

Algebra Activity 7: Maximizing Storage Space

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CALCULATORS: Casio: fx-9750G Plus • Casio: cfx-9850G Series

Student Handout

Introduction

Your favorite dog, Fluffy, just had 6 puppies, 4 males and 2 females. So far, your mom has been happy with keeping them in a box in the laundry room, but she has told you that the puppies need to be outside, in a pen, one month from today.

You need to build the pen. Fencing material, you learn, is expensive. Luckily, your grandfather tells you he has $23 \frac{1}{2}$ feet left over from a project that he will give you for your pen.

Work with a partner (5-10 minutes) to design 3 different rectangular dog pens, with a perimeter of exactly $23 \frac{1}{2}$ feet.

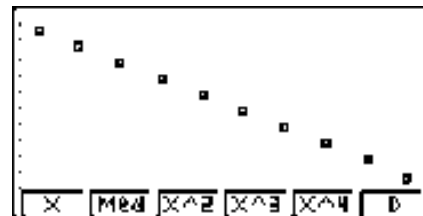
- Share, recording the dimensions on the board or overhead, until you have 10 or 12 different rectangles. Which ones do you think will be best for the puppies? Justify your answers.
- Explain how you figured out the dimensions that would give a perimeter of $23 \frac{1}{2}$ feet.

Part I: Length and Width

1. Turn on the calculators and choose **LIST** from the main menu.
 - Enter the width of each rectangle into List 1.
 - Highlight List 2 and press **OPTN**.
 - Enter $23.5 / 2 - \text{F1}(\text{List}) 1 \text{ EXE}$. This will put the corresponding lengths into List 2.
 - Press **MENU STAT F1(GRPH) F6(SET) Graph Type F1(Scat) X List F1(List 1) Y List F2(List 2) EXE F1(GPH 1)**.

	List 1	List 2	List 3	List 4
1	1	10.75		
2	2	9.75		
3	3	8.75		
4	4	7.75		
5	5	6.75		

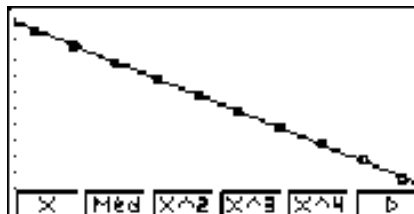
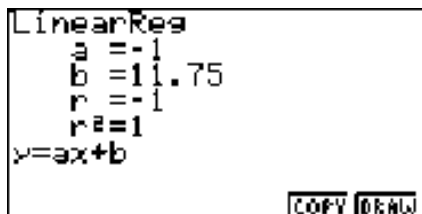
StatGraph1	
Graph Type	:Scatter
XList	:List1
YList	:List2
Frequency	:1
MARK TYPE	:0



2. Describe the data (linear) and explain why it is linear.
3. Guess the equation of a line that would go through the data. Answer these questions:
 - What would the y-intercept be? Why?
 - What would the slope be? Why?

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- Press **F1(X)** for the linear regression equation. Press **F5(COPY)** and **EXE** to store the equation in the y= screen.



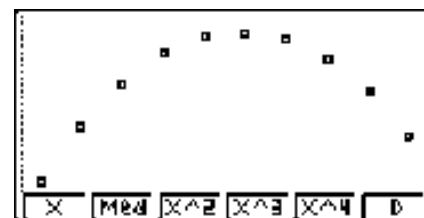
- Press **F6** to draw the line.

Part II: Length and Area

- Now go back to the main menu. Which of the pens would be better? Why?
- Decide which pens would have the most area for the puppies to play in.
 - From the main menu, or press **EXIT** to return to the Stat entry screen.
 - Choose **STAT**.
 - Highlight List 3.
 - Press **OPTN**.
 - Enter **F1(LIST)**, **F1(List) 1** \times **F1(List) 2**. This command will compute the areas of the rectangles.
 - Press **EXIT** twice **F1(GRPH)** **F6(SET)** **F2(GPH2)** Graph Type: Scatter, XList: List 1 YList: List 3 **EXE**.
 - Press **F2(GPH2)**.

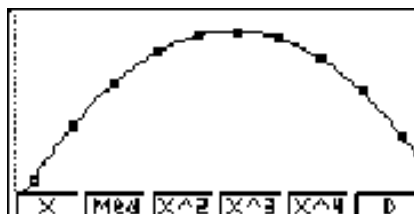
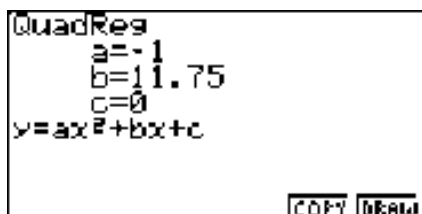
	List 1	List 2	List 3	List 4
1	1	10.75	10.75	
2	2	9.75	19.5	
3	3	8.75	26.25	
4	4	7.75	31	
5	5	6.75	33.75	
			10.75	

StatGraph2	
Graph Type	: Scatter
XList	: List1
YList	: List3
Frequency	: 1
Mark Type	: □

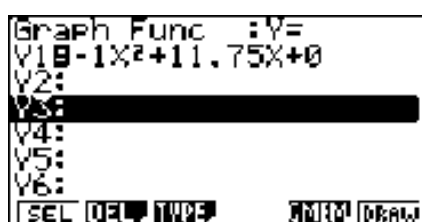


- Describe the data (quadratic) and explain why it has this particular shape. Answer these questions:
 - What is our independent variable?
 - What is our dependent variable?
 - What would happen to the area as the length of one of the sides moves from small to large?
- Press **F3(X^2)** for a quadratic regression equation **F5(COPY)** to get the equation **EXE** to store it in the y= screen **F6(DRAW)**.

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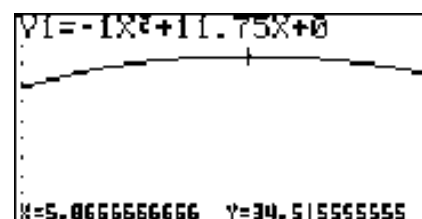
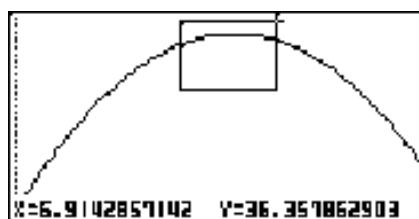
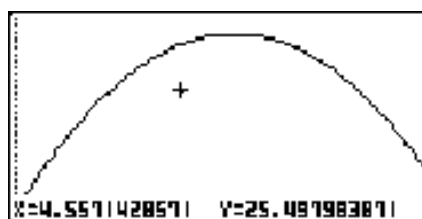


5. Press **MENU** and choose **GRAPH**, press **F6(DRAW)** to draw the parabola, **SHIFT F1(TRACE)**. The cursor will move along the graph and they can find the pen with the maximum area.



Part III: Zooming In For a Closer Look

- When you have decided on the largest area:
 - Press **SHIFT F2(ZOOM)**. Then **F1(BOX)**.
 - Move the cursor to the spot where they would like for the bottom left corner of your box to be and press **EXE**.
 - Move the cursor up past the curve and then to the right. (It will draw a box that will zoom in for a closer look.)
 - SHIFT F1** to trace along the curve to search for a larger maximum area.



- Round the length to the nearest hundredth and then change the dimensions that will give the maximum area into feet and inches.