

Parabolas and their focus

Launch the lesson by asking how we might use parabolas to create heat from the sun.

Supplies- Protractor, graphing calculator, patty paper, handouts, and current text for reference.

Objectives:

- Explore the focus of a parabola
- Write equations of parabolas
- Model real-life problems

Common Core Mathematical Practices:

Mathematically proficient students apply the properties they know about parabolas to solve a real-life problem involving a solar reflector.

If time allows, have each group present a design plan.

Rubric:

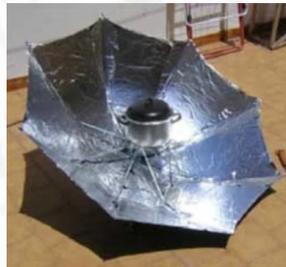
Skill	Possible points	Score
Completion	4 points	
Accuracy	4 points	
Applying properties to situation	4 points	
Precise sketches	4 points	
Group Norms	4 points	
Total	20 points	

* Allowing students to self-evaluate is a great option here.

After the fact:

Give/show this Study done by a grant funded by the National Science Foundation
http://www.geometryexpressions.com/downloads/Investigating_Parabolic_Solar_Cookers.pdf

Show some examples of other design ideas:



Bamboo-solar cooker

Assignment created by
Josh Cunningham

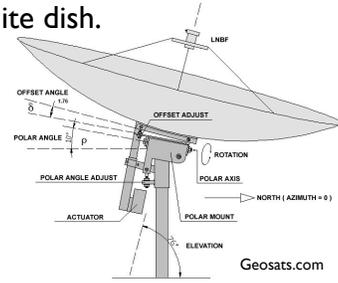
DESIGN A CIRCULAR PARABOLOID SOLAR COOKER

The company you work for wants your team to design a parabolic cook stove. The product will be used for outdoor cooking by those who desire a way to heat without the necessity of fuel. You will use your knowledge of parabolas to create a design for your boss.

Consider important features of product design- aesthetics, cost, space needed, portability, and special components.

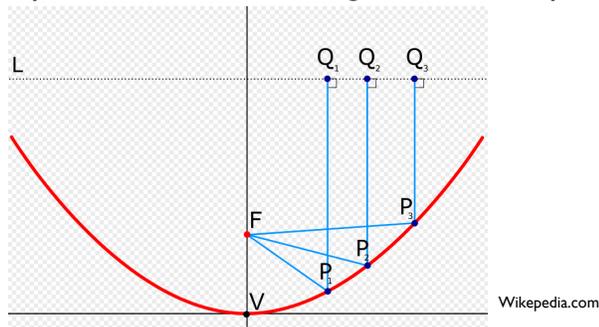
This is a side view of a satellite dish.

1) Label the focus and the vertex.



2) How does a satellite dish relate to designing a functional solar cooking device?

Fact: Vertical rays reflect at the same angle at which they entered

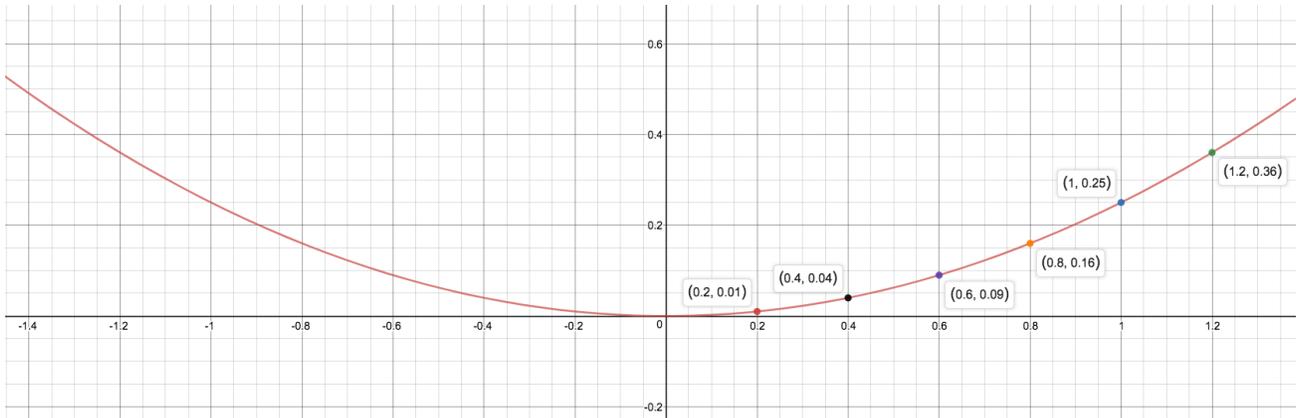


3) Draw, using color coding, the angles referred to in the Fact. Describe the angle.

4) What process did you do to draw the angles accurately?

5) What was the most difficult part and why?

This is a graph of a typical parabolic reflector



6) Write a function that models this satellite reflector

7) Describe the process you used to come up with function.

8) Draw the focus. How did you find the focus?

9) Draw a design of your parabolic solar cooker, including the sun in the image.
(Incorporate accurate dimensions)

We learned that the standard form of a parabola with vertex at (h, k) and p , the distance from the vertex to the focus, is $y = \frac{1}{4p}(x - h)^2 + k$.

- 10) Explain what (h, k) and p are in the previous parabola.
- 11) Describe what these values represent in your solar cooker. Draw a diagram.
- 12) Write a model of your solar cooker in the standard form of a parabola. (Show your work)
- 13) What type of materials are you using? Why did you choose this type of materials?
- 14) Estimate the cost of the materials.
- 15) What are some of the concerns you have with your design?
- 16) What are some of the highlights of your design?
- 17) How can this concept of parabolas be used in other aspects of our lives?