

**IMPORTANT:** Please refer to the Preface for Topographic Map Activities for preliminary instructions and information common to all Topographic Map Activities in the series.

## Topographic Map Activity 1 - Introduction to Topographic Maps (Revision 07-24-20)

Objective: Introduce Topographic Maps

Background: Topographic (Topo) Maps show geographic features, like mountains, with the use of contour lines for elevation. We will be working with topo maps developed by the U.S. Department of the Interior, U.S. Geological Survey. These maps are large PDF files, and have several layers. Show all layers to get the best views. These maps are 7.5' x 7.5' quadrangles (7.5' is 7.5 minutes, and a quadrangle is a four-sided closed figure). A minute is a unit of measurement for the arc on the earth's surface corresponding to  $\frac{1}{60}$  of a degree. The circumference of the earth, at the equator, is 24,901 miles, but 24,860 miles for a great circle going through both poles, and is always 360°. Thus, each degree of longitude (east-west distance) is about 69.17 miles and each minute is about 1.15 miles (at the equator). A minute has 60 seconds ("), so a second of longitude is about 0.019 miles, or 100 feet (at the equator). Each degree of longitude is equal to a smaller number of miles as we move away from the equator, because the circumference of the earth (along lines parallel to the equator, called parallels) gets smaller away from the equator toward either pole. *We will learn to calculate the mileage equivalent for each degree of longitude at a given latitude in a later activity.* Each degree of latitude (north-south distance) is about 69.06 miles, and remains nearly constant everywhere on the earth because latitude is measured along great circles (meridians), which always go through both poles. Likewise, a minute (') and a second (") of latitude remain nearly constant, about 1.15 miles and .019 miles, respectively. The 7.5' x 7.5' quadrangle topo maps we will use are each about 6.978 miles horizontal (longitude) and 8.633 miles vertical (latitude). These quadrangles are not squares because 7.5' of longitude is a smaller distance in miles at 36° N (36<sup>th</sup> parallel) than 7.5 minutes of latitude. Nor are these quadrangles rectangles because the vertical sides, representing longitude lines (meridians), are not parallel. Instead, they get closer to each other as they move away from the equator, merging at either pole. Latitude and longitude can be expressed in whole degrees with a decimal extension (36.625°) or in whole degrees, minutes, and seconds (36° 37' 30"). *We will learn to convert between these two in a later activity.* [Latitude and longitude](#).

Activity: Open the [La Madre Mountain](#) 7.5' x 7.5' quadrangle topo map (if you previously saved it on your computer you don't need to download it again). Once the map is downloaded and open, check that all layers are being shown. Use your mouse or fingers (depending on the device you are using) to scroll around and zoom in or out. Notice all the information that is available: contour lines for elevation, names for geographical features, boundary lines, roads, washes, springs, canyons, grid lines, latitude and longitude for a given point, and more. See if you can select "Tools" > "Measure" > "Geospatial Location Tool" to move around the map with your mouse to show latitude and longitude for given points. Get familiar and comfortable with all the tools available for working with these PDF maps (different versions of Adobe Reader may work differently).

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