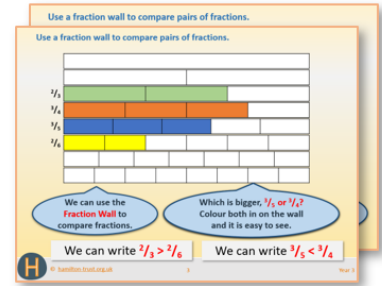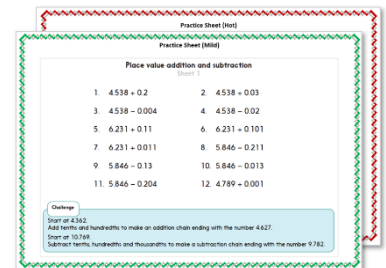# Week 9, Day 4
Describe co-ordinates after a translation
Each day covers one maths topic. It should take you about 1 hour or just a little more.

1. Start by reading through the **Learning Reminders**. They come from our *PowerPoint* slides.

2. Tackle the questions on the **Practice Sheet**.
   There might be a choice of either Mild (easier) or Hot (harder)!
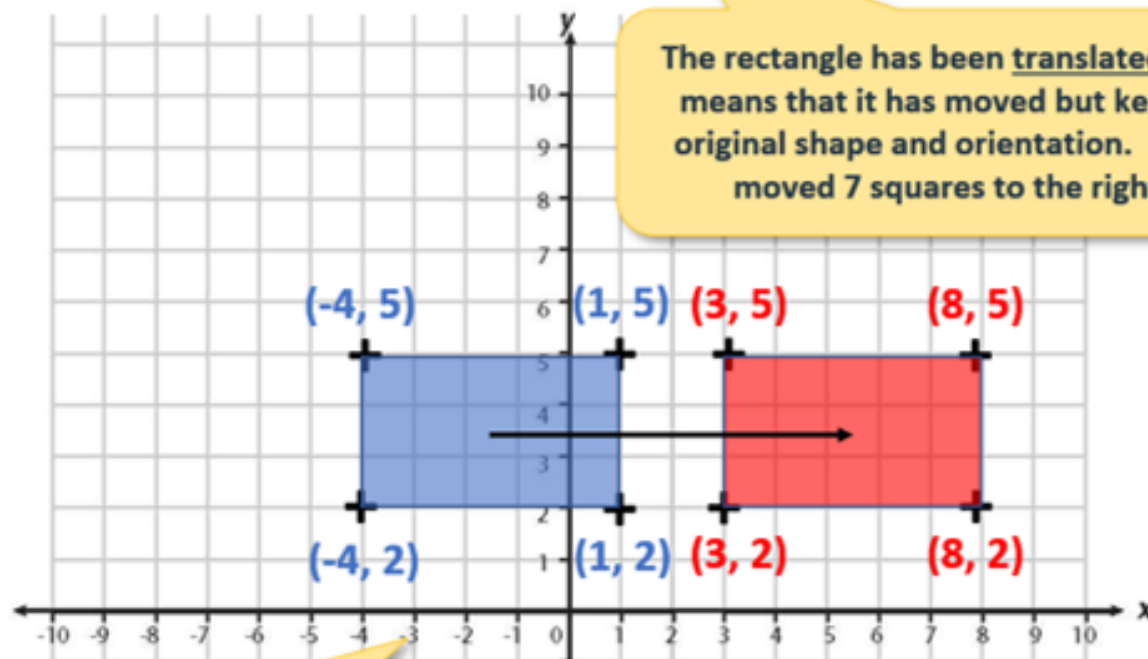   Check the answers.

3. Finding it tricky? That's OK… have a go with a grown-up at **A Bit Stuck?**

4. Think you've cracked it? Whizzed through the Practice Sheets?
   Have a go at the **Investigation**…

Learning Reminders

The rectangle has been **translated**. This means that it has moved but kept its original shape and orientation. It has moved 7 squares to the right.

Look how each x-value has been **increased** by 7, but the corresponding y-values have stayed the same.

Explore more Hamilton Trust Learning Materials at https://wrht.org.uk/hamilton

Learning Reminders
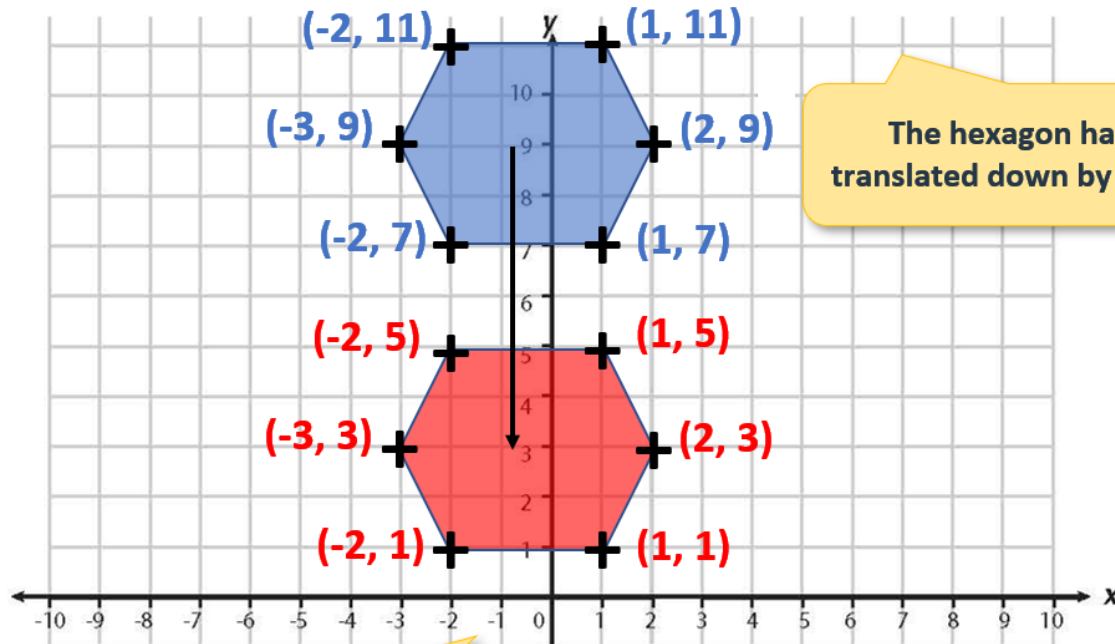
The hexagon has been translated down by 6 squares.

Look how each y-value has been **decreased** by 6, but the corresponding x-values have stayed the same.

Explore more Hamilton Trust Learning Materials at https://wrht.org.uk/hamilton

Practice Sheet Mild
Translations

Choose five different coloured pencils.
Join the first set of points using one colour, then translate the shape, marking its new position in the same colour.
Write the new co-ordinates at each vertex.

Repeat for each set of points in a different colour.

1.   (1, 1), (1, 4), (5, 4), (5, 1). Translate the shape 2 squares to the left.
2.   (1, 9), (2, 8), (4, 8), (5, 9), (4, 10), (2, 10). Translate the shape 3 squares down.
3.   (-5, 5), (-5, 6), (-2, 5). Translate the shape 4 squares to the right.
4.   (-8, 1), (-6, 3), (-2, 3), (-4, 1). Translate the shape 5 squares to the right.
5.   (6, 6), (7, 7), (9, 7), (10, 6). Translate the shape 5 squares to the left.

What happens to the co-ordinates when you move a shape up? And down?

What happens when you move a shape to the left? And right?
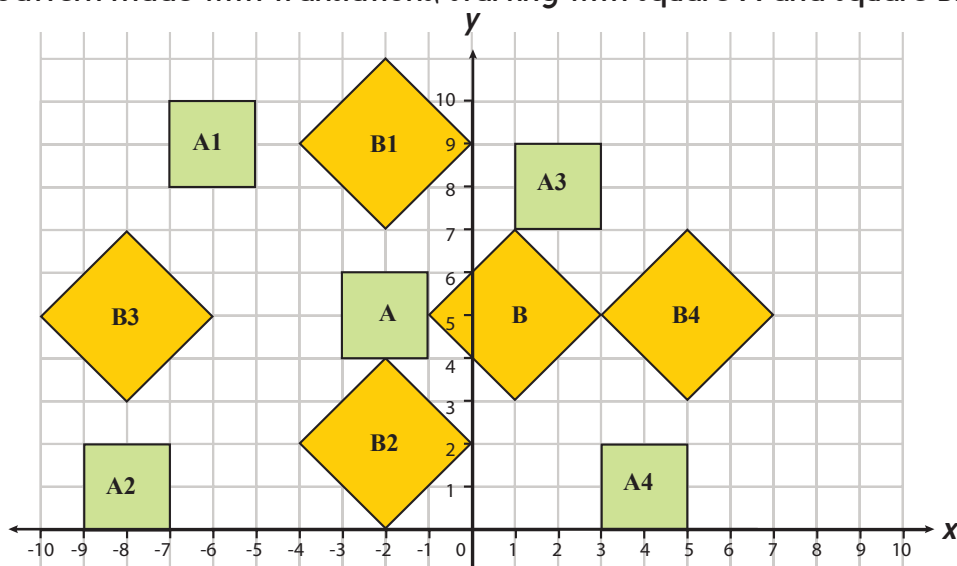
Practice Sheet Mild
Translations
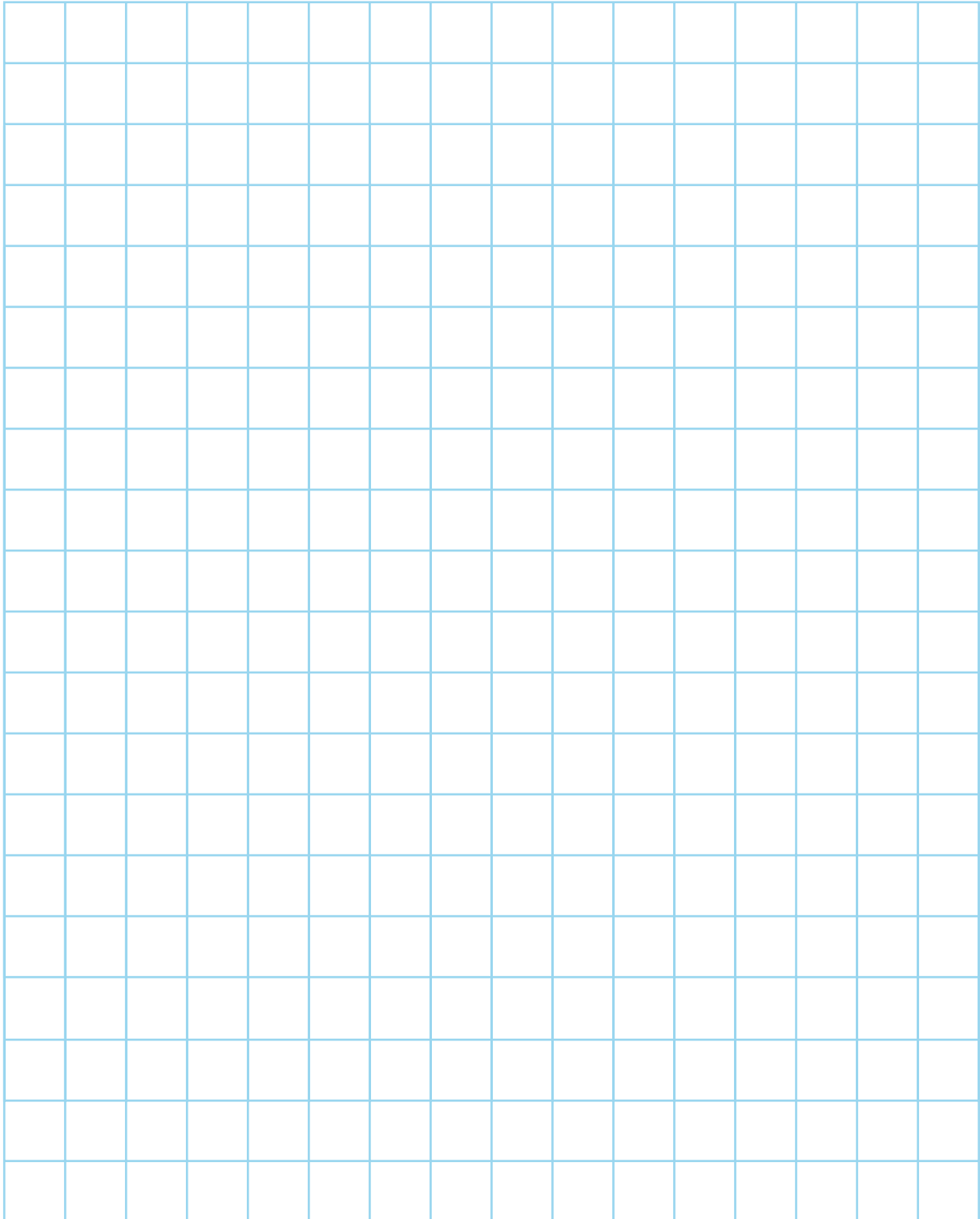
Pattern of translations

Here is a pattern made with translations, starting with square A and square B.

1. Work out how each shape has been translated.
    Fill in the table to show the moves.
    How many squares in the *x*-direction? Is it to the left or right?
    How many squares in the *y*-direction? Is it up or down?

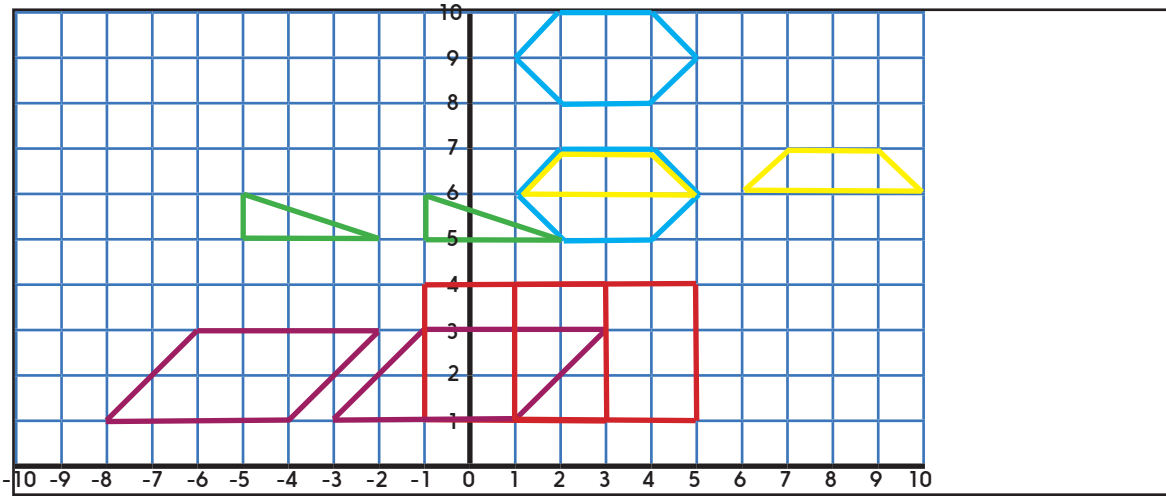| Original shape	Translated shape	Squares in x direction	Squares in y direction
Square A	Square A1	*4 to the left*	*4 up*
Square A	Square A2		
Square A	Square A3		
Square A	Square A4		
Square B	Square B1		
Square B	Square B2		
Square B	Square B3		
Square B	Square B4		

Challenge

Here are the descriptions of two more translations.
What are the co-ordinates of the translated shapes?
a.   Square A ⟶ Square A5   3 squares to the left, 5 squares up
b.   Square B ⟶ Square B5   6 squares to the right, 2 squares down

Practice Sheets Answers

Translations (mild)

New co-ordinates:
1. (-1, 1), (-1, 4), (3, 4) and (3, 1)
2. (1, 6), (2, 5), (4, 5), (5, 6), (4, 7) and (2, 7)
3. (-1, 5), (-1, 6) and (2, 5)
4. (-3, 1), (-1, 3), (3, 3) and (1, 1)
5. (1, 6), (2, 7), (4, 7) and (5, 6)

The y co-ordinate increases when you move a shape up and decreases when you move it down.
The x co-ordinate decreases when you move a shape to the left and increases when you move it to the right.

Pattern of translations (hot)

| Original shape	Translated shape	Squares in x direction	Squares in y direction
Square A	Square A1	4 to the left	4 up
Square A	Square A2	6 to the left	4 down
Square A	Square A3	4 to the right	3 up
Square A	Square A4	6 to the right	4 down
Square B	Square B1	3 to the left	4 up
Square B	Square B2	3 to the left	3 down
Square B	Square B3	9 to the left	0
Square B	Square B4	4 to the left	0

Challenge
The new co-ordinates are:
a) (-6, 9), (-6, 11), (-4, 9), (-4, 11)   b) (5, 3), (7, 1), (7, 5) (9, 3)

A Bit Stuck?
Moving polygons on a grid
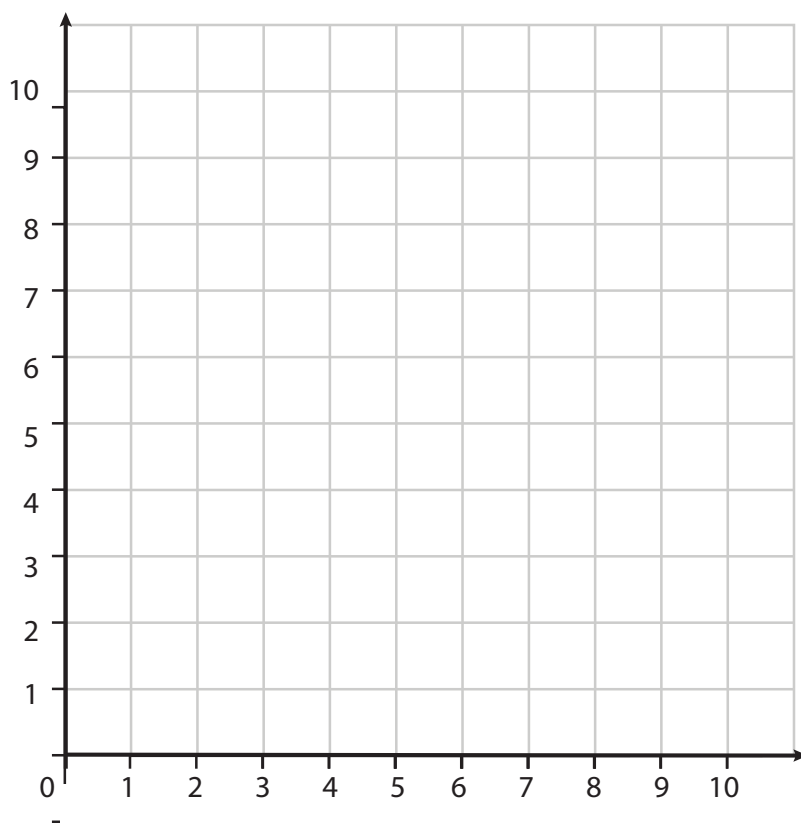
1) Plot these co-ordinates: (1,2), (4,3), (2,5)

2) Join them up, what shape have you made? _____

3) Imagine you slide this shape up three squares.

   What are the new co-ordinates of its vertices?

   _____, _____, _____

4) Draw the new shape on the grid.

5) Plot these co-ordinates: (5,8), (7,10), (5, 10)

6) They are three of the corners of a square.

   What are the co-ordinates of the other corner? _____

7) Plot this point: then join them up to draw the square.

8) Imagine you slide this shape one square down and four squares left. What are

   the new co-ordinates of its vertices?

   _____, _____, _____, _____

9) Draw the new shape on the grid.

S-t-r-e-t-c-h

A shape is translated three squares right and four squares 'up' the grid. It finishes with vertices at: (5,4), (3,9) and (3,4). Where did it start?

Explore more Hamilton Trust Learning Materials at https://wrht.org.uk/hamilton

A Bit Stuck?
Moving polygons on a grid

A Bit Stuck? Answers

Moving polygons on a grid

1. See grid above
2. Triangle
3. (1, 5), (4, 6) and (2, 8)
4. See grid above
5. See grid above
6. (7, 8)
7. See grid above
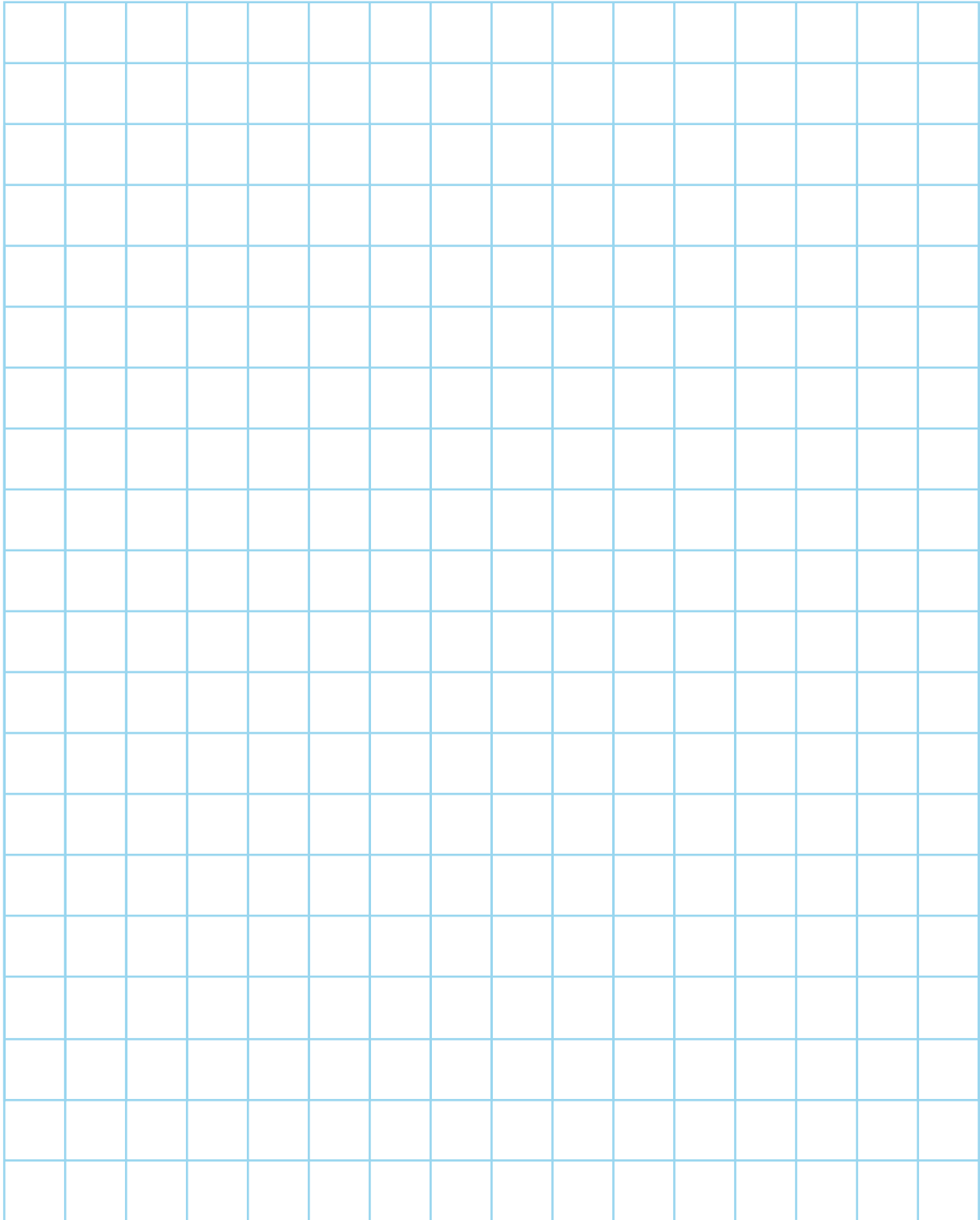8. (1, 7), (1, 9), (3,7) and (3, 9)
9. See grid above

S-t-r-e-t-c-h

A shape is translated three squares right and four squares 'up' the grid. It finishes with vertices at: (5,4), (3,9) and (3,4). Where did it start?   (2, 0), (0, 5) and (0, 0)
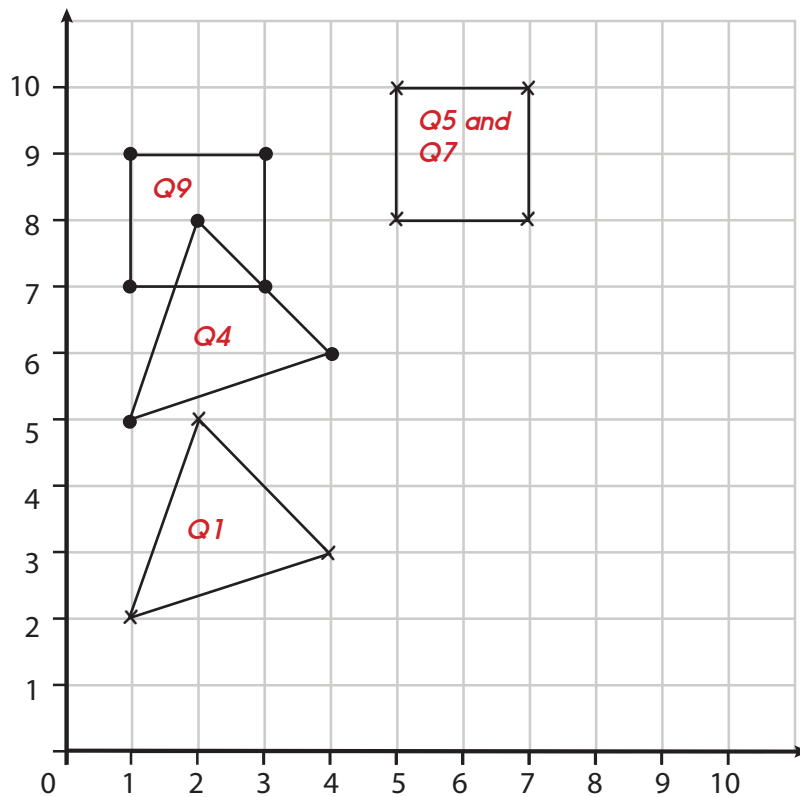
Investigation
Moving shapes

You will need:
- Two quadrants grid
- Coloured pencils

What to do:
- Choose five different coloured pencils.

- Join the first set of co-ordinates (see lists below), using one colour of pencil. They are the vertices of a polygon. Follow the instruction to translate the shape, marking its new vertices in the same colour.

- Write the new co-ordinates at each vertex.

1. (1, 1), (1, 4), (5, 4), (5, 1). Translate the shape 2 squares to the left.
2. (1, 9), (2, 8), (4, 8), (5, 9), (4, 10), (2, 10). Translate the shape 3 squares down.
3. (-5, 5), (-5, 6), (-2, 5). Translate the shape 4 squares to the right.
4. (-8, 1), (-6, 3), (-2, 3), (-4, 1). Translate the shape 5 squares to the right.
5. (6, 6), (7,7), (9, 7), (10, 6). Translate the shape 5 squares to the left.

- Repeat for each set of points using a different colour for each one.

- What happens to the co-ordinates when you move a shape up? And down?

- What happens when you move a shape to the left? And to the right?

Challenge

- Draw any quadrilateral; then translate it two squares up AND two squares to the right. What happens to the x-values? And the y-values?
- Draw a second quadrilateral and translate one square down and three to the left.
  Can you work out the co-ordinates without drawing it first?
- Repeat for further shapes and combined movements.
  What will we do if the shape translates off the grid?!

Investigation
Moving shapes

y

10
9
8
7
6
5
4
3
2
1

-10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10

x

Explore more Hamilton Trust Learning Materials at https://wrht.org.uk/hamilton