Reading Topographic Maps

Figure 1

Understanding Map Contours

The light brown lines overprinted on topographic maps are called contour lines. They indicate the elevation above sea level of land features and thus permit you to view the topography in three dimensions instead of two. Entire books have been written about contour lines and their interpretation. However, you will get along quite nicely if you master these basics:

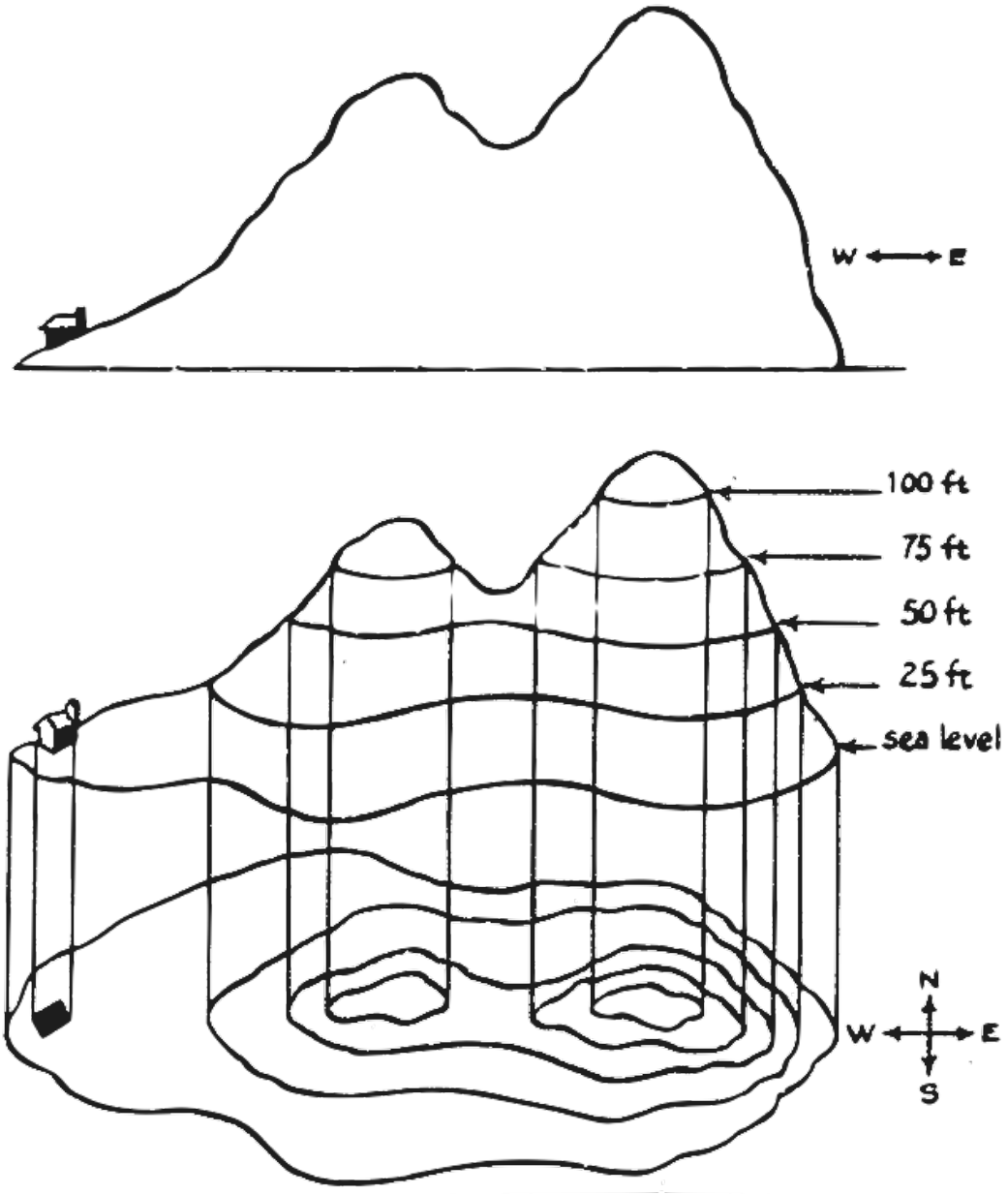

Figure 2: Mountain Island

1. **Contour lines connect points of equal elevation.** You gain or lose elevation only when you travel from one contour line to another. If you walk along a contour line, you will be "on the level."

Closely spaced contour lines indicate areas with lots of elevation change, whereas wide-spaced contour lines show areas with less elevation change. In Figure 2 you can see that the east side of Mountain Island is the steepest, i.e., it has the greatest elevation change per unit of distance, while the west side of Mountain Island is the least steep, i.e., it has the least elevation change per unit of distance. If you look at the topographic map of Mountain Island at the bottom of Figure 2, you can see that the contour lines are closest together on the east side of the mountain (the steepest side) and are farthest apart on the west side of the mountain (the least steep side).

2. **The contour interval is the difference in elevation between contour lines.** The contour interval's value in feet or meters is given in the legend in the lower map margin. If the contour interval is 100 feet, each successive contour line on the map increases or decreases (as the case may be) in elevation by exactly 100 feet. On a topographic map each fifth contour line is a darker brown. These darker brown contour lines are called index contour lines. Index contour lines are often labeled with a number which gives the actual elevation above sea level; this makes it relatively simple to determine the elevation of features near the index contour by either adding or subtracting the contour interval. If necessary, you can also determine the contour interval by dividing the difference between two adjacent index contours by five (Figures 3 and 4).

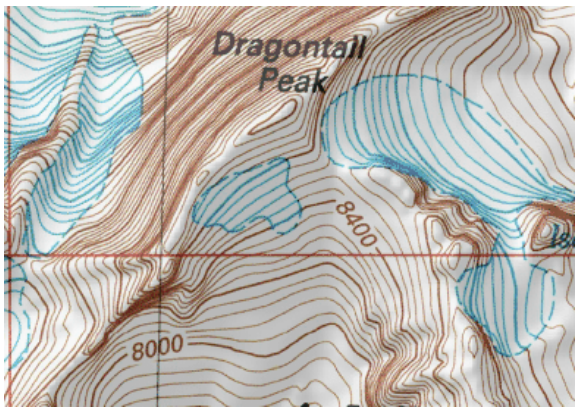

Figure 3
What is the elevation of Dragontail Peak?
(First determine the contour interval)

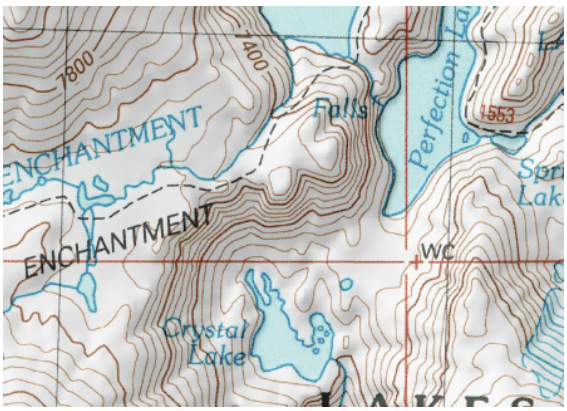

Figure 4
What is the elevation of Crystal Lake?
(First determine the contour interval)

3. The contour interval is based on two factors: the amount of elevation change in the area and the scale of the map. Maps of heavily mountained regions typically have contour intervals of 40 feet or more (Figure 5), while maps of relative flatlands typically have contour intervals of 20 feet or less (Figure 6). Large-scale maps that cover, for example, an entire wilderness area may have contour intervals of 100 feet, 200 feet, 500 feet, etc. (Figure 7). The point to remember is that the contour interval is not the same for all maps, so it is important to check the map legend to find the contour interval for the map you are using.

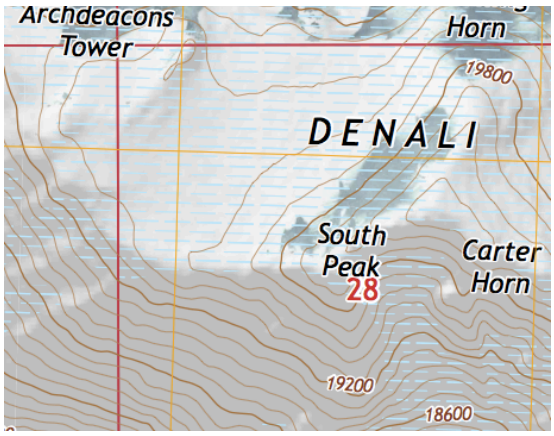

Figure 5: Denali (Mt McKinley)
(Mountainous, small scale—1:25 000)
What is the contour interval on this map?

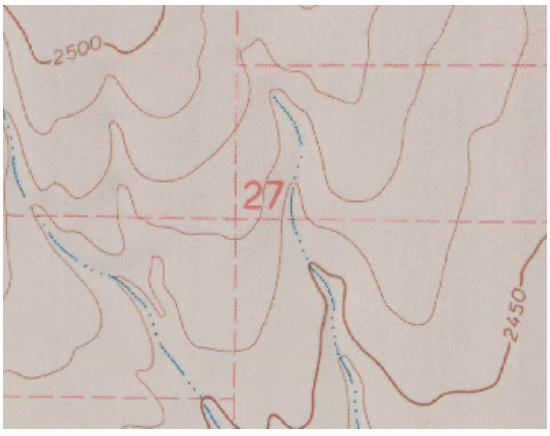

Figure 6: Central Kansas
(Relatively flat farmland)
What is the contour interval on this map?

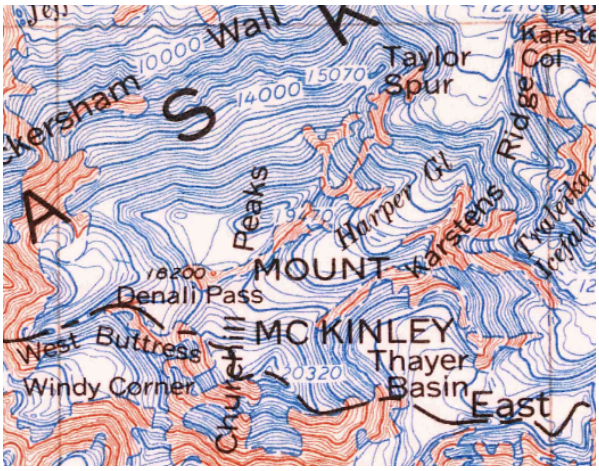

Figure 7: Denali (Mt McKinley)
(Mountainous, large scale—1:250 000)
What is the contour interval on this map?

4. The larger the contour interval, the less clear are the characteristics of the area. A map with a contour interval of 20 feet gives a clearer picture of the topography than one with a contour interval of 100 feet. A map with a contour interval of 100 feet or more may not show steep drop-offs or short cliffs. Keep this fact uppermost in your mind when planning a cross-country hiking or ski trip. Remember, the shortest distance between two points is a straight line only if you are not mountain climbing!

5. Where contour lines touch or run very close together, you'll find an abrupt drop—a cliff, a falls, or a canyon (Figure 8). If the contour interval is 100 feet and two contour lines are touching or close together, it represents a cliff of at least 100 feet, while if the contour interval is 20 feet and two contour lines are touching or very close together, it represents a cliff of at least 20 feet. Be sure to take this into account when planning cross-country routes.

Figure 8: Cliffs at Hole in the Ground.
What is the contour interval on this map?
What is the approximate height of the cliffs?

6. **The closed or "*V*" end of a contour line always points upstream** (Figures 9 and 10). Note that this rule applies to rivers, creeks, intermittent streams, and gullies.

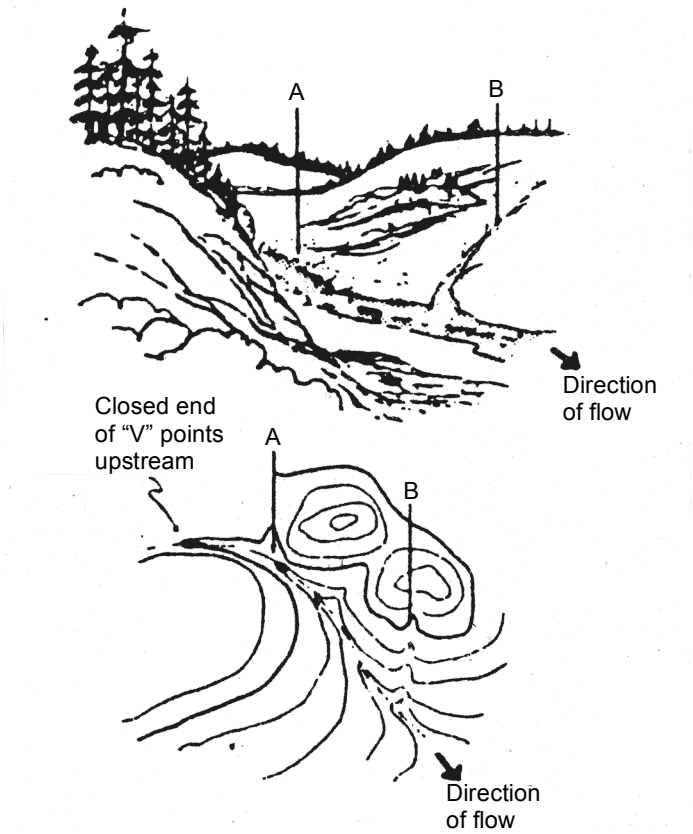

Figure 9: V-shaped contours point upstream

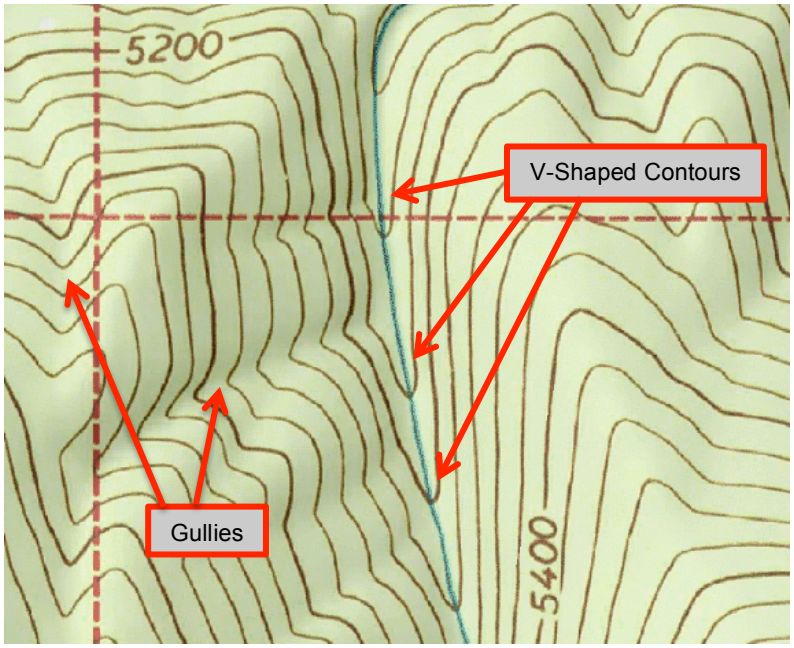

Figure 10: V-shaped contours along a creek
Which direction is the creek flowing?
What is the contour interval for this map?

7. Contour lines become "*U-shaped*," to indicate the outjutting ridge or spur of a mountain. The closed ends of the U's point downhill (Figure 11).

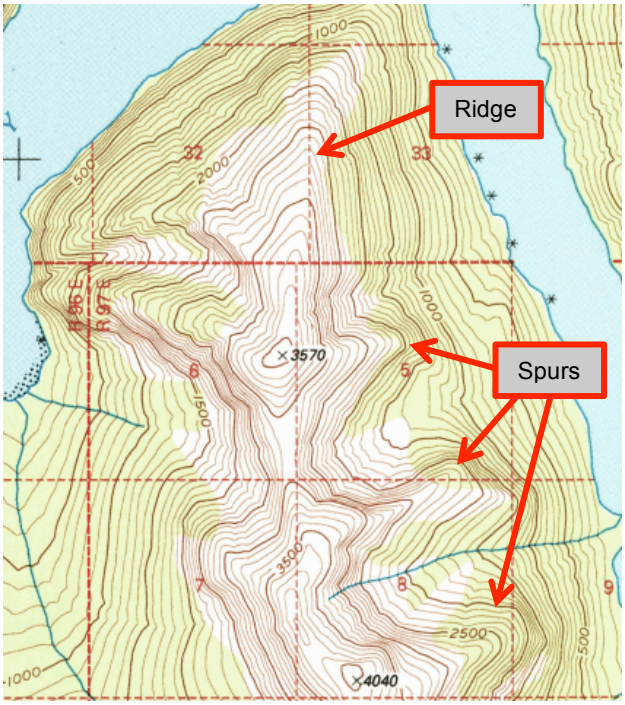

Figure 11: U-shaped contours on a ridge and spurs
What is the contour interval for this map?

8. Mountains and hills typically have round or oval shaped contours that become smaller and smaller towards the summit. The lower land between two summits is called a saddle (Figure 12).

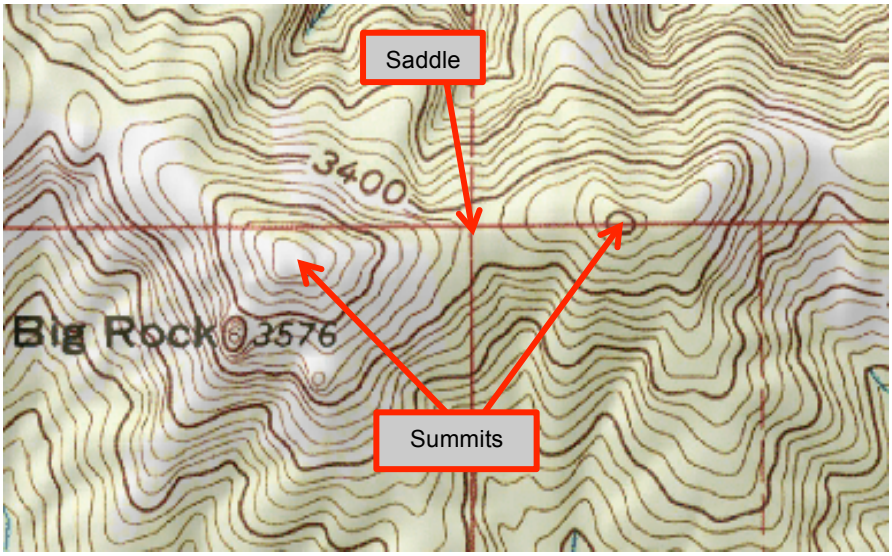

Figure 12: Round or oval contours of mountains and hills

9. The actual heights of some features are given on topographic maps. The features most commonly labeled with elevations are mountains and lakes. The highest point on a mountain may or may not be marked with an "x" (Figure 13).

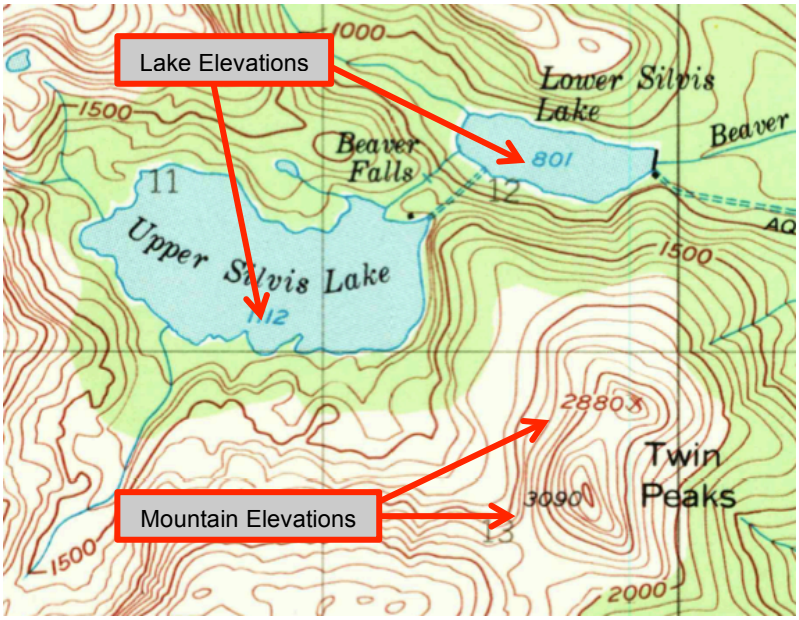

Figure 13: Elevations of Mountains and Lakes

10. The bar scale in the map legend can be used to measure horizontal distance. To compute the distance between two points, connect the two points with the edge of a piece of paper and make marks at the points. Transfer this distance to the scale in the lower map margin to determine the distance. Alternatively, use a ruler or the edge of a compass to measure the distance between the two points.

Keep in mind that distances measured with the scale will only be approximate and do not take into account the ups and downs and twists and turns that you would encounter if you actually were to hike along that route.

For instance, let's say you want to determine the horizontal distance between Johnson Lake and Phyllis Lake in Figure 14.

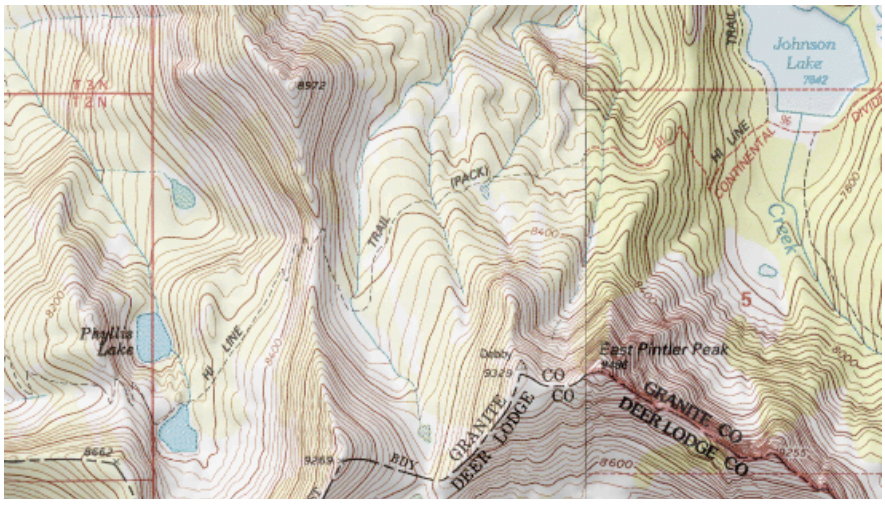

Figure 14: Anaconda Pintler Wilderness

Begin by connecting the edges of the two lakes with a piece of paper. A ruler or compass edge could also be used. Make marks on the paper at the edge of each of the lakes (Figure 15).

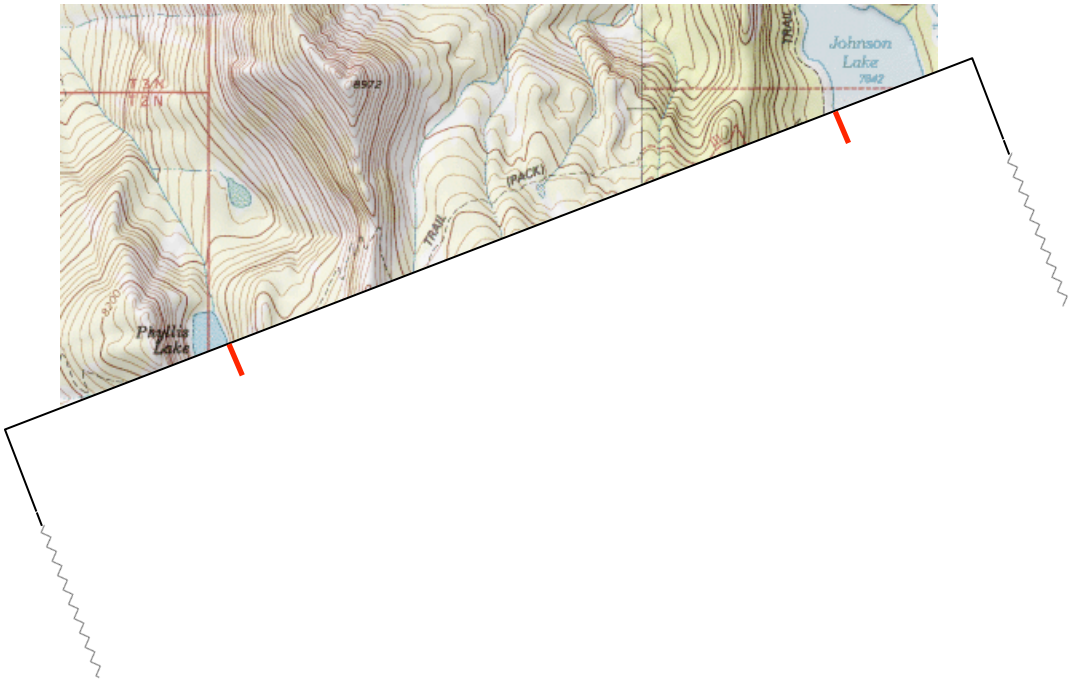

Figure 15: Connecting the points with a sheet of paper

Next, lay the piece of paper below the scale and calculate the distance between the marks using the scale (Figure 16). For distances longer than the scale, it will be necessary to mark off miles on the piece of paper, and then for any distance less than a mile to calculate the tenths of a mile using the left side of the scale.

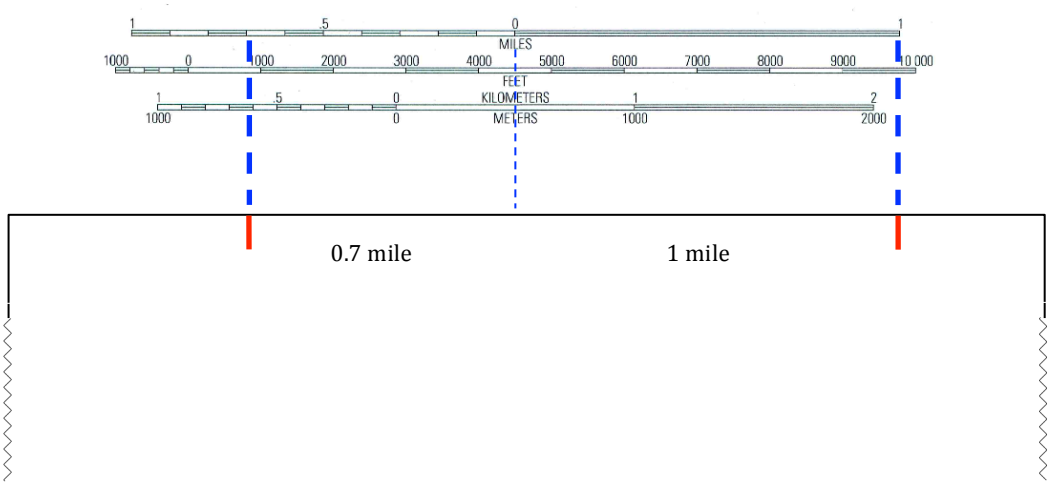

Figure 16: Calculating distance using the scale

In this example, the distance between Johnson Lake and Phyllis Lake is approximately 1.7 miles.