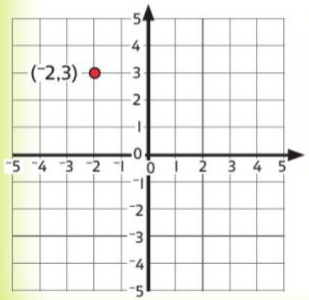
Monday 7.12.20

Unit 6
Geometry – position and direction

In this unit we will ...

- Look at how we can use coordinates to describe the position of a point on a grid
- Look at how coordinates can have positive or negative values
- Explore how we can use our knowledge of properties of shape to help us solve problems on a coordinate grid
- Explore how we can move and change shapes on a coordinate grid, through translations and reflections

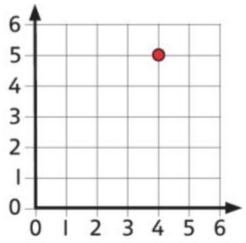


We are going to use grids like this in this unit. How is it different to what you have met before?

We will need some maths words. Which ones have you seen before?

quadrant	four quadrants		translate
translation	*x*-axis	*y*-axis	axis
axes	horizontal	vertical	
vertex	reflect	reflection	

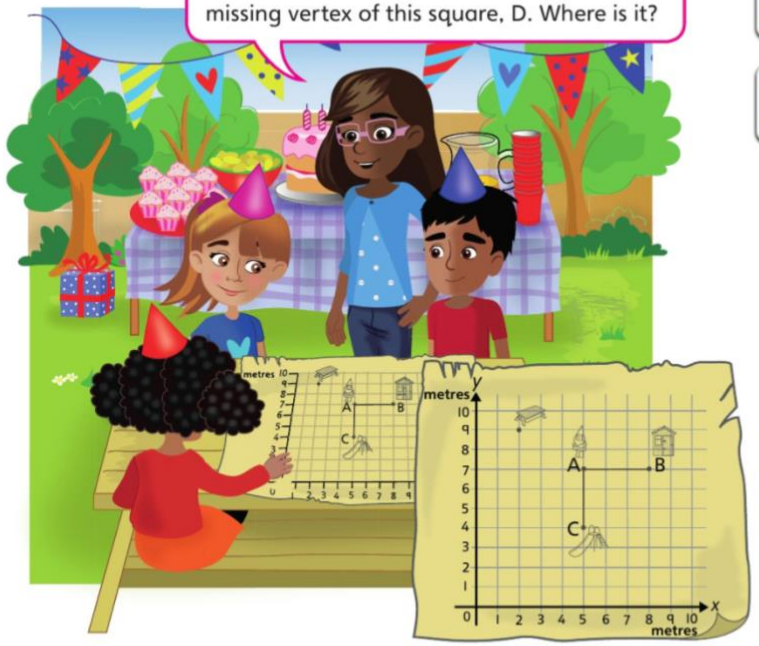
We will need this too! Can you work out how we could describe the position of the point on the grid?



Plotting coordinates in the first quadrant

Discover

This grid represents the garden. A is the garden gnome, B is the shed and C is the slide. You will find the treasure at the missing vertex of this square, D. Where is it?



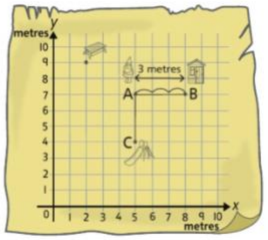
1 **a)** The points A, B and C are vertices of a square. The treasure is at the missing vertex, point D.

What coordinates take you to the treasure?

b) What is the perimeter of the square?

Share

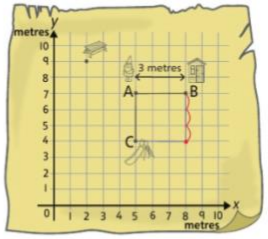
a) B(8,7) is 3 metres away from A(5,7).



The horizontal axis is called the *x*-axis. The vertical axis is called the *y*-axis. The *x*-axis is always given first in a set of coordinates.

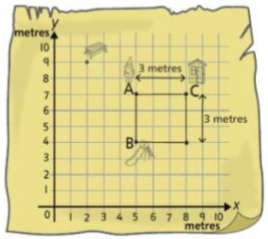
I will count how many metres point B is from point A. The missing point will be the same distance from B but downwards.

Counting 3 metres down from B(8,7) takes you to (8,4).
So D is (8,4), which is where the treasure is hidden.



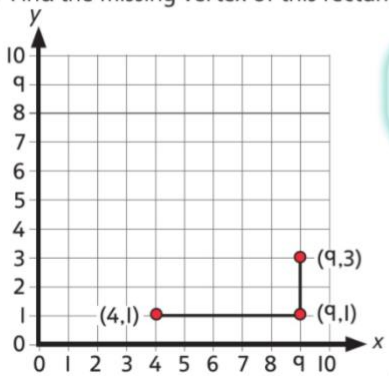
I could count across from C.

b) The length of each side is 3 metres.
Therefore the perimeter is 3 × 4 = 12 metres.



Think together

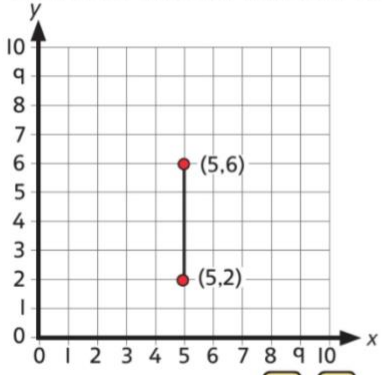
1 **a)** Find the missing vertex of this rectangle.



The missing vertex is at coordinates (☐, ☐).

b) This line is part of a square.

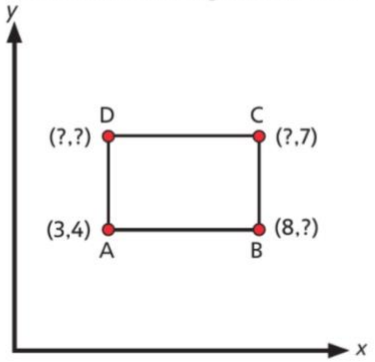
What could two other vertices of the square be?



One vertex could be at (☐, ☐).

Another vertex could be at (☐, ☐).

2 Point A of a rectangle is at (3, 4).
Work out the missing coordinates.



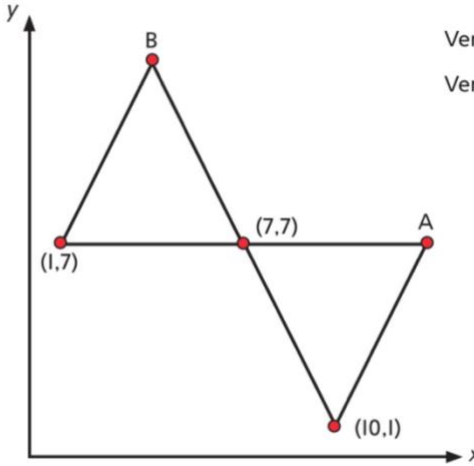
B (8, ☐)

C (☐, 7)

D (☐, ☐)

3 There are two identical isosceles triangles.
What are the coordinates of vertices A and B?

CHALLENGE



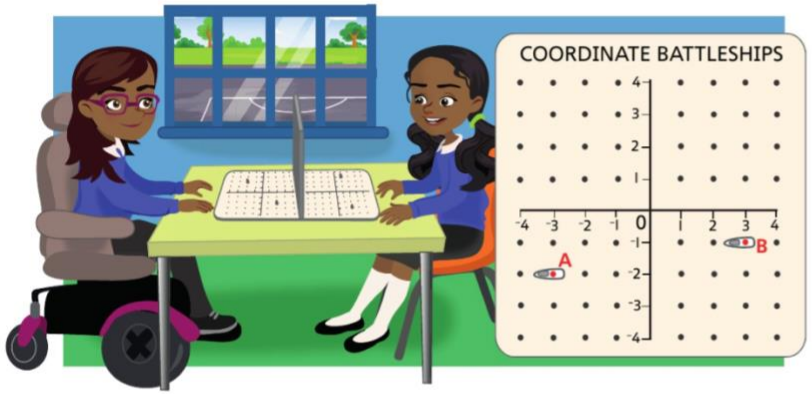
Vertex A (☐, ☐)

Vertex B (☐, ☐)

Tuesday 8.12.20

Plotting coordinates

Discover



1 **a)** What are the coordinates of the ships A and B?

b) Ambika guesses that Reena has a ship at the coordinates (⁻2,3).

Where is this point on the grid?

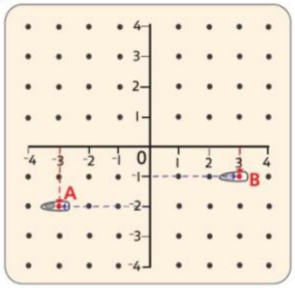
Unit 6: Geometry – position and direction, Lesson 2

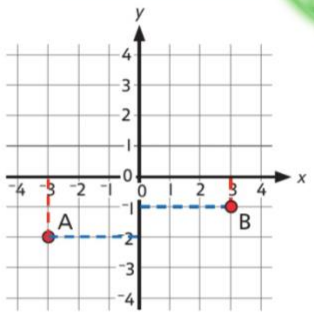
Share

a)

I think coordinates can also have negative values.

I remember that I should read the *x*-axis coordinate first, and then the *y*-axis coordinate.

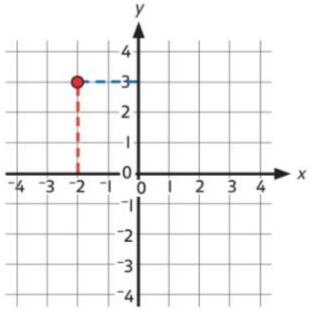




Ship A is in line with ⁻3 on the *x*-axis and it is in line with ⁻2 on the *y*-axis. The coordinates of ship A are (⁻3,⁻2).

Ship B is in line with 3 on the *x*-axis and it is in line with ⁻1 on the *y*-axis. The coordinates of ship B are (3,⁻1).

b)



We say a coordinate grid like this has four **quadrants**. Coordinate grids that show just positive values have only one quadrant.

Point (⁻2,3) is at ⁻2 on the *x*-axis and 3 on the *y*-axis.

Think together

1 **a)** At what coordinates has Liam plotted his ships?

Ship A is at ☐ on the *x*-axis and it is at ☐ on the *y*-axis.

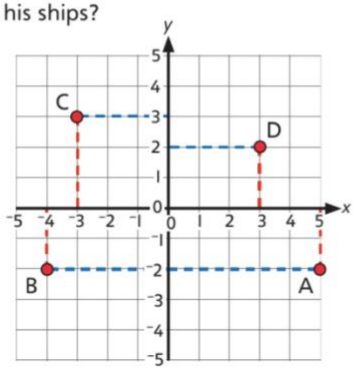
The coordinates of ship A are (☐, ☐).

The coordinates of the other ships are:

Ship B (☐, ☐)

Ship C (☐, ☐)

Ship D (☐, ☐)



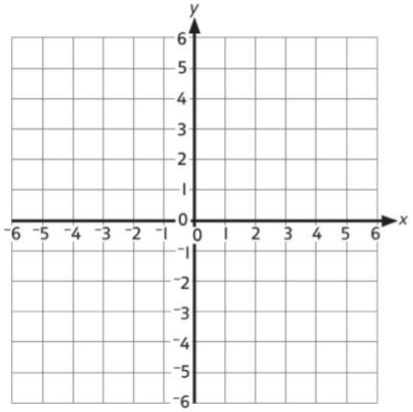
b) Liam guesses where his partner's ships are.

Guess 1 (⁻4,5)

Guess 2 (4,⁻2)

Guess 3 (⁻5,⁻4)

Point to each of his guesses on the grid.



Unit 6: Geometry – position and direction, Lesson 2

2 Mark says that his points are at:

A(1,⁻4)

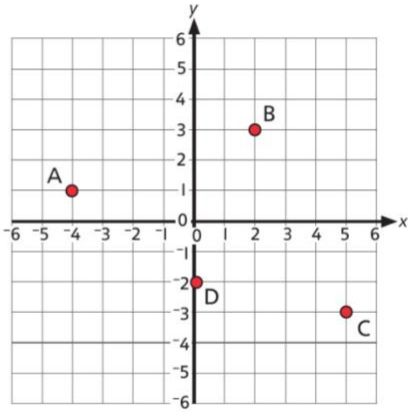
B(2,3)

C(⁻5,⁻3)

D(⁻2,0)

Three of his coordinates are wrong. Can you work out which ones?

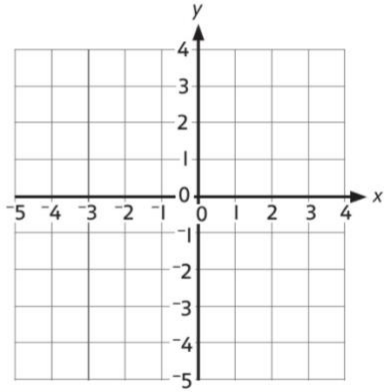
What mistakes did Mark make?



3 Maisy knows her partner's four points make a rectangle.

Which of the coordinates below are the coordinates of Maisy's partner's points?

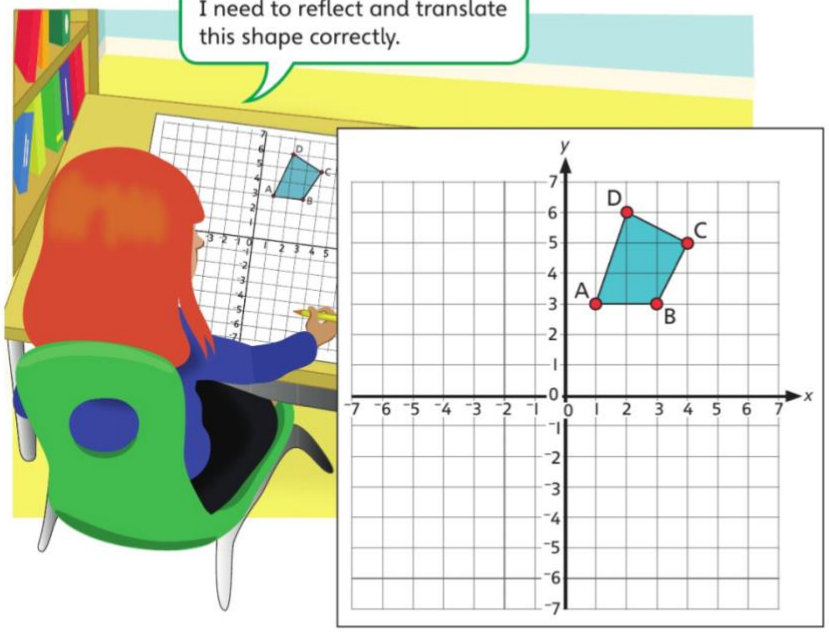
(2,1)	(1,⁻1)	(2,⁻1)
(1,1)	(3,⁻2)	(2,⁻3)
(⁻1,1)	(⁻1,2)	(4,1)



Wednesday 9.12.20

Plotting translations and reflections

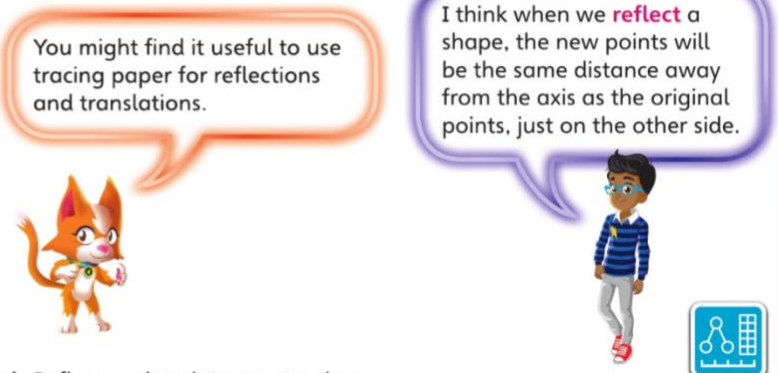
Discover



1 **a)** Where would Olivia draw the shape if it was reflected in the *x*-axis?

b) Where would Olivia draw the shape if her original shape was translated 4 left and 5 down?

Share



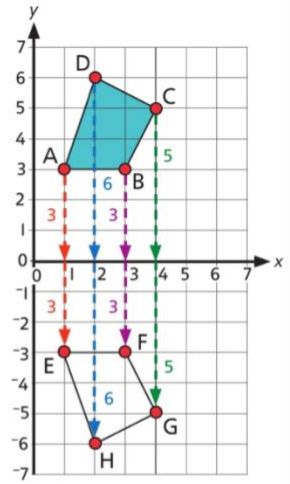
a) Reflect each point one at a time.

Points A and B are both 3 units away from the *x*-axis. Point C is 5 units away from the *x*-axis. Point D is 6 units away from the *x*-axis.

The reflected points will be the same distance away from the *x*-axis.

Join up the points in order to make the shape after it has been reflected.

The new coordinates are:
E is at (1,⁻3)
F is at (3,⁻3)
G is at (4,⁻5)
H is at (2,⁻6)



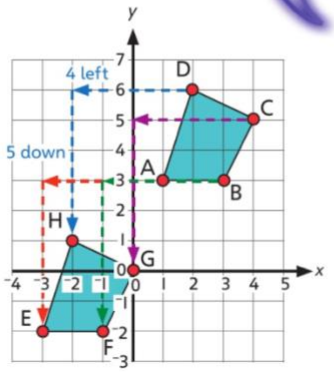
Translate means you move the vertices of the shape according to the instructions you are given.

I am going to move each point one at a time, and then join the points to make my shape.

b) Start by moving point A. Move it 4 left first and then 5 down. Do the same with the other points.

Join up the points in order to make the new shape.

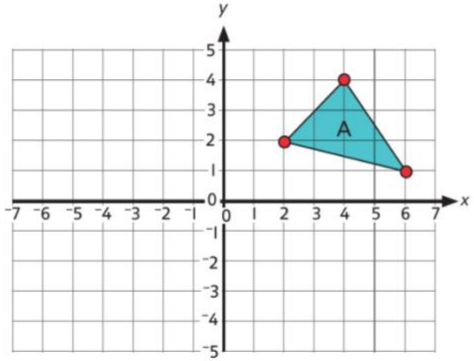
The new coordinates are:
E is at (⁻3,⁻2)
F is at (⁻1,⁻2)
G is at (0,0)
H is at (⁻2,1)



Think together

1 **a)** Reflect shape A in the *x*-axis. Label your new shape B.

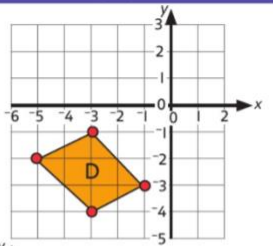
b) Reflect shape A in the *y*-axis. Label your new shape C.



To reflect in the *y*-axis, I think I need to work out the distance from the *y*-axis.

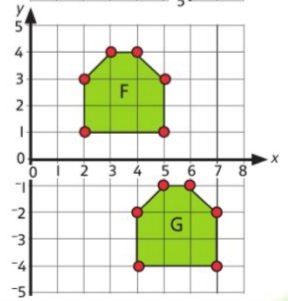
Unit 6: Geometry – position and direction, Lesson 3

2 **a)** Translate shape D 2 units right and 3 units up. Label your new shape E.



b) Look at this diagram. Complete the sentence:

Shape F has been translated ☐ ____ and ☐ ____ to become shape G.

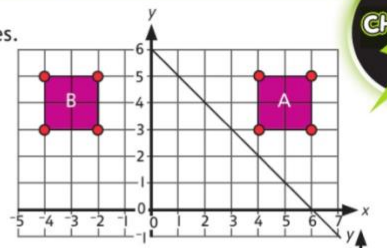


3 Spot and explain the mistakes.

CHALLENGE

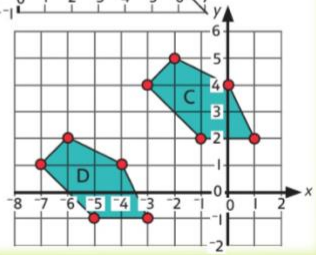
a) Shape B should be a reflection of shape A in the diagonal line.

Explain what mistake has been made. Where should shape B be?



b) Shape D should be a translation of shape C, 4 units right and 3 units down.

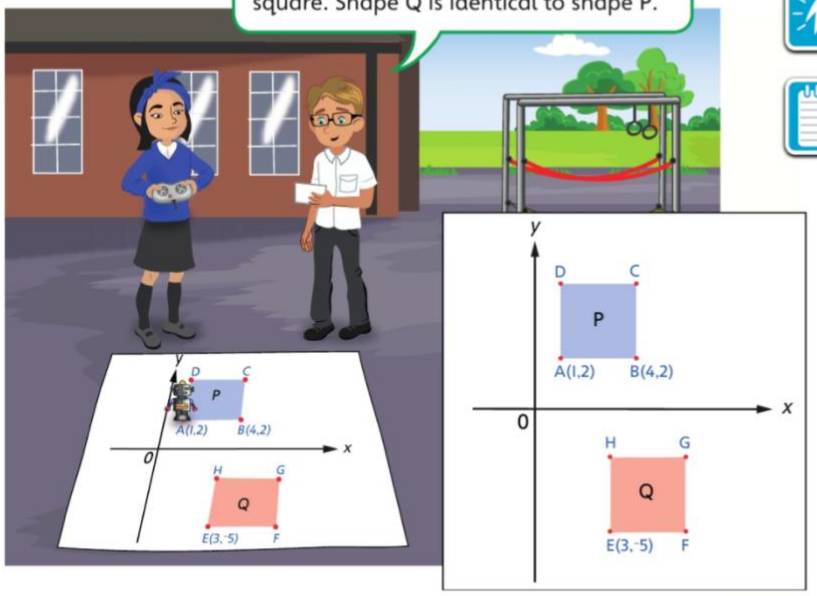
Explain what mistake has been made. Where should shape D be?



Thursday 10.12.20

Reasoning about shapes with coordinates

Discover



1 Lexi and Andy are trying to solve a puzzle.
They have been given some clues.

a) What are the coordinates of points C and D in shape P?

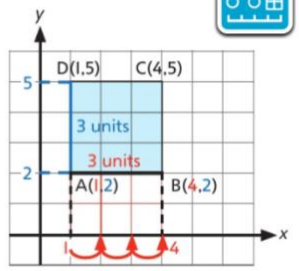
b) What are the coordinates of points F, G and H in shape Q?

Share

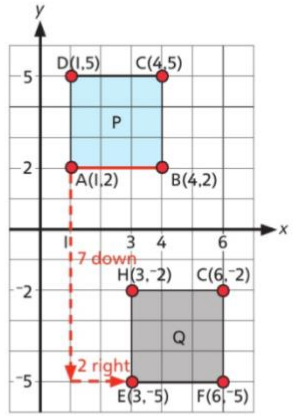
a) The line AB is 3 units long. This means the square has sides 3 units long.

D has the same *x*-coordinate as A but is 3 units higher on the *y*-axis than A. So the coordinates of vertex D are (1,5).

C has the same *x*-coordinate as B and the same *y*-coordinate as D. So the coordinates of vertex C are (4,5).



b) Shape Q is identical to shape P.



We know that vertex E is (3,⁻5). Vertex A has therefore been translated 2 units right and 7 units down.

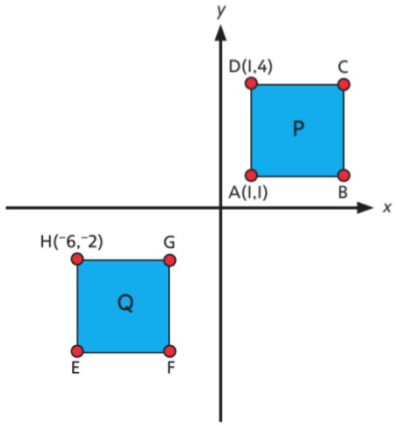
So each vertex has been translated 2 units right and 7 units down.

The missing coordinates for shape Q are:

F (6,⁻5) G (6,⁻2) H (3,⁻2)

Think together

1 Eden and Noah have been given some axes showing two squares. The squares are identical.



a) What are the coordinates of points B and C?

Point B (,)

Point C (,)

b) What are the coordinates of points E, F and G?

Point E (,)

Point F (,)

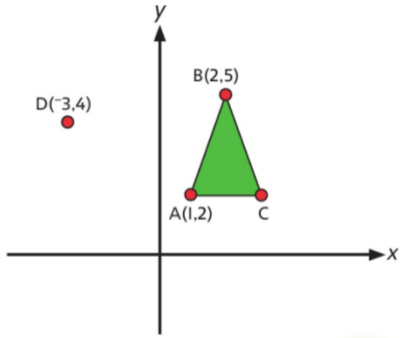
Point G (,)

Unit 6: Geometry – position and direction, Lesson 4

2 This is an isosceles triangle.

a) What are the coordinates of point C?

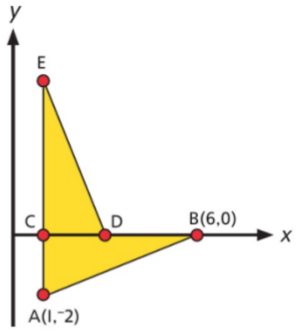
b) The triangle is translated. Point A has moved to where point D is. What are the coordinates of the other two vertices of the triangle?

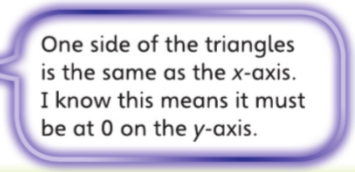


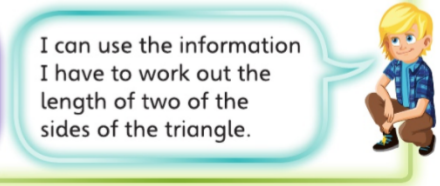
3 Eden and Noah have another puzzle to solve.

The triangles are identical.

What are the coordinates of vertices C, D and E?



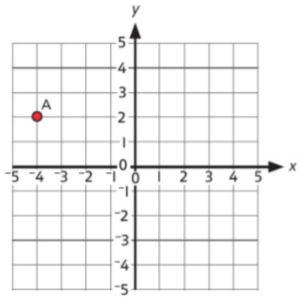




Friday 11.12.20

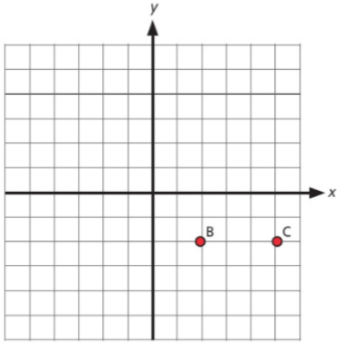
End of unit check

1 What are the coordinates of point A?



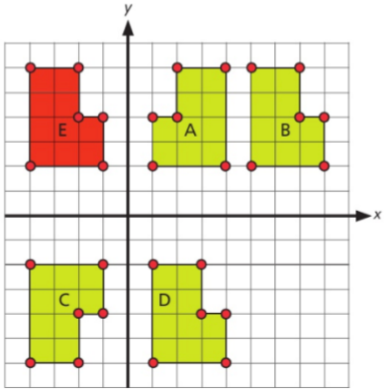
- **A** (2,⁻4)
- **B** (⁻2,⁻4)
- **C** (2,4)
- **D** (⁻4,2)

2 Points B and C are 2 vertices of a square. Which of the coordinates below could **not** be coordinates of another vertex of the same square?



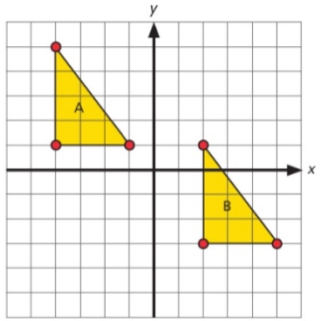
- **A** (5,⁻5)
- **B** (5,1)
- **C** (2,2)
- **D** (2,1)

3 Which shape shows shape E after it has been reflected in the *y*-axis?

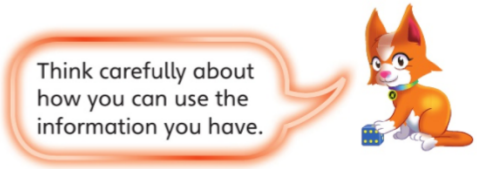


- **A** Shape A
- **B** Shape B
- **C** Shape C
- **D** Shape D

4 Shape A is translated and the result is Shape B. What was the translation?

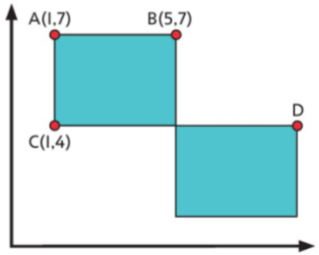


- **A** Translation 6 left and 4 up
- **B** Translation 4 right and 4 down
- **C** Translation 6 right and 4 down
- **D** Translation 6 right and 5 down



5 The diagram shows two identical rectangles.

Find the coordinates of point D.

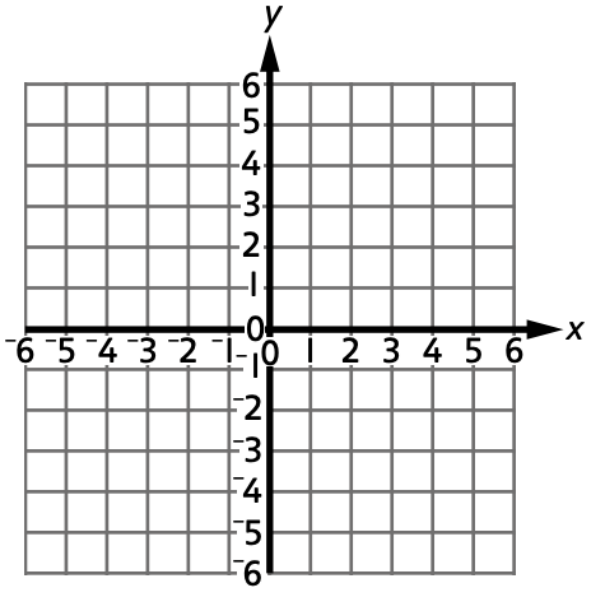


Deepen Activities

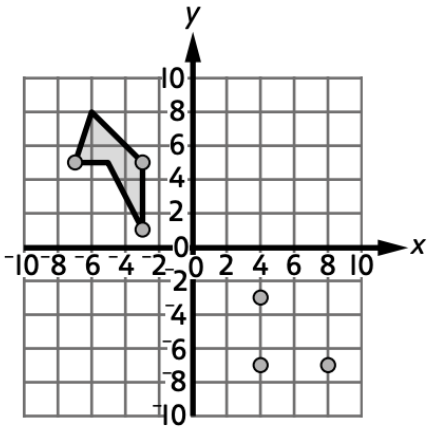
1 A treasure chest is hidden at one point on this grid.

- Ebo says, 'It is in a rectangle with vertices at $(^{-}3, ^{-}2)$, $(1, 2)$ and $(^{-}3, ^{-}3)$.'
- Danny says, 'It is in a square with vertices at $(^{-}3, ^{-}3)$, $(^{-}1, 0)$ and $(0, 5)$.'
- Emma says, 'It is in a triangle with vertices at $(^{-}2, 2)$, $(4, 1)$ and $(4, ^{-}3)$.'

Where is the treasure chest?



2 This shape is moved on a grid. Some of the new vertices are shown.



a) Complete the new shape and label the coordinates of its vertices.

b) Describe how it moved. Use the words 'reflected' and 'translated'.

3 A right-angled triangle has two vertices at $(^{-}2, ^{-}2)$ and $(1, ^{-}4)$.

a) What might the third vertex be?

b) The triangle is half of a square. Give the coordinates of the square.

c) The square is half of a rectangle. Give the coordinates of the rectangle.