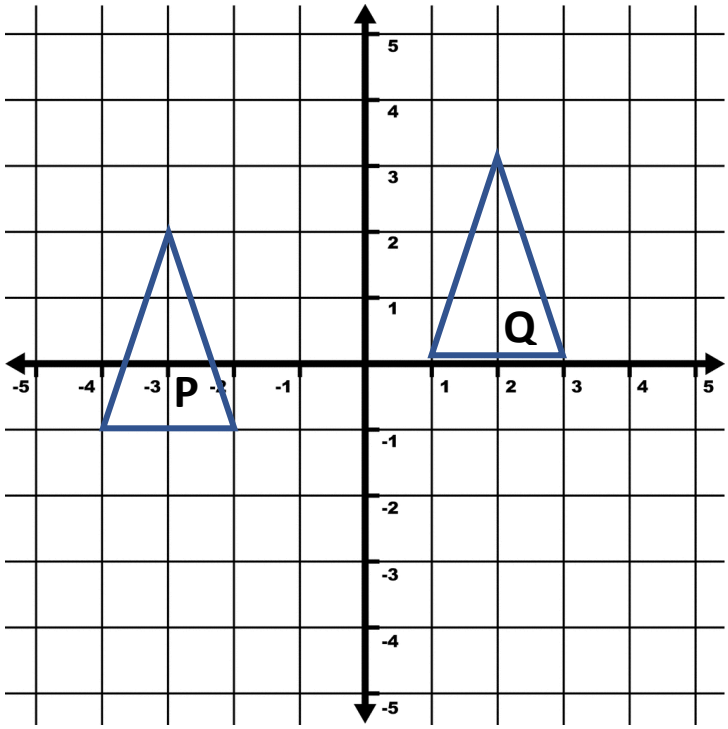
Move each vertex 3 *units left and* 2 *units up:*

$(6, -1)$ *translates to* $(6-3, -1+2) = (3,1)$
$(6, -5)$ *translates to* $(6-3, -5+2) = (3, -3)$
$(8, -5)$ *translates to* $(8-3, -5+2) = (5, -3)$

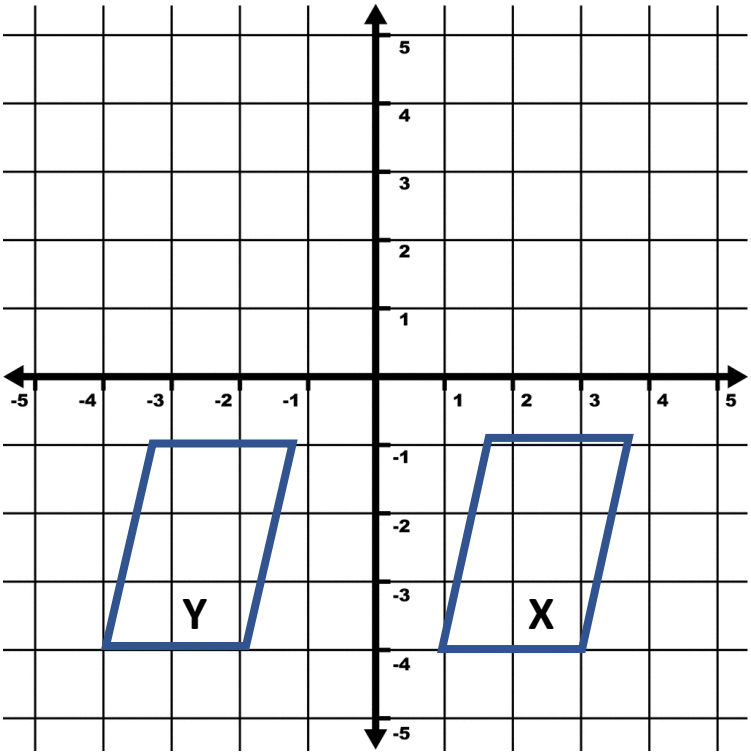


Translations as 2D Vectors – Practice Questions

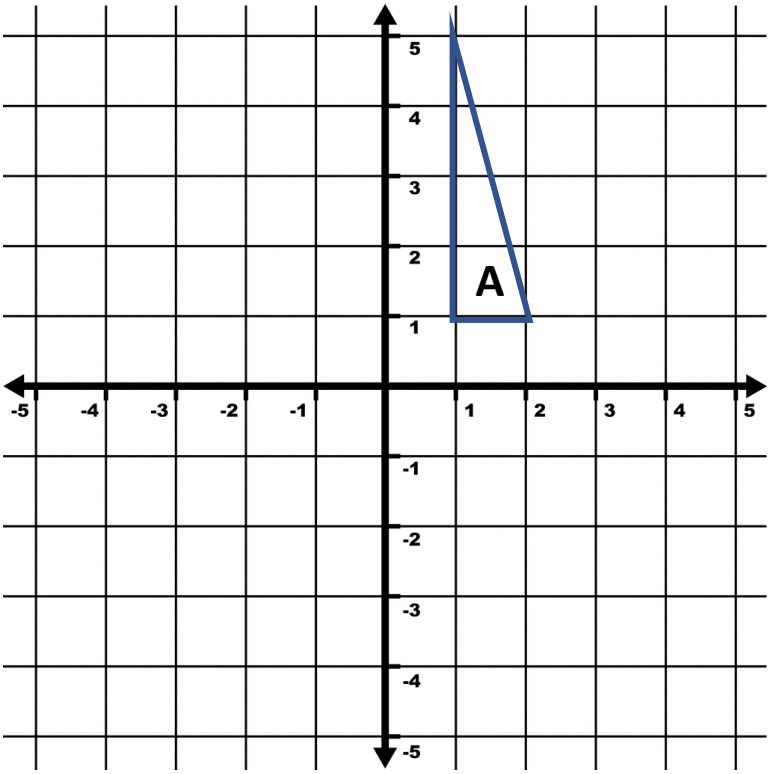
1. Describe the translation of shape P to shape Q as a column vector.



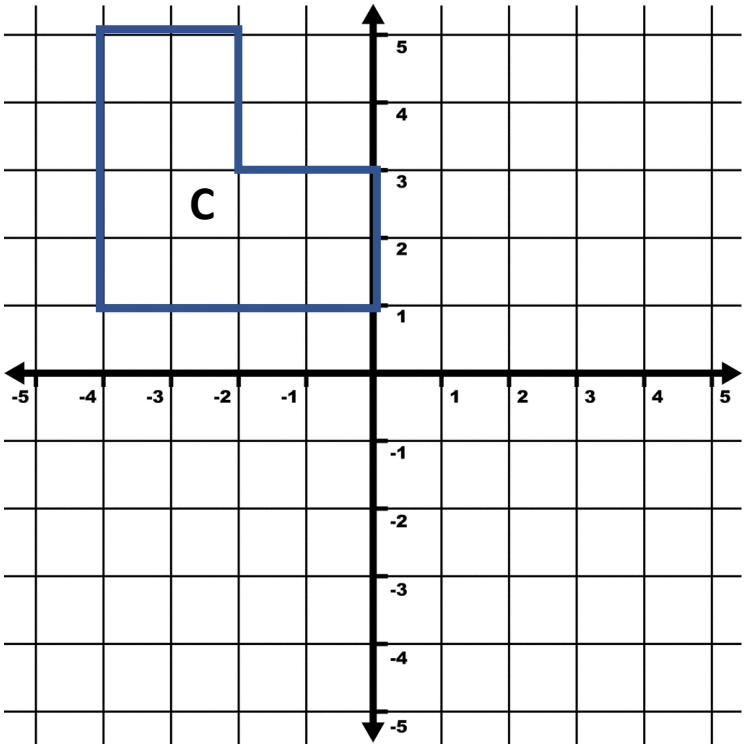
2. Describe the translation of shape X to shape Y as a column vector.



3. Translate shape A by the vector $\begin{pmatrix} -4 \\ -3 \end{pmatrix}$ and label the new shape B.



4. Translate shape C by the column vector $\begin{pmatrix} 0 \\ -2 \end{pmatrix}$ and label the new shape D.



Worked solutions for the practice questions can be found amongst the worked solutions for the corresponding worksheet file.