

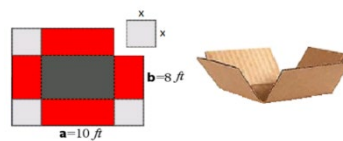


The Classic Box Problem Exploration

Student Activity

Name _____
Class _____

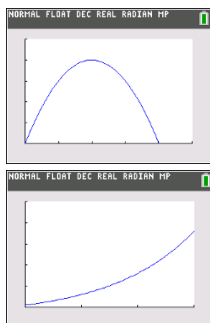
In this activity, you will create an open-box by taking an 8 ft by 10 ft sheet, cutting out square corners with sides of length x , and then bending up the sides. The goal of this activity is to figure out how to determine the size of the squares that result in the largest volume for the box.



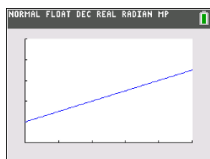
Problem 1 – Creating the Box

1. Before we start the actual box problem, answer the following question. If you graphed the volume versus length of x , what shape do you think the graph will take? Explain your choice.

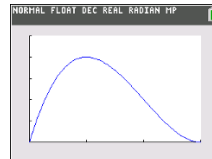
(a)



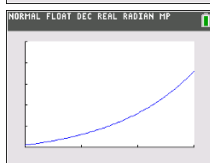
(b)



(c)



(d)



2. What happens to the graph you chose in question 1 as the x value changes? Does the graph only increase? Does the graph increase and decrease? Explain.

Now, create a formula for volume using the 8x10 ft net. With respect to x ...

3. What is the expression that represents width?
4. What is the expression that represents length?
5. What is the expression that represents height?



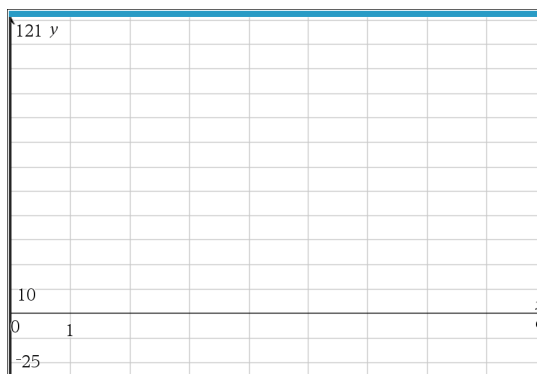
Trigonometric Transformations Student Activity

6. Put it all together. What is the function that represents the volume?
7. Check your function by graphing it on the handheld. Does this graph match the function you chose in question 1? Explain what you notice about the graph.

Problem 2 – Optimization of the Box Problem

A square of side x -inches is cut out of each corner of a 10 in. by 14 in. piece of cardboard and the sides are folded up to form an open-topped box. $V(x)$ represents the volume of the box formed with respect to x .

8. Write the value of V as a function of x .
9. State the domain of the function $V(x)$.
10. Graph the function to find the maximum volume of the box. What is the maximum volume and what value of x gives the maximum volume?



11. How can you tell that this is the maximum value? Explain what is happening to the function, $V(x)$, before this maximum value and after the maximum value.