Linear equations

- Find pairs of numbers that satisfy an equation with two unknowns
- Use simple formulae

Challenge 1

1 Here are some sets of coordinate pairs. Complete the rules.

You will need:
- 1 cm squared graph paper
- ruler

Example

$(1, 3); (2, 4); (4, 6); (7, 9)$ The rule is $y = x + 2$

a $(2, 5); (4, 7); (5, 8); (6, 9)$ The rule is $y = x +$

b $(2, 7); (3, 8); (4, 9); (6, 11)$ The rule is $y = x +$

c $(4, 3); (7; 6); (9, 8); (10, 9)$ The rule is $y = x \dots$

2 Use your answers from Question 1 and follow the steps below.

- Draw axes on your graph paper and label the x- and y-axes from 0 to 12.
- Plot the points from Question 1 and carefully join the coordinates to show lines **a**, **b** and **c**. Label each line.
- Write what you notice about the lines.

3 There is more than one whole number solution for each of these equations. Find two pairs of numbers that satisfy each equation.

a $2x + y = 8$ b $a + 3b = 10$

Challenge 2

1 Draw axes on your 1 cm squared graph paper and label the x- and y-axes from 0 to 15.

- Copy the table and complete the values for y.
- Plot the points and carefully join the coordinates to show the three lines. Label each line.
- Write what you notice about the lines.
- Can you draw another line that follows the same pattern? Write down the equation for your line.

	1st set of coordinates		2nd set of coordinates		3rd set of coordinates	
	x	y	x	y	x	y
$y = x + 1$	1		3		7	
$y = x + 4$	2		5		8	
$y = x + 7$	0		2		6	

2 There is more than one whole number solution for each of these equations. Find two pairs of numbers that satisfy each equation.

a $a + 2b = 12$ b $x + 3y = 12$ c $2a + 3b = 16$ d $5x + 2y = 24$

3 Conversion graphs are commonly used to change units from one to another. Use the rules to draw separate conversion graphs for:

a litres to pints   b kilograms to pounds

Rules
- $4 \cdot 5\, l = 8$ pints
- $5\, kg = 11\, lb$

4 Use your graphs from Question 3 to calculate an approximate value for:

a 6 pints in litres   b 3 kg in pounds

c 7 litres in pints   d 15 pounds in kg

Hint

You need two points to draw a line. The second point can be (0,0).

Challenge 3

Draw axes on your 1 cm squared graph paper and label the x- and y-axes from −10 to +10 to create a 4-quadrant coordinates grid.

- Plot the line $y = x − 3$. Find values for y when $x = − 5$, 2 and 6 to give you three sets of coordinates.
- Write the coordinates for the points where the line crosses the x- and y-axes.
- Now plot the line $y = x + 3$. Find values for y when $x = − 6, − 2$ and 4.
- Write the coordinates for the points where the line crosses the x- and y-axes. What do you notice about the two lines?
- Predict where the lines $y = x − 6$ and $y = x + 6$ will cross the x- and y-axes.
- Find three sets of coordinates for each of the lines and plot the lines to check your prediction.