MiSP Topographic Maps Worksheet #2 L2

Name _____ Date _____

CONSTRUCTING AND STUDYING A CONTOUR MAP

Introduction:

You previously used the make-believe Ellipse Island to study contour maps. That activity had "ideal" contour lines that were evenly spaced. In this activity you will use a model to create a map that is less ideal, and then you will study the terrain on your map.

Objective:

To construct and interpret a contour map

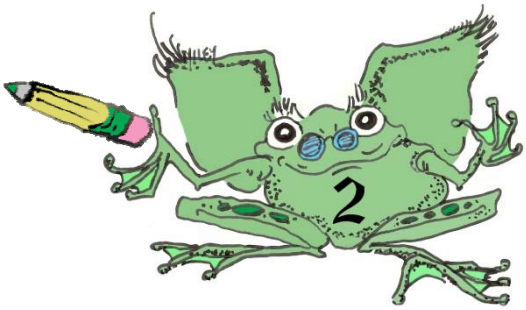
Materials:

- Ruler
- Plastic shoe box "volcano" — Mt. Capulin model or similar setup
- Overhead plastic sheets
- Tape
- Overhead markers or china markers

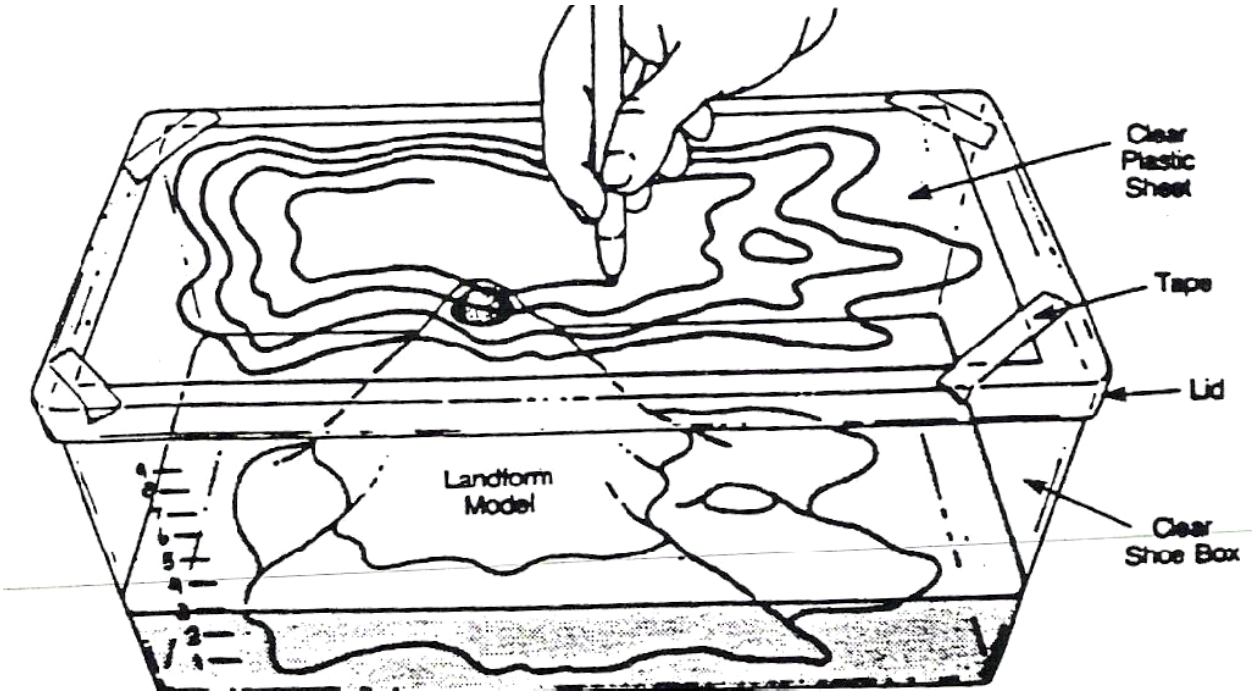
Procedure:

Check off each step as you complete it.

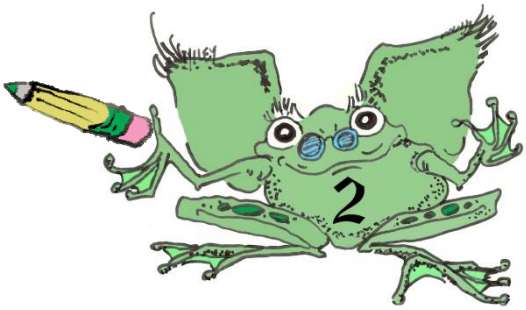
- ☐ Use a ruler to mark small horizontal lines spaced one centimeter apart on the side of the clear plastic shoe box. Measure from the bottom to the top.
- ☐ The scale for the elevation in the activity that is being used is 1 centimeter = 100 meters.
- ☐ Place the plastic model mountain inside the box.
- ☐ Begin filling the shoe box with water, stopping when the water level reaches the first centimeter mark on the bottom.
- ☐ This will be designated as sea level and the elevation should be marked as 0 (zero) meters.
- ☐ Tape the overhead sheet to the top of the plastic lid. Place the lid on the box, and then, using a marker, trace the shoreline onto the plastic overlay (SEE BELOW).
- ☐ Remove the lid and add water until it reaches the next centimeter marking.
- ☐ Replace the lid and trace again.



- Repeat this procedure for every marking until the entire mountain is covered with water.
- Create a contour map by tracing the contour lines from the plastic overlay onto a sheet of blank white paper. **Hint:** The easiest way to do this tracing is to place the paper on the plastic overlay and then place the sandwiched paper and plastic against a window. The light from outside will allow you to see the contour lines easily through the paper. Trace the lines with a pencil onto the paper.
- Label each contour line, starting with the first line. Recall that the first line was sea level, or 0 meters. Using a contour interval of 100 meters, continue labeling the lines (0 m, 100 m, 200 m, etc.).
- **Note:** Since the top of the mountain curves inward, forming a depression, the last contour line should have hachured lines.
- Using a ruler, draw a straight line running through the top of the mountain, cutting your mountain in half lengthwise.
- Label the place on the line you drew in #13 at sea level (0 m) closest to the mountain peak "A" and the place at the other end of the line at sea level (0 m) "B."
- Add a key with the contour interval and a horizontal scale of 1 cm = 1 km. Title your map "Mt. Capulin" (or other name given by your teacher).



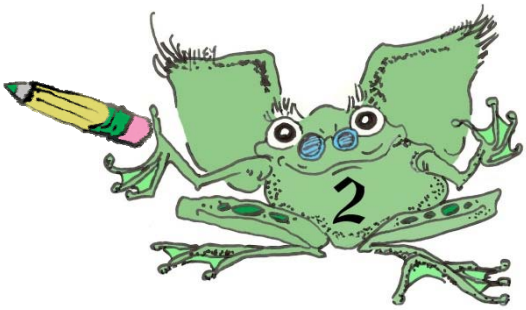
Record your data here:



A Contour lines from **A to the mountain rim**	B Map distance from 0 m to each contour line to the nearest 0.1 cm	C Horizontal distance from the 0 m elevation (COLUMN B) x 1 km/cm
0 meters	0 cm	0 km
100		
200		

A Contour lines from **B to the mountain rim**	B Map distance from 0 m to each contour line to the nearest 0.1 cm	C Horizontal distance from the 0 m elevation (COLUMN B) x 1 km/cm
0 meters	0 cm	0 km
100		
200		

Graph your data:



Plot the data from the table above to show the relationship between the actual horizontal distance (km) and the elevation at each map contour line. Use the graph on page 6. Use a different symbol or color for the data points from point A to the rim and from point B to the rim.

- Label the *x*-axis with total distance (km) (Column C).
- Label the *y*-axis with elevation (m) (Column A).
- Connect the data points for each set of data.
- Write a key for the graph.
- Draw lines on your graph from A to the rim and from B to the rim.

Make a profile of Mt. Capulin on graph or profile paper. A profile may be made across any straight line on a contour map by following the procedure below. Often a profile is made across the sea level line. Your teacher will give you further instructions for your profile.

a. Lay a strip of profile or graph paper along a line across the area where the profile is to be constructed.

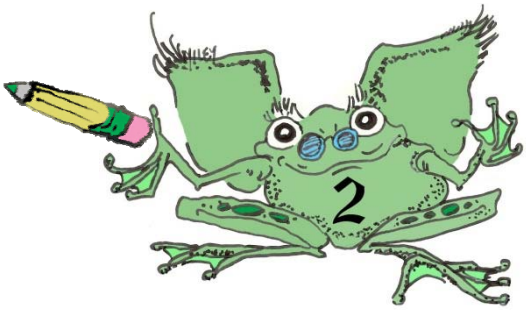
b. Mark on the paper the exact place where each contour, stream, and hilltop crosses the profile line.

c. Label each mark with the elevation of the contour it represents.

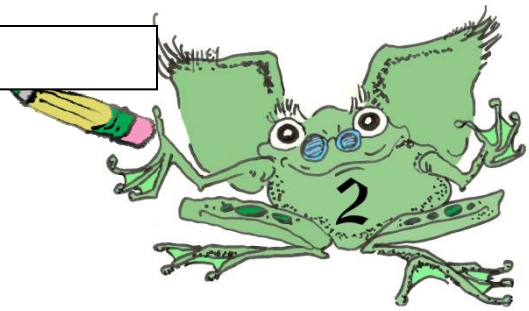
d. Prepare a vertical scale on profile paper by labeling the horizontal lines corresponding to the elevation of each index contour line.

e. Place the paper with the labeled contour lines at the bottom of the profile paper, and project each contour to the horizontal line of the same elevation.

f. Connect the points.



Key
A – Rim distances and height:
B – Rim distances and height:



Discussion Questions:

1. Look at your map and the "connected points" graph from A to the rim. Between which two elevation points is the increase in elevation the greatest?

   _____

   Between which two elevation points is the increase in elevation the least?

   _____

   Is there a decrease in elevation between any two points? If so, where?

   _____

2. Look at your map and the connected points graph from B to the rim. Between which two elevation points is the increase in elevation the greatest?

   _____

   Between which two elevation points is the increase in elevation the least?

   _____

   Is there a decrease in elevation between any two points? If so, where?

   _____

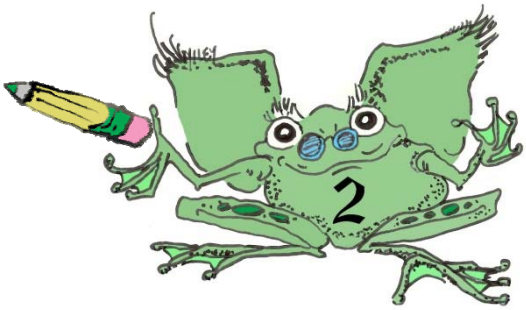
3. What do the lines connecting A to the rim and B to the rim represent?

   _____

4. Which line is steepest: from A to the rim or from B to the rim? How do the contour lines show that on the map?

   _____

   _____



5. Find the gradients. A gradient is the difference in elevations between two locations divided by the distance between the two locations. It indicates how fast the elevation is changing. When the number is big, the gradient is steep.

Gradient: A to Rim

Difference in elevations: _____ m

Horizontal distance from A to the rim: _____ km

Calculation: $\frac{\text{Difference in Elevations}}{\text{Horizontal distance from A to rim}}$ = _____ = _____ m/km

Gradient: B to Rim

Difference in elevations: _____ m

Horizontal distance from B to the rim: _____ km

Calculation: $\frac{\text{Difference in Elevations}}{\text{Horizontal distance from B to rim}}$ = _____ = _____ m/km

6. Compare your profile of the contour map to the connected points graph. How are these two representations of the mountain similar?

_____

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How are the two representations of the mountain different?

_____

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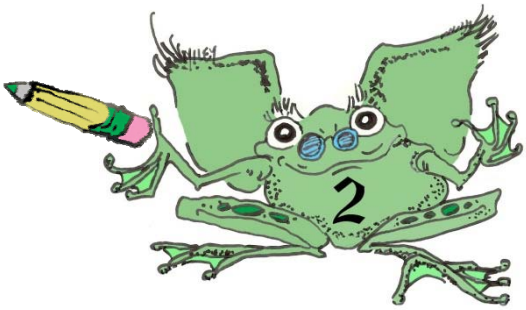

7. The gradient calculated in #5 is a rate of change over a big distance. Are there places between B and the rim where the gradient is less or more than the calculated gradient? When is it greater? When is it less? How do you know?

_____

_____

_____

8. Look at the graph you drew. You will compare the distance and elevation data for the lines from A and B to the rim by calculating the unit rate of change (slope) of each line. Use the lines you drew between A and the rim or B and the rim. The ordered pairs used to determine slope must be taken from these lines, not from the data chart.

Unit Rate of Change = $\frac{\Delta \text{ Elevation (m)}}{\Delta \text{ Distance (km)}} = \frac{\Delta y}{\Delta x} = \frac{(y_2 - y_1)}{(x_2 - x_1)}$

Graphed data	Ordered Pair used for calculation (x_1, y_1) (x_2, y_2)	Δ Elevation (m) Δy	Δ Distance (km) Δx	**Unit Rate of Change (slope)** $\Delta y/\Delta x$
A to the rim				
B to the rim				

9. How do the unit rates of change (slopes) of the two lines compare? Discuss numerical value and sign (positive/+ or negative/-).

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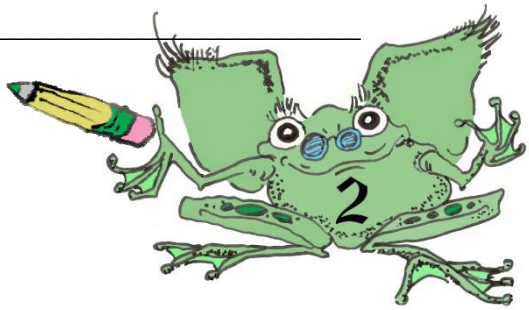

10. How do the unit rates of change (slopes) compare with the gradients calculated in #5?

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