Trig - Week of March 30

Applications of Quadratic Functions

Fences

ACTIVITY 3.1

SUGGESTED LEARNING STRATEGIES: Marking the Text, Activating Prior Knowledge, Group Presentation, Look for a Pattern, Guess and Check

My Notes

Fence Me In is a business that specializes in building fenced enclosures. One client has purchased 100 ft of fencing to enclose the largest possible rectangular area in her yard.

1. If the width of the rectangular enclosure is 20 ft, what must be the length? Find the area of this rectangular enclosure.

2. Choose several values for the width of a rectangle with a perimeter of 100 ft. Determine the corresponding length and area of each rectangle. Share your values with members of your class. Then record each set of values in the table below.

Width (ft)	Length (ft)	Area (ft^2)

3. What is the relationship between the length and width of a rectangle with perimeter of 100 ft?

4. Based on your observations, predict if it is possible for a rectangle with perimeter of 100 ft to have each area. Explain your reasoning.

a. 400 ft^2

b. 500 ft^2

c. 700 ft^2

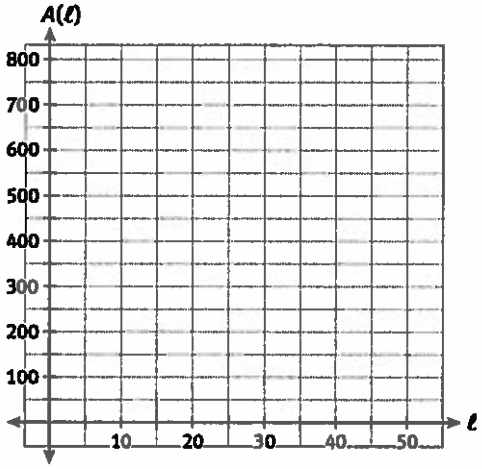
SUGGESTED LEARNING STRATEGIES: Create Representations, Marking the Text, Summarize/Paraphrase/Retell, Group Presentation

My Notes

5. Let l represent the length of a rectangle with a perimeter of 100 ft. Write an expression for the width of the rectangle in terms of l.

6. Express the area $A(l)$ for a rectangle with a perimeter of 100 ft as a function of its length, l.

7. Graph the quadratic function $A(l)$ on the coordinate grid.



TECHNOLOGY TIP

You can also use a graphing calculator to graph your function $A(l)$. Set your window to correspond to the values on the axes on the graph.

8. Use the graph of the function to revise or confirm your predictions from Item 4. If a rectangle is possible, write the dimensions and explain how to use the graph to determine the dimensions.

a. 400 ft²

b. 500 ft²

c. 700 ft²

SUGGESTED LEARNING STRATEGIES: Marking the Text, Summarize/Paraphrase/Retell, Quickwrite, Self/Peer Revision

My Notes

9. You may have been unable to use the graph to determine exact values for the dimensions in the previous item. Use the function you found in Item 6 to *algebraically* determine the length l of a rectangle with a perimeter of 100 ft and the areas given below, if possible. Show your work.

a. 400 ft²

b. 500 ft²

c. 700 ft²

10. What is the maximum value of the function in Item 6? Explain how you arrived at this conclusion and what this maximum represents.

11. For the maximum value that you found in Item 10, what is the corresponding length l of the rectangle? Explain how you arrived at this conclusion.

12. What is the specific name of the rectangle with a perimeter of 100 ft and maximum area?

MATH TERMS

Quadratic equations can be solved by factoring, completing the square, or using the Quadratic Formula. Use the **Quadratic Formula** $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ to solve quadratic equations in the form $ax^2 + bx + c = 0$, where $a \neq 0$.

CONNECT TO AP

The process of finding the maximum (or minimum) value of a function is called *optimization*, a topic addressed in calculus.

My Notes

SUGGESTED LEARNING STRATEGIES: Create Representations, Look for a Pattern

13. Another customer bought 180 ft of fencing to build a rectangular enclosure. Support your answers with explanations.

a. Write a function $R(l)$ that represents the area of the rectangle.

b. What are the dimensions of a rectangle with an area of 1925 ft^2?

c. What is the maximum area of the rectangular enclosure?

CHECK YOUR UNDERSTANDING

Write your answers on notebook paper or on grid paper. Show your work.

A rectangle has a perimeter of 120 ft.

1. Write a function $B(l)$ that represents the area of the rectangle with length l.
2. Graph the function $B(l)$, using a graphing calculator. Then copy it on your paper, labeling axes and using an appropriate scale.
3. Use $B(l)$ to find the dimensions of the rectangle with a perimeter of 120 feet that has each area. Explain you answer.
   a. 500 ft^2 **b.** 700 ft^2
4. An area of 1000 ft^2 is not possible. Give two explanations for why this is true.
5. MATHEMATICAL REFLECTION How is the maximum value of a function shown on the graph of the function? How would a minimum value be shown?