Where's the point?

1. Look at Fig. 1. If ABCD is a square, what are the coordinates of D?
2. If ABCD is trapezium but not a square, what might the coordinates of D be?
3. How many different answers can you find for the coordinates of D if ABCD is a trapezium?
4. Could (5,-6) be an answer for the coordinates of D if ABCD is a trapezium?
5. Look at your answers. Do you notice anything interesting?

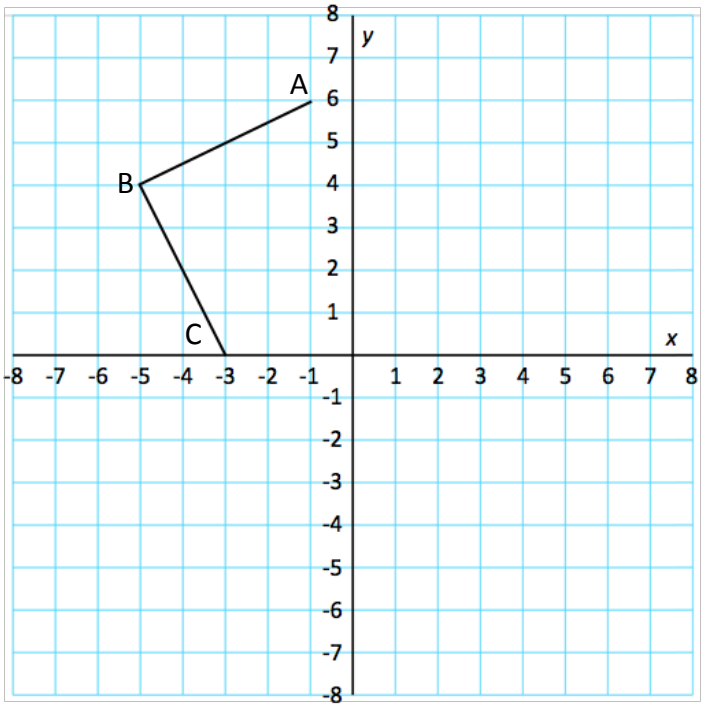


Fig. 1

6. Look at Fig. 2. If ABCD is a rectangle, what are the coordinates of D?
7. If ABCD is trapezium but not a rectangle with BC parallel to AD, what might the coordinates of D be?
8. How many different answers can you find for the coordinates of D if ABCD is a trapezium?
9. Could (8,-15) be an answer for the coordinates of D if ABCD is a trapezium?
10. Look at your answers. Do you notice anything interesting?

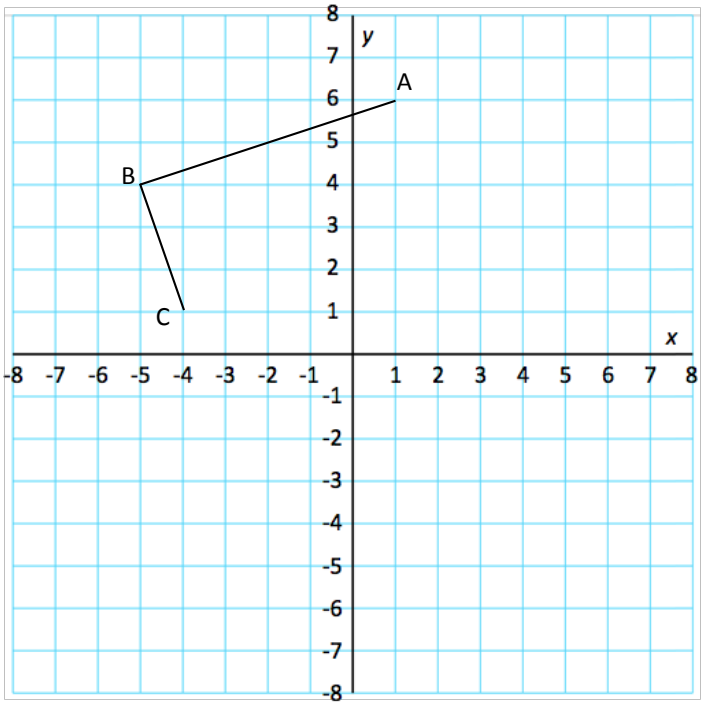
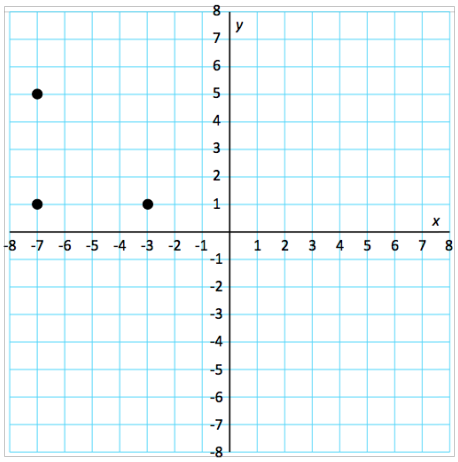


Fig. 2

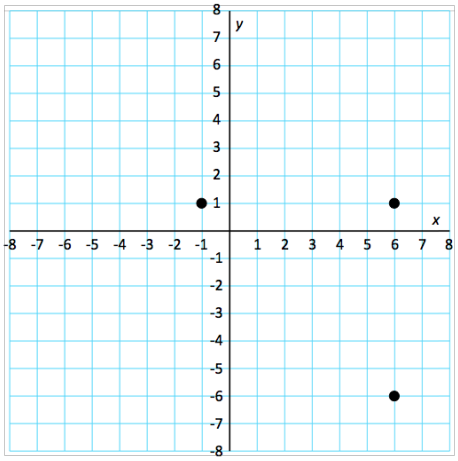
1. For each of these questions you need to find the missing corner of the shape. Plot the coordinates in your book and then join the edges together to form the given shape.

a.



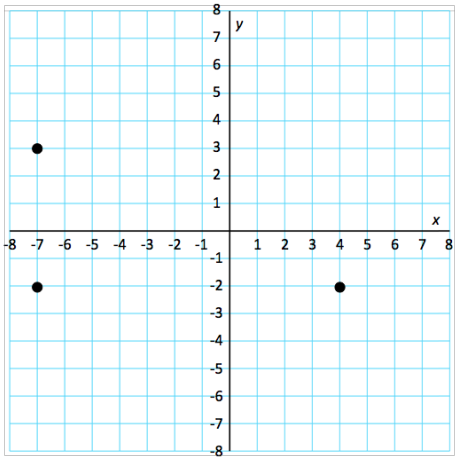
Square (-7, 1), (-3, 1), (-7, 5), (,)

b.



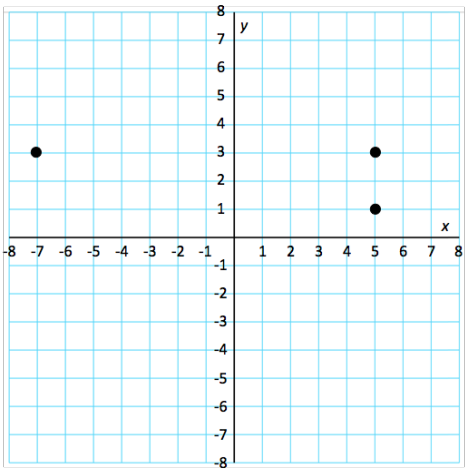
Square (-1, 1), (6, 1), (6, -6), (,)

c.



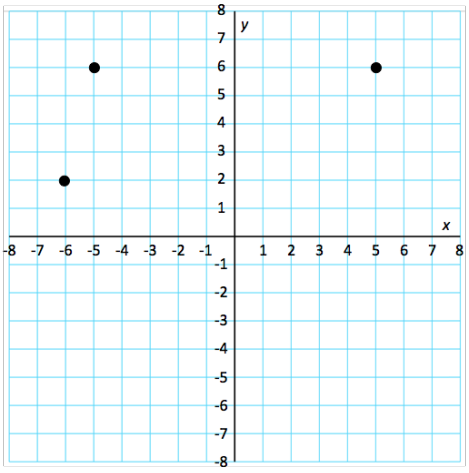
Rectangle (-7, -2), (-7, 3), (4, -2), (,)

d.



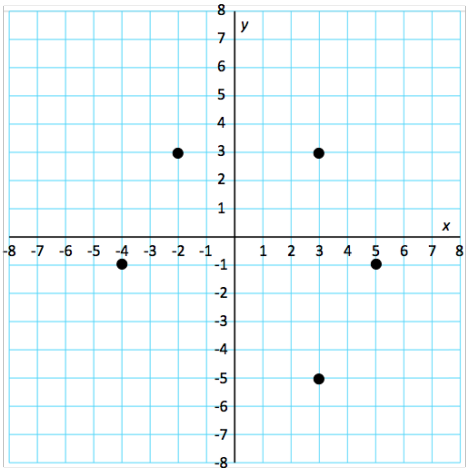
Rectangle (-7, 3), (5, 3), (5, 1), (,)

e.



Parallelogram (-5, 6), (-6, 2), (5, 6), (,)

f.

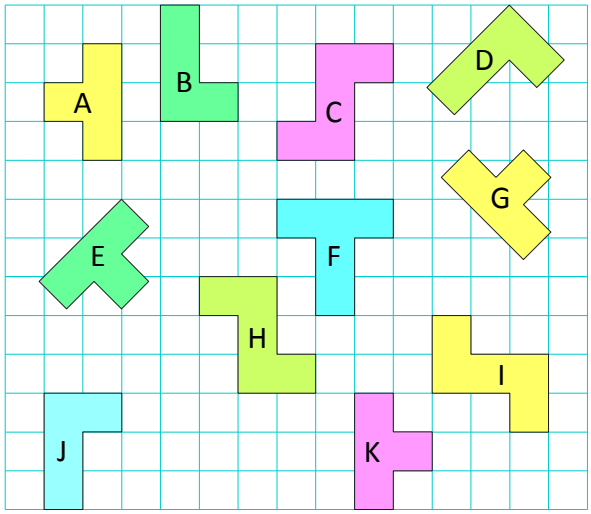


Symmetrical hexagon (-4, -1), (-2, 3), (3,3), (5, -1), (3, -5), (,)

Let's investigate congruent shapes

Two shapes are **congruent** if they are identical in shape and size. Shapes can be congruent even if one of them has been rotated or reflected. Colour doesn't matter.

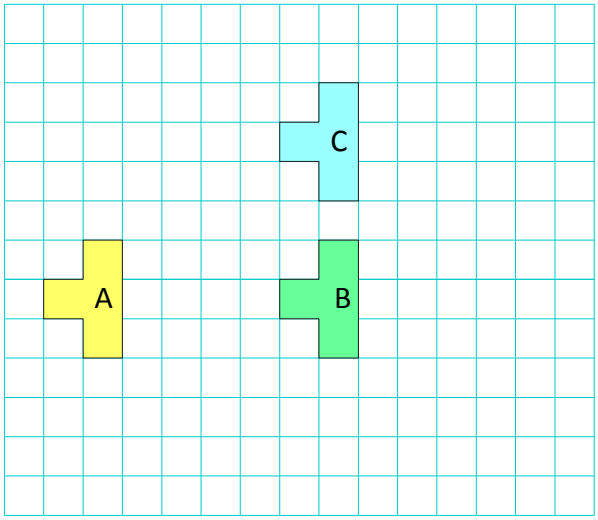
Look at these 11 shapes. Split them into groups of congruent shapes.



Translating or sliding shapes

Look at this picture. Shape A, Shape B and Shape C are congruent.

Describe in your own words, how you could slide Shape A so that it fits exactly on Shape B.



How would you describe a move from B to C?

How would you describe a move from A to C?

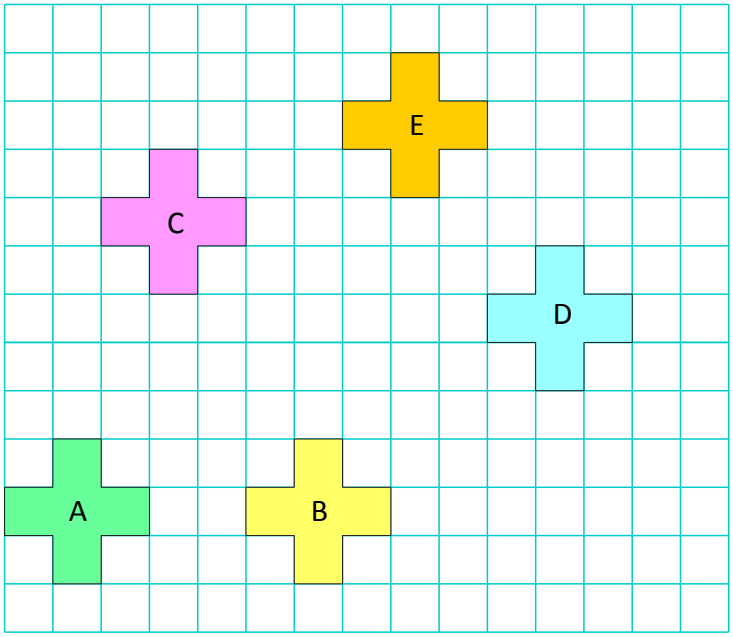
Translation notation

Translations are usually described by how many units you have moved horizontally and how many units you have moved vertically. For example, to move from A to C in the previous example, we move 2 units right and 6 units up.

This can also be written as $\begin{pmatrix} 2 \\ 6 \end{pmatrix}$. This is called **vector notation**.

To describe the move from A to B we could write $\begin{pmatrix} 5 \\ 0 \end{pmatrix}$ in vector notation.

Look carefully at this diagram.



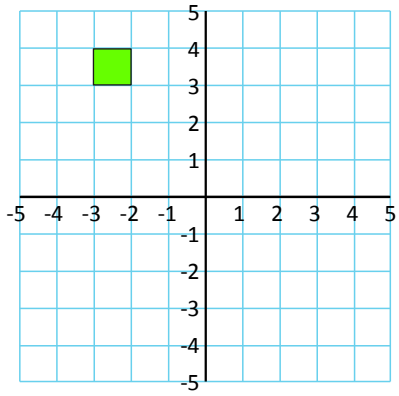
Describe in words, how you would move from:

a) A to B
b) B to D
c) D to E
d) E to C

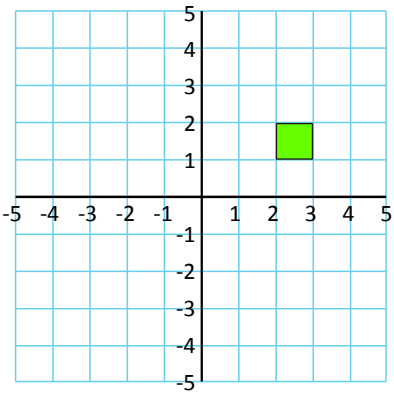
Describe using vector notation, how you would move from:

e) A to C
f) C to B
g) B to E
h) E to D
i) D to A

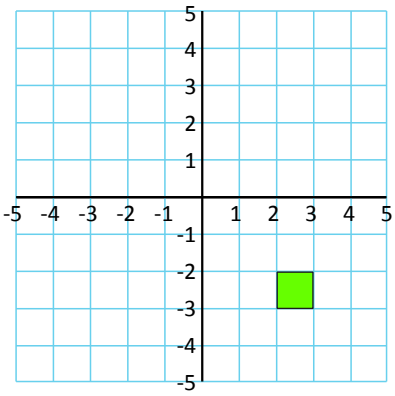
Worksheet Transformations_1b 1



Translate 3 squares right and 2 squares down

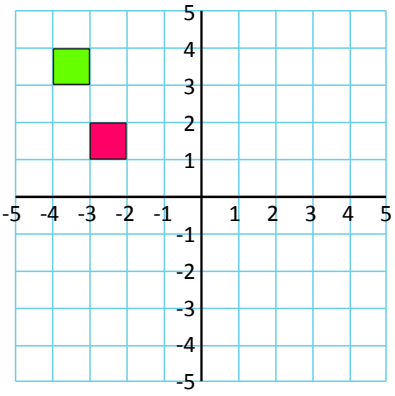


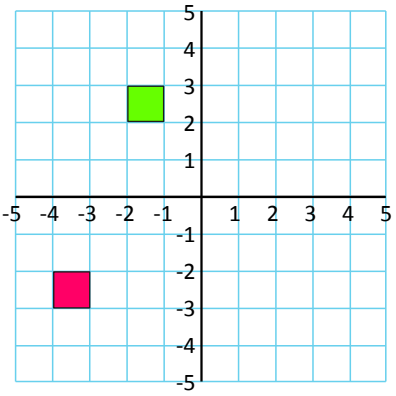
Translate 6 squares left and 3 squares down

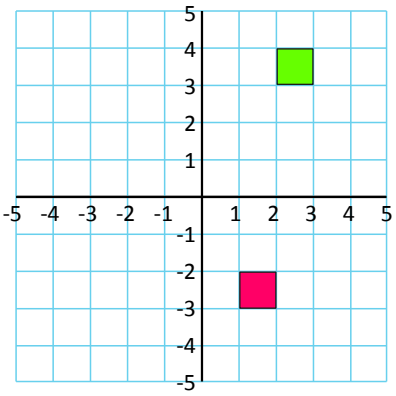


Translate 3 squares left and 3 squares up

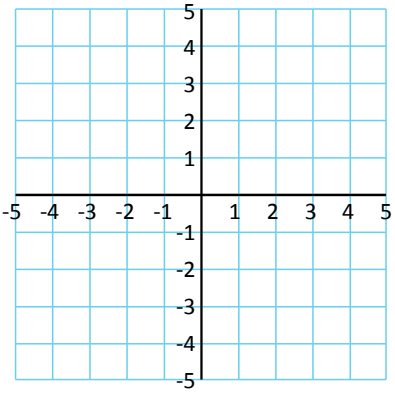
Write the translation from the green square to the red square in vector notation for the questions below.

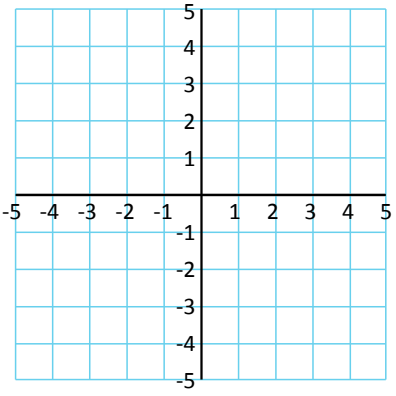


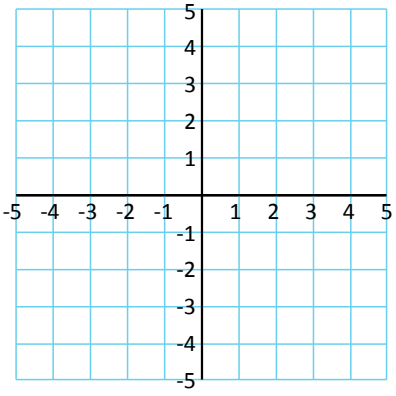




Create your own translation questions!





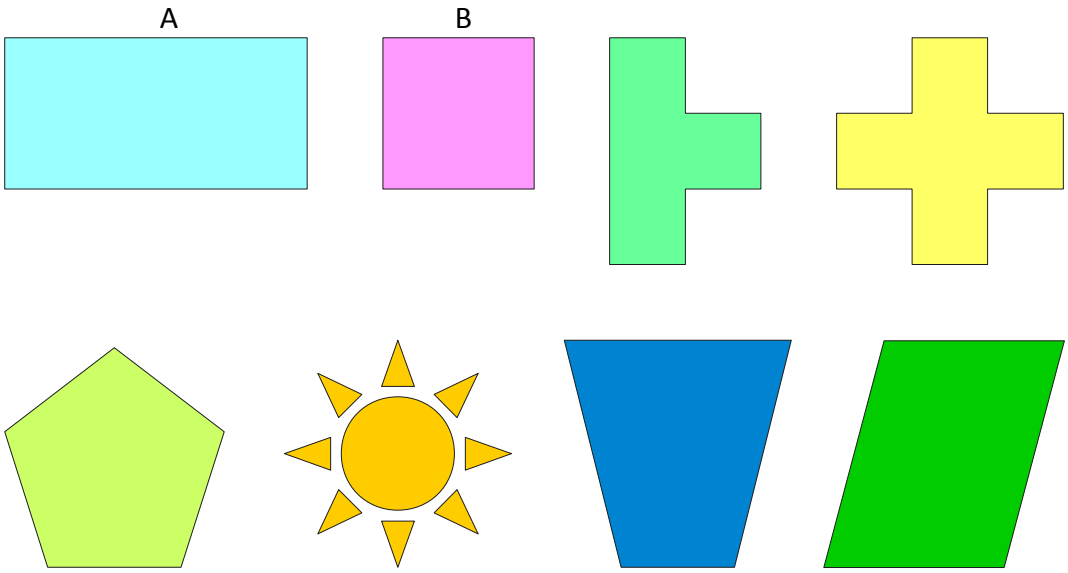


Let's investigate symmetrical shapes

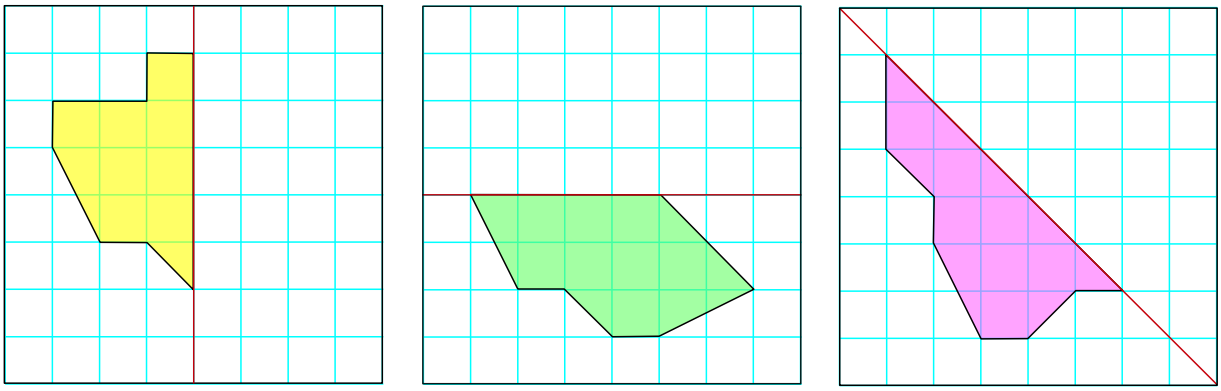
Lines of symmetry

If a shape can be folded exactly in half, then we say that it has line symmetry and the shape has reflective symmetry.

1. How many lines of symmetry does each of these shapes have?



2. Copy and complete each of these shapes to give them a line of symmetry.



Reflection or Flipping shapes

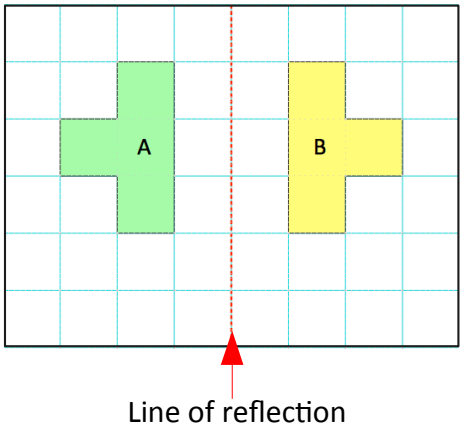
Reflection is another transformation that creates congruent shapes.

When a shape is reflected in a line, the **image is** formed on the other side of the line. Each point is at the same distance from the line.

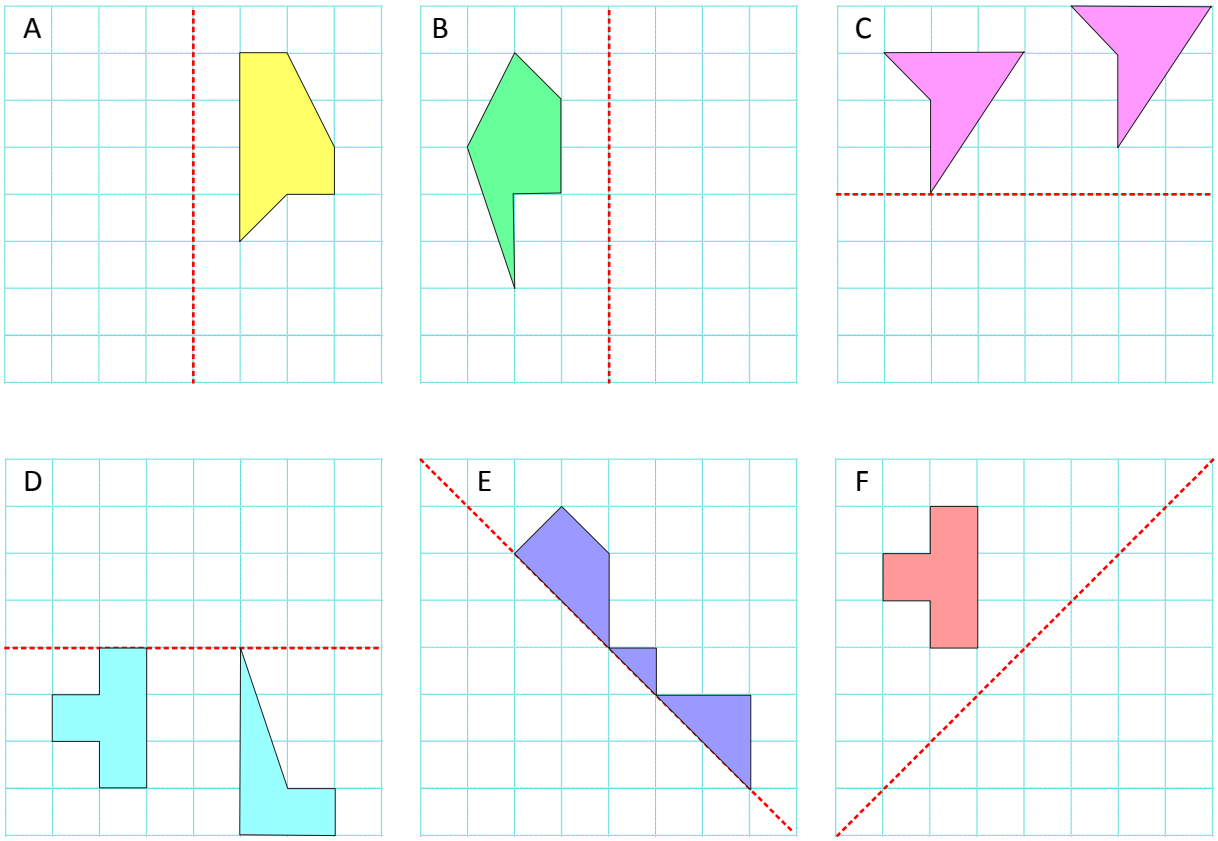
The line is called the **line of reflection** or **mirror line**.

Sometimes “reflection” is called “flipping ”as the shape is “turned over” about the mirror line.

Mirror lines do not have to be vertical or horizontal.



Copy these shapes and reflect each one in the mirror line.

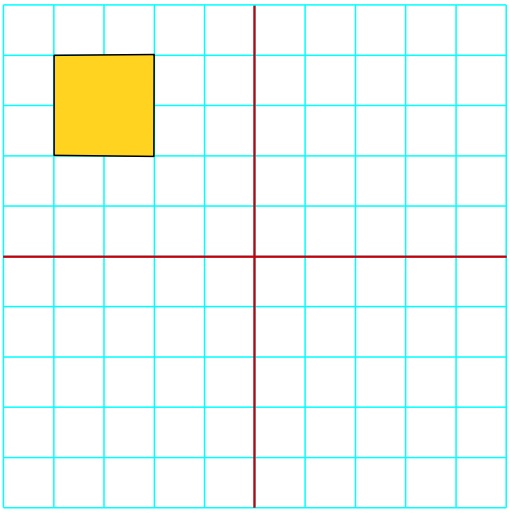


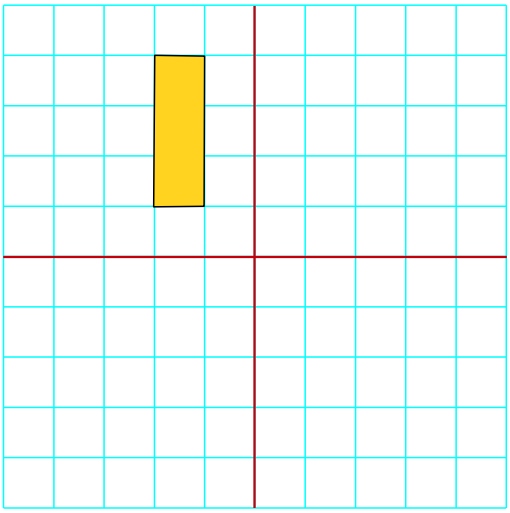
Fitness check

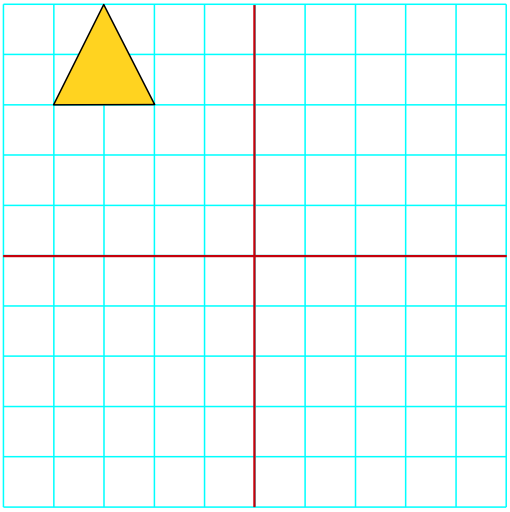
Now try the questions on Worksheet Transformations_1b 2

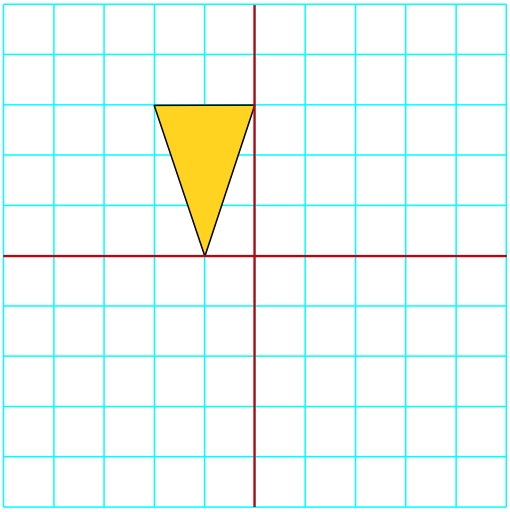
Worksheet Transformations_1b 2

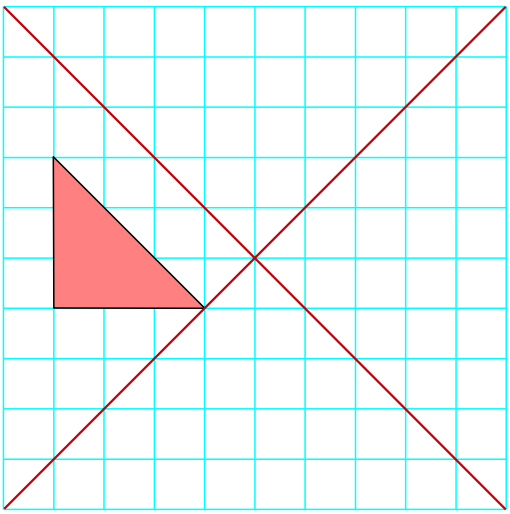
Create a shape with two lines of symmetry by reflecting this shape in the two red lines of symmetry.

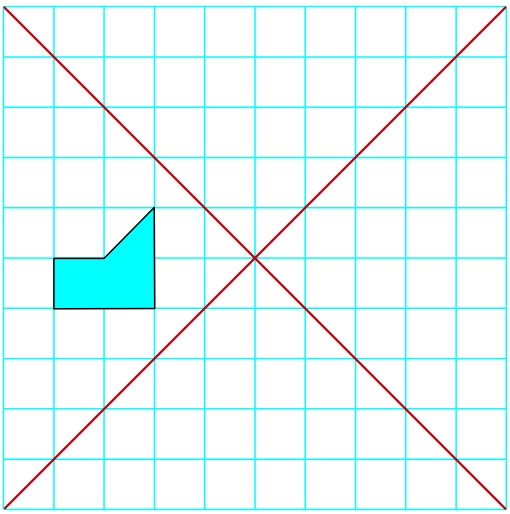






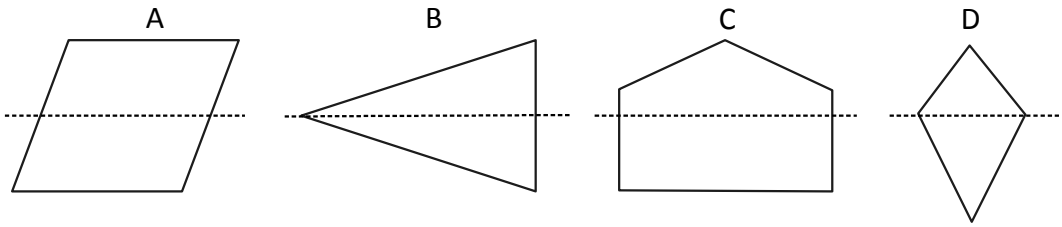




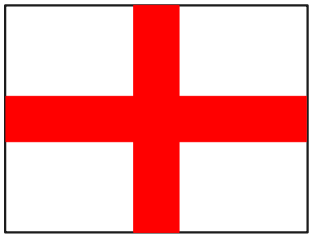


Geometry 1b: Mastery questions

1. Which of these diagrams shows one line of symmetry?

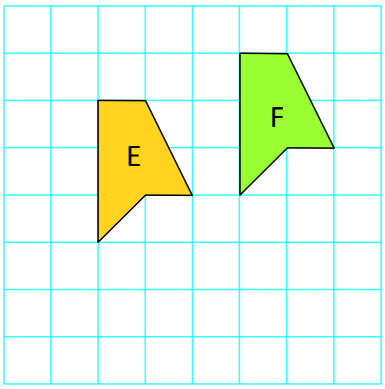


2. How many lines of symmetry does this shape have?



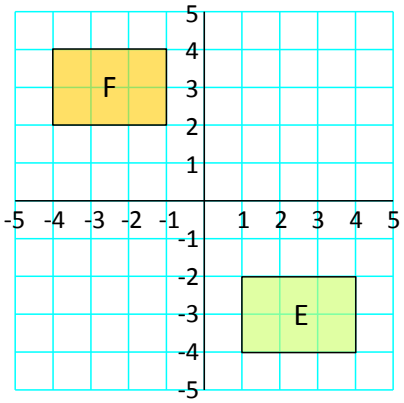
A	B	C	D
0	1	2	4

3. What statement correctly describes the transformation that would move shape E onto shape F?



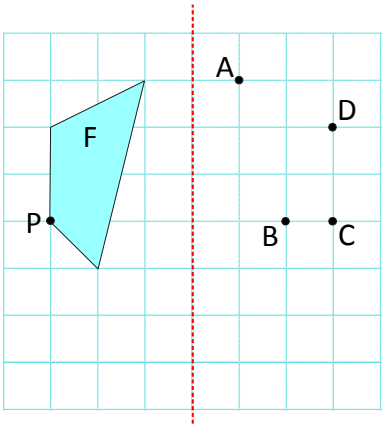
A	Translation of $\begin{pmatrix}1\\3\end{pmatrix}$
B	Translation of $\begin{pmatrix}3\\1\end{pmatrix}$
C	Translation of $\begin{pmatrix}1\\4\end{pmatrix}$
D	Translation of $\begin{pmatrix}4\\1\end{pmatrix}$

4. What vector describes the translation from shape E to shape F?

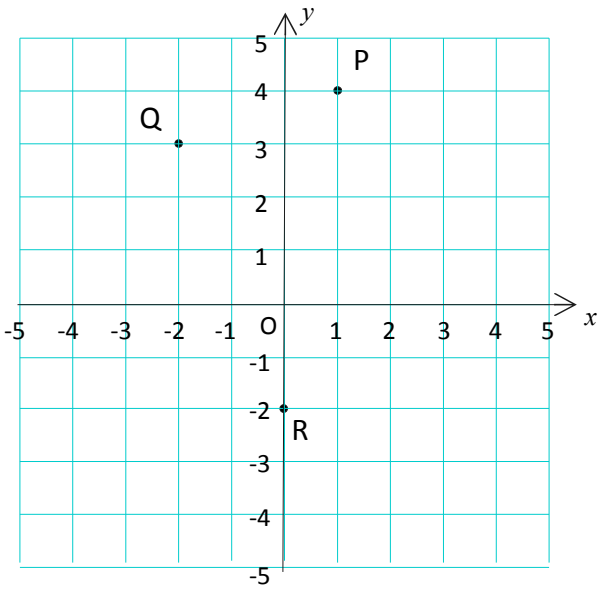


A	$\begin{pmatrix}5\\6\end{pmatrix}$
B	$\begin{pmatrix}6\\5\end{pmatrix}$
C	$\begin{pmatrix}-5\\-6\end{pmatrix}$
D	$\begin{pmatrix}-5\\6\end{pmatrix}$

5. If the Shape F is reflected in the mirror line. Which point would be the reflection of P?

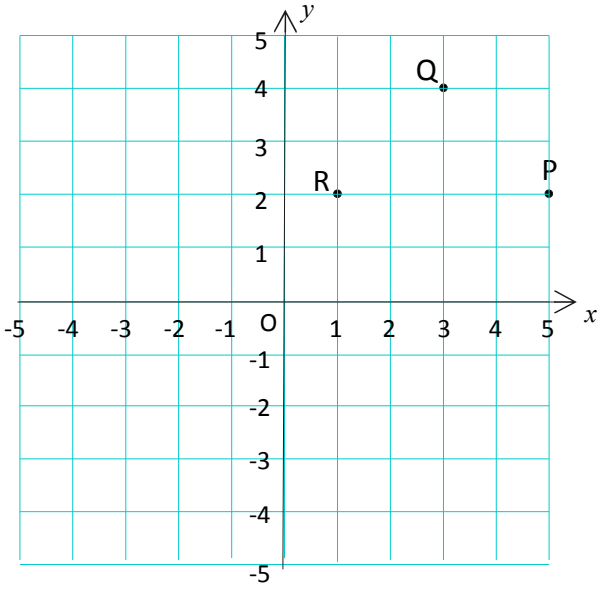


6. PQRS is a rectangle. What are the coordinates of S?



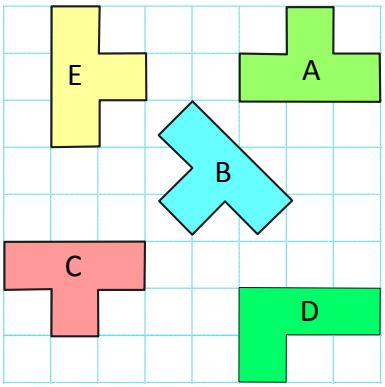
A	(2, 0)
B	(-1, -2)
C	(2, -3)
D	(3, -3)

7. PQRS is a trapezium but not a square. Which of these points could not be the coordinates of S?

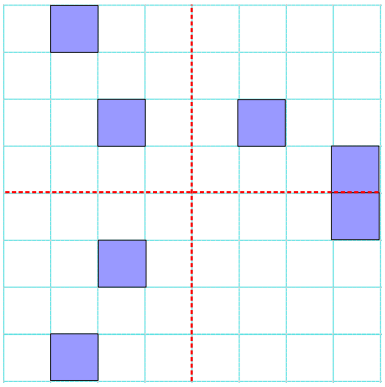


A	(3, 0)
B	(1, -2)
C	(-1, -4)
D	(-3, -6)

8. Which of these shapes is not congruent to shape E?

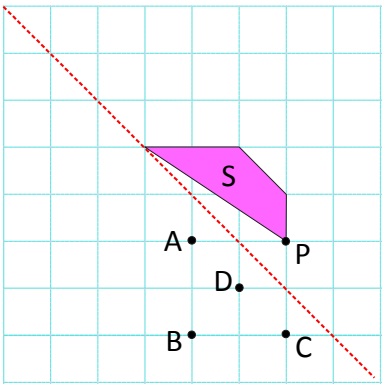


9. What is the least number of squares that need to be added to this diagram to ensure it has two lines of symmetry?

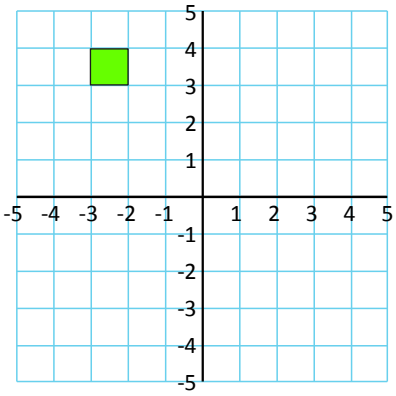


A	3
B	4
C	5
D	6

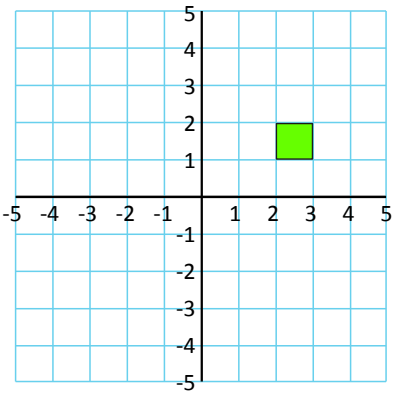
10. Shape S is reflected in the mirror line. Which point is the reflection of P?



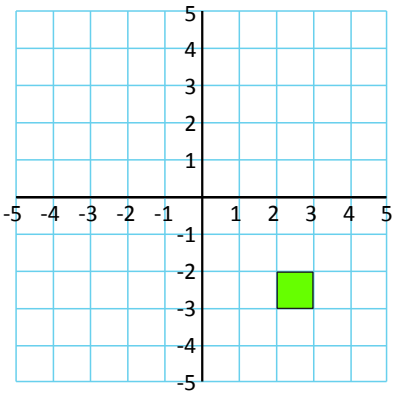
Worksheet Transformations_1b 1



Translate 3 squares right and 2 squares down

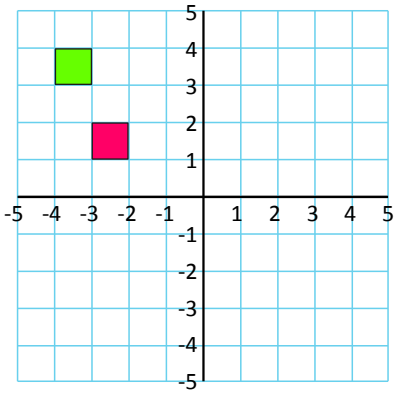


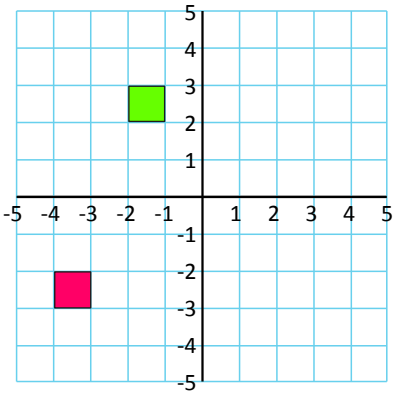
Translate 6 squares left and 3 squares down

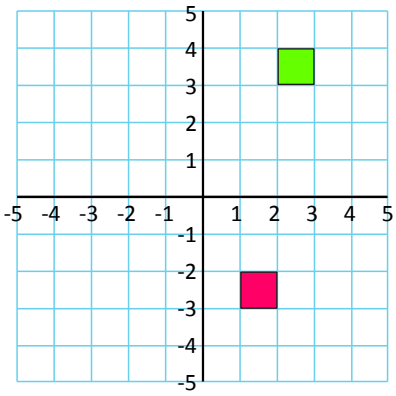


Translate 3 squares left and 3 squares up

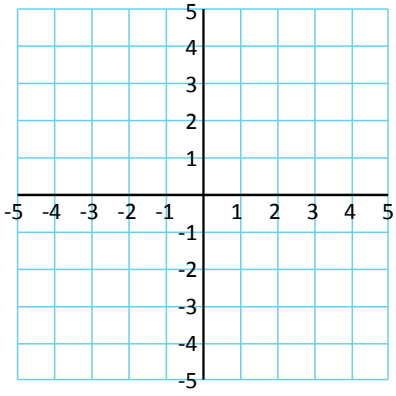
Write the translation from the green square to the red square in vector notation for the questions below.

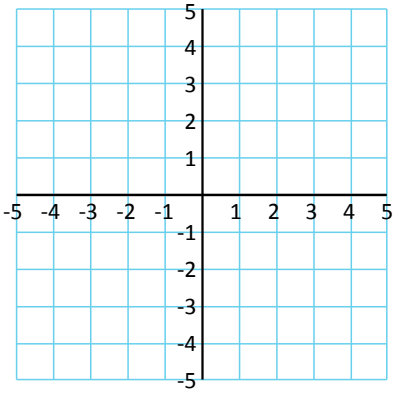


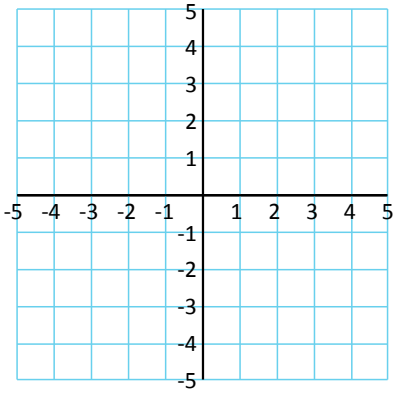




Create your own translation questions!







Worksheet Transformations_1b 2

Create a shape with two lines of symmetry by reflecting this shape in the two red lines of symmetry.

