

TOPOGRAPHIC MAPS

What can they tell us?

ACTIVITY



Focus Question

What does the topographic map of Barro Colorado Island tell you about the shape of the land surface?

Activity Overview

To build the Panama Canal, engineers dammed the Chagres River. In the process, new lakes were formed, a valley was flooded, and towns and forests were covered with water. As the waters rose, the top of a large hill known as Barro Colorado Hill was surrounded by water and became an island. Barro Colorado Hill is now called Barro Colorado Island (BCI).

In this activity, you will use a TI-73 Explorer™ and a topographic map of BCI to explore information about actual land features from a map. A topographic map shows the surface features of a place or region. It uses contours to indicate the elevations of places or regions and how far apart they are. Contours are imaginary lines that join points of equal elevation on the surface of the land, usually above or below sea level. Contours make it possible to measure heights of mountains, depths of the ocean floor, and the steepness of slopes.

What does the graph tell you about the steepness of the land? How does the shape of the surface of the land change as you take a hike across BCI?



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Part A — Understanding Your Topographic Map

Procedure

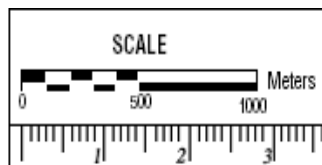
1. Obtain a copy of the topographic map of Barro Colorado Island from your teacher.
2. Complete the Data Analysis section. Answer the questions in your journal.

Data Analysis

Topographic maps provide information about the shape of a land's surface. When you look at a topographic map, imagine that you are in an airplane, looking directly down at the land's surface. The lines on a topographic map—called contour lines—represent specific elevations. All points on a contour line have the same elevations. For example, on the topographic map of Barro Colorado Island, any point on the contour line labeled “25 meters” represents an area that is 25 meters above sea level.

1. How many contour lines does the topographic map of Barro Colorado Island have?
2. Examine your topographic map of Barro Colorado Island and identify the elevation of:
 - a. Location 1
 - b. Location 2
 - c. Location 3

You can use a topographic map to find the distance between any two locations on the island. The scale on the map shows that every 1 cm on the map equals 357 m of land.



When you want to find the distance between two locations on the island, first use your ruler to measure the distance between the two points on the map in centimeters. The formula below, which uses the scale, can then help you find the actual distance in meters.

$$\text{Distance (m)} = \text{Distance (cm)} \times \frac{357 \text{ (m)}}{1 \text{ (cm)}}$$

3. What is the distance between Location 1 and Location 2 in meters?
4. What is the distance between Location 2 and Location 3 in meters?

ACTIVITY

Materials*

- TI-73 Explorer™
- Topographic Map of BCI
- Metric Ruler



TI-73 Explorer™

* This activity has been written for the TI-73 Explorer™ but you can easily substitute the TI-83 or TI-83 Plus.



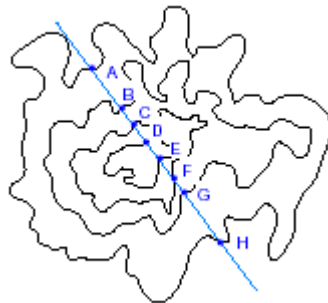
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Part B — Taking a Hike across the Island

Procedure

1. Draw a line across your map.

- a. Find the innermost contour line on the map of BCI. It indicates the area of highest elevation on the island. Mark a point on this line. Then draw a straight line across the map that passes through this point. The line you've drawn should pass through all contour lines on the map. See example below.



Crossing a contour line indicates that you have ascended or descended beyond a particular elevation. Note that you have probably drawn a different line from your classmates and therefore you will observe a different path.

- b. Label the points where your line crosses contour lines. Start by labeling Point A on the 25 meter contour line. **Make sure to label all points, including those that touch a contour line more than once.** See example above.
- c. Copy Table 1, below, into your journal. Note that the distance at Point A (start) is 0 cm. The elevation at Point A is 25 meters because Point A falls on the 25 meter contour line.
- d. Use a ruler to measure the map distances in cm between Point A and the other points on your map. Remember to start measuring each distance from Point A. Enter your map distance measurement in cm, and the elevation for each point along your trail in Table 1. *Note: The elevation at Point A is 25 meters because Point A falls on the 25 meter contour line.*
- e. Convert each map distance (cm) to an actual distance (m), using the formula from Part A, and round off to the nearest meter. Record the actual distances in Table 1.

Table 1

| Hike Segment | Map Distance (cm) | Actual Distance (m) | Elevation (m) |
|-----------------|-------------------|---------------------|---------------|
| Point A (start) | 0 | 0 | 25 |
| A - B | | | |
| A - C | | | |
| A - D | | | |
| A - E | | | |
| A - F | | | |
| A - G | | | |
| A - H | | | |



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2. Reset the TI-73 Explorer™ to the default settings.

- Turn on the TI-73 Explorer™.
- Press **2nd** [MEM] **7** **2** **2**.
- Press **2nd** [MEM] **6** **ENTER**.

3. Enter your data in the TI-73 Explorer™.

- Press **LIST**.
- Enter each actual distance (m) from Table 1 in L1. After entering each number, press **ENTER**.
- Enter each elevation (m) from Table 1 in L2. After entering each number, press **ENTER**.

| L1 | L2 | L3 | 1 |
|----------|-------|-------|---|
| ████████ | ----- | ----- | |
| L1(1)= | | | |

4. Graph your data.

- Press **2nd** [PLOT] **1** **ENTER**.
- Press **↓** **↓** **ENTER** to select line graph (↘↗).
- Press **↓** **2nd** [STAT] **1** to select L1 (X-coordinate) for the X-axis.
- Press **↓** **2nd** [STAT] **2** to select L2 (Y-coordinate) for the Y-axis.
- Press **↓** **ENTER**.
- Press **GRAPH** to see the plot.
- Press **ZOOM** **7** to fit the graph on the screen.

| | | | | |
|--------|-----|-----|---|---|
| Plot1 | Off | Off | | |
| Type: | ↘↗ | ⊠ | ⊡ | ⊢ |
| Xlist: | L1 | | | |
| Ylist: | L2 | | | |
| Mark: | ⊠ | + | . | |

5. Complete the Data Analysis section. Answer the questions in your journal.



What can they tell us?

Data Analysis

Refer to your map, graph, and Table 1 to answer the following questions.

1. For the following line segments, do you travel uphill, downhill, or on a surface with no change in elevation? Explain your answers.
 - a. From Point A to Point B
 - b. From Point G to Point H
 - c. From Point D to Point E
2. Describe your hike between Point C and Point F. *Hint: Describe which segments of the hike are uphill, downhill, or on a surface with no change in elevation.*
3. Draw a sketch of your graph in your journal. Obtain a map of your classmate's hike. Use that map to sketch your classmate's hike on your graph.
4. Compare your hike between Point A and Point B with that of your classmate. Who had the steeper hike? Explain.
5. Compare your hike between Point A and Point B with that of your classmate. Who traveled the longer distance? Explain.
6. How do you think the steepness of your hike would change if Point A and Point B were further apart on your hike path? Explain.
7. How do you think the steepness of your hike would change if Point A and Point B were closer together on your hike path? Explain.
8. How do you think the steepness of your hike would change if Point B was at a higher elevation? Explain.

