What is a quadratic?

 This is 🢥  **y = 2x2**

 **So is this** 🢥 **y = x2 + 3**

 **And these** 🢥 **y = 5x2 – 4x + 7**

 **y = x2 – 7x – 12**

 **y = – 1.5x2 + 3.2 x**

**In general, a quadratic is an equation with a squared term (but no higher power)**

**In algebraic language, that is y = ax2 + bx + c (a, b and c are numbers)**

**What happens when we change a, b and c?**

**In this worksheet, you will investigate these questions.**

**To do this, open the simulation found at:**

<http://phet.colorado.edu/sims/equation-grapher/equation-grapher_en.html>

**Part A: Changing a (the coefficient of the x2 term)**

1. **Draw the graph y = x2 by setting the value for a to 1.** 

**HINT**

**You can change the value using the slider but to get a particular value, you may find it easier to type it into the box.**

1. **Draw a set of axes and sketch the graph of y = x2 on them.**
2. **Click on the save button and then change the value of a to 2.**

**Sketch the new graph on the same set of axes in a different colour.**

1. **Change the value of a to 0.5. Use a third colour to record this graph on the same axes.**

**Label the graphs y = x2, y = 2x2 and y = ½x2 respectively.**

1. **Write a sentence or two about how changing the value of a affects the graph.**

**But what about negative numbers?**

1. **Use the simulation to draw a graph of y = -2x2 and record it on the same axes as before.**

**Write an explanation of how negative values of a affect the graph.**

**Part B: Changing a (the coefficient of the x term)**

1. **Draw a new set of axes and change a to 1.**
2. **Leave a = 1 and try several different values of b. Sketch the graphs on the axes in different colours, as before. Label the graphs (y = x2 + x, y = x2 + 2x, y = x2 - 2x etc.)**

**Include some negative values for b.**

1. **Write a sentence or two about how changing the value of a affects the graph.**

**Part C: Changing c (the constant)**

1. **Draw a new set of axes and change a and bto 1.**
2. **Repeat the same process used in parts a and b to find out what happens when you change b.**

**Part C: Challenge**

1. **Work in pairs. One student sets the other a particular description of a parabola. The other student has to use the simulation to draw a parabola which meets the set criteria, sketch the graph and write the equation for the graph.**
2. **Reverse the roles and the second student sets a challenge for the first.**

***Examples of challenges:***

* ***A parabola with the turning point at (1,2)***
* ***A parabola with x=-1 as the axis if symmetry.***
* ***A parabola with the y intercept at (0,4) and only one y intercept.***
* ***A parabola with the turning point at (1,0)and two x intercepts, 4 units apart.***

***… or any other combination of turning point, axis if symmetry, x or y interceptsor anything else you can think of.***