

Algebra I & II:
New Course Content
Standards
End-of-Year Assessments
and Model Lessons

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Developing an Understanding for a Direct Variation

In this investigation you will look at data about the length of large lakes to draw a graph and write an equation that states the relationship between miles and kilometers. You'll see several ways of finding the information that is missing from the table.

Lengths of Large Lakes of the World

| | Length in Miles | Length in Km. |
|----------------------------|-----------------|---------------|
| Caspian Sea (Russia) | 745 | 1199 |
| Lake Superior (US) | 383 | 616 |
| Lake Victoria (Uganda) | 200 | 322 |
| Lake Michigan (US) | 321 | 517 |
| Lake Huron (US) | 247 | 397 |
| Lake Eyre (Australia) | 130 | 209 |
| Lake Winnipegosis (Canada) | 152 | 245 |
| Great Salt Lake (US) | 75 | 121 |
| Nicaragua (Nicaragua) | 110 | |
| Baikai (Russia) | | 636 |

- Draw a hand graph of the data in the chart. Let x represent the length in miles and y represent the length in kilometers.
- What pattern or shape do you see in your graph? Connect the points to illustrate this pattern. Explain how you could use your graph to approximate the length in kilometers of the Nicaragua Lake and the length in miles of the Baikai Lake.
- Make a scatter plot of the data in your calculator. Place the length in miles in L1 and the length in kilometers in L2.

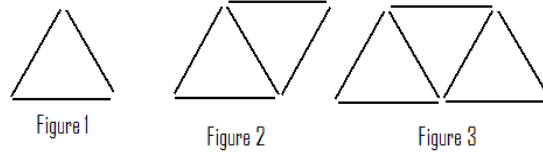
- Use L3 to create a set of values for the ratio L1/L2. Explain what the values in L3 represent. If you round each value in L3 to the nearest tenth, what do you get?
- Use the rounded value you got in the last step to find the length in kilometers of the Nicaragua Lake. Could you also use your result to find the length in miles of the Baikai Lake?
- How can you change x miles to y kilometers? Using variables, write an equation to show how miles and kilometers are related.
- Use the equation you wrote in the last step to find the length in kilometers of the Nicaragua Lake and the length in miles of the Baikai Lake. How is using this equation like using a rate?
- Graph the equation on your calculator. Compare this graph to your hand-drawn graph. Why does the graph go through the origin?
- Trace the graph of your equation. Approximate the length in kilometers of the Suez Canal by finding when x is approximately 101 miles. Trace the graph to approximate the length in miles of the Baikai Lake. How do these answers compare to the one you got from your hand-drawn graph?
- Use the calculator's table to find the missing lengths for the Nicaragua Lake and the Baikai Lake.
- In this investigation you used several ways to find missing information: Approximating with a graph, calculating with a rate, solving an equation, and searching a table. Write several sentences explaining which of these methods you prefer and why.
- Since the ratio was the same for every pair of points, we say that kilometers and miles are directly proportional.
- The relationship between kilometers and miles is called a direct variation.
- It follows the form $y = kx$ where k is a constant of variation.

Studying Constant Rate of Change with Recursive Sequences



- The Empire State Building has 102 floors and is 1250 feet high. How high are you when you reach the 80th floor?
 - Explain your reasoning.
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- A 25-story building has floors at the described heights. What recursive sequence can describe the heights?
 - Find the height of the 4th and 10th floors?
 - Which floor is 215 feet above ground?
 - How high is the 25th floor?
 - Explain your reasoning
 - Model this on the graphing calculator

| Floor Number | Basement (0) | 1 | 2 | 3 | 4 | ... | 10 | ... | ... | 25 |
|--------------|--------------|---|----|----|---|-----|----|-----|-----|-----|
| Height (ft) | -6 | 7 | 20 | 33 | | | | ... | 215 | ... |



- Make figure 1-3
- Determine how many toothpicks it takes to make each figure.
- Determine the number of toothpicks on each perimeter.
- Make figures 4-6.
- Collect a table of data about each picture.
- What is a rule for finding the number of toothpicks in each figure.
- What is the rule for find the perimeter of each figure.
- Make figure 10.
- Confirm your table values by writing a recursive procedure on the calculator.



- Make a row of squares rather than triangles.
- Label the first three figures: 1, 2, and 3.
- Determine how many toothpicks it takes to make each figure.
- Determine the number of toothpicks on each perimeter.
- Collect a table of data about each picture.
- What is a rule for finding the number of toothpicks in each figure.
- What is the rule for find the perimeter of each figure.
- Make figure 10.
- Confirm your answers for figure 10 by checking it on the calculator by setting up a recursive sequence.