Earth Science Workshop

How to Use Topographic Map

Topographical Maps

There are many types of maps, all of which try to display different information that is useful for different reasons. The primary function of topographical maps are to visually show the changes in elevation of a locality and are primarily used by geologists, hikers, and others who need elevation data.

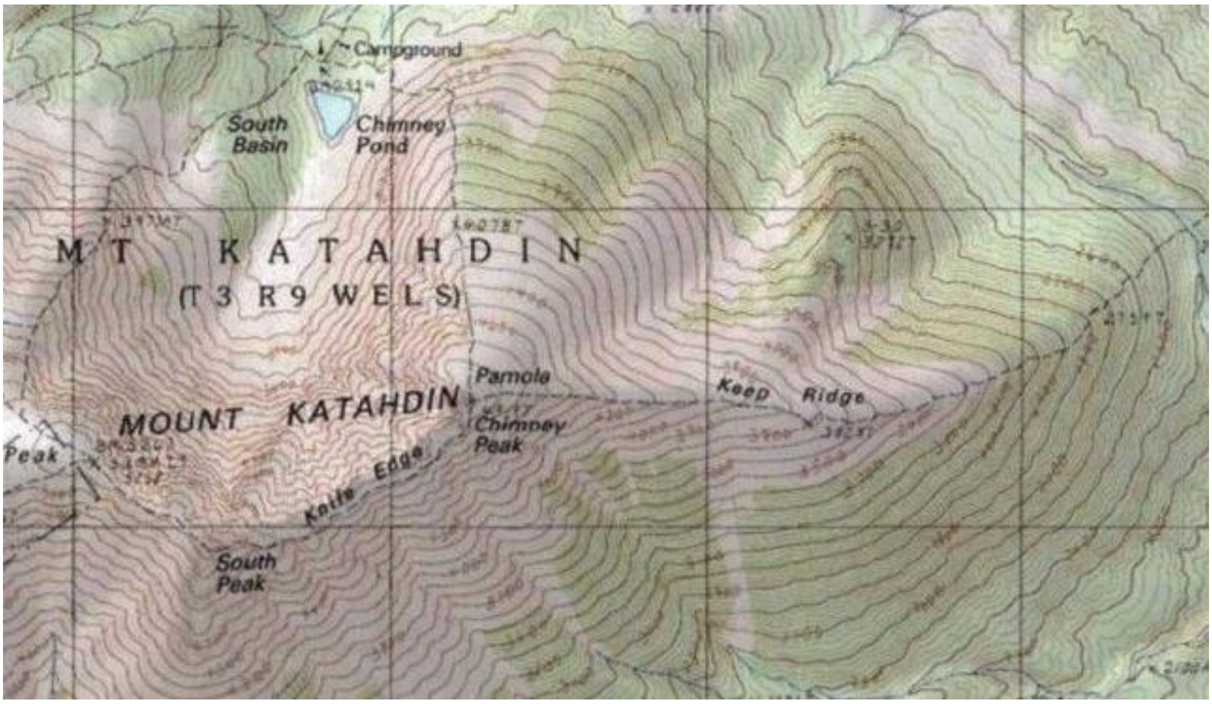
Contour Lines

Contour lines are the most important part of a topographical map. Contour lines represent lines of equal elevation. Everywhere along the contour will be the same elevation. Each line represents a different elevation. The standard topographical map will have one bold contour with an even number such as 1200 feet, followed by four thinner contour lines that increase or decrease in elevation. The amount the next contour line increases or decreases is called the contour interval. Most USGS maps have a contour interval of 40 ft. So, in our examples the first bold contour line would be 1200, the next thin contour lines going uphill would be 1240 ft, 1280 ft, 1320 ft, 1360 ft, and the next line would be another bold line with 1400 ft. Bold contour lines are labelled, so to calculate the contour interval we would take two bold lines, calculate the difference, and then divide that number by the number of contour lines that make up a set, which is usually 5. (Bold, thin, thin, thin, thin, and then resets with bold again.)

Questions

1. A two bold contour lines have elevations of 5400 ft and 5600 ft. What is the contour interval for this map, assuming the number of lines is 5?
2. A bold contour line reads 4200 ft and the contour interval is 40 ft. What would be the elevation represented by the third contour line above the bold one?

The topography of an area is shown by how the contour lines are laid out. To figure out if the map shows increasing or decreasing elevation, just look at two bold contour lines and see which one is larger than the other. Because contour lines connect areas of equal elevation, mountains and depressions make the lines wrap around them, forming concentric circles that wrap around them, such as the mountain in the image below. In the centre-left of the map, there is a circle, right under Pamola, which represents the peak of the mountain. The peak is not high enough to meet the next contour interval. The distance between contour lines also denotes how shallow or steep the slope is. Contours that are more closely packed together represent a steeper slope and contours that are more spaced out represent shallower slopes. Areas where the contour lines form a sharp V represent rivers or streams that flow downhill. The direction the V points is uphill.

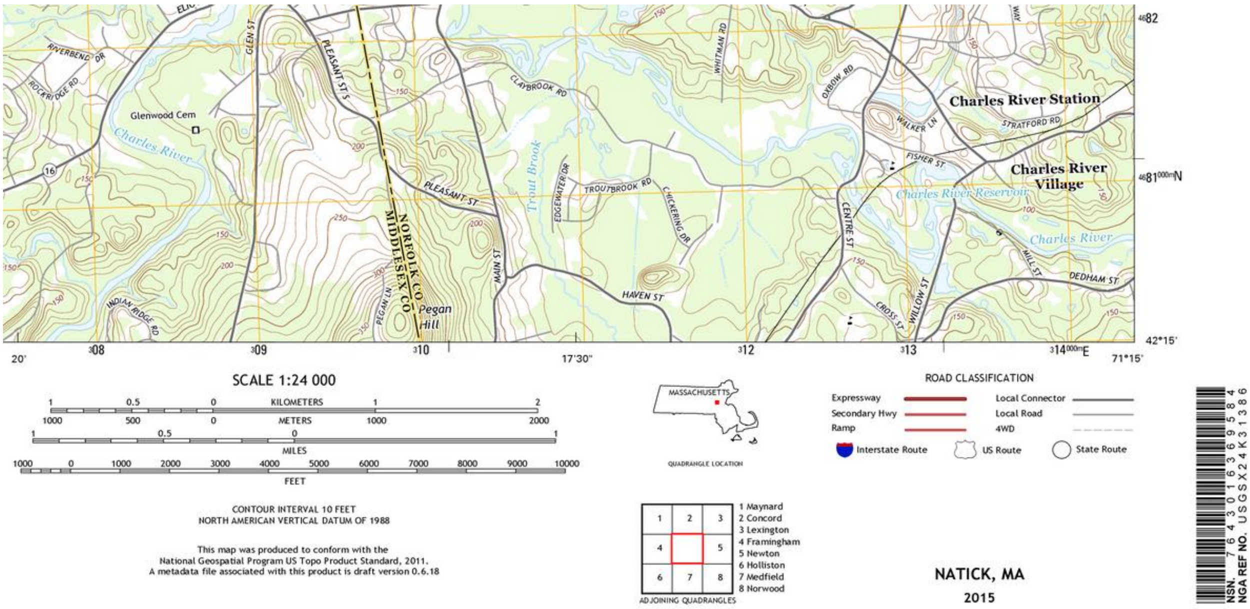


Questions

3. You look at a map to figure out where you are and you see an area where the contour lines are tightly packed together and another where they are spaced far apart. You look around and find you are standing in a field. Which of the two areas are you more likely to be in?
4. You notice that the contour lines form a generally circular shape, and that there is an area where the contour lines V sharply. The V points towards the center of the circle. Is the circle a mountain or a depression?

Scale & Magnetic Declination

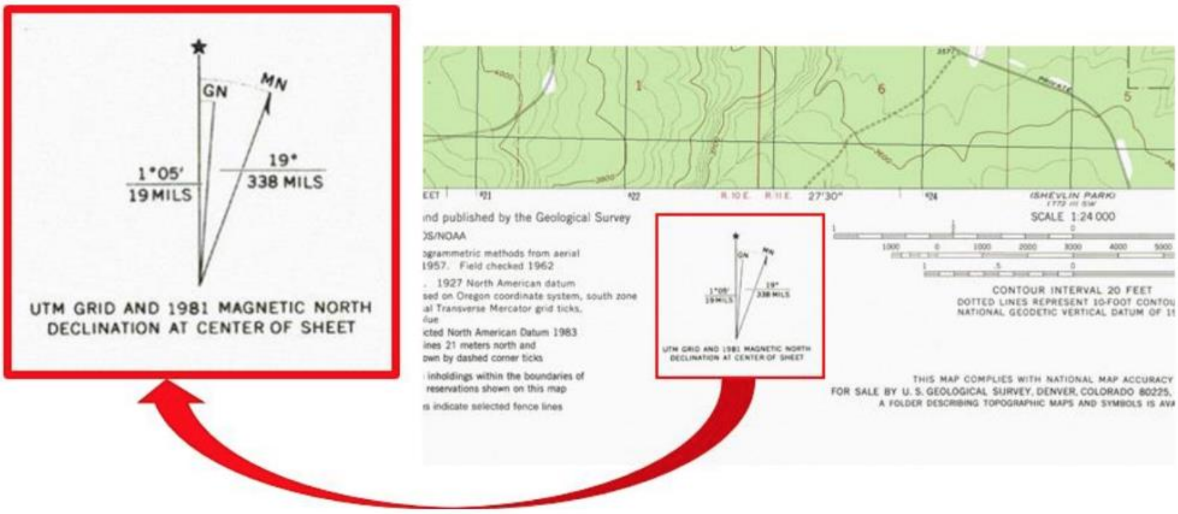
The scale of a map is a ratio that tells us how big the features of the map really are. The scale is usually found at the bottom of the map, as in the image below. The scale is given in the format of 1:X and is a unitless number. The ratio means that for every 1 of something we measure on the map, 1 inch, cm, foot, anything, the map represents X number of it in the real world. For instance, on our map below the scale is 1:24,000. When we measure an inch between two points, the real-world distance between those two points would be 24,000 inches. The same is true of cm, feet, meters, any unit you could measure. It is impossible to calculate scale just from looking at a map, but the scale of one map can be used to calculate the scale of another, assume the two maps show the same area at different zoom levels. The scale of a map will be larger the more area it shows and smaller the less area it shows.



Questions

5. A map shows a scale of 1:15,000. If you measured 3 cm connecting two points, how far would that be in the real world?
6. Two maps have scales of 1:9,000 and 1:13,000. Which one shows more area?

The magnetic declination of a map is also shown at the bottom. There is a difference between the geographic North Pole and the magnetic North Pole. While they are very close to each other they do not exactly overlap. This does not affect our everyday use of the compass that much since they are relatively close enough for the average hiker. But for someone trying to scientifically map any area, the difference can throw off their readings and make their maps inaccurate. Depending on where you are in the world, the magnetic declination changes and can be off by different degrees. The bottom of the map will show you what the declination is, as well as where the geographical North is, as shown in the picture below. In our example, the magnetic declination is 19 degrees off. If a scientist is out in the field, they can use this declination to adjust their measurements to make sure they are on track with respect to geographical North, not the magnetic North.



Questions

7. Assuming you stand in a place with a magnetic declination of 12 degrees and face due North on your compass, would you be facing magnetic North or geographic North?

Answers

1. 40 ft.
2. 4320 ft.
3. The spaced out area.
4. A mountain.
5. 45,000 cm.
6. The one with 1:13,000
7. The magnetic North Pole.