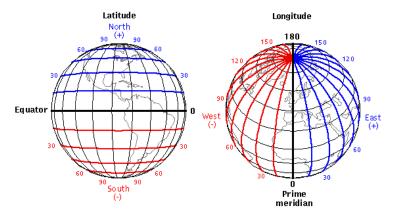## Orienteering/Map Reading

1. **Latitude/Longitude:** These are imaginary lines that show a coordinate system on Earth. This allows for people to locate places using coordinates.

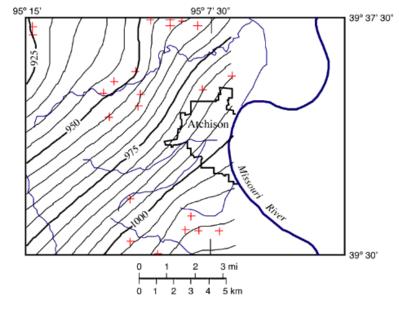Latitude (think rungs of a ladder, run parallel to the equator).

These lines are measured into degrees. To more accurately pinpoint a position, these degrees are divided into 60 minutes and each minute is further divided into seconds. Example: 30°, 42', 38".
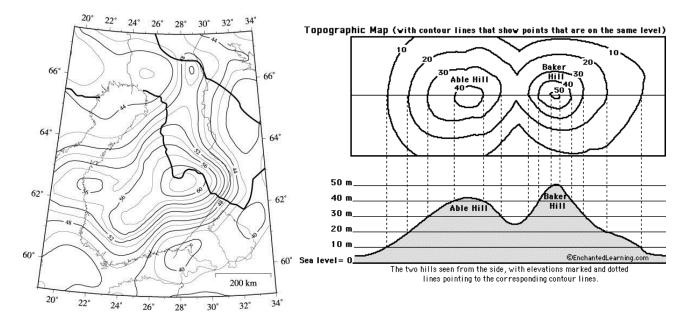
2. **Topographical maps:** These are maps that show the contours on elevation changes in an area. This is especially important in places like Colorado that has large changes in the elevation. Each contour interval will reflect a change in the elevation. Common intervals are 10 or 50 feet. The map has a key that will tell you this or you can figure it out by counting the number of lines between the index intervals, which shows the elevation. Look at this example. What does each line represent for interval changes?

Why does this matter and why should I care? Look at the next example on the left, and try to figure out what it is showing. If you are taking little kids on a hike which path would be better to take and why? What do the circles represent? So the closer the intervals, the _____ the path. Next, we will take the bird's eye view of these maps and turn them into a profile that we see when we look at the mountains. Here is an example as shown on the right, of how to do this.

3. **Rock Canyon High school area map activity:** Each person will get a topographical map of the area around our high school. Orient yourself and see if you can find the approximate location of our school. Can you see canyons on this map as we are called Rock Canyon? I drew a line and labeled it A----------B. Take a small piece of graph paper and lay it along this line and mark in each contour line along with the elevation. Draw a profile map of the line from A to B. Here is an example:
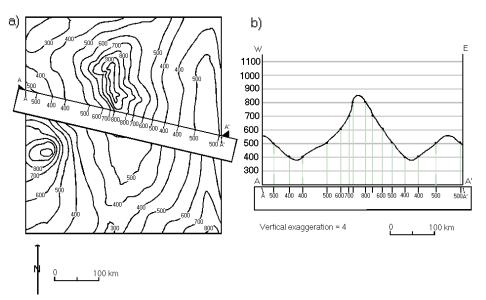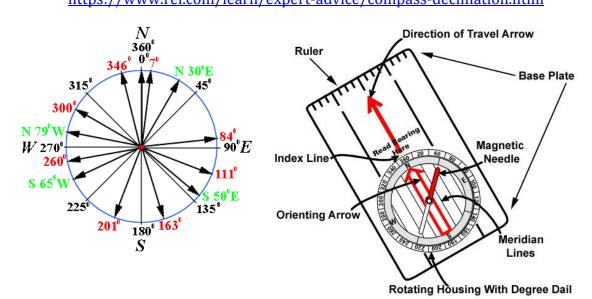

Figure 3. Illustration of how to draw a topographic profile from a contour map

4. **How to use a compass.** All maps are oriented to the north, which is based off of the North Pole. This is called **true north**. If you lay a compass on a map and point it north, you will notice that the red magnetic needle will be slightly off by 12-18 degrees. That is because it is measuring **magnetic north.** The difference in degrees between these 2 readings is called **magnetic declination**. In the eastern U.S. you add these degrees and in the western U.S. you subtract these degrees. Some compasses especially ones on your phone already have this declination adjustment built in.
REI has an excellent website that explains this:
https://www.rei.com/learn/expert-advice/compass-declination.html

5. Taking a bearing: This is used to find your way to a particular location. Aim the compass at the desired location (see red arrow on diagram to the upper right). Turn the dial until the orienteering arrow and the red magnetic arrow are lined up. If you have a map that has a declination angle incorporated into the compass rose, turn your compass to account for this difference. If using a topographical map, line the compass on the map in the direction that you desire to go. Hold the compass level and directly in front of you and follow the arrow.
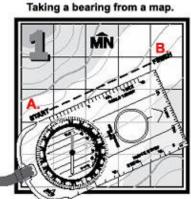
Here is a video:
https://www.youtube.com/watch?v=4O8DmkAC2wI

Practice: Take your compass outside and mark a spot. While standing at the spot set your compass to any bearing between 0 and 120 degrees, pick a landmark along the direction of travel and take 15 steps toward it. Stop, add 120 degrees to your initial bearing, pick out a landmark along that bearing and walk another 15 steps toward it, stop and once again increase your bearing by 120, pick out a third landmark and again walk 15 steps. Notice you have arrived back at your original starting location. If you have not returned to your original location, ask someone to help you.
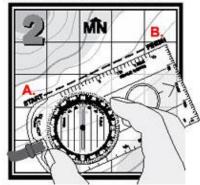
5. **Triangulation:** A common method to find an object is to use triangulation. Two groups will be standing in different locations and they will use their compass to point in a given direction such as 120°. They will point their compass in this direction, while the second group will be given another reading to measure. Where the 2 readings intersect will be the object. Here is a video that shows triangulation:

   https://www.youtube.com/watch?v=5KYvMzBp9WE
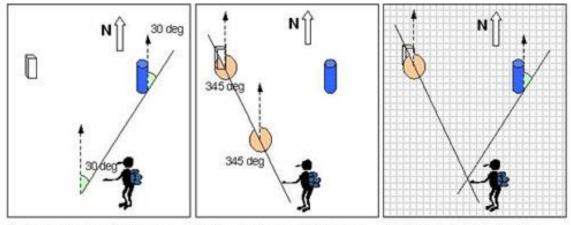
Taking a bearing from a map.

We will practice this outside. There will be several transmitters in an area but each group will be responsible for finding a specific one. There will be different questions at each location that you will answer so I will know that you took the correct bearings. The picture that shows this triangulation is on the next page.

On the map align either the left or the right edge of the base plate through landmarks A and B with the direction of travel arrow pointing toward B.

Turn the compass housing until the orienteering arrow points to the top of the map.

Read the bearing at the compasses index line, and follow the bearing in the field.

4

Fred reads a bearing of 30 degrees to the tower. He draws a line on the map through the tower at an angle of 30 degrees.
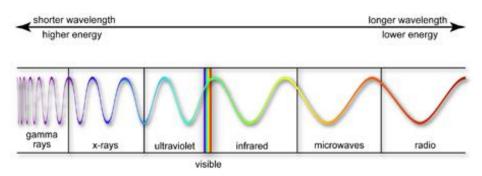
Fred reads a bearing of 345 degrees to the building. He draws a line on the map through the building at an angle of 345 degrees.

Fred is located at the intersection of the two bearing lines.

6. There are **two flipped classroom videos on schoology**. Go to the left side bar and click on the wiener dog. One is on fox hunting and one is on ham radio. Answer the questions.

7. You need to find out how a **2 m yagi antenna** works. Read the information on this page: http://www.hamuniverse.com/yagibasics.html

   Answer these questions:
   1. What are the 3 elements of the antenna? Explain the purpose of each.

8. **Properties of radio waves**: Radio waves are transverse waves that move at the speed of light (c= 3 x 10^8 m/s) and can travel without a medium such as air. They have the longest wavelength and frequency so they have the less energy on the electromagnetic spectrum.

9. **What is an attenuator?** This topic can be complicated but here is a short answer.http://www.amateur-radio-wiki.net/index.php?title=Attenuators

10. What is ARDF? Go to this video then write your answer.

   https://www.youtube.com/watch?v=tl4HztSY8Mo

11. After we learn how to triangulate, we will use the ham radios and yagi antennas to search for the transmitters outside.