



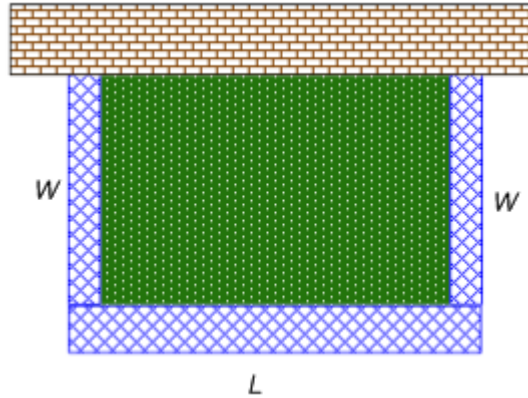
Building a Garden Fence

Student Activity

Name _____

Class _____

You and a friend are visiting her grandparents on their small farm. They have asked the two of you to design a small, rectangular-shaped vegetable garden along an existing wall in their backyard. They wish to surround the garden with a small fence to protect their plants from small animals.



To enclose the garden, you have 24 sections of 1-meter long rigid border fencing. In order to grow as many vegetables as possible, your task is to design the fence to enclose the maximum possible area. There are many rectangular shapes that can be formed using the 24 fencing sections and, before digging the fence posts, you should do some calculations.

1. If you were to use three sections of fencing (1-meter long each) along each of the two widths of the garden, how many sections of fencing would remain to form the length? What would be the area of this garden? Explain and show work.

Copy these values into the table, and then enter three more possible garden sizes into the table. Try to guess the width and length of the garden with the largest possible area. Compare your results with others in your class.

Possible Dimensions of Garden Fence

Width (m)	Length (m)	Area (m ²)
3		



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- For this situation, if you know what the width is, how can you find the length? Write an equation that shows this relationship between length, L , and width, W .
- The smallest number of fencing pieces you can use along the garden width is one. What is the largest number of pieces that you can use along the width of the garden? Explain how you know this.

Use your TI-84 to make a more complete table of possible dimensions. In L_1 list the possible widths and then calculate the lengths in L_2 and area in L_3 .

Tech Tip: Press **STAT** **ENTER** and enter the possible number of sections for the width in L_1 . If you need help clearing the lists, your teacher can give you some tips. Press **▲** to move to the top so that L_2 is highlighted. Enter your equation from question 2, but press **2nd** **1** to get $[L_1]$ for W , the width.

- How can the values for L_3 (the areas) be determined from L_1 and L_2 ? Remember that L_1 stores the possible widths and L_2 stores possible lengths. Enter this equation in L_3 .
- Examine the values for area in L_3 . Are the values you computed earlier contained in this list? Describe any patterns you see in the data values contained in L_3 .
- Examine the third list to find the dimensions of the rectangular garden area that has the largest possible area. Complete the following sentence to provide a solution to the original question:

A rectangle of a width _____meters and length _____m
gives the largest or maximum possible garden area of _____square meters.



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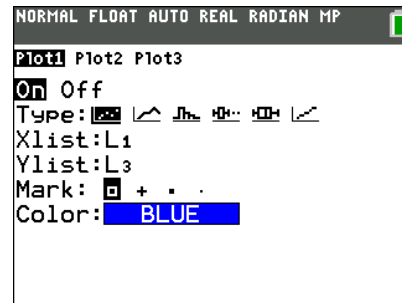
Name _____

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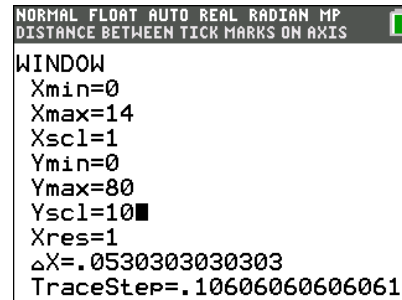
Plot the area versus width on your TI-84 to help you graphically explore how the area changes as the width is increased.

Tech Tip: To plot the data in L_1 and L_3 press 2nd Y= for [STAT PLOT] and turn on Plot1. Choose the Xlist to be L_1 (2nd 1) and Ylist to be L_3 . Press WINDOW and set the domain and range based on the data. Press GRAPH to see the plotted data.

7. When creating the scatterplot of the areas, you can enter the settings shown at right for the display window. Why do you think these values are used?



8. After pressing GRAPH to see the plot, press TRACE to move through the data points in the scatterplot. Which point corresponds to the maximum area? What sets it apart from the other points on the plot?



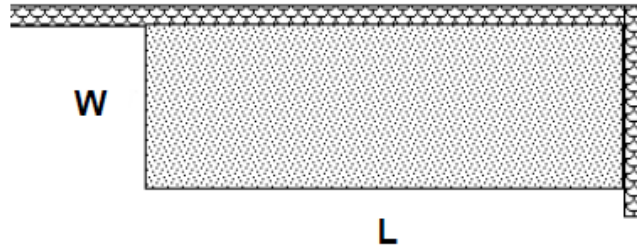
9. How do any patterns that you observed in the lists show up in the scatterplot of the data?



Problems for Additional Exploration

Use the list capabilities of your graphing calculator to investigate each of these situations. In each case, produce a scatterplot of the widths and areas. Assume you still have the 24 sections of fencing to use in forming your border.

1. A friend suggests that you plant your grandparent's garden at a back corner of the yard so that the existing fence can border two of the four sides of your garden. What are the dimensions of the garden with the largest possible area? Is this configuration an improvement over the original plan? Explain your reasoning.



2. Suppose the garden were placed at the corner of a barn so that it was positioned as shown below. What dimensions would give the largest garden area?

