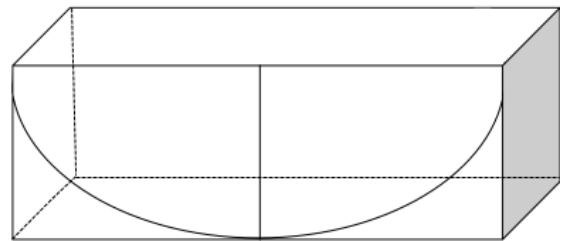


Conic Sections - A Dynamic Approach Parabola Cooker - Teacher's Notes

Materials

- Box with open top (a shoe box works well)
- Wire coat hangar
- Aluminum foil
- Tape
- Measuring tape or ruler
- Hot Dogs, buns, mustard, relish, paper plates, napkins, etc.

The box should be oriented as shown below with the bottom edge as the x-axis. Measure the length of the box and mark the midpoint. Draw a line segment perpendicular to the bottom edge through the midpoint to serve as the y-axis. The parabola will have its vertex at the origin and will pass through the top right and left corners of the box.



The equation for a parabola with vertex at the origin is:

$$y = \frac{1}{4p} x^2$$

The value of p will determine the location of the focus. This is where the coat hanger wire will pass through the box and (the hot dog too) in order to cook the hot dog. To get the correct value for p , students will need to substitute the coordinates for the corner of the box into the equation for x and y and then solve for p . This will give them the distance they need to measure on the y -axis from the vertex to plot the focus.

After they have drawn the parabola on the box and plotted the vertex and focus, they should then place the aluminum foil inside the box, following the shape of the parabola as closely as possible. Tape the top of the foil to the box. Place the straightened wire through the focus all the way to the other side of the box. Remove the wire and skewer the hot dog. Place the cooker in a sunny location and within a few minutes you should see the hot dog begin to cook!



Rubric for the Parabola Cooker Project

Names _____

	POSSIBLE POINTS	YOUR POINTS	COMMENTS
Measurements are correctly drawn on the box.	15		
Parabola Equation is correct for the coordinates of the corners.	15		
Focus is computed correctly and plotted correctly on box.	10		
Wire hanger and aluminum foil are placed correctly in the box.	5		
Hot Dog cooks in a reasonable time.	5		
Total Points Possible	50		



Rubric for the Parabola Cooker Project

Names _____

	POSSIBLE POINTS	YOUR POINTS	COMMENTS
Measurements are correctly drawn on the box.	15		
Parabola Equation is correct for the coordinates of the corners.	15		
Focus is computed correctly and plotted correctly on box.	10		
Wire hanger and aluminum foil are placed correctly in the box.	5		
Hot Dog cooks in a reasonable time.	5		
Total Points Possible	50		



Parabola Cooker Student Worksheet

Name _____ Date _____

Instructions for constructing the Parabola Cooker

1. Measure the length of the box (in centimeters). Length _____
2. Mark the midpoint of the length.
3. Draw a line segment through the midpoint, perpendicular to the bottom edge of the box. The bottom edge is the x-axis and the line segment is the y-axis.
4. Measure and mark the top right and left corners of the box. List them as ordered pairs.

The parabola you construct will have its vertex at the origin and will pass through the top right and left corners of the box.

5. Use the equation below (the form for a parabola with the vertex at the origin). Substitute the coordinates of the right corner for x and y to solve for p.

$$y = \frac{1}{4p} x^2$$

p = _____

Equation _____

6. Draw the parabola on the front of your box. Use the value of p to plot the focus.
7. Place the aluminum foil in the box. Form the foil in the shape of the parabola.
8. Make a small hole at the focus. Put the wire hangar through the hole to the opposite side of the box. The hot dog will be skewered on the wire.
9. Place the box in a sunny location and the hot dog will begin to cook.

Question: Why does this cooker design cook the hot dog cook most efficiently?

