In this activity you will use a spreadsheet with the extension .xlsx to explore how the shape and the position of a graph changes when you change the constants (the fixed values) in its equation.

You will look for connections between the numbers in equations like $y = 2x + 3$, $y = 20/x$ and $y = x^2 + 5x - 3$
and the graphs that represent them.

Information sheet A Using Spreadsheet graphs

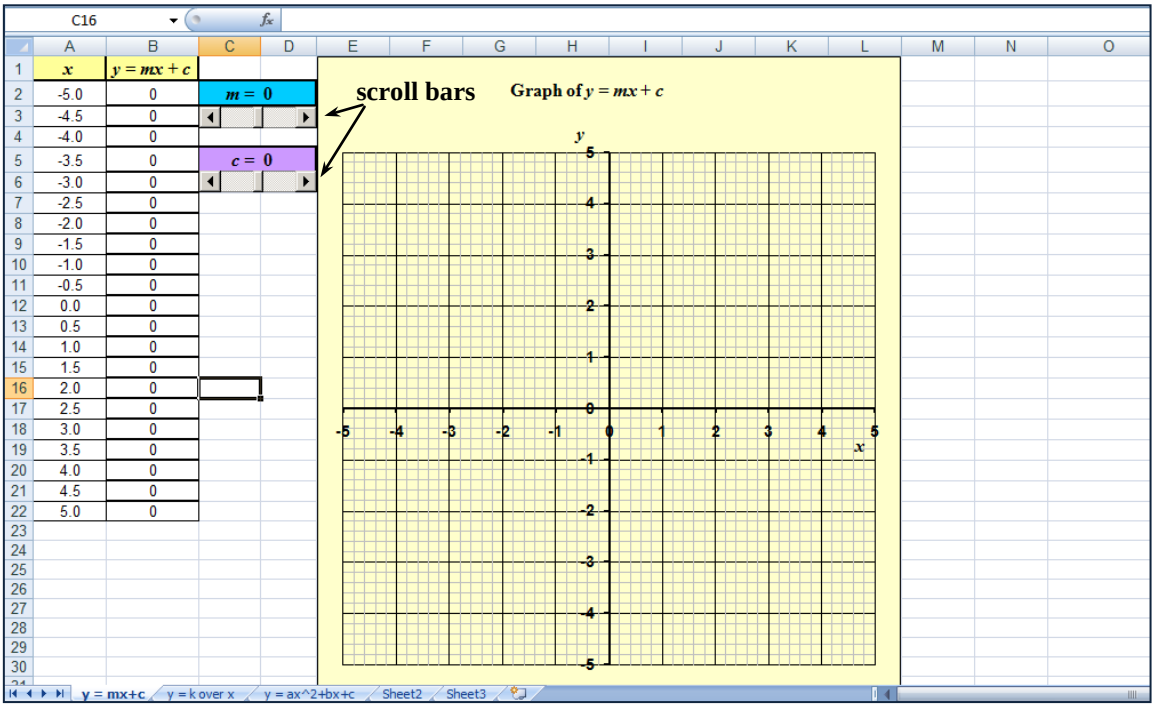
Open Spreadsheet Graphs.xlsx

The first sheet is shown below.
It will show graphs with equations of the form $y = mx + c$

At present the values of m and c are both zero.
You can change these values using the scroll bars.

Leave the value of c equal to zero, and use the scroll bar to change the value of m.

Try using different parts of the scroll bar to see what happens and look at the tables and graphs you get.



You have been looking at some graphs with equations of the form $y = mx$ (since c is zero).

B Exploring graphs with equations of the form $y = mx$

Keep $c = 0$, so that in each case y is ***proportional*** to x.

Try these

1 What point on the graph does the line ***always*** pass through?

……

2 What happens to the line as the value of m increases from 0 to 5?

……

3 What happens to the line as the value of m decreases from 0 to –5?

……

C Exploring graphs with equations of the form $y = c$

Now keep $m = 0$ and use the scroll bar to change the value of c.

Try these

4 What happens to the line as the value of c increases from –4 to 4?

……

D Exploring graphs with equations of the form $y = mx + c$

Try these

Keep $m = 1$ and use the scroll bar to change the value of c.

5 What happens to the line as the value of c increases from –4 to 4?

……

Keep $m = –1$ and change the value of c.

6 What happens to the line as the value of c increases from –4 to 4?

……

Reflect on your work

What can you say about the link between the line and the value of c?

What can you say about the link between the line and the value of m?

Can you think of any real life situations that can be modelled by an equation of the form $y = mx + c$?

E Exploring graphs with equations of the form $y = k/x$

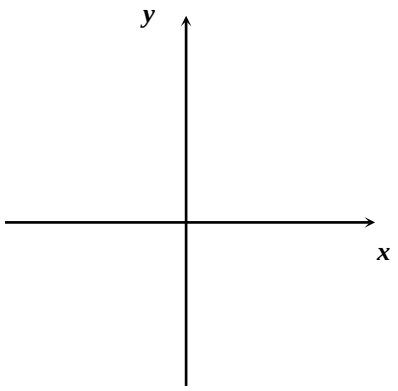
Now look at the second sheet ($y = k$ over x).

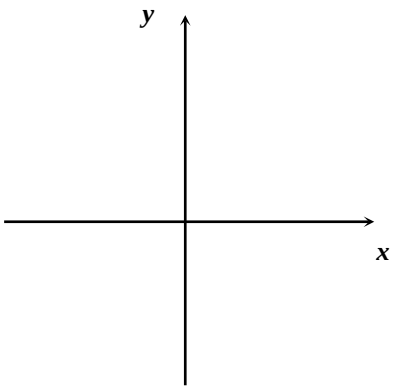
It will show graphs with equations of the form

Experiment with different values of k. $y = \frac{k}{x}$

7 On the left-hand set of axes, below sketch the graph when k is positive.

8 On the right-hand set of axes, sketch the graph when k is negative.





9 What point on the graph does the curve *never* pass through?.....

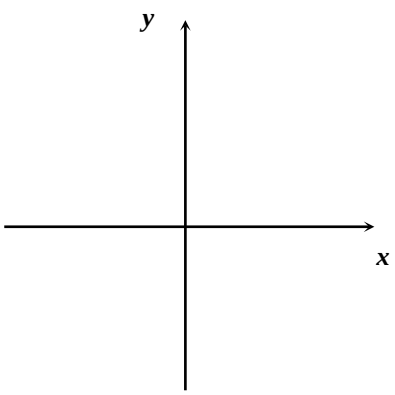
F Exploring graphs with equations of the form $y = ax^2 + bx + c$

Now look at the third sheet.

It will show graphs with equations of the form $y = ax^2 + bx + c$.

Questions 10 to 13 are about curves with equations of the form $y = ax^2$

Keep b and c at zero and experiment with different values of a.



10 On this set of axes sketch the graph when a is positive.

11 Describe what happens to the curve as the value of a increases from 0 to 5.

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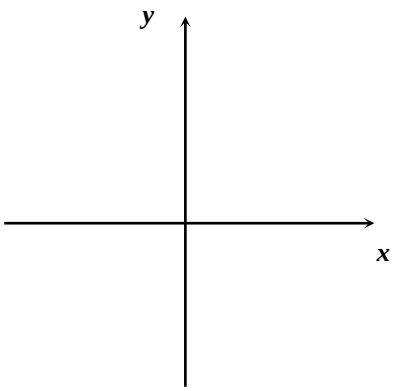

12 On this set of axes, sketch the graph when a is negative.

13 Describe what happens to the curve as the value of a decreases from 0 to –5.

……

Questions 14 to 16 are about curves with equations of the form $y = ax^2 + c$

Keep a = 1 and b = 0. Use the scroll bar to change the value of c.

14 What happens to the curve as the value of c increases from –4 to 4?

……

Keep a = – 1 and b = 0. Change the value of c.

15 What happens to the curve as the value of c increases from –4 to 4?

……

Try other values of a and c, keeping b = 0.

16 What can you say about the link between the curve and the values of a and c?

……

Questions 17 to 21 are about curves with equations of the form $y = ax^2 + bx$

Keep a = 1 and c = 0 and change the value of b.

17 Describe what happens to the curve as the value of b increases from 0 to 4
Write down anything you notice.

……

……

18 Describe what happens to the curve as the value of b decreases from 0 to –4.

……

……

Now keep a = –1 and c = 0, and change the value of b.

19 Describe what happens to the curve as the value of b increases from 0 to 4.
Write down anything you notice.

……

……

20 Describe what happens to the curve as the value of b decreases from 0 to –4.

……

……

Experiment with different values of a, b and c.
Check what effect changing each constant has on curves with equations of the form $y = ax^2 + bx + c$.

Reflect on your work

Describe the effects on the graph of changing each constant, a, b and c in the equation $y = ax^2 + bx + c$.