

TOPOGRAPHIC MAPS

What can they tell us?

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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, students 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.

Conclusion: Students will learn how to use a topographic map to find the elevations of places and how far apart they are. They will also determine the steepness of the land by observing the contour lines on the map.

Activity at a Glance

Grade: 4-9
Subject: Science
Category: Earth Science
Topic: Maps, topographic maps

Time Required

- Two 45-minute periods

Level of Complexity

- Medium

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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Concept Background

- Topographic maps provide information about an area's landscape. You can use topographic maps to determine whether a landscape is steep or flat.
- BCI emerged as an island only 80 years ago as a result of the Panama Canal's construction. Formerly a hilltop, the 15-square kilometer island is home to at least 1,316 plant species, 381 bird species, and 102 mammal species.
- Crossing the Isthmus of Panama saves travelers 18,000 miles of sea travel around the tip of South America.
- If a person is planning to explore an area such as BCI, a topographic map will help the person plan for the trip and also inform the person about the strenuousness of the hike.

Preparation and Classroom Management Tips

- During the first period, perform Part A. Use the topographic map of BCI to demonstrate what information your students can obtain from it and how it can be used. Practice measuring distances on a map.
- During the second period perform part B. Hand out copies of the topographic map and consider having predetermined hike paths. Calculate distance and elevation in advance to help students complete the activity.
- If students performed the activity using predetermined hike paths, you may add a third period to repeat the activity by drawing their own lines on the map.
- For grades 4 and 5, consider implementing Part A only. You may use three class periods to complete the activity.
- In Part B, Procedure, Step 1, students draw a straight line across the map and label the points where the line crosses contour lines. Make sure that students label all points including those that touch a contour line more than once.
- Consider having students work in groups.
- Encourage students to answer the Data Analysis questions in their journals.
- Create your own student questions for use on your students' TI handhelds using the Texas Instruments StudyCard applications.

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National Education Standards

Science Standard D: Earth and Space Science

Students should develop an understanding of the structure of the Earth's system.

Math Standard: Problem Solving

Students should develop an understanding of mathematical concepts by working through problems that allow applications of mathematics to other contexts.

Geography Standards 1 and 3: The World in Spatial Terms

Students should learn how to view the world in spatial terms and organize information about people, places, and environments in a spatial context.

Geography Standard 14: Environment and Society

Students should learn how human actions modify the physical environment, how these actions lead to other changes, and about the role of technology in the human physical environment.

English Language Arts Standard 7

Students research issues and interests by generating ideas and questions and by posing problems. They gather, evaluate, and synthesize data from a variety of sources to communicate discoveries.



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Part A — Understanding Your Topographic Map

Data Analysis

1. Q. How many contour lines does the topographic map of Barro Colorado Island have?
 - A. *The topographic map of Barro Colorado Island has 4 contour lines.*
2. Q. Examine your topographic map of Barro Colorado Island and identify the elevation of:
 - A. *a. The elevation at Location 1 is 65 meters.*
 - b. The elevation at Location 2 is 65 meters.*
 - c. The elevation at Location 3 is 105 meters.*
3. Q. What is the distance between Location 1 and Location 2 in meters?
 - A. *The distance between Locations 1 and 2 is about 2000 meters.*
4. Q. What is the distance between Location 2 and Location 3 in meters?
 - A. *The distance between Location 2 and Location 3 is about 175 meters.*

Part B — Taking a Hike across the Island

Data Analysis

1. Q. 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
 - A. Answers may vary depending on student's hike path.
 - a. Students should be hiking uphill.*
 - b. Students should be hiking downhill as though coming down the other side of the island's summit.*
 - c. Students should be hiking on a surface with no change in elevation.*
2. Q. 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.*
 - A. *Answers will vary but if students have drawn their lines across the island as instructed, they will likely describe a hike that starts uphill, flattens out at Barro Colorado Island's summit, and then finishes downhill.*

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Vocabulary

Conquistador A Spanish word meaning “conqueror.” Usually refers to the leaders of 16th-century Spanish military expeditions who discovered and conquered vast territories in the Americas.

Contour line A line on a map that joins points of equal elevation.

Data Observations and measurements about the real world. In science, data are used to support or refute hypotheses.

Elevation The height of an object or landmark above a reference level, especially above sea level or above the Earth's surface.

Isthmus A narrow strip of land that has water on either side and connects two larger bodies of land.

Terrestrial Living on land.

Topographic map A map that shows the surface features of a place or region, indicating their relative positions and elevations.

Topography The surface features of a place or region.

Transcontinental Extending across a continent.



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3. Q. Draw a sketch of your graph in your journal. Obtain a map from a classmate of yours. Sketch your prediction of your classmate's hike on your graph in your journal.
4. Q. Compare your hike between Point A and Point B with that of your classmate. Who had the steeper hike? Explain.
A. *Answers will vary.*
5. Q. Compare your hike between Point A and Point B with that of your classmate. Who traveled the longer distance? Explain.
A. *Answers will vary.*
6. Q. 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.
A. *If Point A and Point B were further apart the steepness of the hike would decrease, provided the elevations at each point remain the same.*
7. Q. 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.
A. *If Point A and Point B were closer together the steepness of the hike would increase, provided the elevations at each point remain the same.*
8. Q. How do you think the steepness of your hike would change if Point B was at a higher elevation? Explain.
A. *If Point B was at a higher elevation steepness of the hike would increase, provided the distance between Points A and B remains the same.*

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