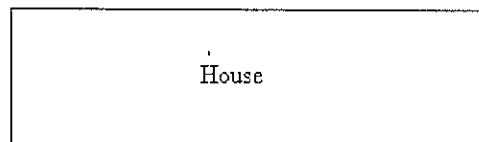
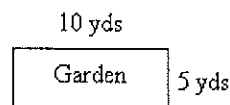


**Fences and Functions (Culminating Task)**

Name \_\_\_\_\_

Date \_\_\_\_\_

Claire decided to plant a rectangular garden in her back yard using 30 yards of chain-link fencing that were given to her by a friend. Claire wanted to determine the possible dimensions of her garden, assuming that she would use all of the fencing and make each side a whole number of yards. She began making a drawing that would give her a garden 5 yards by 10 yards.



1. Claire looked at the drawing and decided that she wanted to consider other possibilities for the dimensions of the garden. In order to organize her thoughts, she let  $x$  be the garden dimension parallel to the back of her house, measured in yards, and let  $y$  be the other dimension, perpendicular to the back of the house, measured in yards. She recorded the first possibility for the dimensions.
  - a. Make a table showing the possible values for  $x$  and  $y$ .
  - b. Find the perimeter of each of the possible gardens you listed in part a. What do you notice? Explain why this happens.
  - c. Write a formula relating the  $y$ -dimension of the garden to the  $x$ -dimension.
  - d. Make a graph of the possible dimensions of Claire's garden.
  
2. After listing the possible rectangular dimensions of the garden, Claire realized that she needed to pay attention to the area of the garden, because area determines how many plants can be grown.
  - a. Using the possible side lengths from your work above, make a table showing the possible areas. What do you notice? Explain why this happens.
  - b. Write a formula relating the *area* of the garden to the  $x$ -dimension.
  - c. Make a graph showing the relationship between the  $x$ -dimension and the area of the garden.

## **Fences and Functions (Culminating Task)**

Name \_\_\_\_\_

Date \_\_\_\_\_

### **Mathematical Goals:**

- Compare and contrast linear, quadratic, and exponential functions
- Interpret key features of functions in context

### **Essential Questions:**

- How do I distinguish between linear, quadratic, and exponential situations?
- How do I represent linear, quadratic, and exponential situations?

### **GEORGIA STANDARDS OF EXCELLENCE**

**MGSE9-12.F.LE.1** Distinguish between situations that can be modeled with linear functions and with exponential functions.

**MGSE9-12.F.LE.5** Interpret the parameters in a linear ( $f(x) = mx + b$ ) and exponential ( $f(x) = a \cdot d^x$ ) function in terms of context. (In the functions above, “ $m$ ” and “ $b$ ” are the parameters of the linear function, and “ $a$ ” and “ $d$ ” are the parameters of the exponential function.) In context, students should describe what these parameters mean in terms of change and starting value.

**MGSE9-12.F.IF.7** Graph functions expressed algebraically and show key features of the graph both by hand and by using technology.

**MGSE9-12.F.IF.9** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one function and an algebraic expression for another, say which has the larger maximum.*

### **STANDARDS FOR MATHEMATICAL PRACTICE**

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

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3. Later in the summer as the garden plants were fading, Claire decided that she would raise rabbits. She pulled out the dead plants and cleaned up the area. Her research showed that each rabbit needs 2 square feet of space in a pen, and that rabbits reproduce every month, having litters of about 6 kits. She started with 2 rabbits (one male and one female). Claire began tracking the number of rabbits at the end of each month and displayed her data in the table:

# of months	0	1	2
# of rabbits	2	8	32

- a. Write a formula relating the # of months and the # of rabbits.
- b. Make a graph showing the relationship between the # of months and the # of rabbits.
- c. The dimensions of the rabbit pen (formerly the garden) are 7 yards by 8 yards. When will Claire run out of room for her rabbits? Explain.

