Pacific NW Rocks & Minerals
Lab 3: Topographic Maps

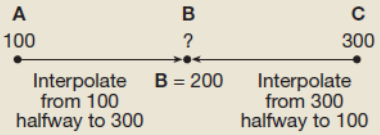
Name: _____ Date: _____

A topographic map is a two-dimensional (flat) representation (model) of a three-dimensional land surface (landscape). It shows landforms (hills, valleys, slopes, coastlines, gullies) and their relief (difference in elevation) by using contour lines to represent elevations of hills and valleys. The contour lines are the distinguishing features of a topographic map. They are what make a topographic map different from the more familiar planimetric map, such as a highway map, which has no contour lines and does not show relief of the land. Yet topographic maps still have many of the features of the planimetric maps (roads, buildings, streams, etc.).

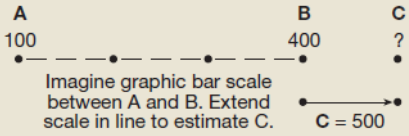
RULES FOR CONTOUR LINES

1. Every point on a contour line is of the exact same elevation; that is, contour lines connect points of equal elevation. The contour lines are constructed by surveying the elevation of points, then connecting points of equal elevation.

2. Interpolation is used to estimate the elevation of a point B located in line between points A and C of known elevation. To estimate the elevation of point B:



3. Extrapolation is used to estimate the elevations of a point C located in line beyond points A and B of known elevation. To estimate the elevation of point C, use the distance between A and B as a ruler or graphic bar scale to estimate in line to elevation C.

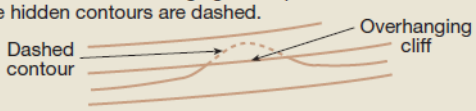


4. Contour lines always separate points of higher elevation (uphill) from points of lower elevation (downhill). You must determine which direction on the map is higher and which is lower, relative to the contour line in question, by checking adjacent elevations.

5. Contour lines always close to form an irregular circle. But sometimes part of a contour line extends beyond the mapped area so that you cannot see the entire circle formed.

6. The elevation between any two adjacent contour lines of different elevation on a topographic map is the *contour interval*. Often every fifth contour line is heavier so that you can count by five times the contour interval. These heavier contour lines are known as *index contours*, because they generally have elevations printed on them.

7. Contour lines never cross each other except for one rare case: where an overhanging cliff is present. In such a case, the hidden contours are dashed.



8. Contour lines can merge to form a single contour line only where there is a vertical cliff or wall.

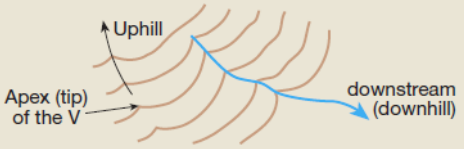
9. Evenly spaced contour lines of different elevation represent a uniform slope.

10. The closer the contour lines are to each other the steeper the slope. In other words, the steeper the slope the closer the contour lines.

11. A concentric series of closed contours represents a hill:

12. *Depression contours* have hachure marks on the downhill side and represent a closed depression:

13. Contour lines form a V pattern when crossing streams. The apex of the V always points upstream (uphill):

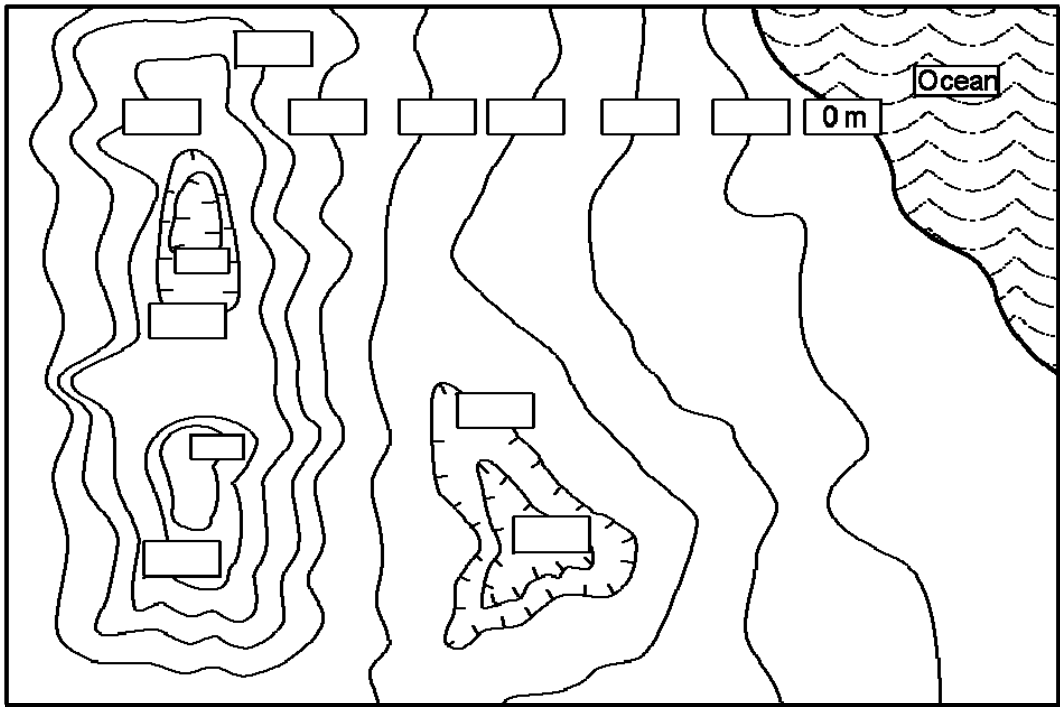


14. Contour lines that occur on opposite sides of a valley or ridge always occur in pairs. See Figure 9.13.

Busch, (2011) AGI

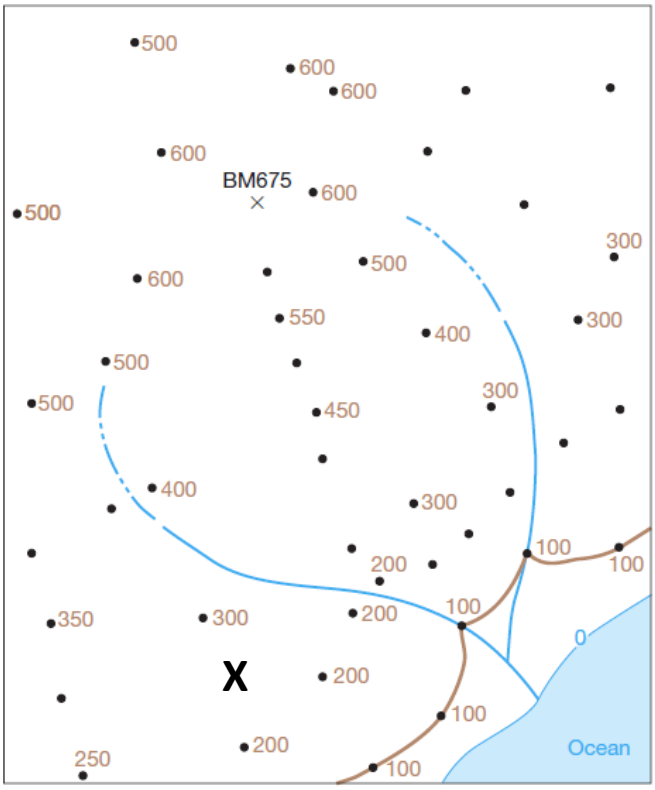
Part 1: Understanding Topographic Maps (15 pts)

1. Label the elevation of the contours on the map below. Watch out for depressions with repeated contours!



Contour Interval = 20 m

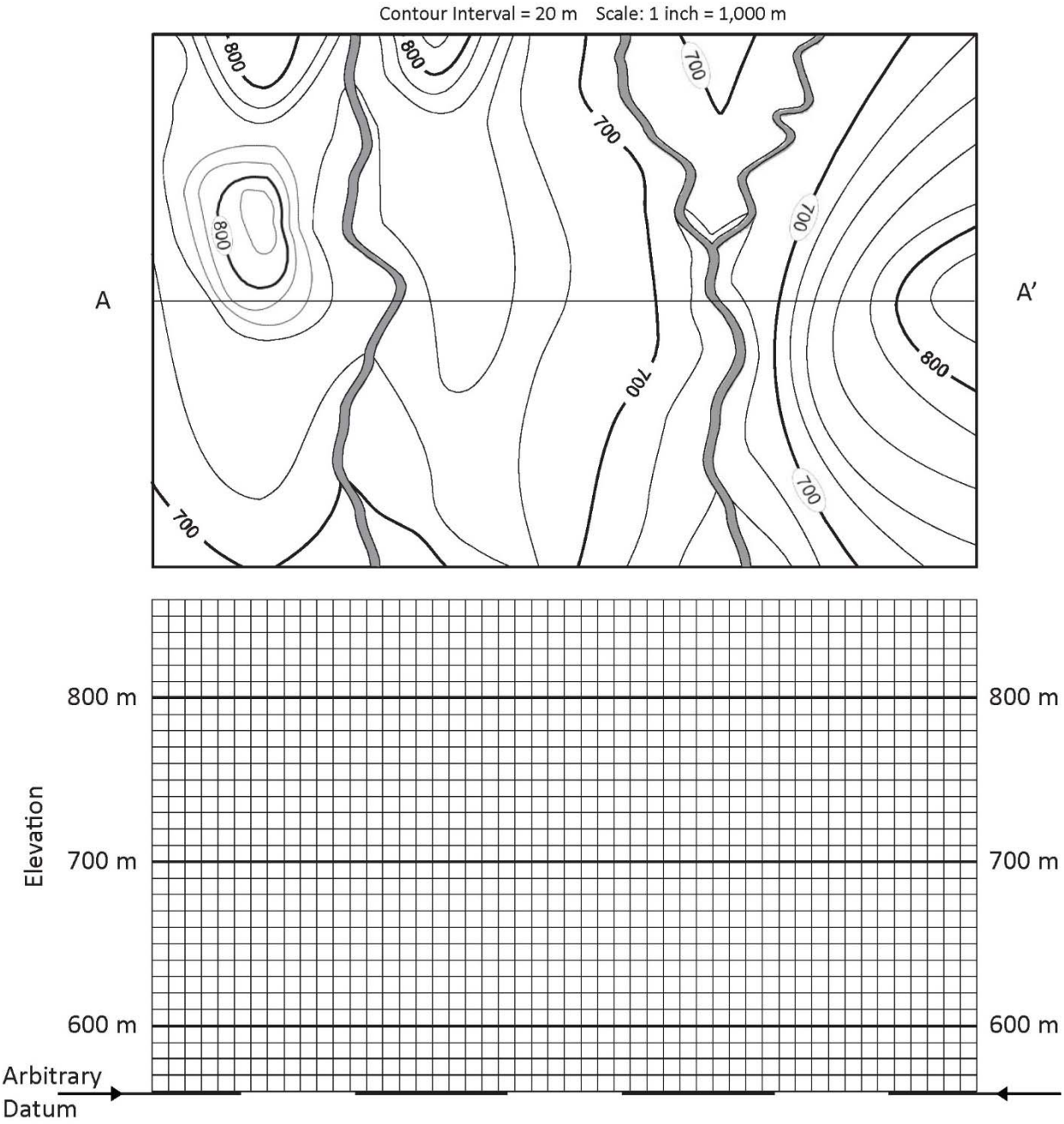
2. Use interpolation and extrapolation to estimate and label elevations of all points below that are not labeled (see Figure 9.10 for help). Then add contour lines using a contour interval of 100 meters. Notice how the 0-meter and 100-meter contour lines have already been drawn. Sea level elevation = 0 m. <u>Remember the rule of the V's!</u>



Estimate the elevation of location X by interpolating between the contour lines.

X = _____m

3. Using the topographic map below, construct a topographic profile from A to A'. Grey shaded areas are rivers. Refer to the Rules for Contour Lines and the rule of Vs.



On the profile you just created

a. What is the horizontal scale in meters/inch? _____m/inch

b. What is the vertical scale in meters/inch (round to the nearest 100)? _____m/inch

c. What is the vertical exaggeration?

Part 2: Topography of Mt. Saint Helens (15 pts)

For this section, examine the topographic map of Mt. Saint Helens! All of the information in this section is written somewhere on the map so it should be relatively easy to find.

Part A: Basic Topographic Map Features

1. What is the name of this quadrangle?

2. What part of Washington State is this quadrangle in?

3. Is this a 7 ½ or a 15 minute quadrangle?

4. What is the difference in area between a 7 ½ and a 15 minute quadrangle?

5. What is the ratio scale (or, relative fraction scale) of this map?

6. How many meters in real life does 1 cm on the map equal?

1 cm on the map (Map Distance) = _____ meters in real life (Real World Distance)

7. What is the magnetic declination in the area of this map?

8. If you wanted to hike eastward past the limit of this map, which quadrangle would you need a map of?

9. Benchmarks are locations of known location and elevation. Benchmarks are shown on the topographic map by an x symbol followed by the elevation value. Calculate the total relief shown on the topographic map using the benchmarks.

Total relief = _____ ft

Part B: Using Topographic Maps for Measurement and Navigation

Now that you understand the basics, try and find your way around the map.

10. What is the distance in meters between the northern and southern peaks at Butte Camp Dome?

_____ m

11. If you hiked east along the Muddy River, would you be traveling uphill or downhill?

12. What is the horseshoe-shaped structure in the center of the map?

13. What is the small (about one inch) feature in the center of this horseshoe-shaped structure?

14. What feature is located at the northern opening of this horseshoe-shaped structure? What do you think caused this?

15. Where is the majority of the vegetation located on this map? Why?

16. If you wanted to hike to the lava dome to roast marshmallows, what would be the easiest direction to hike from? Why?

17. You are standing at the lava dome and want navigate to the following locations using your map and compass. What is the compass bearing from the lava dome to the following locations? Choose either the azimuthal or quadrant method to represent your bearing in degrees.

a. Crescent Ridge? _____

b. Redrock Pass? _____

c. Forsyth Glacier? _____

18. Look at the glaciers on the map.

a. What feature is present at the base of most glaciers?

b. Why is this feature present?

19. Locate the Shoestring Glacier.

a. What is the length of the glacier in km?

_____ km

b. What is the relief of the glacier in ft?

_____ ft

c. What is the relief of the glacier in meters (1 m = 3.28 ft)?

_____ m

d. What is the gradient of the glacier in m/km?

_____ m/km

20. Locate the Tallus Glacier.

a. What is the length of the glacier in km?

_____ km

b. What is the relief of the glacier in ft?

_____ ft

c. What is the relief of the glacier in meters (1 m = 3.28 ft)?

_____ m