Planner

Reflections, rotations and translations

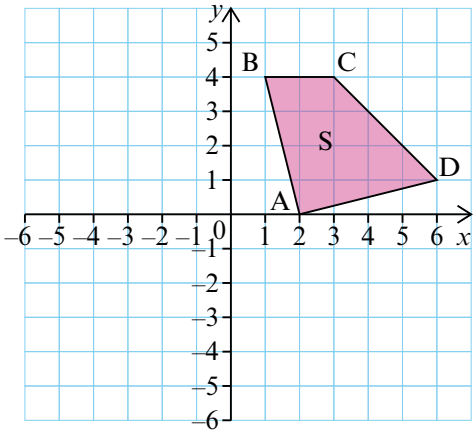
- Carrying out reflections, rotations and translations
- Carrying out combinations of transformations

Keywords

You should know

explanation 1a | explanation 1b | explanation 1c

1 The diagram shows the quadrilateral S.



a Copy the diagram. Write the coordinates of the vertices A, B, C and D.

b Which point stays in the same place when the shape S is reflected in the x-axis?

c Reflect the shape S in the x-axis and label the image T.

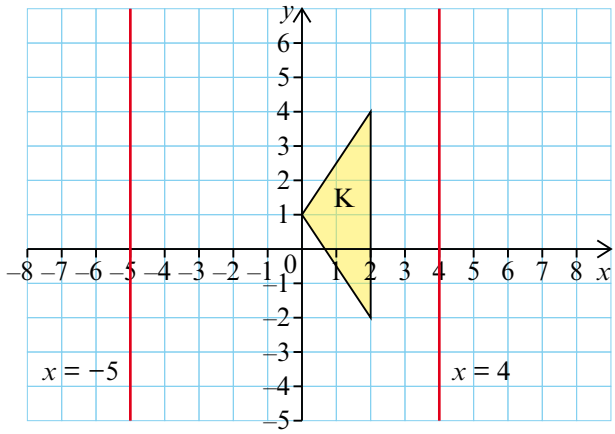
d Reflect T in the y-axis. Label the image U.

e Reflect U in the x-axis. Label the image V.

f What single transformation will map S to V?

g Jo reflects S in a line and the points B and C do not change. Describe the reflection in words.

2 The diagram shows the triangle K and the lines $x = 4$ and $x = -5$.



a Copy the diagram. Reflect K in the line $x = 4$ and label the image L.

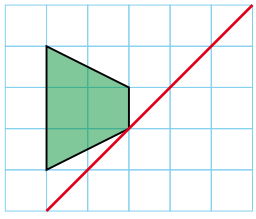
b Reflect L in the y-axis and label its image M.

c Reflect M in the line $x = -5$ and label its image N.

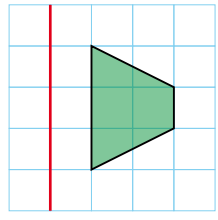
d What single transformation will map K to N?

3 Copy each green shape separately onto squared paper and reflect it in the red mirror line. Shade the image grey.

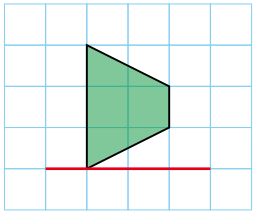
a



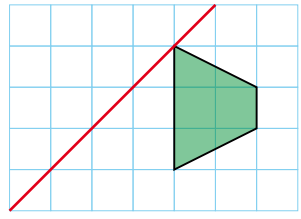
b



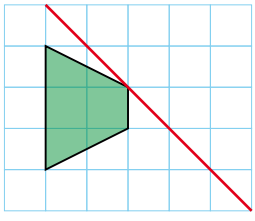
c



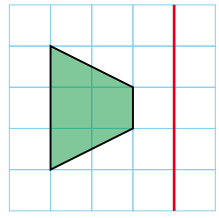
d



e



f



4 Barry is reflecting the triangle T in the line $y = x$. He labels the image of vertex A as A' and the image of B as B'. His teacher tells Barry to check his work.

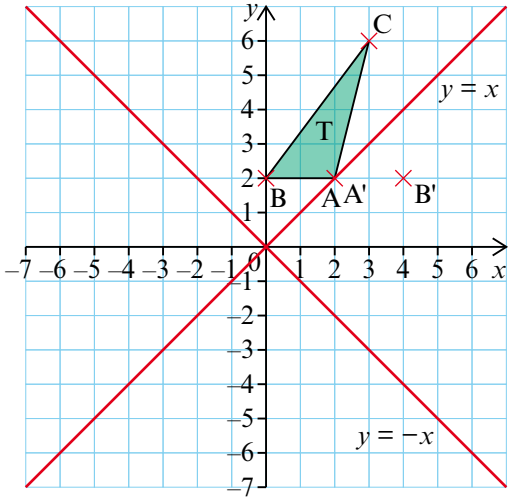
a What mistake has Barry made?

b Copy the diagram. Reflect triangle T in the line $y = x$. Label the image S.

c Reflect S in the line $y = -x$ and label the image R.

d Reflect R in the y-axis and label the image Q.

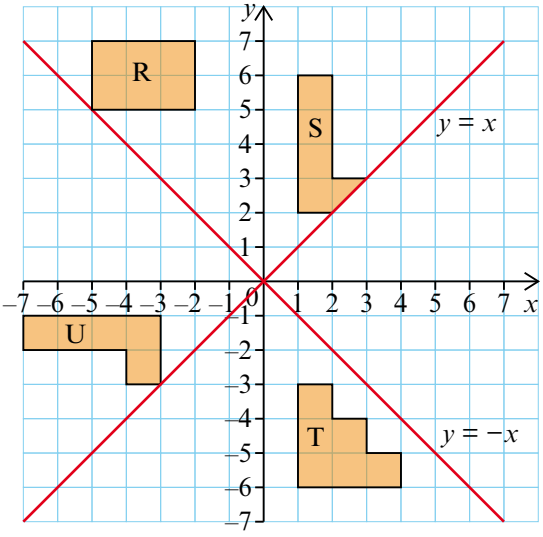
e What transformation maps T to Q?



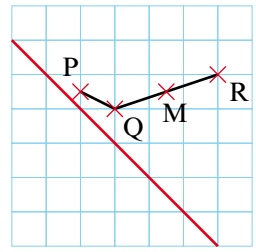
5 The diagram shows four shapes and the lines $y = x$ and $y = -x$.

a Copy the diagram. Reflect shapes S and U in the line $y = x$. Label the images S' and U'.

b Reflect shapes R and T in the line $y = -x$. Label the images R' and T'.



6 The diagram shows four points joined by lines, and a mirror line.



a Copy the diagram.

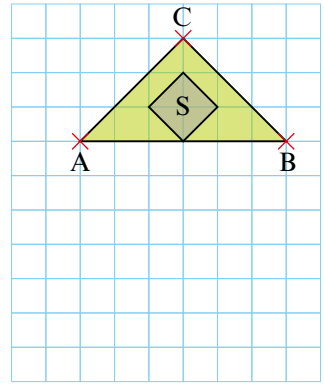
b Reflect P, Q, R and M in the red line and label their images P', Q', R' and M'.

c Is M' the midpoint of R' and Q'?

d Name two things that do not change under a reflection.

explanation 2 — online

7 The diagram shows a triangle and a square.



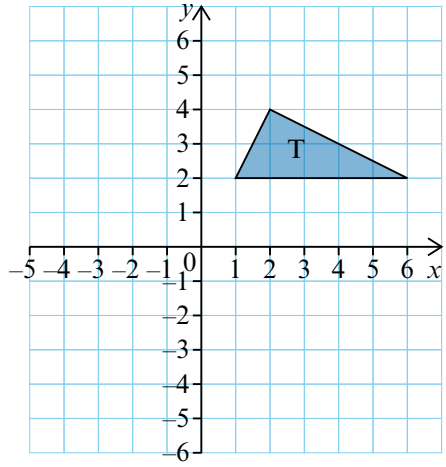
a Copy the diagram.

b Rotate the square 90° anticlockwise about the point A.

Label the image of the square S'.

c Rotate the triangle ABC through 90° clockwise about the point A and label the vertices A', B' and C'.

8 The diagram shows the triangle T.



a Copy the diagram and mark the origin with a dot.

b Rotate the triangle T through 90° anticlockwise about the origin.

Label the image S.

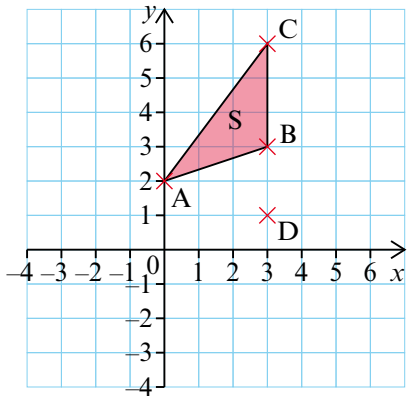
c Reflect the triangle S in the x-axis and label this R.

d Reflect R in the y-axis and label this Q.

e Copy and complete this sentence.

The single transformation that maps the triangle T to triangle Q is a rotation of _____ about _____

9 The diagram shows the triangle S.



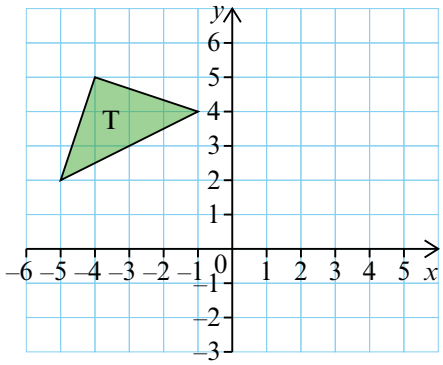
a Rotate the triangle S through 90° anticlockwise about the point A.
Label the image T.

b Rotate the triangle S through 180° about the point D.
Label this image U.

c Rotate the triangle S through 180° about the point A. Label this image P.

d What single transformation will map triangle P to triangle T?

10 The diagram shows the triangle T.



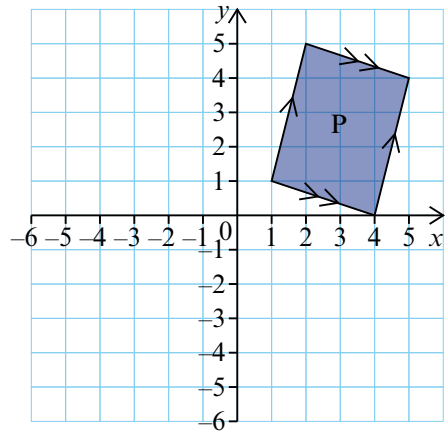
a Copy the diagram. Label the point (0, 2) as A.

b Rotate the triangle T through 180° about the point A.
Label the image U.

c Reflect the triangle U in the *y*-axis.
Label the image V.

d What single transformation maps triangle T to V?

11 The diagram shows a parallelogram P.



a Write the properties of a parallelogram.

b Rotate the parallelogram through 90° clockwise about the origin.

Label this Q.

c Reflect Q in the y-axis and label this R.

d Reflect R in the x-axis and label this S.

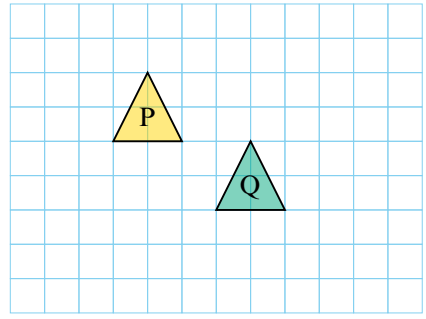
e What single transformation will map P to S?

f Name two things that do not change when a shape is rotated.

explanation 3a explanation 3b explanation 3c

12 The diagram shows a triangle P and its image Q after the translation $\begin{pmatrix} 3 \\ -2 \end{pmatrix}$.

Copy the diagram and draw the images of triangle P under these translations.



a $\begin{pmatrix} 0 \\ -3 \end{pmatrix}$ **b** $\begin{pmatrix} -3 \\ 1 \end{pmatrix}$

c $\begin{pmatrix} 7 \\ 0 \end{pmatrix}$ **d** $\begin{pmatrix} 4 \\ 2 \end{pmatrix}$

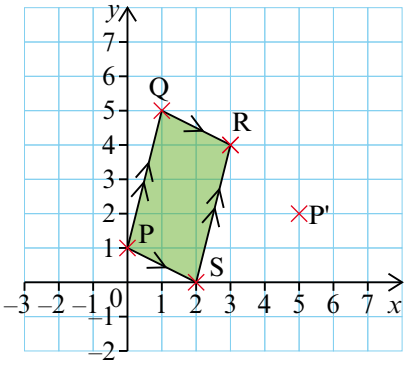
13 These column vectors describe translations.

i $\begin{pmatrix} 0 \\ -2 \end{pmatrix}$ **ii** $\begin{pmatrix} 4 \\ 1 \end{pmatrix}$ **iii** $\begin{pmatrix} -5 \\ 0 \end{pmatrix}$ **iv** $\begin{pmatrix} -1 \\ 4 \end{pmatrix}$ **v** $\begin{pmatrix} -3 \\ -5 \end{pmatrix}$

a Kersti says the first translation means move all points 2 squares down. Is she correct?

b Explain the other translations.

14 The diagram shows a parallelogram PRQS and the image of P is labelled P'.



a Which translation maps P to P'?

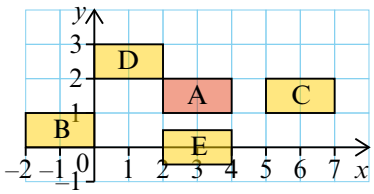
$\begin{pmatrix}1\\5\end{pmatrix}$ $\begin{pmatrix}5\\2\end{pmatrix}$ $\begin{pmatrix}-5\\0\end{pmatrix}$ $\begin{pmatrix}5\\1\end{pmatrix}$

b Copy the diagram and complete the image of the parallelogram PQRS under the translation.

15 Copy and complete this sentence.

Reflections, rotations and translations map shapes to _____ images.

16 Write the translation that maps shape A to the shapes in the diagram.



a Shape B **b** Shape C

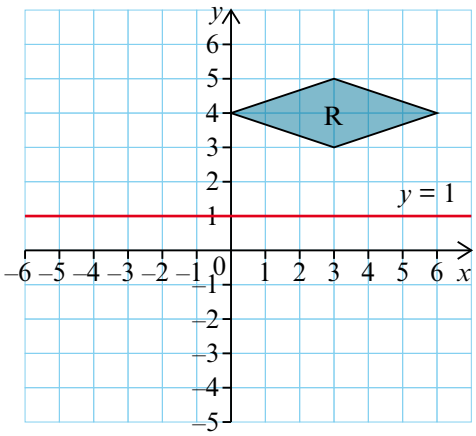
c Shape D **d** Shape E

17 The diagram shows a rhombus R and the line $y = 1$.

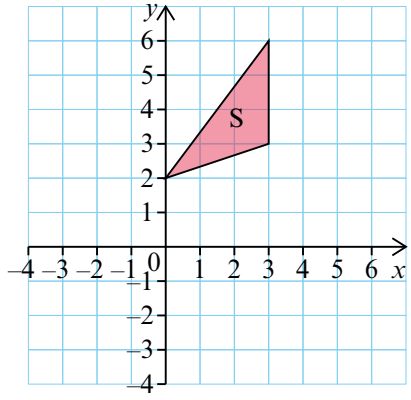
a Copy the diagram and draw the image of R under a translation of $\begin{pmatrix}-5\\1\end{pmatrix}$. Label this R'.

b Reflect R' in the line $y = 1$. Label this image R".

c What translation will map R" to R?



18 The diagram shows the triangle S.



a Draw the triangle S.

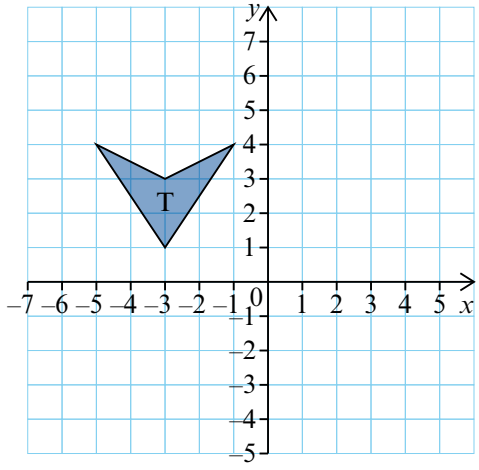
b Rotate S through 90° clockwise about the point (0, 6) and label this image V.

c Rotate S through 90° clockwise about the point (0, 0) and label this image W.

d What single transformation will map triangle V to triangle W?

explanation 4 online

19 The diagram shows an arrowhead labelled T.



a Find the image of T after a rotation of 90° anticlockwise, centre the origin, followed by a translation $\begin{pmatrix} 5 \\ 3 \end{pmatrix}$. Label the final image T'.

b Jordan thinks that if you did the translation first, and then the rotation, the final result would be the same.

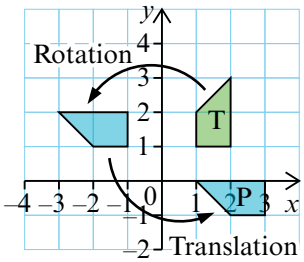
Is he correct? Test his claim.

20 Miriam has five cards. Each describes a particular transformation.

Reflection in the *x*-axis	Reflection in the *y*-axis	Rotation 90° anticlockwise about the origin	Rotation 180° about the origin	Translation $\begin{pmatrix}4\\-2\end{pmatrix}$

These cards are shuffled and the top two cards are turned over. The diagram shows the results of the combined transformations. The final image is labelled P.

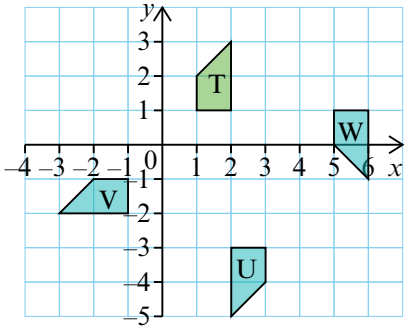
Rotation 90° anticlockwise about the origin followed by Translation $\begin{pmatrix}4\\-2\end{pmatrix}$



a Reverse the cards so that the first card is the translation and the second card is the rotation of 90°. Draw the diagram and carry out the combined transformation. Label the final image Q.
Does changing the order of the transformations make a difference?

b Draw a new diagram to carry out the combined transformation on the shape T if the first card is the rotation of 180° and the second is the reflection in the *x*-axis. Label the final image R.

c This diagram shows the final images of a combined transformation. The images are labelled U, V, and W. For each final image find the two cards, in the correct order, that represent the combined transformation.



d Make your own set of cards and test your partner on combined transformations.