

## What's the Biggest Area?

You want to build a garden whose perimeter is equal to 24 meters. If you plan to use all of the fencing material for each garden, find the dimensions of at least eight different rectangular regions that each have a perimeter 24 meters.

Find the area of each garden.

Make a table to record the width, length, and area of the possible gardens. As you find dimensions for the rectangles, the lengths can be shorter than the widths.

Think about the widths and lengths of the garden that would have an area of zero. Enter these in your lists also.

Enter the data for the possible widths into list L1. Enter the lengths in L2 and the area measures into list L3.

Label a set of axes and plot points in the form  $(x, y)$ , with  $x$  representing width in meters and  $y$  representing area in square meters. Describe as completely as possible what the graph looks like. Does it make sense to connect the points with a smooth curve?

Where does your graph reach its highest point? What is the name of this point? Which rectangular garden has the largest area? What are its dimensions?

Using the graphing calculator

Create a graph of (width, length) or (L1, L2) data.

What is the length of the garden that has a width of 3 meters?

Width 5.5 meters?

Write an expression for length in terms of width  $x$ .

Using your expression for the length from the previous step, write an equation for the area of the garden. Enter this equation into Y1 and graph it. Does the graph confirm your answer for the size of the rectangle with the largest area?

Write an equation that states that the area of the rectangle is zero.

Locate the points where the graph crosses the  $x$ -axis. What is the real-world meaning for these points?

How many different widths produce an area of 30? 35?

If you were to use a different perimeter for the garden that was not 24 meters, do you think the general shape of a garden with maximum area would change? Explain your answer.

Summary:

Writing an equation for the area of a rectangle whose perimeter is always 24 created what type of function?

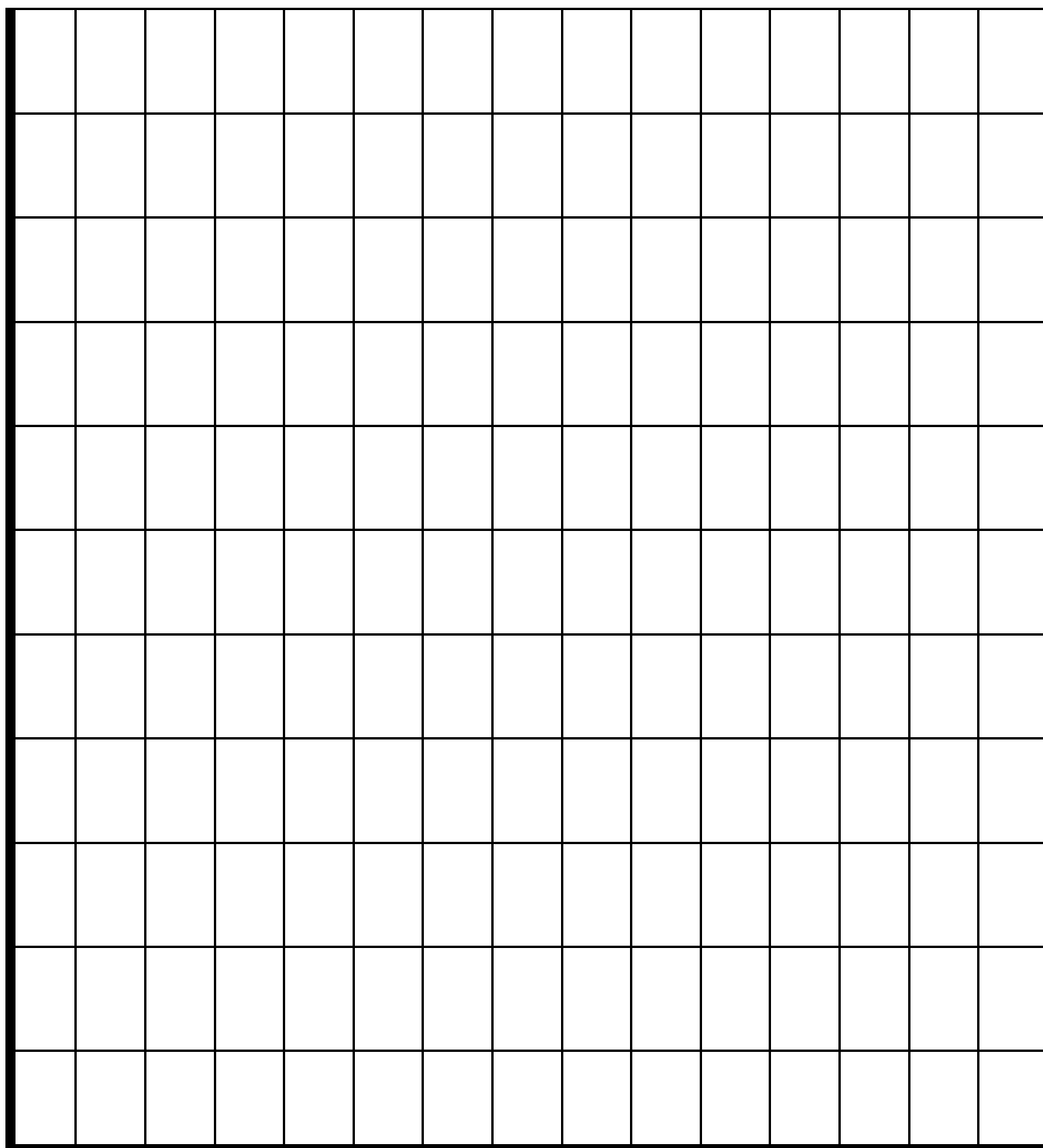
This function had several points of interest:

- the zeros or the  $x$ -values that produced zero area
- the vertex or the  $x$  value where the maximum area occurs
- for each area between zero and the maximum of 36, there are two  $x$ -values that produce each area.



# What's the Biggest Area?

Area in Square Meters



Width of Meters