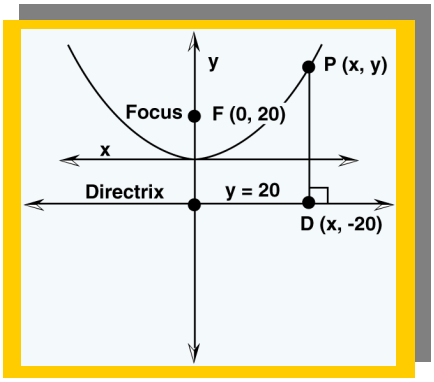
Dynamic Design: A Collection Process

Parabolic Problem
Algebra Enrichment

STUDENT ACTIVITY

BACKGROUND

A cross-section of the mirror grid in the Genesis solar wind concentrator is a parabola. A parabola is a curve consisting of all points equidistant from a line called the directrix and a point called the focus. One way to determine the equation of a parabola is to use the distance formula. In this mathematics enrichment activity, students determine the equation for a parabola and graph the parabola using measurement similar to that of the Genesis concentrator.



MATERIALS

- Graph paper
- Paper, pencil
- Pipe cleaners and/or clay
- Calculator (optional)

PROCEDURE

1. The distance between two points can be determined by using the distance formula. If P_1 is (x_1, y_1) and P_2 is (x_2,y_2) then the distance between them is :

   Distance between P_1 and P_2 = $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

2. Suppose the focus of the concentrator is located at F (0,20), the directrix is y = -20, P (x,y) is any point on the parabola, and D (x,-20) is where the perpendicular line joining the directrix and point P intersect the directrix. Find the equation of the parabola.

3. Using the equation fill in a T chart.

x	y

4. Using this information graph the parabola.

5. Using pipe cleaners make a model of the parabolic curve. Make the model three-dimensional by using three pipe cleaners bent to the shape of the parabola. (Join them at the vertex.)

6. Use clay to make a three-dimensional model of the paraboloid.

EXTENSION

With an understanding of calculus you may:

1. Find the area under the curve.
2. Find the surface area of part of the paraboloid.
3. Find the volume of part of the paraboloid.