

Make a TOPOGRAPHIC MAP

TEACHER



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 learn how to make a topographic 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.

In order to make their topographic map they will first prepare a simulated terrain, which consists of your classroom floor and two boxes of different sizes. They will use a Motion Detector connected to a TI CBL 2™, or Vernier LabPro and a TI-73 Explorer™, to measure the elevation of specific points on each surface. Then students will plot the coordinates of these points, and learn how to connect points of equal elevation to make a topographic map.

Conclusion: Students can use the topographic map to read the elevation at any location of their simulated terrain. They can also find the position of any location on the map and how far apart two locations are.

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

- High

Materials*

- TI-73 Explorer™
- TI CBL 2™ or Vernier LabPro
- TI-73 DataMate
- Motion Detector
- 1 board, 1.5 m long to support the Motion Detector
- Masking tape
- 2 boxes of different sizes
- Chalk marker
- Metric ruler

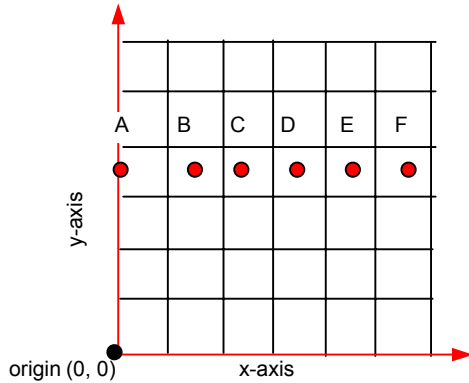
* This activity has been written for the TI-73 Explorer™ but you can easily substitute the TI-83 or TI-83 Plus. Also see Appendix A for steps on how to transfer DataMate to your graphing device and how to use DataMate for data collection.



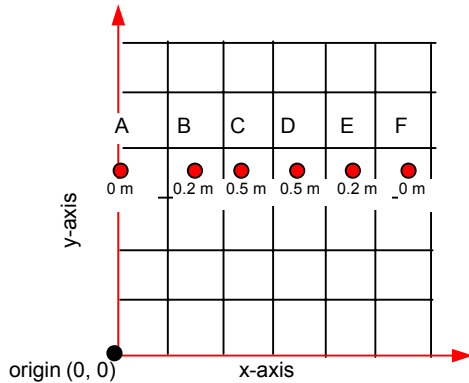
Adapted from "Experiment 12 — Ocean Floor Mapping," *Middle School Science with Calculators*, written by Volz, Don, and Sapatka, Sandy, published by Vernier Software & Technology, 2000.

Make a TOPOGRAPHIC MAP

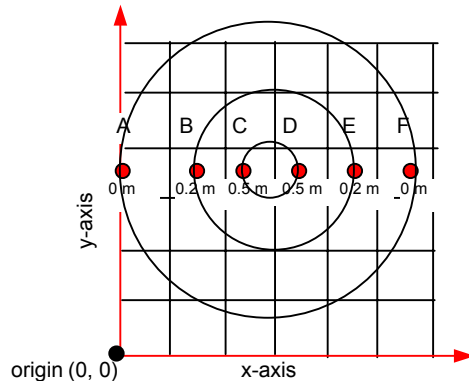
- In Procedure, Step 10e, students should have a graph similar to the one shown below:



- In Procedure, Step 10f, students should have a graph similar to the one shown below:



- In Procedure, Step 10g, students should have a graph similar to the one shown below:



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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

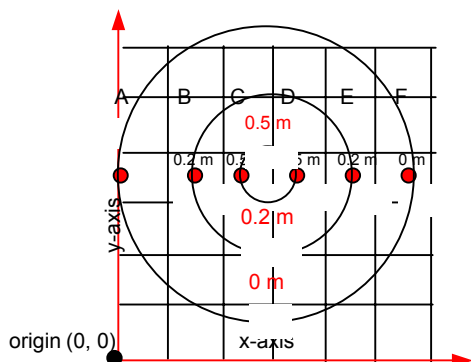
Students research issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources to communicate discoveries.



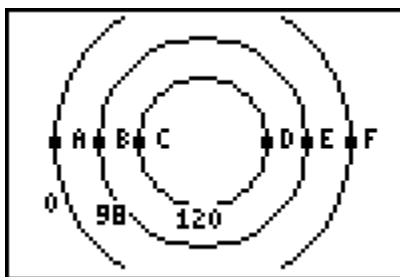
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- The completed topographic map (Procedure, Step 10h) should be similar to the one shown below:



- Students can draw the map on the TI-73 using the DRAW functions (see diagram below).
 - Enter the XY Coordinates into the LISTS (Procedure, Step 2).
 - Adjust the WINDOW, xmin = 0, xmax = 70, ymin = 0, and ymax = 70.
 - Plot the coordinates using a scatter-plot.
 - Use the DRAW function to Label each point.
 - Use the DRAW function to Circle the points with equal elevations.
 - Use the DRAW function to Label each circle.



- This activity works well with students working in groups, or as a demonstration.
- Encourage students to answer the questions in Data Analysis in their journal.
- Create your own student questions for use on your students' TI graphing devices using the Texas Instruments StudyCard applications.

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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 is used to prove or disprove hypotheses.

Elevation The height of a location above a reference level, especially above sea level or above the earth's surface.

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

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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TOPOGRAPHIC MAP**Data Analysis**

- 1** Q. How many contour lines does your topographic map have?
A. *The topographic map has three contour lines.*
- 2** Q. How many elevations does your map show?
A. *The topographic map shows three elevations.*
- 3** Q. What is the lowest elevation?
A. *The lowest elevation (floor) is 0 m.*
- 4** Q. What is the highest elevation?
A. *Answers will vary.*
- 5** Q. Which points fall on the contour with the lowest elevation?
A. *Point A and Point F fall on the contour with the lowest elevation.*
- 6** Q. Which surface is represented by the contour with the lowest elevation?
A. *The floor is represented by the contour at the lowest elevation.*
- 7** Q. Which points fall on the contour with the highest elevation?
A. *Points C and D fall on the contour with the highest elevation.*
- 8** Q. Which surface is represented by the contour with the highest elevation?
A. *Box 2 is represented by the contour with the highest elevation.*
- 9** Q. What is the elevation of Points C and D?
A. *Answers will vary. Students should observe that Points C and D fall on the same contour line.*
- 10** Q. What surface does Point C and Point D represent?
A. *Points C and D represent Box 2.*
- 11** Q. What is the actual distance in cm between Points B and C? Hint: Measure the distance between the two points on the map in cm and then use the scale from Step 10 to find the actual distance in cm.
A. *Answers will vary.*
- 12** Q. What is the actual distance in meters between Point B and Point E?
A. *Answers will vary.*
- 13** Q. What is the difference in elevation between Point B and Point E?
A. *Point B and Point E fall on the same contour line, so the difference in elevation is 0 m.*



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