White Rose Maths

Summer - Block 3

Position & Direction

Overview

Small Steps

Describe position	R
Draw on a grid	R
Position in the first quadrant	
Translation	
Translation with coordinates	
Lines of symmetry	R
Complete a symmetric figure	R
Reflection	
Reflection with coordinates	

Notes for 2020/21

Children have looked at plotting and reading coordinates in year 4 and this should be revisited before moving on to year 5 content.

You might notice that the order of reflection and translation has been changed, this is so clearer links can be made between reflection and previous learning on symmetry.

©White Rose Maths

Describe Position

Notes and Guidance

Children are introduced to coordinates for the first time and they describe positions in the first quadrant.

They read, write and use pairs of coordinates. Children need to be taught the order in which to read the axes, x-axis first, then y-axis next. They become familiar with notation within brackets.

Mathematical Talk

Which is the x-axis?

Which is the y-axis?

In which order do we read the axes?

Does it matter in which order we read the axes?

How do we know where to mark on the point?

What are the coordinates for _____?

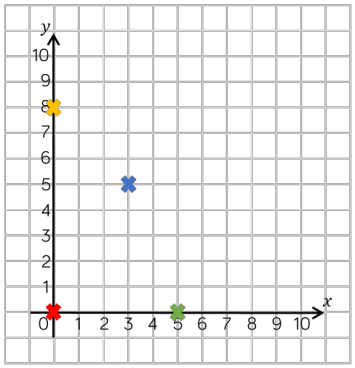
Where would (__ , __) be?

Varied Fluency

R

- Create a large grid using chalk or masking tape. Give the children coordinates to stand at. Encourage the children to move along the axis in the order they read them.

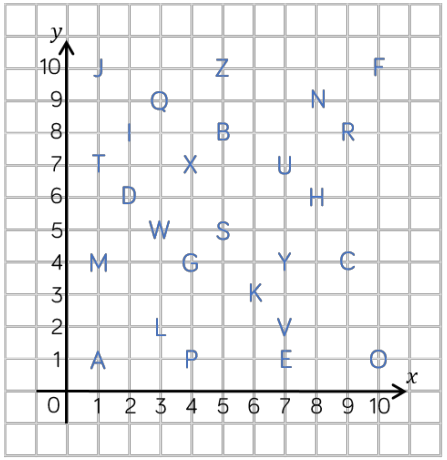
- Write the coordinates for the points shown.



(__ , __) (__ , __)

(__ , __) (__ , __)

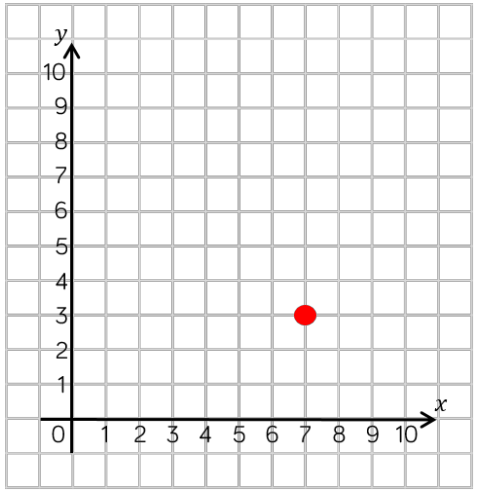
- Write out the coordinates that spell your name.

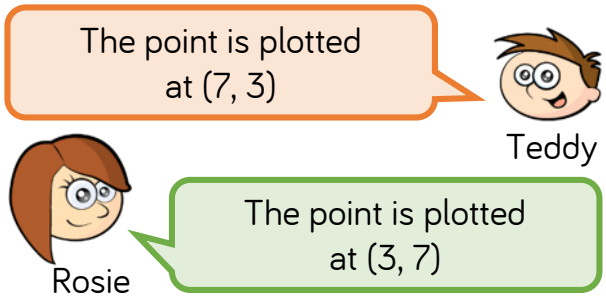


©White Rose Maths

Describe Position

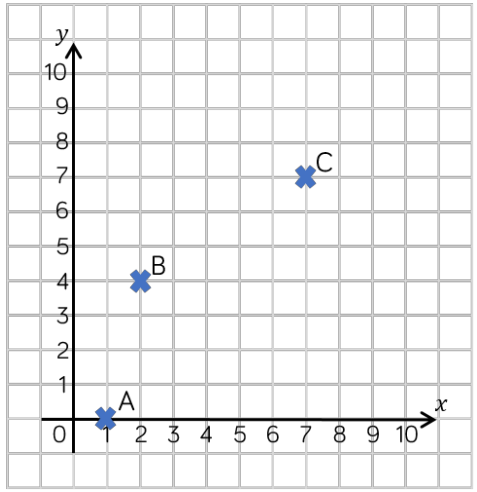
Reasoning and Problem Solving





Who is correct?
What mistake has one of the children made?

Teddy is correct. Rosie has read the y-axis before the x-axis.



Which clue matches which coordinate?

Clue 1	My x coordinate is half of my y coordinate.
Clue 2	My y coordinate is less than my x coordinate.
Clue 3	Both my coordinates are prime numbers.

Clue 1 - B
Clue 2 - A
Clue 3 - C

©White Rose Maths

Draw on a Grid

Notes and Guidance

Children develop their understanding of coordinates by plotting given points on a 2-D grid.

Teachers should be aware that children need to accurately plot points on the grid lines (not between them).

They read, write and use pairs of coordinates.

Mathematical Talk

Do we plot our point on the line, or next to the line?

How could we use a ruler to help plot points?

In which order do we read and plot the coordinates?

Does it matter which way we plot the numbers on the axis?

What are the coordinates of _____?

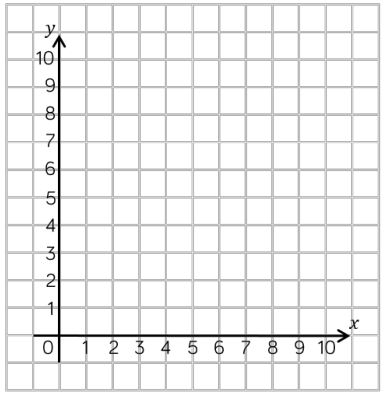
Where would (__, __) be?

Can you show _____ on the grid?

Varied Fluency

R

Draw the shapes at the correct points on the grid.



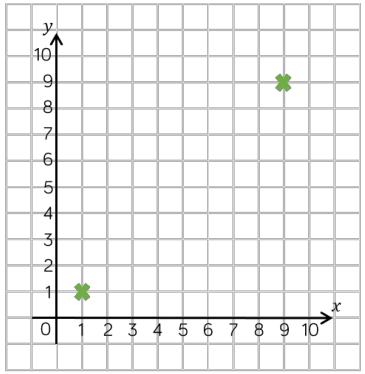
(7, 8)

(4, 6)

(9, 1)

(10, 0)

Plot two more points to create a square.



Plot these points on a grid.

(2, 4) (4, 2) (5, 8) (7, 6)

What shape has been created?

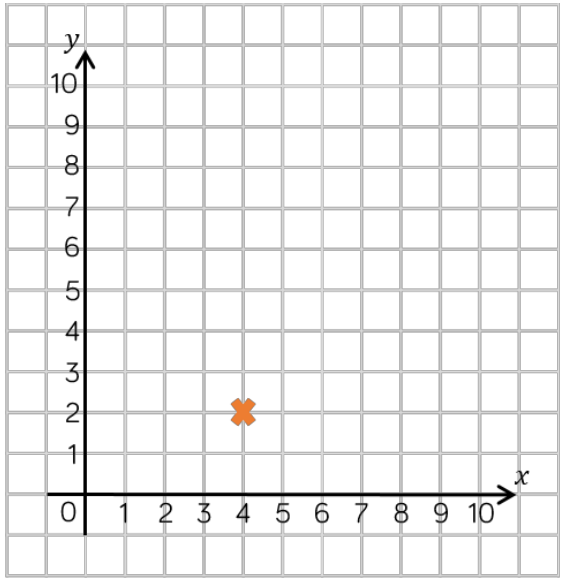
©White Rose Maths

Draw on a Grid

Reasoning and Problem Solving

R

What shapes could be made by plotting three more points?



The children could make a range of quadrilaterals dependent on where they plot the points.
If children plot some of the points in a line they could make a triangle.

When you are plotting a point on a grid it does not matter whether you go up or across first as long as you do one number on each axis.

Amir

Do you agree with Amir?
Convince me.

Amir is incorrect.
The x-axis must be plotted before the y-axis.
Children prove this by plotting a pair of coordinates both ways and showing the difference.

Always, Sometimes, Never.

The number of points is equal to the number of vertices when they are joined together.

Sometimes.
If points are plotted in a straight line they will not create a vertex.

©White Rose Maths

Position in the 1st Quadrant

Notes and Guidance

Children recap their use of coordinates from Year 4.

They start with an understanding of the origin (0, 0), before moving onto reading other coordinates. They understand that the first number represents the x-coordinate and the second number represents the y-coordinate. Teachers might explain how a coordinate is fixed (does not move) whereas a point can be plotted at different coordinates, so it can be moved.

Mathematical Talk

Which of the numbers represents the movement in the direction of the x-axis (from the origin)? Which of the numbers represents the movement on the y-axis (from the origin)?
Does it matter which way around coordinates are written?
Look at the point I have marked, what are the coordinates of this point?
If I moved the point one place to the left, what would be different about the coordinates? If I moved the point down one, what would be different about the coordinates?

Varied Fluency

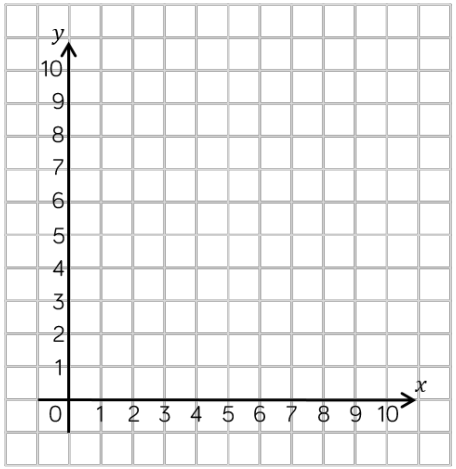
- Plot the following points on the grid.

(3, 5)

(4, 4)

(0, 2)

(4, 0)



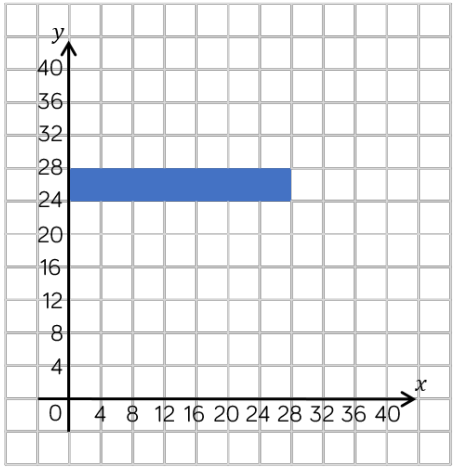
- What are the coordinates of the vertices of the rectangle?

(,)

(,)

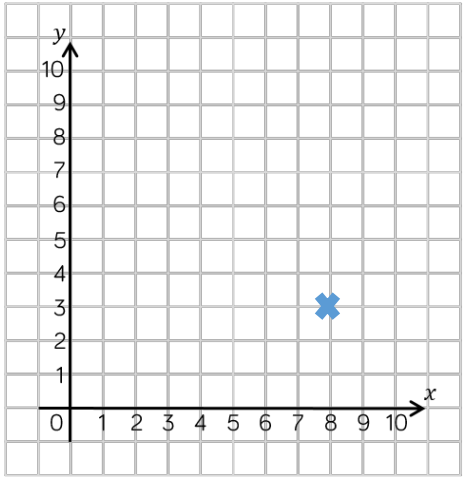
(,)

(,)



Position in the 1st Quadrant

Reasoning and Problem Solving



The point is at (8, 3)

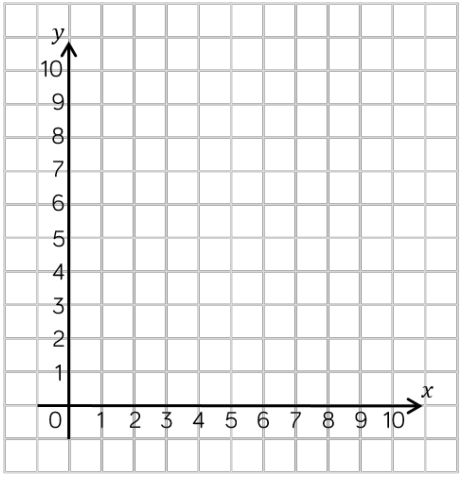
Mo

The point is at (3, 8)

Alex

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

Mo is correct. Alex has made a mistake by thinking the first number is the y-coordinate.



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.

Annie's coordinates form a diagonal line (8, 0) to (0, 8)

Translation

Notes and Guidance

Children learn to translate shapes on a grid.

Children could focus on one vertex at a time when translating.

Attention should be drawn to the fact that the shape itself does not change size nor orientation when translated.

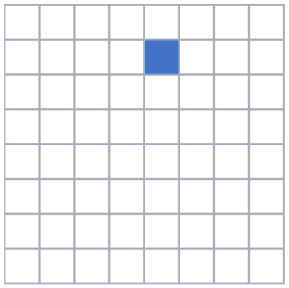
Mathematical Talk

What does translate mean?

Look what happens when I translate this shape. What has happened to the shape? Have the dimensions of the shape changed? Does it still face the same way?

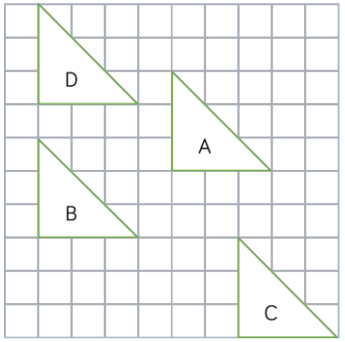
Are there any other ways I can get the shape to this position?

Varied Fluency

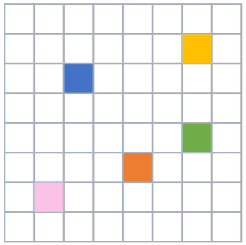


A square is translated two squares to the right and three down.
Draw the new position of this square.

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.



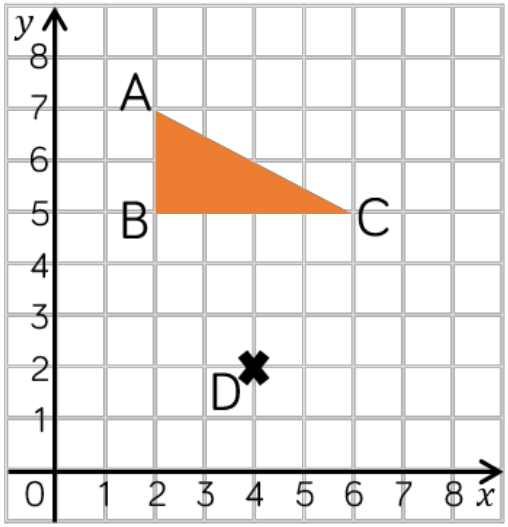
Match the translations.



to		4 right, 2 down
to		2 left, 3 up
to		5 left, 5 down

Translation

Reasoning and Problem Solving



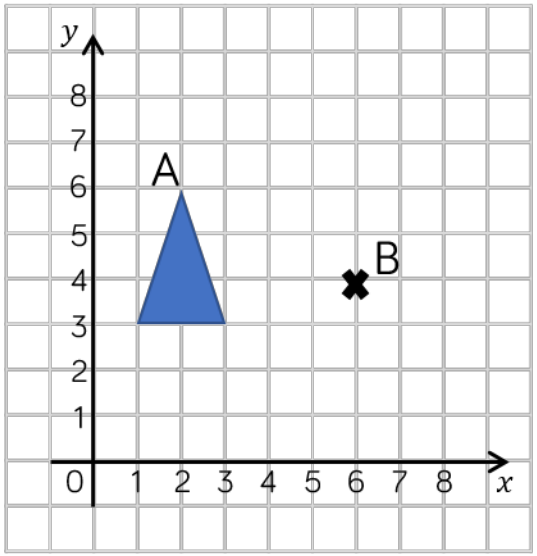
Triangle ABC is translated so that point B translates to point D

It won't fit on this grid!

Amir

Do you agree with Amir?
Explain your thinking.

Amir is incorrect, the shape is translated two to the right and three down. It will fit on this grid.



A triangle is drawn on the grid.
It is translated so that point A translates to point B.

What would be the coordinates of the other vertices of the translated triangle?

(7, 1)

(5, 1)

Translation with Coordinates

Notes and Guidance

Children translate coordinates and also describe translations of coordinates.

Attention should be drawn to the effect of the translation on the x-coordinate and the y-coordinate. For example, how does a translation of 3 up affect the x and y-coordinate?

Mathematical Talk

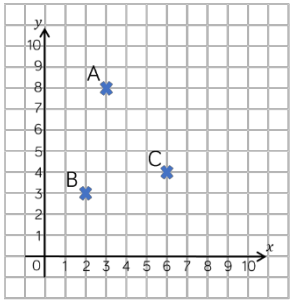
If we move this point down, what will happen to its coordinates? What if it moves up?

If I move the point two right, what will happen to the coordinates?

If these are the translated coordinates, what were the original coordinates?

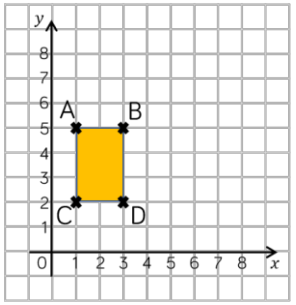
Varied Fluency

- Translate each coordinate 2 down, 1 right. Record the coordinates of its new position.

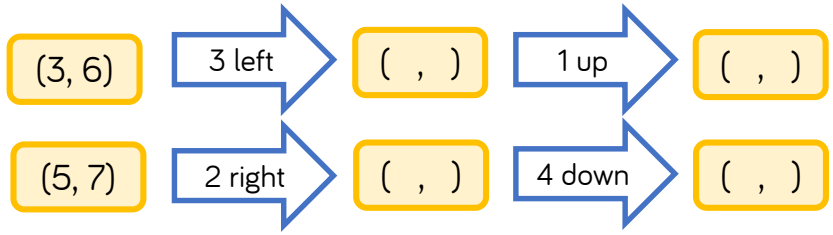


	Before translation	After translation
A	(3, 8)	
B		
C		

- Rectangle ABCD is translated so vertex C is translated to (3, 5). Describe the translation. What are the coordinates of the other vertices of the translated rectangle?



- Translate the coordinates below.



Translation with Coordinates

Reasoning and Problem Solving

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?

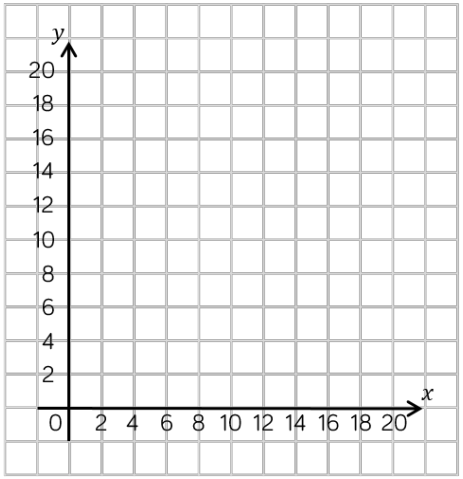
Describe the translation.

Translation 2 right 2 down.

(1 , 3) → (3 , 1)

(2 , 5) → (4 , 3)

(4 , 3) → (6 , 1)



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?

(8, 10) (12, 10)

(8, 4) (12, 4)

Lines of Symmetry

Notes and Guidance

Children find and identify lines of symmetry within 2-D shapes. Children explore symmetry in shapes of different sizes and orientations. To help find lines of symmetry children may use mirrors and tracing paper.

The key aspect of symmetry can be taught through paper folding activities. It is important for children to understand that a shape may be symmetrical, but if the pattern on the shape isn't symmetrical, then the diagram isn't symmetrical.

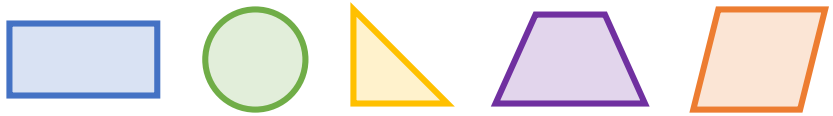
Mathematical Talk

Explain what you understand by the term 'symmetrical'.
Can you give any real-life examples?
How can you tell if something is symmetrical?
Are lines of symmetry always vertical?
Does the orientation of the shape affect the lines of symmetry?
What equipment could you use to help you find and identify lines of symmetry?
What would the rest of the shape look like?

Varied Fluency

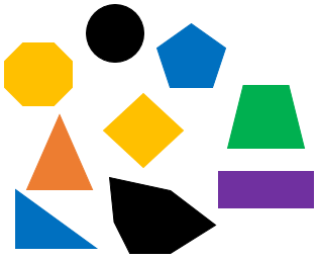
R

- Using folding, find the lines of symmetry in these shapes.

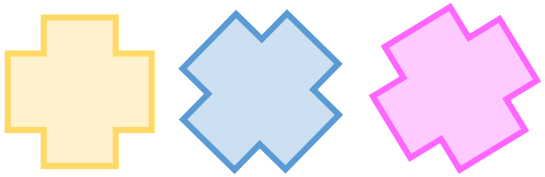


- Sort the shapes into the table.

	1 line of symmetry	More than 1 line of symmetry
Up to 4 sides		
More than 4 sides		



- Draw the lines of symmetry in these shapes (you could use folding to help you).



What do you notice?

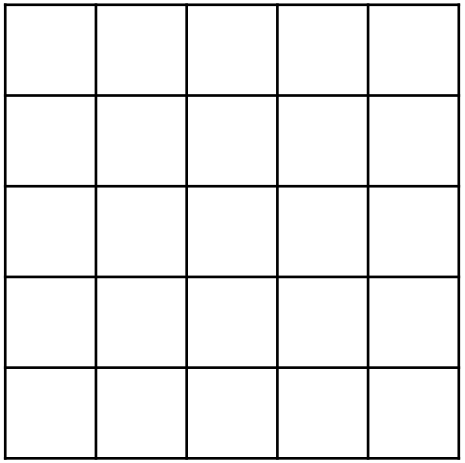
©White Rose Maths

Lines of Symmetry

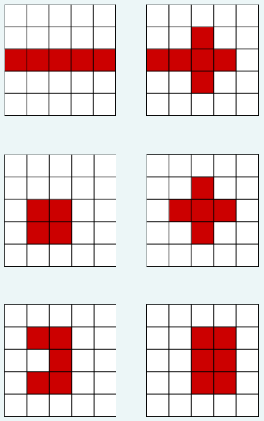
Reasoning and Problem Solving

R

How many symmetrical shapes can you make by colouring in a maximum of 6 squares?



There are a variety of options. Some examples include:



Jack

A triangle has 1 line of symmetry unless you change the orientation.

Is Jack correct? Prove it.

Jack is incorrect. Changing the orientation does not change the lines of symmetry. Children should prove this by drawing shapes in different orientations and identifying the same number of lines of symmetry.

Always, Sometimes, Never.

A four-sided shape has four lines of symmetry.

Sometimes, provided the shape is a square.

©White Rose Maths

Symmetric Figures

Notes and Guidance

Children use their knowledge of symmetry to complete 2-D shapes and patterns.

Children could use squared paper, mirrors or tracing paper to help them accurately complete figures.

Mathematical Talk

What will the rest of the shape look like?

How can you check?

How can you use the squares to help you?

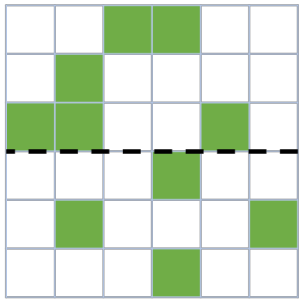
Does each side need to be the same or different?

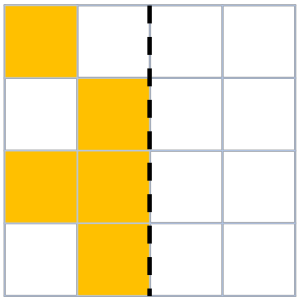
Which lines need to be extended?

Varied Fluency

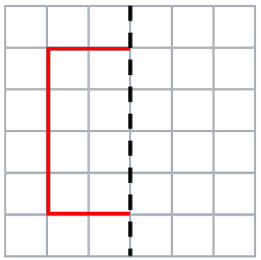
R

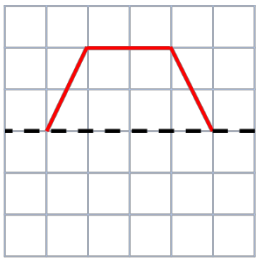
- Colour the squares to make the patterns symmetrical.

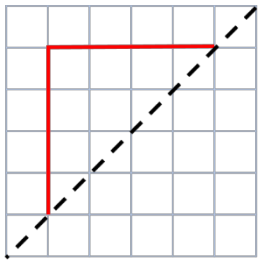




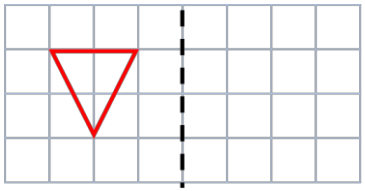
- Complete the shapes according to the line of symmetry.

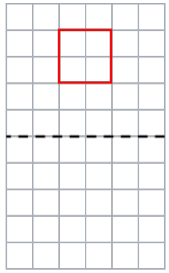






- Reflect the shapes in the mirror line.





©White Rose Maths

Symmetric Figures

Reasoning and Problem Solving

R

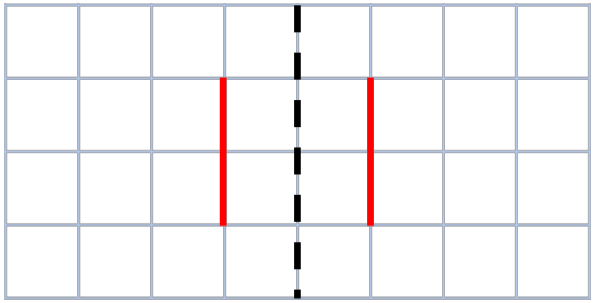
Dora

When given half of a symmetrical shape I know the original shape will have double the amount of sides.

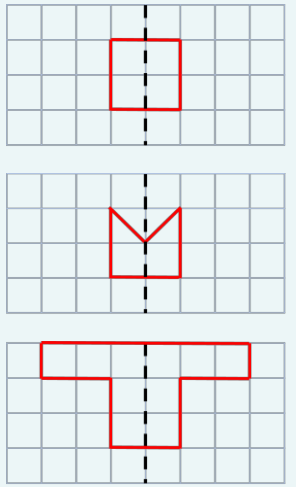
Do you agree with Dora?
Convince me.

Dora is sometimes correct. This depends on where the mirror line is. Encourage children to draw examples of times where Dora is correct, and to draw examples of times when Dora isn't correct.

How many different symmetrical shapes can you create using the given sides?



Children will find a variety of shapes. For example:



©White Rose Maths

Reflection

Notes and Guidance

Children reflect objects using lines that are parallel to the axes. Children continue to use a 2-D grid and coordinates in the first quadrant. Teachers might want to encourage children to use mirrors, or to count how far the point is away from the mirror line, so that they can work out where the reflected point will be located. Children should be introduced to the language object (name of shape before reflection) and image (name of shape after reflection).

Mathematical Talk

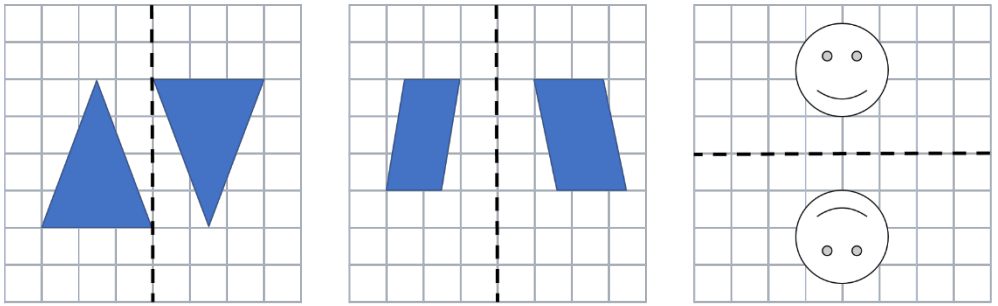
When I reflect something, what changes about the object? Is it exactly the same?

What are the coordinates of this point? If I reflect it in the mirror line, what are the new coordinates?

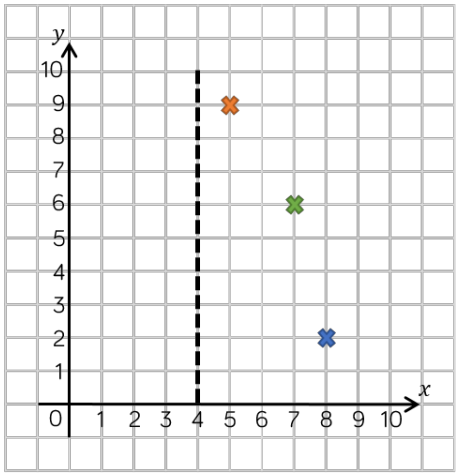
If I reflect this point/shape in a vertical/horizontal mirror line, what will happen to the x-coordinate/y-coordinate?

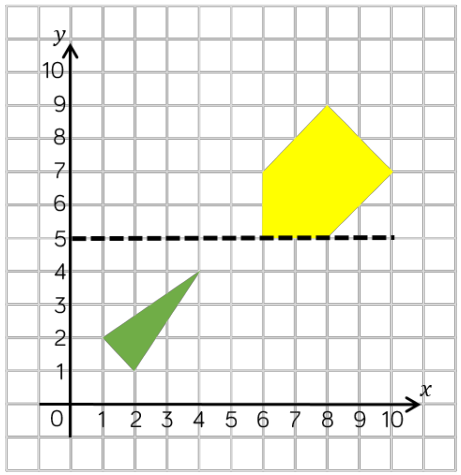
Varied Fluency

Which of the diagrams show reflections in the given mirror line?



Reflect the coordinates and the shapes in the mirror line.





Reflection

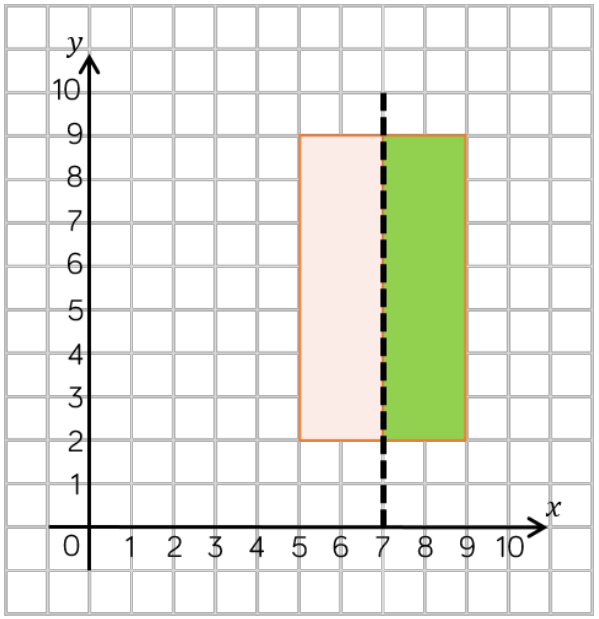
Reasoning and Problem Solving

When you reflect a shape, its dimensions change.

Dora

Do you agree with Dora?
Explain your thinking.

Dora is incorrect, the shape's dimensions do not change, only its position is changed.



The rectangle is pink and green.
The rectangle is reflected in the mirror line.
What would its reflection look like?

The shape would remain in the same position, although the colours would be swapped – green on the left and pink on the right.

Reflection with Coordinates

Notes and Guidance

Teachers should explore what happens to points when they are reflected in lines parallel to the axes.

Children might use mirrors to do this. This might be done through investigation where children record coordinates of vertices of the object and coordinates of vertices of the image in a table.

Mathematical Talk

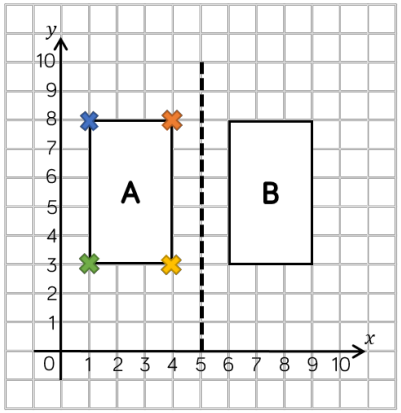
What is the x-coordinate for this vertex? What is the y-coordinate for this vertex?

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

Do you always need to use a mirror? How else could you work out the coordinates of each vertex?

Varied Fluency

Object A is reflected in the mirror line to give image B.
Write the coordinates of the vertices for each shape.



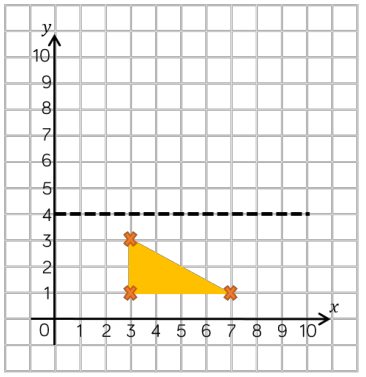
	Original Coordinate	Reflected Coordinate
✖		
✖		
✖		
✖		

Write the coordinates of the image after the object (triangle) has been reflected in the mirror line.

(,)

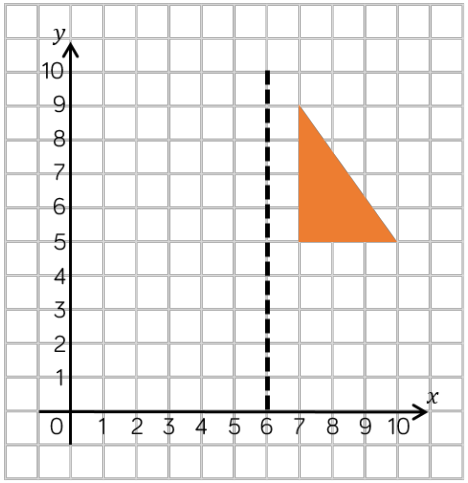
(,)

(,)



Reflection with Coordinates

Reasoning and Problem Solving

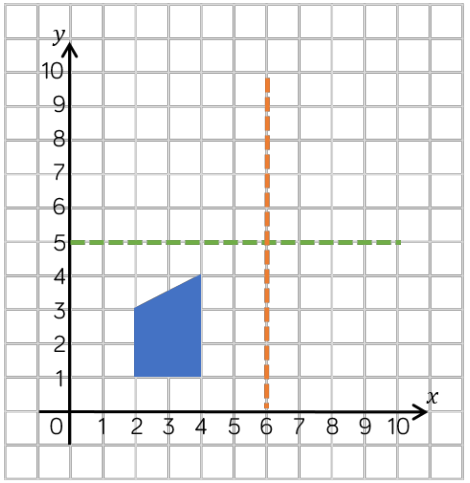


Eva reflects the shape in the mirror line.
She thinks that the coordinates of the vertices for the reflected shape are:

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

Is Eva is correct?
Explain why.

The (2, 9) coordinate is incorrect, it should be (5, 9).



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?

There are two possibilities for the object.