NAME: DATE: PD

Shoe Box Activity
Constructing a Topographic Map

Background Information

All maps are models of some feature of the real world. The kind of map often used by scientists is called a contour or topographic map. Topographic maps show elevation, or height above sea level, of land areas. On a topographic map, differences in elevation are illustrated by lines that are drawn through points of equal elevation. Such lines are known as contour lines.

In this investigation you will make a contour map of a landform model.

- **1cm = 250 feet on the actual mountain**
- **The bottom of the box represents on elevation of 6280 feet above mean sea level.**

Problem

How is a contour map created?

Materials (per group)

model landform in a transparent plastic box with lid
nonpermanent marking pen
source of colored water
container
tracing paper (transparancy)

Procedure

1. Check to see that your plastic box has a centimeter scale marked on one of its sides. The scale will be used to measure the level of water in the box.

2. Pour colored water into the plastic box up to the 1-cm mark.
    a. Notice that the water forms a shoreline with the landform model. *See Figure 1*.

3. Place the cover on the box. Using the marking pen, trace the shoreline onto the cover where the colored water meets the landform model. Look straight down at the shoreline as you trace it. *See Figure 1 again*.

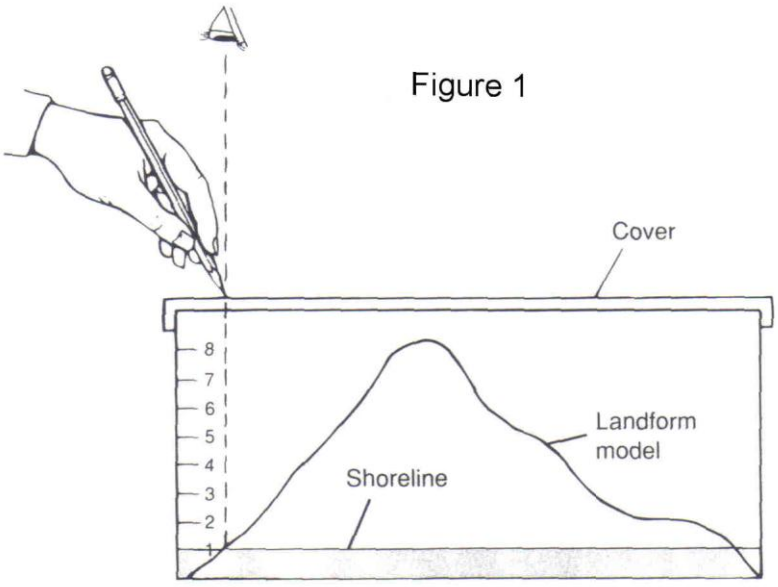


Figure 1

4. Continue filling the container with colored water, 1 cm at a time. Trace the new shoreline formed after each filling. When you have completely covered the landform model, you will have created a contour map of that landform. *See Figure 2 on the next page*

NAME: DATE: PD

5. Remove the cover from the plastic box, which is now filled with colored water.

6. Carefully pour the colored water into the sink or bucket. *If the instructor allows, you may also pour it back into the large container from which you took it.* Remove a small amount at a time.

7. Place a sheet of (tracing) paper over the contour map that you have traced on the cover and trace the map onto the paper.

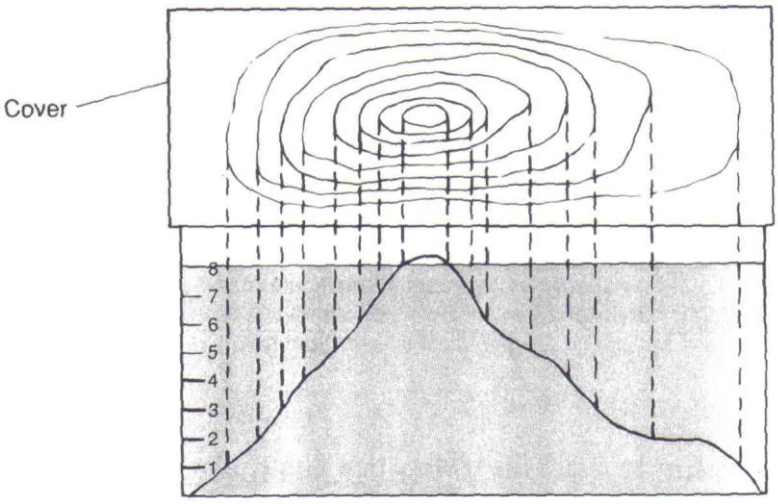


Figure 2

   a. You may find that if you hold the cover against a window glass, the sunlight behind it will make it easier to see the contour lines.

8. Each student traces his or her own map from the one that they made on the lid of the shoe box.

9. After tracing the contour lines onto your tracing paper, wash the lines from the cover. Return all materials to the proper place. The lines should not touch each other.

Observations

1. In this model, the vertical distance between the bottom of the box and the first horizontal line (surface of the water) is the contour interval. On a contour map, the contour interval is the vertical distance between two successive contour lines. What is the contour interval of the map you made? _____

2. Label the height of each contour line on the map that you made.

NAME: DATE: PD

Analysis and Conclusions

1. What is the height of the highest point on the topographic map that you made?

2. According to your map, is the slope from the shoreline to the highest point on the landform uniform on all sides?

3. How can you tell?

4. How would your topographic map be different if the landform you mapped was a large plateau?

Evaluation Questions:

5. Describe the general shape of the contour lines?

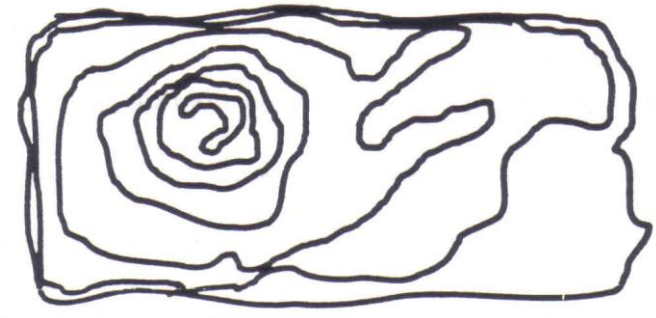
6. What general statement can be made about the closeness of the lines and the steepness of the slope?

7. Describe the shape of this landform, are some areas steeper than other?

8. Has the shape affected the pattern of contour lines?

9. How would a steep valley down the side of the volcano change the contour pattern?

10. Would it be possible to distinguish a basin from a mountain on a topographic map or chart?



NAME: DATE: PD

Shoe Box Activity part 2
Constructing a Topographic Map Profile

BACKGROUND INFORMATION

Topographic maps show both natural features and the work of humans. Agricultural, architectural and transportation-system expansion in response to a growing Earth population has greatly changed the nature of the earth's surface. Topographic maps tell a cultural as well as a geological story.

Topographic maps are bounded by parallels of latitude and meridians of longitude. The standard topographic map symbols represent different features such as buildings, landmarks, bridges, wells, tanks, railroads, major/minor roads, lakes, woods, town lines, park boundaries, state lines, etc.

One important kind of interpretation made from topographic maps is the cross-section, or profile. Profiles often have a vertical scale that is exaggerated in relation to the horizontal scale. This causes the vertical extent of the cross-section to appear much higher than it would actually be when viewed in relation to the horizontal region of the cross-section. This practice helps to show relief features. Relief refers to the difference in elevation between the high and low points in a given area.

From the profile line we can determine the slope, or rate of change in elevation per unit distance by applying the mathematical formulas:

$$\frac{slope\_Line\_cm}{} X \frac{250\,ft}{1cm} = \frac{(your\_answer)\,ft}{1} x \frac{1mi}{5280\,ft} = total\_dis\tan ce$$

- **1 cm = 250 feet** **1 mile = 5280 feet**

$$Change\_in\_Elevation = (Highest\_Point) - (Lowest\_Point)$$

Average slope can tell us if the land falls away sharply (steep gradient, or large value) or if it falls gently (small gradient value).

$$GRADIENT = AVERAGE\_SLOPE = \frac{CHANGE\_IN\_ELEVATION}{tOTAL\_DISTANCE}$$

OBJECTIVES:

To demonstrate how landscapes can be studied by interpreting topographic maps.

PROCEDURE: Complete the topographic cross section.

1. **Draw a segment line** (cross-section line) straight across ON YOUR Volcano
   a. This line is about 27**cm long**.

2. Label this segment line “A” and “B”

3. Next **calculate a benchmark** (BM) along the AB line. (this is the **TOTAL DISTANCE**)
   a. This is done by using the mathematical formula from the background information.
   b. Use the proper units and SHOW YOUR WORK on next page

NAME: DATE: PD

$$\frac{\_\_\_\_\_\ cm}{1}\ X\ \frac{250\ ft}{1cm} =$$

$$\frac{\_\_\_\_\_\ ft}{1}\ x\ \frac{1mi}{5280\ ft} =$$

4. Next calculate a **change in elevation**
    a. The top of the mountain minus the base of the mountain
    b. This is done by using the mathematical formula from the background information. Use the proper units and SHOW YOUR WORK below

_____ *ft* − _____ *ft* = _____ *ft*

5. **Then calculate the Average Slope** of the mountain
    a. This is done by using the mathematical formula from the background information.
    b. Use the proper units and SHOW YOUR WORK below

$$Average\_Slope = \frac{\_\_\_\_\_\ feet}{\_\_\_\_\_\ miles}$$

$$Average\_Slope =$$

6. Finally **construct a vertical profile of the volcano**
    a. Create a scale on the next page. The bottom line of the chart should start with the BASE number

ANALYSIS AND CONCLUSIONS

1. Give a general description of the appearance of the landscape shown by this map?

NAME: DATE: PD

Constructing a Vertical profile Draw your topographic map on this page