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Shoe Box Activity LAB PART 1
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 (transparency)

PART A of this LAB... creating your topographic map

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 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.*
   b. Water level may go down as you add water. Keep checking it.

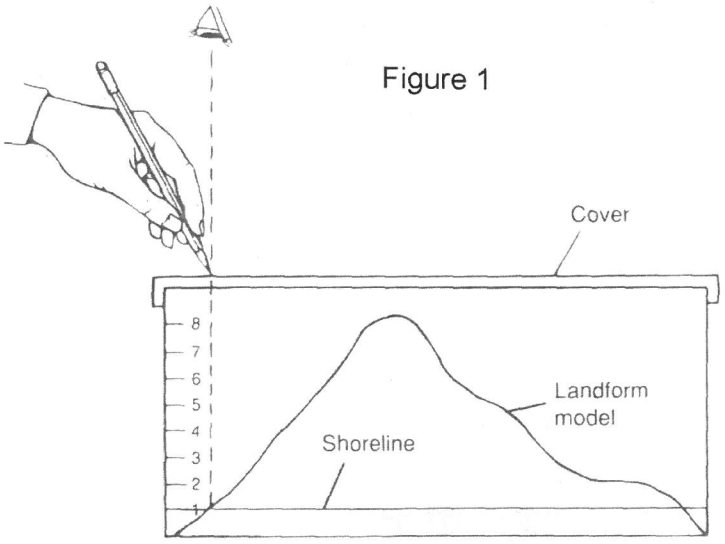

Figure 1

3. Place the lid on the box and cover it with the transparency paper.
   a. Place the transparency paper on top of the lid and mark it so that it lines up.
   b. Look straight down at the shoreline as you trace it. *See Figure 1*
   c. Using the water marking pen, trace the shoreline onto the transparency paper where the water meets the landform model. REPLACE THE CAP ON THE WATER MARKING PEN EVERY TIME.
   d. Remove the lid & transparency from the plastic box

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4. Continue filling the container with water, 1 cm at a time, until you reach 8 cm.
    a. Water level may go down as you add water, so keep checking it.
    b. Trace the new shoreline formed after each filling.
    c. When you have completely covered the landform model, you will have created a contour map of that landform. *See Figure 2 below*

5. Remove the transparency paper only when you completed all 8 contour lines. Cover the shoe box, which is now filled with water, with the lid.

6. Carefully pick up the shoe box and lid and pour the water into the sink. Remove a small amount at a time.

7. Wipe the shoe box container down with a dry towel and return it to your lab station.

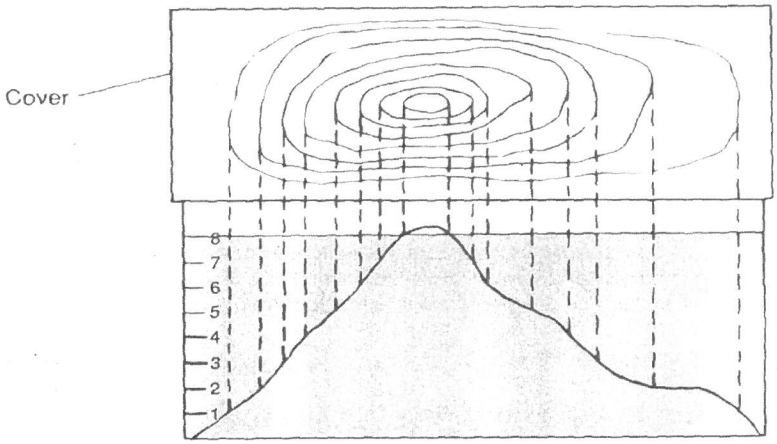


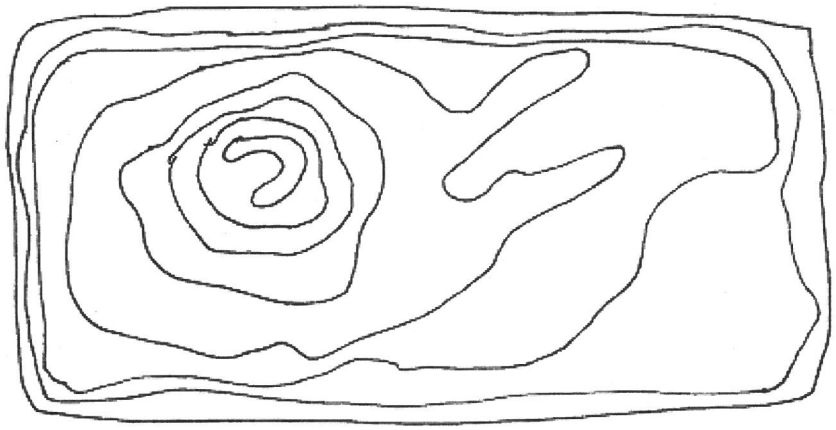
Figure 2

PART B of this LAB... tracing your topographic map

8. SEE our Teacher for materials: Place a sheet of white (tracing) paper over the transparency side up and you have to trace on the lines you made on to the sheet of paper.
    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.

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

10. After tracing the contour lines onto your white sheet of tracing paper, wash the lines from the transparency by running it under water. Return all materials to the proper place. Remember that contour lines should not touch each other.



11. Label the height of each contour line on the map that you made. See background information for more help as to the starting height of the first contour line you made.

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Shoe Box lab Analysis and Conclusions questions.

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?

   _____

   a. 250 feet =1in
   b. 250 feet =1cm
   c. 250 cm =1foot
   d. 6280 feet =1cm

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

   a. 7780 feet
   b. 8030 feet
   c. 8280 feet
   d. 8530 feet

3. According to your map, is the slope from the shoreline to the highest point on the landform uniform (all the same) on all sides?

   a. **YES**
   b. **NO**

4. From the previous question select the BEST answer to "How can you tell?"

   a. You see closer the lines to one side than the other
   b. The contour lines would be square shape if it was the same
   c. You see a gentle slope on ALL sides of the volcano
   d. You see closer the lines all the way around

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

   a. You see closer the lines to one side than the other
   b. The contour lines would be square shape if it was the same
   c. You see a gentle slope on ALL sides of the volcano
   d. You see contour lines on top of each other all the way around

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

   a. Closer the lines, more gentle of a slope
   b. Closer the lines, steeper the slope

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

   a. **YES**
   b. **NO**

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

   a. **YES**
   b. NO

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

   a. **YES**
   b. **NO**

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

    a. **YES**
    b. **NO**

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Shoe Box Activity part 2 to be completed the next day
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:

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

- **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

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

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

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?

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Constructing a Vertical profile

Draw your topographic map on this page