Grade level: 9-12
Subject: mathematics
Time required: 45 to 90 minutes

Rectangles and Parabolas

by – Margaret Bambrick

Activity overview

Students will tackle a traditional problem from the Algebra I curriculum geometrically, numerically, graphically, and algebraically: "Sixty feet of fencing is purchased for the grounds crew to fence off a rectangular portion of property for a garden. The owner has made it perfectly clear that he would like the rectangular plot of land with the greatest area. Help the grounds crew decide on the dimensions for the maximum area."

Concepts

Model real world problems with quadratic relationships: area of a rectangle.
Recognize patterns in data; understand how to transform a quadratic function to find the model of a data set; interpret the graph of a quadratic function within a real world context.

Teacher preparation

This activity is designed to be used in an Algebra I classroom after students have been introduced to quadratic functions.
Students should know how to drag a point on the handheld.

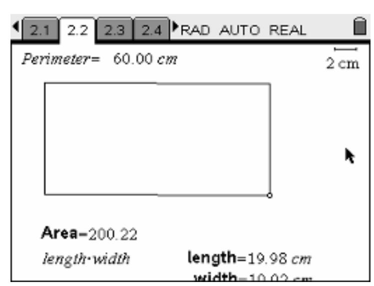
Classroom management tips

Students may work in pairs or independently. Students will need the Rectangles_Parabolas.tns file and the student worksheet

TI-Nspire Applications

Notes Page, Graphs & Geometry, Lists & Spreadsheet

Step-by-step directions



Step 1
Have students open the tns file, read through pages 1.1, 1.2, and 1.3, and respond to the questions on the student worksheet.

Step 2
Ask students to open up page 1.4 and observe what happens when they move a vertex of the rectangle

Step 3
Let students use a numerical approach to answer the question based on the spreadsheet measurements collected.

Step 4
Students should come up with the term "parabola".

Step 5
Have students share their responses.

Step 6
Some students may choose to insert a calculator page to test values. Some students may choose to use the trace function feature to find the maximum (M) on the graph.

Step 7
Now the student comes up with the algebraic model.

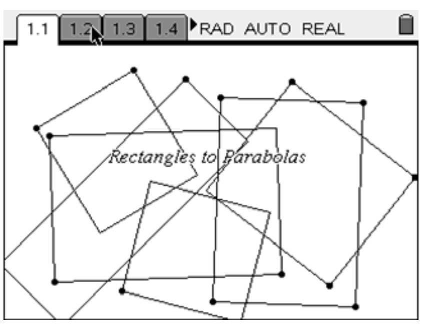
Step 8
Consider asking some other questions at this point.
How does the perimeter affect the maximum area?
What would the graph of the parabola look like if the perimeter was larger? Smaller?
Given the graph, how could you find the perimeter of the rectangle?

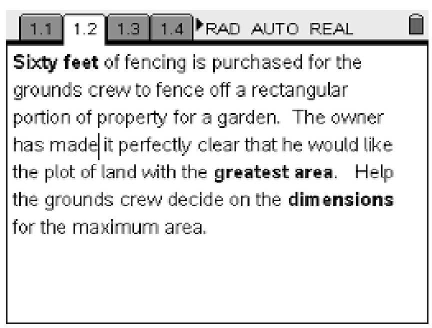
Assessment and evaluation

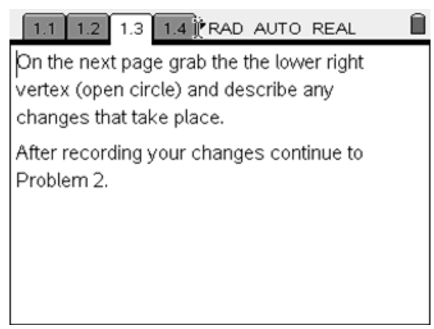
- *Pose a different problem for the student to solve where the fencing provided is 28 or 100. You could also change the shape of the garden.*

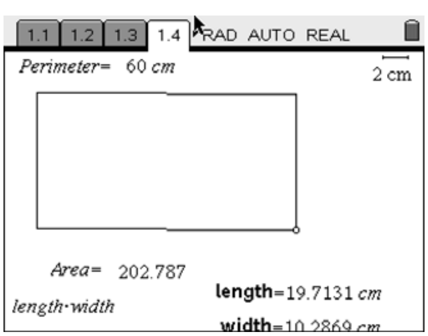
Student TI-Nspire Document

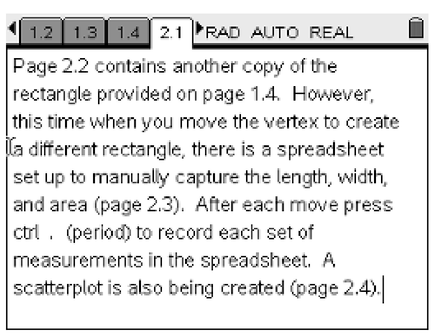
Rectangles_Parabolas.tns

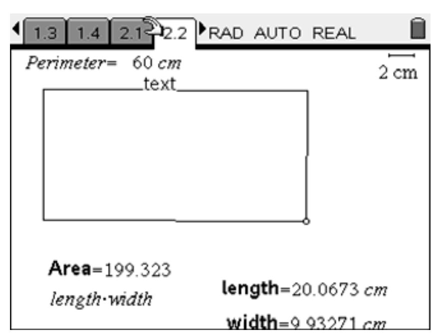


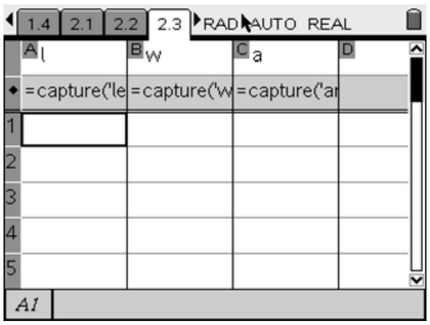











1.4
2.1
2.2
2.3
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A l
B w
C a
D
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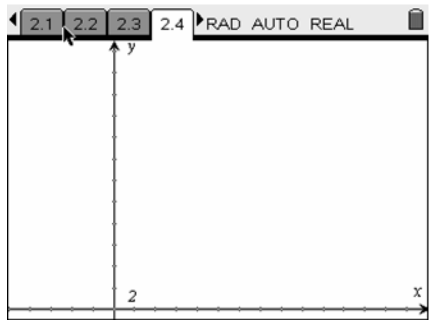
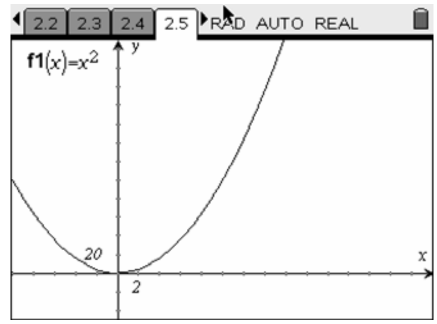
=capture('ar
A1


2.1
2.2
2.3
2.4
RAD AUTO REAL
y
x
2


2.2
2.3
2.4
2.5
RAD AUTO REAL
f1(x)=x^2
y
x
20
2