

# Modeling Topographic Maps

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## Teacher Notes

**TIME REQUIRED** Four 45-minute periods

## SKILLS ACQUIRED

Constructing models  
Identifying patterns  
Interpreting  
Measuring

## RATING

Easy ← 1 2 3 4 → Hard

Teacher Prep–1  
Student Set-Up–2  
Concept Level–2  
Clean Up–1

## THE SCIENTIFIC METHOD

**Make Observations** Procedure, steps 1–6

**Analyze the Results** Analysis, questions 1–3

**Draw Conclusions** Conclusions, question 4

**Communicate Results** Extension, question 1

## MATERIALS

The materials listed are for a group of 3 to 4 students.

## SAFETY CAUTIONS

Be sure students handle the fishing line carefully because it can cause cuts. Be sure to check for known student allergies to clay.

## MISCONCEPTION ALERT

Students may believe that a two-dimensional drawing cannot represent a three-dimensional surface. Point out that cartographers use various devices (contour lines, color keys) to indicate variations in elevation.

## TIPS AND TRICKS

Point out to students that the center hole in their mountain slices and the markings N, E, S, and W are essential to lining up the slices so they represent the original contours of the mountain.

**TEACHER RESOURCE PAGE**

# Modeling Topographic Maps

What is the easiest way to hike across a mountainous landscape? How can you know if a mountain range is steep? When you plan ahead you can take the route that has the gentlest slopes to climb. But, how do you know the route? A regular road map may not be of much help because it may not show the steepness of mountain slopes. The maps that show you the elevation of the land are called topographic maps.

Cartographers, the people who make maps, draw topographic maps specifically to show the elevation, or height above sea level, of the land. Although topographic maps are flat, they use various graphical and visual devices to indicate elevation. In this activity, you will use one such device, contour lines, to draw a topographic map of a mountain. You will use the data from Table 1 to discover how such a map provides clues to the steepness of a slope.

## OBJECTIVES

**Create** a topographic map.

**Observe** and **conclude** how contour lines reveal the steepness of a slope.

**Analyze** the data on a topographic map of a mountain to compare and contrast the steepness of its slopes.

## MATERIALS

- fishing line
- modeling clay
- pencil
- poster board, white (1 sheet)
- ruler
- wax paper
- wooden dowel, long, thin



## Procedure

1. Working on a flat surface, make a model mountain out of the clay. Make the mountain on a piece of wax paper to protect your work surface. The clay mountain should be about 10–20 cm tall. Make the sides of the mountain variously steep. In other words, each side should have a different steepness.
2. Use the ruler to mark off 1 cm vertical increments on the mountain.
3. Pass the dowel vertically down through the center of the mountain. Remove the dowel.

**TEACHER RESOURCE PAGE****Modeling Topographic Maps *continued***

4. Carefully use the fishing line to cut horizontal slices at the 1 cm intervals you have marked. Start at the top and work your way downward.
5. Mark each slice with the letters N, E, S, and W (north, east, south, and west) so you know the original configuration of each slice. Set aside each slice.
6. Place the largest slice of the mountain on the sheet of paper and use the pencil to trace its outline. Mark the paper with the letters N, E, S, and W to coincide with the marking on the slices.
7. Remove this slice and replace it with the next largest slice, which is the next highest level of the mountain. Make sure that this slice is aligned properly with the location of the previous slice. Do this by using the center hole in the slice and the letters N, E, S, and W.
8. Trace the outline of this slice on the paper.
9. Repeat steps 7 and 8 with the other slices until you have traced all the slices.
10. Place the slices back together to reform your original mountain.
11. Place the mountain next to the topographic drawing you made. Align the mountain with the drawing.

**Analysis**

1. **Examining Data** How do the contour lines (tracings) vary?  
**They vary in how close they are to one another.**
2. **Identifying Patterns** What is the significance of the variations of contour lines?  
**The closer the contour lines are, the steeper the slope of the mountain.**
3. **Analyzing Results** Using only the contour lines as a guide, draw the slope of each side of the mountain. Mark your drawings N, E, S, and W to identify each side of the mountain. Explain how your drawings compare to the actual slopes of the mountain's sides.  
**Responses will vary. But if done well, the drawings should be close approximations of the slopes of the model.**

## TEACHER RESOURCE PAGE

Modeling Topographic Maps *continued*

### Conclusions

4. **Evaluating Models** How is a topographic map like a real landscape? How is it different from a real landscape?

**A topographic map represents the three dimensions of a landscape. However, a topographic map is flat (two dimensional), while a real landscape has depressions and elevations (three dimensional).**

5. **Applying Conclusions** Explain why your topographic map would aid hikers traversing the mountain.

**Hikers generally seek the flattest areas to traverse. They avoid very steep slopes. A topographic map provides such information.**

### Extension

1. **Research and Communications** Obtain a topographic map of a mountainous or hilly region. Choose a starting and ending point for a hike. Using a colored pencil or marker, draw the route that would be easiest to travel between the points. Write a brief log of what a hiker would encounter on the hike.

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## Modeling Topographic Maps *continued*

### Conclusions

- 4. Evaluating Models** How is a topographic map like a real landscape? How is it different from a real landscape?
  
- 5. Applying Conclusions** Explain why your topographic map would aid hikers traversing the mountain.

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