# Position and Direction

Position in the 1ˢᵗ Quadrant

All of the graphs we have looked at so far we describe as being in the first quadrant. It is made up of the x-axis (horizontal) and y-axis (vertical).

The point (0,0) is known as the **origin**. To refer to specific points on the graph we use coordinates, e.g. (3,4). The first number represents the x-coordinate; the second number represents the y-coordinate.

The coordinate itself does not move, but the point can be plotted at different coordinates can be moved.

Watch this **BBC** Bitesize clip and complete the tasks at the bottom of the page:

https://www.bbc.co.uk/bitesize/topics/zgthvcw/articles/z96k9qt

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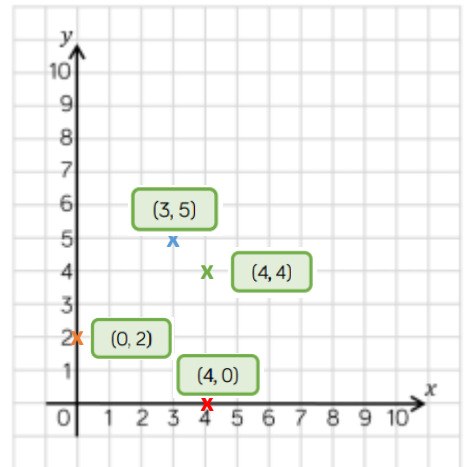
Example

Remember to give the x-coordinate first. A way to remember this is 'along the corridor and up the stairs'.
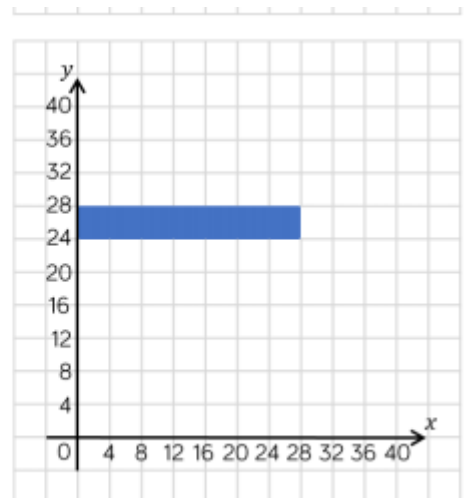
The point marked with the red circle:

Its x-coordinate is 0; its y-coordinate is 28. So the coordinate for the point is (0,28).

Can you work out the coordinates of the remaining vertices?

What are the coordinates of the vertices of the rectangle?
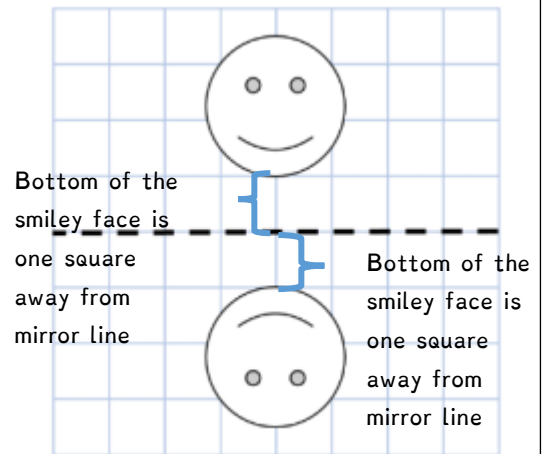
(,)   (,)

(,)   (,)

Reflection

Reflection is where a shape is reflected parallel to a mirror line. When you are reflecting a shape, it doesn't change size or shape. This means it should be the same number of squares or points away from the mirror lines on both sides. Look at the example opposite.

This **BBC** Bitesize clip explains Reflection (and other ways shapes can be transformed):

https://www.bbc.co.uk/bitesize/topics/z2dqrwx/articles/zcjs97h

Bottom of the smiley face is one square away from mirror line

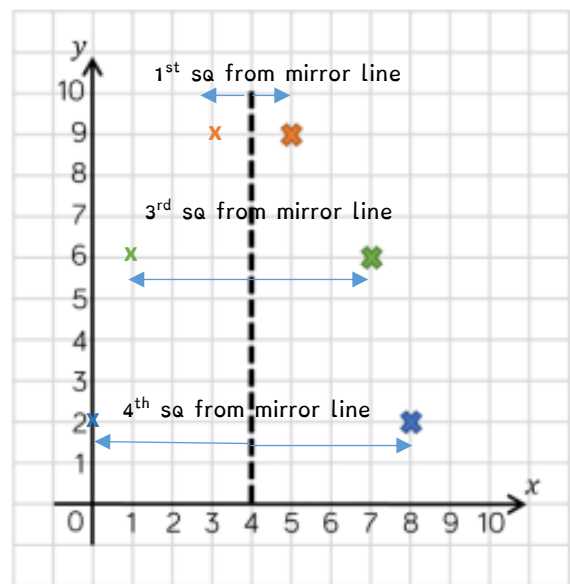Bottom of the smiley face is one square away from mirror line

Example

Remember when reflecting a shape or point, the shape shouldn't change — only is position. When reflecting with a vertical line (parallel to the y-axis), the x-coordinate will change; when reflecting with a horizontal line (parallel to the x-axis), the y-axis will change.

This tutorial shows how you can reflect a shape in a mirror line by looking at one point at a time:

https://www.youtube.com/watch?v=AE0w7QRjGqQ

1st sq from mirror line

3rd sq from mirror line

4th sq from mirror line

Object A is reflected in the mirror line to give image B.
Write the coordinates of the vertices for each shape.
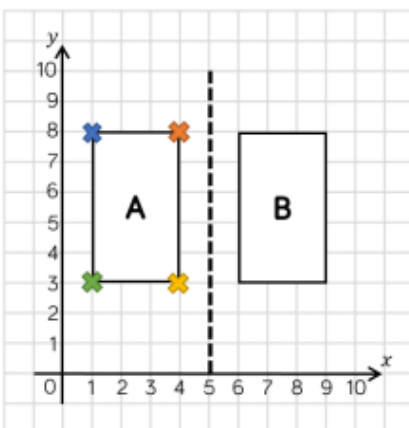
	Original Coordinate	Reflected Coordinate
✖ (blue)		
✖ (orange)		
✖ (green)		
✖ (yellow)		

Remember that Shape B is the result of reflecting Shape A. Think about where the vertices are in relation to the mirror line.

Helpful questions to ask to help talk you through each point:

If we look at this point, where will its new position be on the image when reflected? What's different about the coordinates of the image?
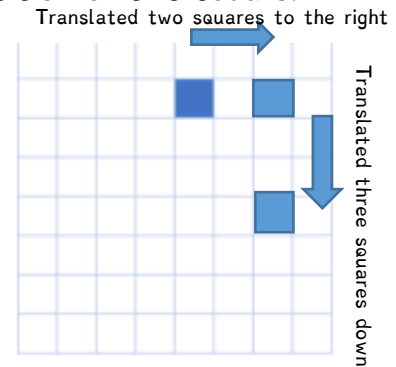
Translation

Translation is where a shape is moved a certain distance from its original position. Similar to reflection, in translation, the size and shape do not change — only the position changes. A shape can be translated horizontally or vertically (or both).

Watch the **BBC** Bitesize clip which talks through the ways to translate shapes.
https://www.bbc.co.uk/bitesize/topics/z2darwx/articles/zcjs97h

A square is translated two squares to the right and three down. Draw the new position of this square.

Translated two squares to the right

Translated three squares down

Try this

Describe the translation of shape A to shape B, C and then D. Use the stem sentence to help you.
Shape A has been translated _____ left/right and _____ up/down.
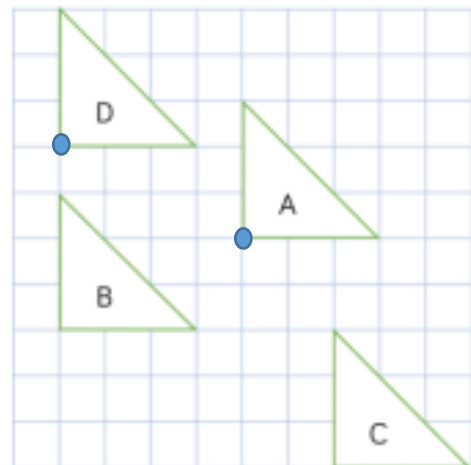
Choose one point on each shape to see how it has been translated. E.g. for Shape A to shape D:

Shape A has been translated 4 squares to the left and 2 squares up.

Translate each coordinate 2 down, 1 right. Record the coordinates of its new position.
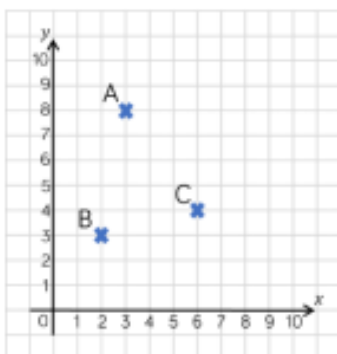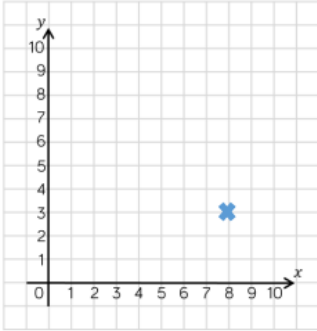
	Before translation	After translation
A	(3, 8)	
B		
C		

Problem Solving and Reasoning Challenges

Some of you may wish to challenge yourself beyond the tasks set on Mathletics and Purple Mash. Try these problem solving and reasoning challenges.

Coordinates

The point is at (8, 3)

Mo

The point is at (3, 8)

Alex

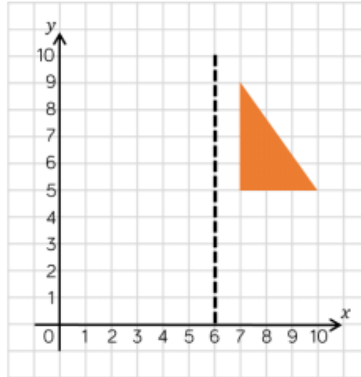Who do you agree with? Can you spot the mistake the other child has made?

Annie is finding co-ordinates where the x-coordinate and the y-coordinate add up to 8.
For example: (3, 5) $3 + 5 = 8$

Find all of Annie's coordinates and plot them on the grid. What do you notice?

Now do the same for a different total.

Reflection Challenges
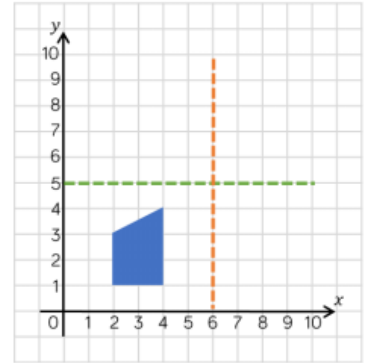
Eva reflects the shape in the mirror line. She thinks that the coordinates of the vertices for the reflected shape are:

(5, 5)   (2, 5)   (2, 9)

Is Eva is correct?
Explain why.

This is a shape after it has been reflected. This is called the image.

Use the grid and the marked mirror lines to show where the original object was positioned.

Is there more than one possibility?

Translation Challenges

These three coordinates have all been translated in the same way.
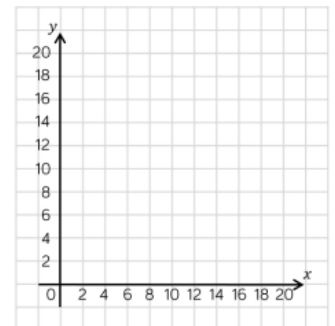
(_, _) → (3, 1)

(_, 5) → (4, 3)

(4, _) → (6, 1)

Can you work out the missing coordinates?

Describe the translation.

A rectangle is translated two to the left and 4 up.

Three of the coordinates of the translated rectangle are: (6, 8) (10, 14) and (10, 8).

What are the coordinates of the original rectangle?