Investigating Rectangle Areas

In this lesson, we will investigate rectangle areas by looking for patterns in tables and graphs. These are the questions we will be thinking about:
   ◊   How does the area of a rectangle change if you vary the length or width and leave the other dimension unchanged?
   ◊   How does the area of a rectangle change if you vary both the length and the width?

1. What is the area of a rectangle with the following dimensions?
    a. 1 by 9
    b. 2 by 9
    c. 3 by 9
    d. 9 by 9

2. What is the area of a rectangle with the following dimensions if x = 10?
    a. 1 by x
    b. 2 by x
    c. 3 by x
    d. x by x

3. Fill out this table:

Rectangle area	
x	1 by x
1	1
2	
3	
4	
5	
6	

4. Draw axes, with x on the horizontal axis, and *area* on the vertical axis. Plot the points you obtained in the previous exercise for the area of 1 by x rectangles. For example, (1,1) will be on the graph.

5. Does it make sense to connect the points you plotted? What would be the meaning of points on the line, in between the ones you got from your table?

6. Now fill out these tables:

Rectangle area	
x	2 by x
1	
2	4
3	
4	
5	
6	

Rectangle area	
x	3 by x
1	
2	
3	9
4	
5	
6	

Square area	
x	x by x
1	
2	
3	
4	16
5	
6	

7. On the same axes, graph the data you obtained for 2 by x, 3 by x, and x by x rectangles (i.e. squares.) For more accuracy on the last one, you may use your calculator to find points for x = .5, 1.5, and so on.

8. **Discussion:** Answer these questions about the graphs:
    a. Which ones represent a proportional relationship?
    b. How do the first three graphs differ from each other? Explain.
    c. What is special about the fourth graph?
    d. Do the graphs intersect? What is the meaning of the intersections?
    e. Where would the graphs meet the y-axis if we extended them?
    f. Which area grows the fastest? why?

9. I am thinking of a number, which I will call k. If I made a table and a graph for rectangles with dimensions k by x, it would start like this:

Rectangle area	
x	k by x
1	5

What is k equal to? Explain.

10. Here is one part of a table:

Rectangle area	
x	9 by x
?	13.5

What is the missing number? Explain.