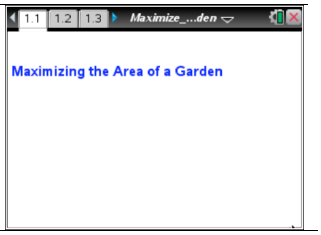
Maximizing the Area of a Garden
Student Activity

Name
9/25/17

Open the TI-Nspire™ document *Maximize_Area_Garden.tns*.

A garden with a rectangular shape is attached to a barn. Exactly three sides of the garden must be fenced, and 22 meters of fencing will be used. What are the dimensions of the garden with the maximum possible area?



Move to page 1.2.

Press ctrl ▶ and ctrl ◀ to navigate through the lesson.

1. As directed on page 1.2, draw a sketch of each of your five different gardens. Be sure to use a variety of width values. Remember that only three sides of the garden are to be fenced and that you will use 22 meters of fencing.

2. Record the width, length, and area of each garden in the table below. Be sure to include appropriate units of measurement.

Sketch no.	Width	Length	Area
1			
2			
3			
4			
5			

3. Considering the data from your sketches, describe what happens to the area of the garden as the width of the garden increases.

4. If the goal is to maximize the area of the garden, which of your garden sketches would be the best option? Why? Give the width, length, and area of the garden.

Move to page 1.3.

5. On page 1.3, click in cell A1 of the spreadsheet in the lower-left work area of the screen. Enter the width and area data for each of your five garden sketches.

6. As you enter data in the spreadsheet, a scatter plot of the data will be graphed. Describe the shape of the plot.

7. Write a formula for the amount of fencing used in terms of the width (w) and length (l) of the garden.

8. Rearrange the formula from question 8 to express the length (l) of the garden in terms of the width (w).

9. Write an equation that could be used to determine the area (A) of the garden if you know only the width (w) of the garden. **Hint**: Use your answer from question 9 that expresses the length of the garden in terms of the width.

10. Let x represent the width of the garden and let $f(x)$ represent the area of the garden in terms of its width. Write a function to express the area of the garden in terms of the width of the garden.

Move to page 1.4.

12. On page 1.4, graph your function with the scatter plot on a full page.
    - Press ctrl G or tab to show the entry line.
    - *f*1(*x*) = is displayed. Enter your function definition, and then press enter.
13. If the graph of the function does not fit your data, recheck your data entries on page 1.3 and your answer for question 11.

14. What are the width and area of the garden with the maximum possible area?

15. Suppose that a rectangular garden of this type (with three sides fenced using 22 meters of fencing) is to have an area of 52.5 square meters.

    What width and length could be used to form a garden with this area?

16. Jackie will use 44 meters of fencing to make a garden with a rectangular shape that will be attached to a barn. (Only three sides will be fenced.) How will the maximum area of her garden compare to the maximum area of the same type of garden that used 22 meters of fencing? Justify your answer. (Add pages, as needed, to the TI-Nspire document to solve this problem.)

Extension:

1. Suppose that a garden with a rectangular shape is not attached to a barn. You will still use 22 meters of fencing, but all four sides must be fenced. What width and length should the garden have to produce the maximum area?

Katelyn Eustis 9/25/2012 9:59 PM
Formatted: Normal, Right: 0.35"
Katelyn Eustis 9/25/2012 9:59 PM
Deleted: