Introduction to Quadratic Relationships   Name _____KEY_____

Explore   Date _____ Period _____

You are going to plant a rectangular garden in your backyard. You only have a specific amount of fencing so the perimeter will be fixed. You decide to explore different dimensions for your garden.
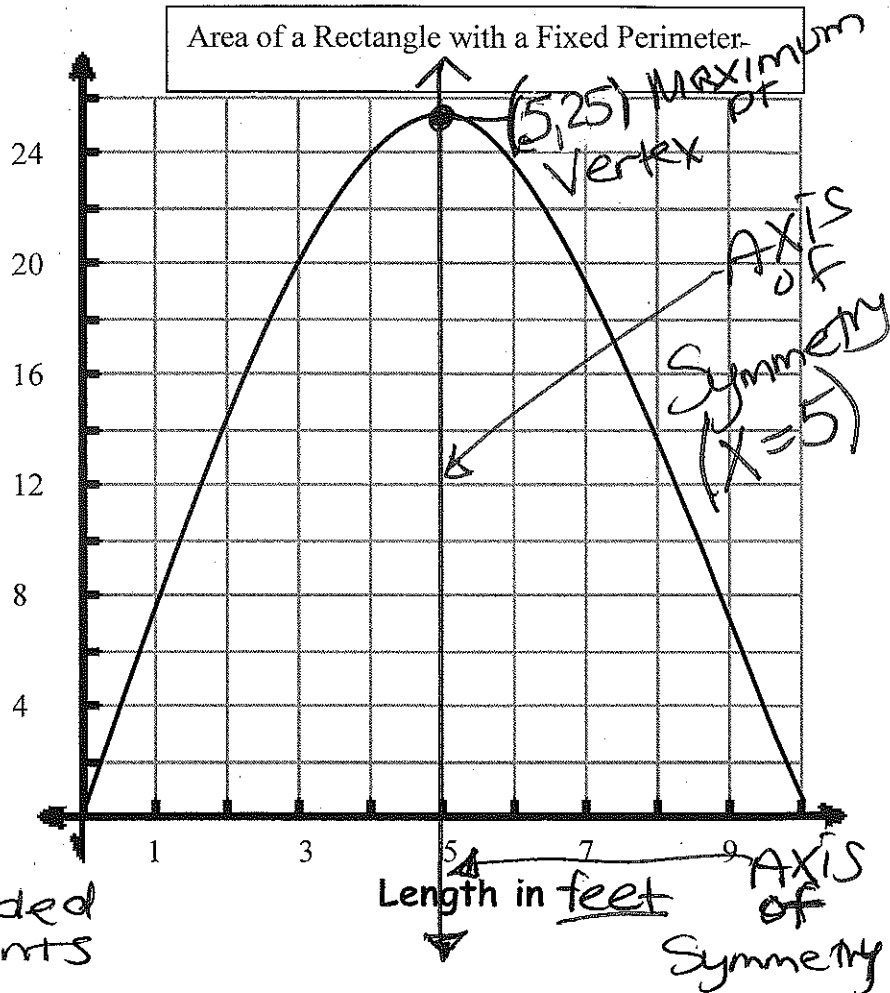
can't change

A. Complete the table showing all the <u>whole number</u> possibilities comparing the length of a side and the area enclosed.

$2(l+w)$
$2l + 2w$

B. What is the fixed perimeter? _____20 ft._____

Width	Length (x)	Area (y)
9	1	9·1 = 9
8	2	16
7	3	21
6	4	24
5	5	25
4	6	24
3	7	21
2	8	16
1	9	9
0	10	0

MAX

☆ not a rectangle but needed to include all possible points

Area of a Rectangle with a Fixed Perimeter

(5, 25) MAXIMUM or Vertex

AXIS OF Symmetry (x=5)

Area in square units (feet)

Length in <u>feet</u>

AXIS OF Symmetry

1. Describe the shape of the graph and any <u>special features</u> you see.
<u>Parabola</u>; U-shaped   symmetrical
area increases hits a <u>high point</u> then decrease

2. What patterns do you observe in the table? Compare those patterns with those that you found in the graph.
y-values increase and then decrease - same as graph
☆ repeated y-values that indicate symmetry

3. Draw the line of symmetry on the parabola. (AOS)
☆called <u>Axis of symmetry</u> - always goes through the maximum (high pt) or minimum (low point).
<u>Maximum/Minimum</u> is also called a <u>Vertex</u> (turning point)

#4 – 6 refer to the exploration on the previous page.

4. What is the <u>greatest area possible</u> for a rectangle with a perimeter of 20 units? $25 ft^2$
   ↳maximum

5. What are the dimensions of this rectangle? How do you find the dimensions on the graph?
   On the table? Dimensions: __5 ft X 5 ft.__
   Graph: find highest point (maximum); Divide the Area (y) by the length (x) to get the width
   Table: find the turning point in the y-values; greatest/highest y-value

6. Write the maximum point as an ordered pair. Where do you find the maximum point on the graph?
   On the table? Maximum: __(5,25)__
   Graph: the highest point
   Table: the turning point; point in between matching pairs of y-values

7. The graph represents the depth of a submarine, in thousands of feet, over time, in hours.
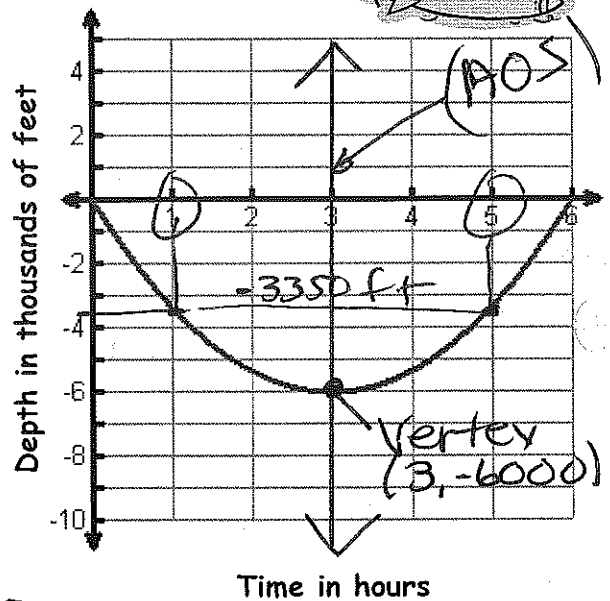
   a. What is the lowest depth of the submarine?
      −6000 ft

   b. What is the vertex as an ordered pair? (3,−6000)
      Is it a minimum or a maximum point? Minimum
      What does this point represent in this situation?
      After 3 hours the sub is at its lowest depth of 6000 ft below the surface

   c. Draw the axis of symmetry.
      $X = 3$

   d. When is the submarine at an approximate depth of 3350 ft below the surface ?
      At 1 hour and 5 hours

   e. What does the point (6, 0) represent in this situation?
      After 6 hours the submarine is back on the surface

   (AOS)
   −3350 ft
   Vertex (3,−6000)

   Time in hours

   Depth in thousands of feet

8. How are the axis of symmetry and the vertex related?
   Axis of Symmetry <u>ALWAYS</u> goes through the vertex

Summary: Describe
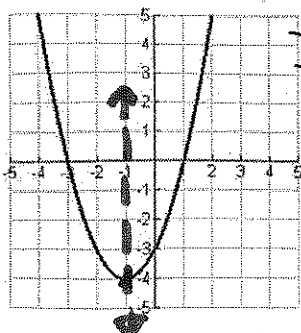
   −opens up
   − vertex is a minimum at (−1,−4)
   −AOS x=−1
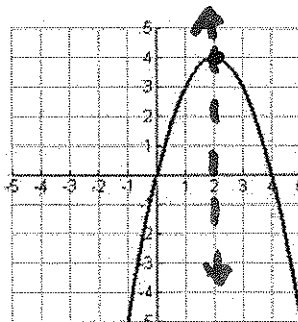
   −Opens down
   −Vertex is a maximum at (2,4)
   −AOS x=2