MiSP Topographic Maps Worksheet #2

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 study the terrain on your map.

Objective

To construct and interpret a contour map.

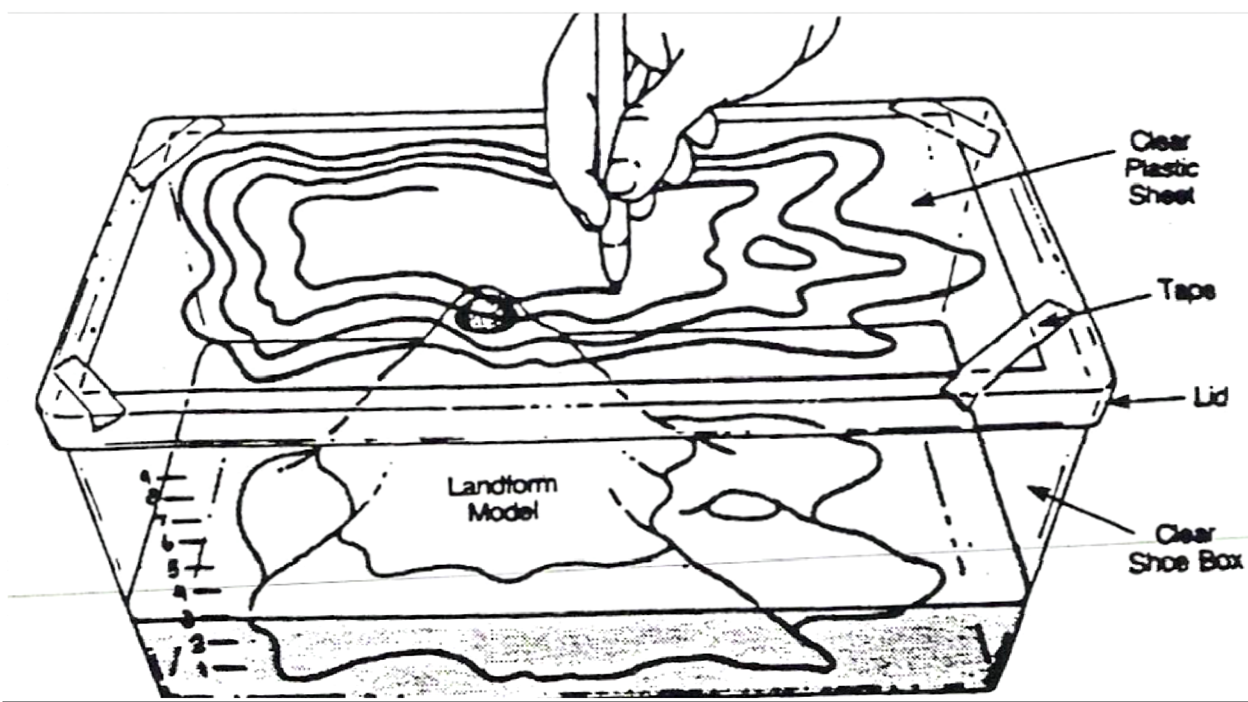
Materials

Ruler
Plastic shoe box/volcano – Mt. Capulin model or similar set-up
Overhead plastic sheets
Tape
Overhead markers or china markers

Procedure

1. Use a ruler to mark small horizontal lines spaced one centimeter apart on the side of the clear plastic shoebox. Measure from the bottom to the top.
2. The scale for the elevation in the activity that is being used is 1 cm = 100 meters.
3. Place the plastic model mountain inside the box.
4. Begin filling the shoebox with water, stopping when the water level reaches the first centimeter mark on the bottom.
5. This will be designated as sea level and the elevation should be marked as 0 meter.
6. 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).
7. Remove the lid and add water until it reaches the next centimeter marking.
8. Replace the lid and trace again.

9. Repeat this procedure for every marking until the entire mountain is covered with water.
10. 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 trace this is to place the paper onto of 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.
11. Label each contour line starting with the first line. Recall, the first line was sea level, or 0 meters. Using a contour interval of 100 meters, continue labeling the lines (i.e.: 0 m, 100 m, 200 m, etc.).
12. **Note**: Since the top of the mountain curves inward forming a depression, the last contour line should have hachured lines
13. Using a ruler, draw a straight line running through the top of the mountain, cutting your mountain in half lengthwise.
14. 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".
15. Add a key with the contour interval and a horizontal scale of 1 cm = 1 km. Title your map Mr. Capulin (or other name from your teacher).



16. Enter Data from your Contour Map in the table below:

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		

17. 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 5. 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

18. 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.

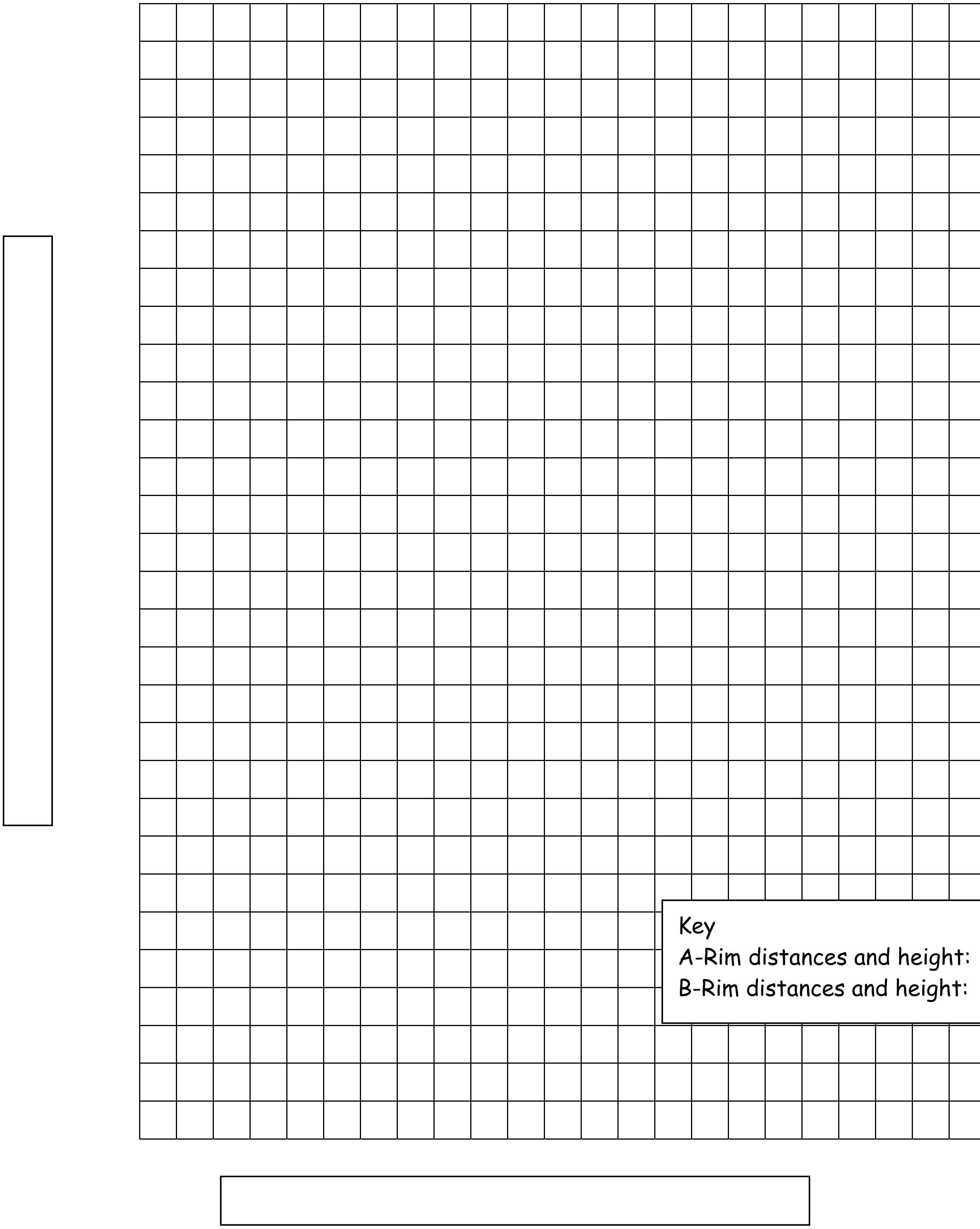
b. Mark on the paper the exact place where each contour, stream and hill top crosses the profile line.

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

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?

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   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 connecting B to the rim

   represent?____

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

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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: $\dfrac{\text{Difference in Elevations}}{\text{Horizontal distance from A to Rim}}$ =_________________ =

_______________ m/km

Gradient: B to Rim

Difference in elevations: _____________ m

Horizontal distance from B to the Rim ____________ km

Calculation: $\dfrac{\text{Difference in Elevations}}{\text{Horizontal distance from A to Rim}}$ =_________________ =

_______________ 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 their places between B and the rim where the gradient is less or more than the calculated gradient? When is it greater? When is less? How do you know?

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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. <u>Use the lines you drew between A or B and the rim</u>. The ordered pairs used to determine slope must be taken from this line, not from the data chart.

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

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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11. The lines connecting A or B and the rim both have a y intercept that = 0 (zero), Use the unit rates of change (slopes) that you calculated above and the y intercept to write an equation for the relationship between distance and elevation for each line. Remember that the equation for a line is **y = mx + b** and m is the unit rate of change (slope) and b is the y intercept.

Equation: A to the rim	Equation: B to the rim

12. Using each equation above, calculate the predicted elevation in km for the hiking distance indicated. Show work:

Distance	A to the rim	B to the rim
X = .8 km	Y = ___________ m	Y = ___________ m
X = 6.7 m	Y = ___________ m	Y = ___________ m