Drexel-SDP GK-12 LESSON

Subject Area: Math

Lesson Title
Contour Maps

Grade Level 8

Time Required
Lesson time is dependent on student background, but may require up to 2 hours if the concept of slope has not been previously covered.

Summary
This lesson is intended to be an introduction to, and a mapping application lesson on the use of contour maps. There is a simple contour map and accompanying questions and also a contour map of a portion of a Pennsylvania park. This map is intended to emphasize the real-world, nearby use of contour maps.

Keywords
- slope
- rise/vertical
- run/horizontal
- contour line
- elevation

Educational Standards
PA Math 2.6.8A

Learning Objectives

After this lesson, students will be able to…

- identify the contour lines on a contour map
- understand the physical relevance of contour lines
- find slope from the information on a contour map
- determine features such as minimum and maximum elevations and location of valleys and hilltops

Introduction / Motivation

Contour maps are used by surveyors, architects, engineers and even hikers. Contour mapping is also used to represent many other types of data. It is the first opportunity to glean a third dimension of data from a two-dimensional map.

Associated Activities

Page 1 for **Contour Maps**

The first page of this lesson is intended to relate the concentric rings associated with contours to elevations. A profile and contour is shown at the top of the page. Students should learn which measurements represent distances and which distances represent heights. Students should also calculate path distances using the Pythagorean theorem.

1. Discuss how a contour map represents elevation, or height above sea level. Students may have many ways of expressing this concept.

2. Write 'sea level' in mathematical terms. That is, height=0 or elevation=0.

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3. Consider the path with the lowest slope. This path would be on the left side of this particular hill, along the vertical center line of the contour map. The most difficult path would likewise be the path on the right along the center line. Students should know that the lowest slope, or easiest path occurs where the contour lines are farthest apart.

4. The slope is 300/1000, or 3/10.

5. The slope is -400/200, or -2.

6. (Pythagorean theorem) $a^2 + b^2 = c^2$

7. 1044 meters

8. 447 meters

Page 3 for **Contour Maps**

1. Hilltops are where there are no more contours within contours, that is, where the smallest 'circles' are, roughly speaking. Three hilltops may be marked on this map. We can tell these are hilltops by looking at the increasing elevations approaching the hilltops.

2. Valleys are between the hills. It is useful to realize that 'Plum Run' would flow along the bottom of a valley. There is one main valley with a smaller valley on the left of the map.

3. The change in elevation on Warren Ave is roughly 90 feet.

4. The steepest slope is where contour lines are closest. Students may identify several places where this occurs.

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5. Though not marked, the elevation on the right side of the map is roughly 690 feet.

6. The river flows to the lower left of the map, down to an approximate elevation of 480 feet.

7. Measure a distance along Warren Ave. Use the formula rise/run.

8. The river flows to the lower left.

9. There are many correct answers to this question. Students may imagine the hills from any direction and interpret. It may help to draw a straight line through the map and draw a profile as on the first page.

Assessment
Either of the worksheets themselves may be used for assessment purposes.

Owner
Drexel University GK-12 Program

Contributors

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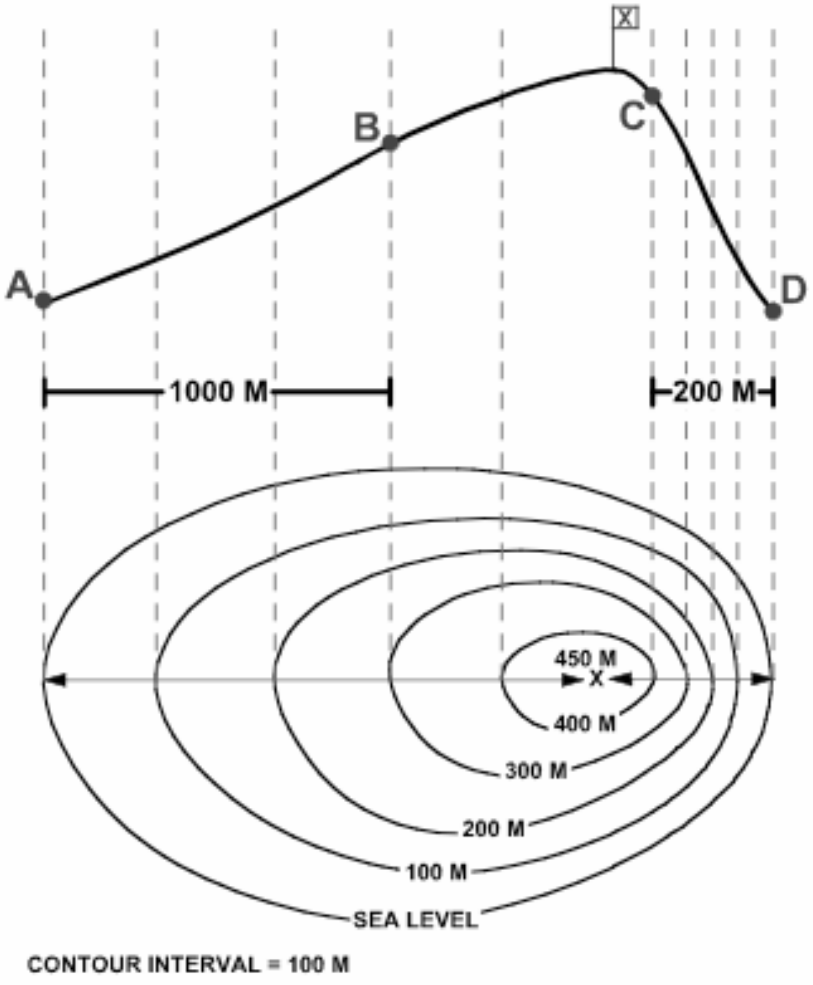
Contour Maps

Name: _____ Date:_____



The top image shows the profile of a hill. The bottom image shows a contour map of the same hill.

1. What does a contour map represent?

2. What is another way of writing 'sea level"?

Contour Maps

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3. If you were hiking up this hill, what would be the easiest path? Which path would be the most difficult? Explain this by describing the lines on the contour map.

4. Imagine you are hiking from A to B. What is the slope?

5. Imagine you are hiking from C to D. What is the slope?

6. What equation would you use to determine the distance from A to B?

7. Find the distance from A to B? Draw your right triangle on the profile, and use a dashed line to draw your path on the contour map.

8. Repeat the instructions for number 7 for points C to D.

Contour Maps

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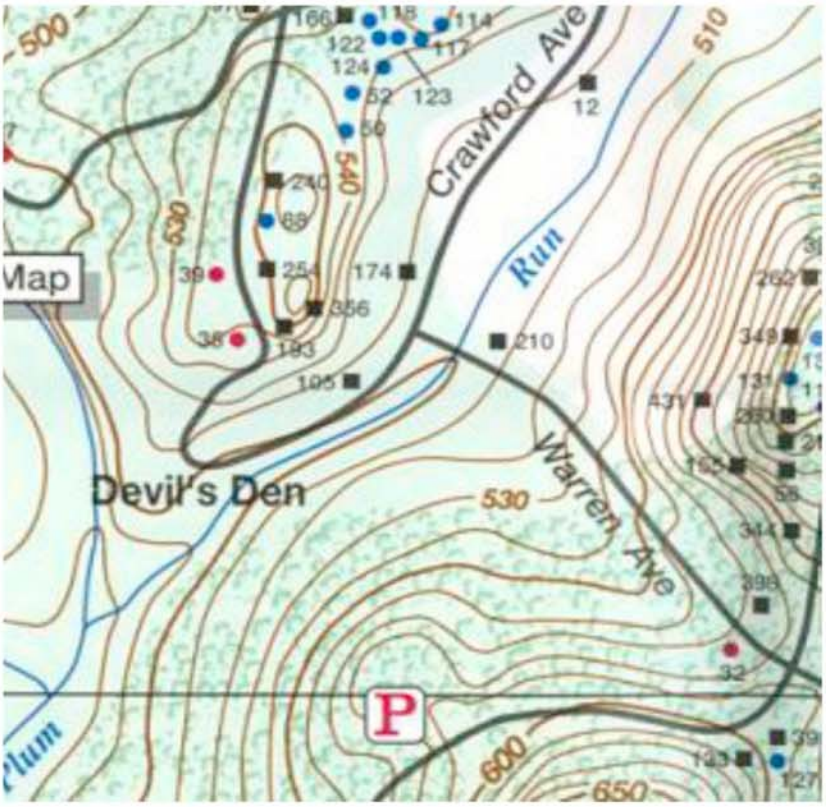
This is a map of a part of a park in Pennsylvania.



1. Mark the hilltops with a + sign. How do you know these are hills not valleys?

2. Mark the valleys with minus signs. Why is this a valley?

3.What is the change in elevation on warren ave?

4. Where is the steepest slope?

Contour Maps

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5. What is the highest point on the map? How high is this?

6. What is the lowest point on the map? How low is this?

7. If the scale of the map is 1 inch = 1 mile, what is the slope of Warren Ave.?
   Draw a right triangle to represent this.

8. Which way does the river flow? Why? Draw arrows on the river to show this.

9. Draw a sketch of what you think the landscape looks like (the profile)?