

Topographic Maps - Laboratory 8

(Name)

The most basic way that we navigate from location to location is by **latitude** and **longitude** (see Figure 1). For example, 0° latitude follows the equator. Latitudinal lines north or south of the equator increase to 90° at the poles. In contrast, longitudinal lines run pole to pole, and 0° longitude runs through Greenwich, England. Longitude is therefore expressed as so many degrees East or West of the principal meridian running through Greenwich. Hence, it varies from 0° to 180° . One degree of longitude or latitude is equal to 60 minutes while 1 minute is equal to 60 seconds. There are therefore 3600 seconds in one degree.

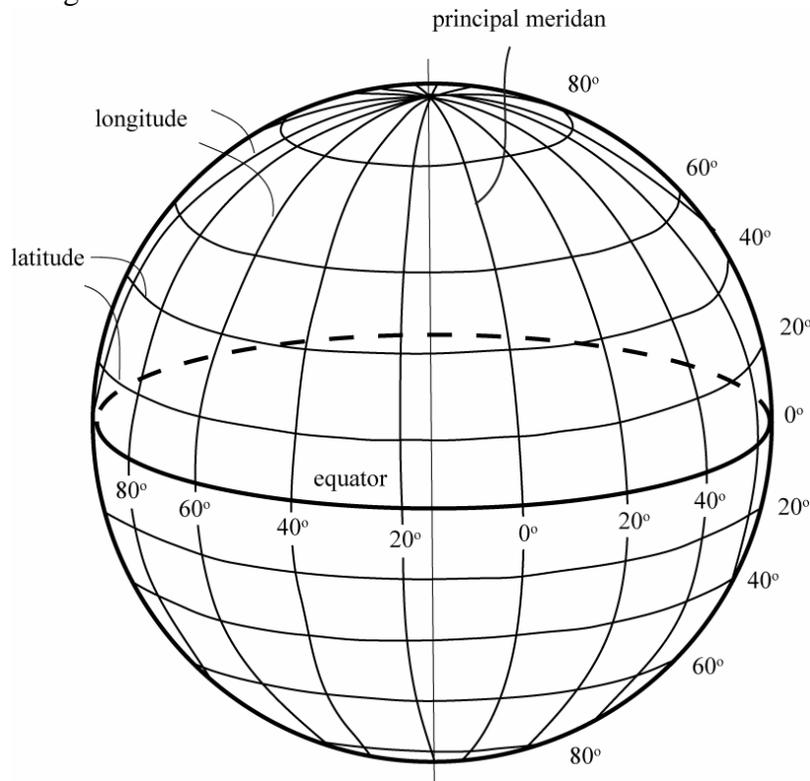


Figure 1. Latitude and longitude on a globe.

Quadrangle maps represent the three dimensional features of a segment of the Earth's surface and are bounded by a specified degree of latitude and longitude. Perhaps the most common type of quadrangle map is the **7.5 minute** variety, which is bounded by 7.5 minutes of longitude and 7.5 minutes of latitude.

Many of you at some time in the future will end up purchasing homes. Your deed will express the general location of where your property is located. Hence, it is important that you learn how to read and understand such information.

Government agencies, both local and federal, create so called townships, by arbitrarily defining a base line (an arbitrary latitude), and an arbitrary principal meridian (an arbitrary longitude). They then mark off from this starting point blocks that are 6 miles by 6 miles in an EW and NS direction, and designate each block with a township and range designation (See Figure 2).

In Figure 2, I is designated T2N, R3E.

- (1) What would be the designation of II?
- (2) What would be the designation of III?

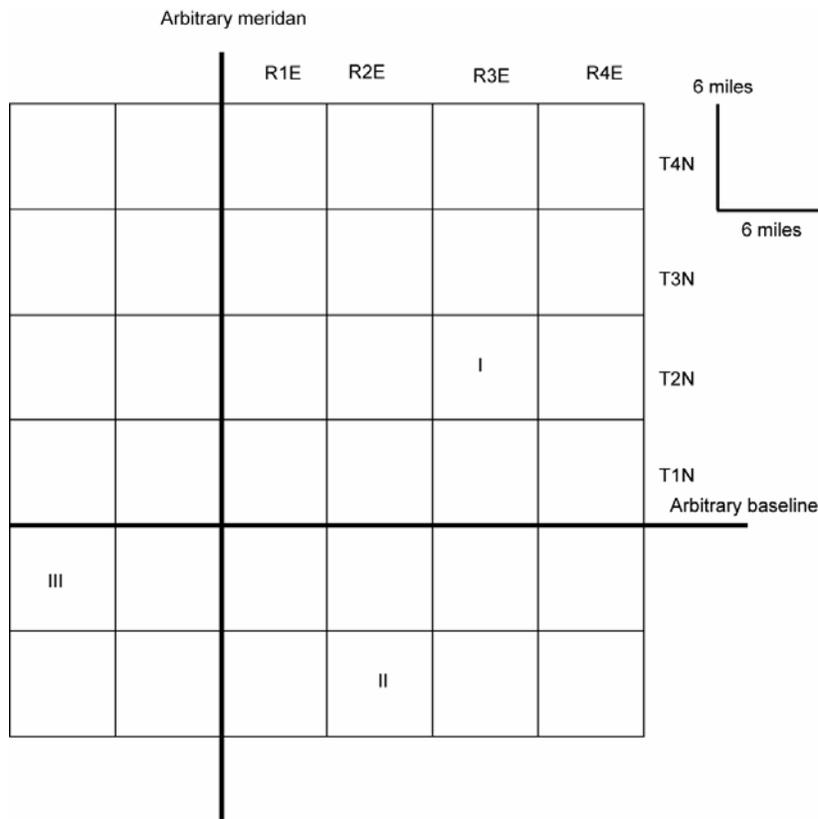


Figure 2. A grid for a township.

Each Township is further subdivided into 36 sections, each section being 1 mile by 1 mile in size. Hence, it can be thought of as consisting of 6 rows and 6 columns. The first row

consists of sections 1 through 6 numbered from east to west. The second row consists of sections 7 through 12 numbered from west to east. This numbering continues in this manner until the last section designated 36 is reached. In Figure 3 (a) please fill in the missing section numbers.

(a)

6	5	4	3	2	1
31	32	33	34	35	36

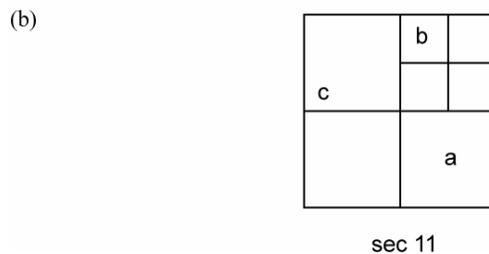


Figure 3. Sections within a township.

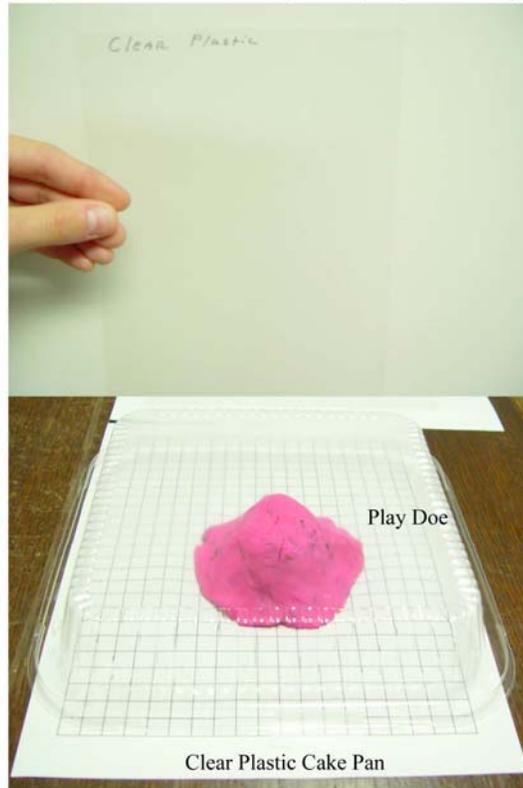
Each section can be further subdivided into quarters (See Figure 3 (b)). For example, the letter *a* in Figure 3(b) occupies the SE1/4 of sec 11, of T2N, R3E.

- (1) What is the location of letter *b*?
- (2) What is the location of letter *c*?

The principle way that we represent the 3D aspects of the Earth's surface is through topographic contours. **Topographic contours** represent the intersections of a series of horizontal planes at a specific elevation above or below sea level with the Earth's surface. If you are walking along a topographic contour, then you would increase or decrease in elevation. In other words *topographic contours are curves marking points of equal elevation.*

In order to gain a better understanding of topographic contours we are going to build a model of a quadrangle map. The tools that we will use are shown in Figure 4.

Clear plastic sheet that will be taped to top of plastic cake pan



Note shown: Laser carpenters level

Figure 4. The tools that we will use in constructing a topographic map.

Please complete the following steps:

- (1) Using some kind of clay build on a piece of plastic or sheet of paper a mountain with variable slope and containing at least one ravine or valley. Your mountain should be no taller than 4 cm at its highest point and should cover a surface area of about 12 cm by 12 cm.
- (2) The scale of your model is 5 cm = 50 feet. Moreover, because there will be no vertical exaggeration the above scale applies to both the vertical and horizontal dimensions.
- (3) Using the laser and the carpenter's level, trace out on your model the intersection of a horizontal plane at 50 feet and 100 feet with your model of a mountain. Use a spatula to mark these positions.
- (4) Place a clear plastic pan over your model, and tape it to the desk.
- (5) Tape a clear piece of plastic to the pan, placing it directly over your model of a mountain.
- (6) Looking vertically over your model trace out the outline of your mountain, and label it 0 feet.
- (7) Looking vertically over your model trace out the 50 foot intersection and label it 50 feet.
- (8) Looking vertically over your model trace out the 100 foot intersection and label it 100 feet.
- (9) Locate the very top of your mountain and trace out an X on the clear plastic overlay.

Remove your overlay, and draw out a line 4 cm long and label it scale. You may also label one end of the line 0 and the other 200 feet.

You should also indicate the direction of North. For this lab we will make the long dimension of the clear plastic sheet North.

Your clear plastic sheet now represents a topographic or quadrangle map of the your model of a mountain. Please answer the following questions:

- (1) How are topographic contours for shallowly inclined surfaces expressed relative to topographic contours for steeply inclined surfaces.
- (2) The so called "contour interval" is the minimum change in elevation represented by topographic contours on a map. What is the contour interval for your map?

Finally, we are going to draw a topographic section through your modeled mountain. On the clear plastic sheet containing your topographic map lay out a line all the way across the map and label one end A and the other end A'. Now transfer that line to a blank sheet of paper and label A and A'. Everywhere that the line crosses a contour place a tick and

label the elevation. Now draw a line segment 4 cm long extending from A upward at 90 degrees to A-A' and scale off 50, 100, 150, and 200 feet segments. Do the same thing at the opposite end of the line segment. You now have a kind of graph where the Y axis is elevation above sealevel, and the X axis is position on the Earths surface along A-A'. Now graph the elevation points where A-A' crosses the above identified topographic contours and then connect the points with a smooth line. The results represents a topographic cross-section through the modeled mountain.