# MAX AREA FIXED PERIMETER

Open a new document with the Graphs & Geometry application.

Choose (menu)(2)(2) which will switch the view from a regular set of coordinate axes to a "blank" piece of paper on which you will draw.

Choose (menu)(8)(3) which will provide you with a tool for drawing a rectangle. Click for one corner, drag to another corner, click, and finish up the rectangle shape. Click (esc).

Choose (menu)(7)(1) to measure the length of the perimeter of the figure. The entire figure will blink when you are pointing at it. Click(x) to see that length, then drag the number away to somewhere convenient on your page. Click again to place it there.
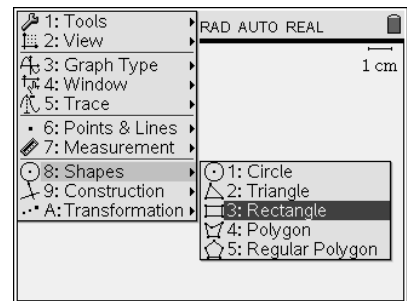
Point at one of the first two corner points that you established for your rectangle. Hold down the click key until the "claw" closes and grabs the point. Now you may drag it to a different shape, while the perimeter changes as well. Get the perimeter to be equal to the value you desire to fix. Let's say you would like a perimeter of 10. Keep dragging that shape around until you are close enough. Then, click on the measurement and it will highlight it. Choose (ctrl)(menu) Attributes, and see the little decimal place tool. Hit the left arrow to decrease the accuracy of that measurement to 2 or 1 decimal values, and your measurement will round off. Then, hit the down arrow to get down to the locking feature. Lock it!
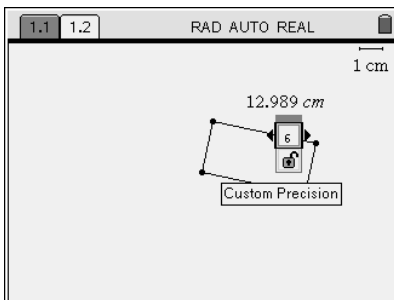
Now, in order to measure a side, you must draw a line segment on top of the rectangle, which is a continuous segment itself. Use the (menu)(6)(5) to draw a segment for the length, and one for the width. Click, drag, click.

Choose (menu)(7)(1) to measure the length of the two sides that you are calling length and width. (esc) so that you can move away and store those measurements as variables.

Click on a measurement, and hit (ctrl)(var) and type in a name like "len" for length and "wid" for width. Notice that the text will become boldface.

Select Text, and add the expression len*wid to the page. Then, choose Calculate, then hover over the variable that is requested each time. You can also store this calculation as a named variable for collection in the data spreadsheet later.
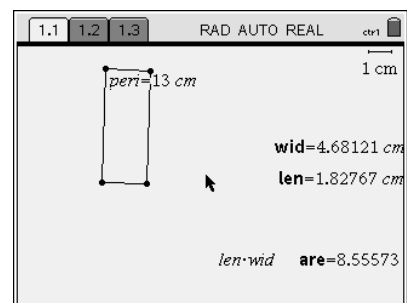
Insert a new page (ctrl)(I) with a Spreadsheet. Go to the top of each column and name them Length and Width. Go to the formula line and hit (menu)(7)(1) or (2) so that you can capture data from the other page. If you choose Manual, you will need to drag the figure, then hit (ctrl) and the decimal point each time you wish to collect. If you choose Automatic, the data will fill the columns as you drag. (just don't drag too quickly or you will freeze the calculator!)
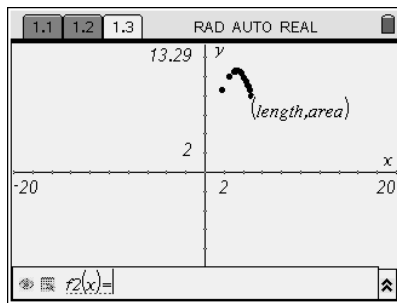
Go to the top of the next column, and call it area. Go down into the formula line and hit = ⟨sto▸ var⟩ and choose the variables length times width. Enter.

Now, hit ⟨ctrl⟩, page left to get back to your rectangle sketch. Grab a corner and drag. If you are collecting data manually, don't forget to stop and hit ⟨ctrl⟩, period. Repeat the dragging through some different looking shapes of your rectangle.
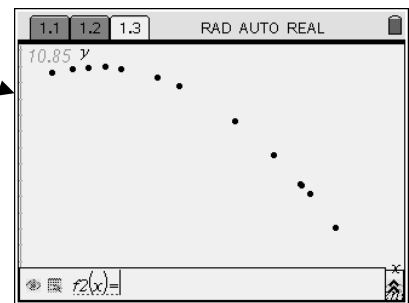
Now you are ready to plot the data. Insert a new page with Graphs and Geometry. With the cursor in the function line, hit ⟨menu⟩⟨3⟩⟨3⟩ to choose scatter plot. For the independent variable (x), choose length using the ⟨sto▸ var⟩ key, and choose area for the dependent variable (y). Hit ⟨menu⟩⟨4⟩⟨9⟩ to Zoom in on the data values. Notice how the view of the data improves with this window.

Return to your Spreadsheet, and click into a data entry line that is empty, probably in column D or E. Choose ⟨menu⟩⟨4⟩⟨1⟩⟨6⟩ to choose the Quadratic regression. Choose the correct variables, length and area. The values for a,b, and c will appear in the table.

Now, go back to your graph page, and return the cursor to the function line. Choose ⟨menu⟩⟨3⟩⟨1⟩ this time and hit ⟨enter⟩. Voilà!

Last of all, you will need to choose ⟨menu⟩⟨6⟩⟨2⟩ to place a point directly on your beautiful curve. Grab the point, and drag it toward the peak, or the vertex of the parabola. A capital M will appear, signifying Maximum. There is your answer! The x-value is the length of the rectangle with dimensions that will produce the maximum area that is the y-value of that point. Write a sentence that describes this scenario.