Exploring Geometer’s Sketchpad

By: Mallory Thomas

Objective: Define and construct a parabola given a fixed point for the focus and a line (segment) for the directrix through Geometer’s Sketchpad (GSP).

A parabola is the set of points equidistant from a line, called the directrix, and a fixed point, called the focus. We will be assuming that the focus is not on the directrix.

First, we will use an action button in GSP to generate the parabola from an animation and trace of a constructed point. To begin constructing a parabola we first have to construct a line segment (the directrix) and an arbitrary point (the focus) above the line segment, which can be seen in the image below.

![Focus and Directrix Image]
Next, we find any point on the directrix, which we will label A. Then we will draw a line from point A to the focus, and we will label the midpoint on this line. From there we will draw a perpendicular line through the midpoint, which can be seen in the image below labeled as P1.

Now we construct a perpendicular line to the directrix through point A, and label it as P2.

We will label the intersection of P1 and P2 as B, and then we will construct a line segment from point B to the focus. B is equidistant from the directrix and the focus. We will also construct a line segment from point B to point A, which is seen in the image below.
Now, we can trace point B and drag point A, to get our parabola in the image below.

We can repeat this same process but instead of tracing point B to create the parabola we can trace the perpendicular line P1 and animate point A.
Finally, for the last construction of a parabola we can use the locus command. We will repeat the same construction but instead of tracing and moving one point we will look for locus points equidistant from the focus and the directrix. To do this we will select points A and B, and then select locus command.

All of these GSP files can be seen in Exploration 5 with different GSP scripts.