

Ellipse Investigation 1

The geogebra file that you will use in this investigation should be visible on the right hand side of this screen.

A general rule for an ellipse is also shown, but the graph you should see is actually a **circle**.

1. What is the radius of this circle?
2. What are the coordinates of the centre of this circle?
3. What is the equation of this circle?
4. Substitute the values of a and b from the sliders into the rule for the ellipse and show that the ellipse rule can also be used to generate the rule for a circle.
5. What other values of a and b will result in a circle graph? Use the geogebra file to test your answer.
6. All circles are also ellipses. What is the relationship between the a and b if an ellipse is also a circle?

Ellipse Investigation 2

This part of the investigation will explore how the values of a and b influence the shape of the ellipse. All of the ellipses will have centres at the point $(0,0)$.

A general rule for the ellipse is shown.

1. Click the reset button to return the geogebra file to its original settings.
2. Increase the value of a to 3.
 - a. Along which axis did the circle stretch to become an ellipse?
 - b. Which variable (x or y) is "connected" to the value of a in the rule for the ellipse?
 - c. Write down the equation of the ellipse with $a=3$ and $b=2$.
3. Set the sliders to $a=2$ and $b=3$.
 - a. In which direction did the circle stretch this time?
 - b. Write down the equation of the ellipse with $a=2$ and $b=3$.
4. Explore the orientation (longer vertical or longer horizontal) of the ellipse for different values of a and b , then complete the following sentences:
 - a. If the value of a is greater than the value of b , then the ellipse
 - b. If the value of b is greater than the value of a , then the ellipse

Ellipse Investigation 3

Change the sliders to create a graph of the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$

1. Write down the coordinates of the x-axis intercepts
2. Write down the coordinates of the y-axis intercepts

Change the sliders to create another ellipse, with your choice of values for a and b.

3. Write down the coordinates of the x-axis intercepts
4. Write down the coordinates of the y-axis intercepts

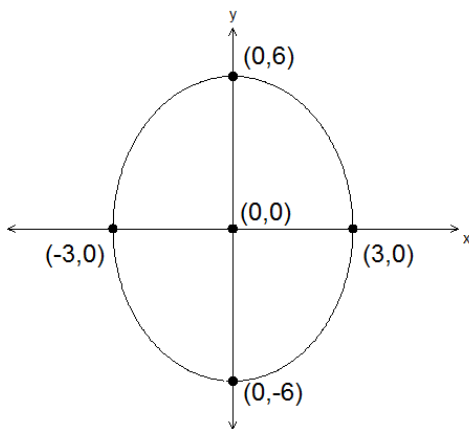
In terms of the general rule for the ellipse, and in terms of a and b:

5. Write down the coordinates of the x-axis intercepts
6. Write down the coordinates of the y-axis intercepts

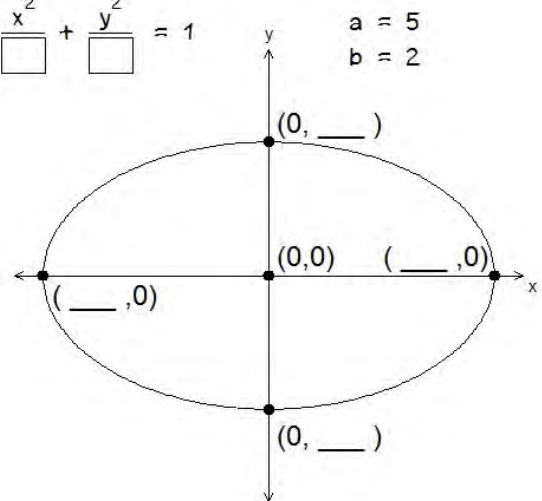
Ellipse Investigation 4

Here is a quick test of your learning so far. There are 2 ellipses shown in the table below, however some of the information is missing. There are also spaces to sketch 2 more ellipses

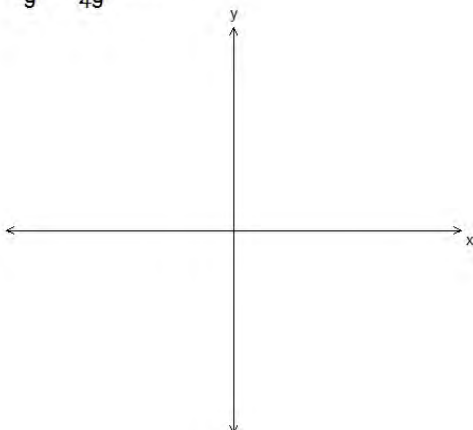
$$\frac{x^2}{\square} + \frac{y^2}{\square} = 1$$



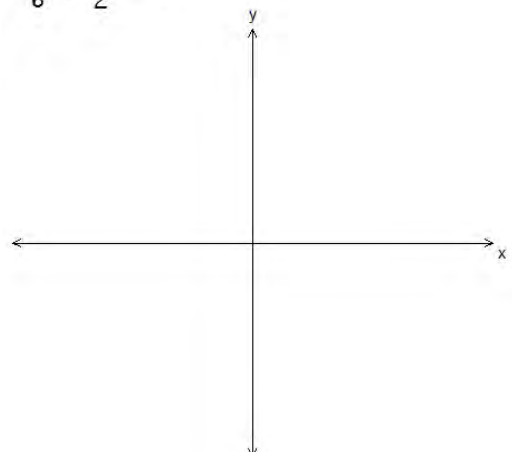
$$\frac{x^2}{\square} + \frac{y^2}{\square} = 1$$



$$\frac{x^2}{9} + \frac{y^2}{49} = 1$$



$$\frac{x^2}{6} + \frac{y^2}{2} = 1$$



Ellipse Investigation 5

A new geogebra file should have opened up on the right hand side of the screen now.

Another general rule for the ellipse is:

$$\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$$

You already have knowledge about the transformation of functions from earlier studies and so the effect of the h and k variables in this rule should be familiar.

1. Complete these sentences:

- a. Increasing the value of h will . . .
- b. Increasing the value of k will . . .

2. Check your predictions by adjusting the sliders in the geogebra file.

3. Explore a variety of values of a, b, h and k.

a. What are the coordinates of the centre of the general ellipse?

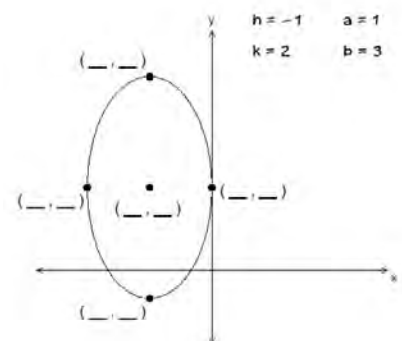
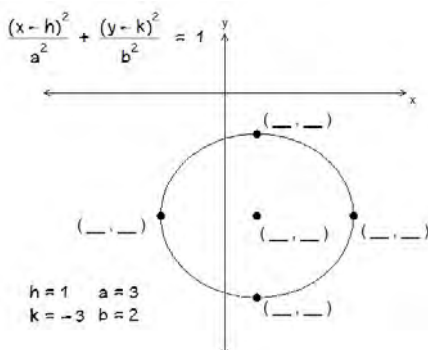
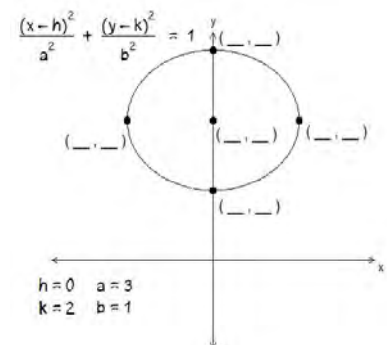
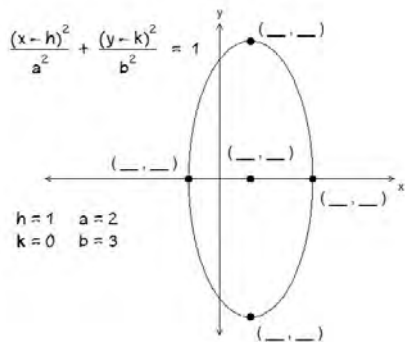
Ellipse Investigation 6

A general rule for an ellipse is also shown on the geogebra file on the right.

This investigation will be about the coordinates of the extreme points of the ellipse. The extreme points are the points at the very left, right, top and bottom of the ellipse.

For each of the diagrams below:

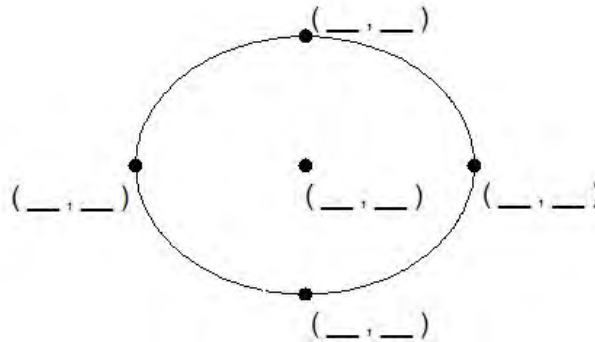
- a. adjust the sliders to match the given values
- b. fill in the missing extreme points on your seminotes



Ellipse Investigation 7

Use the examples you completed in Investigation 7, and any further adjustment of the sliders in the geogebra file, to complete the following diagram.

Fill in the coordinates of the extreme points and the centre of an ellipse in terms of a, b, h and k.



Ellipse Investigation 8

Four ellipses are shown in the table below and there is a copy of the table in your seminotes.

All you need to do is work out the equation of the ellipse, from the given information.

You can check your answers by adjusting the geogebra file, or by clicking the link below the table.

