**How to Draw an Ellipse**

An ellipse is a regular geometric shape, which is fairly easy to draw because it has a wonderful property that can be illustrated with a length of string or yarn, two thumbtacks, a pencil and a sheet of paper fixed to a table or wall.

First, pick two points on the paper. The distance between the two points should not exceed the length of the string or yarn, but do not place the points too close together.

Next, loop the string or yarn around the pencil once; no knots! Make sure the string or yarn can move freely around the pencil.

Then, using the thumbtacks, fix the two ends of the string or yarn to the two points you’ve already chosen. The string or yarn should still be looped around the pencil.

Finally, gently and without putting any marks on the paper, pull the pencil so that there is tension in the string or yarn; there should be two “legs” of string or yarn attached to the pencil, each attached to a thumbtack. Maintaining the same amount of tension, pull the pencil around the tacks while allowing the pencil to mark the paper. Thus you should be able to draw a pretty good ellipse.

Now for the details: the two points you chose are called the *foci* of the ellipse (the singular of foci is focus). Note that the foci are not located at the *center* of the ellipse, except when the ellipse is actually a circle.
If you drew the ellipse correctly, the wonderful property of the ellipse is that the total length of string or yarn never changed. In other words, every point along the ellipse has the same total distance from the two foci as every other point on the ellipse. If the pencil neared one focus, one leg of the string or yarn would be very short, and the other leg would compensate by being quite long.

The line that connects the foci and extends to the ellipse on both sides of the foci is called the major axis, and is the longest possible line able to be drawn within the ellipse. The line perpendicular to the major axis that splits the foci is called the minor axis, and is the shortest possible line within the ellipse. The semi-major axis is the length of half of the major axis.

The eccentricity of an ellipse describes how oval it is, and runs on a scale from 0 to 1. An ellipse with zero eccentricity is technically a circle, and an ellipse with an eccentricity of 1 will never close (the shape is a parabola). By increasing the distance between the foci, you can draw a more oval ellipse (higher eccentricity).

The eccentricity of an ellipse can be calculated by dividing the distance between a focus and the center of the ellipse by the length of the semi-major axis.