

Location, Location, Location Latitude and Longitude on Maps and Charts

Please read Appendix III in the textbook for reference.

Learning Objectives for this lab

1. Use the latitude-longitude system to describe location on a map or chart.
2. Describe the angles used to define latitude and longitude within a globe.

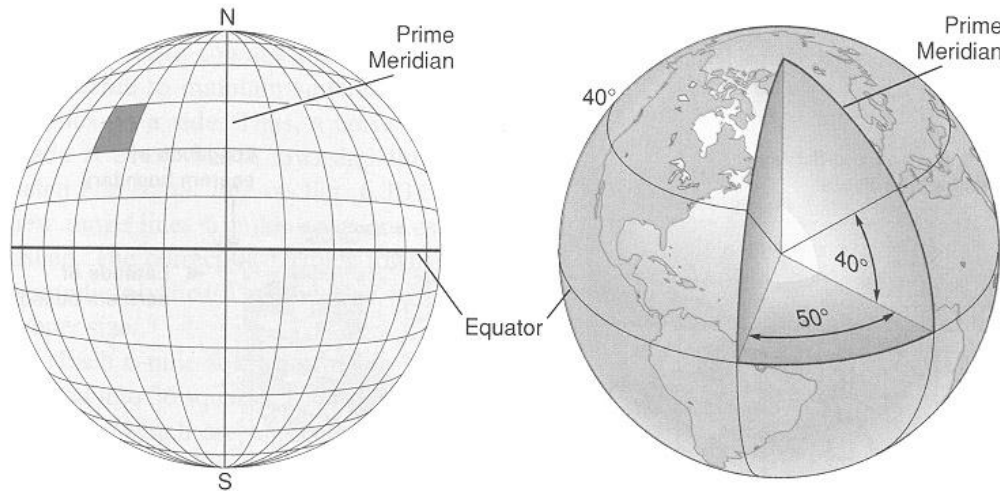
What is a chart?

A chart is a special kind of map that is used for nautical navigation. It usually shows the bathymetry (water depths) of coastal areas, navigational features such as buoys and lighthouses, and the shape of the coastline. The chart we will use in this lab is NOAA chart 18685 of Monterey Bay.

I Location, location, location: all about Latitude and Longitude

Lines of latitude and longitude are used to locate positions on maps and charts. Lines of latitude are imaginary lines that run parallel to the equator. They are labeled by their angular distance north or south of the equator as shown below. Lines of longitude run from pole to pole and are labeled by their angular distance east or west of Greenwich, England. The north-south line that runs through Greenwich, England is known as the Prime Meridian.

The angular unit of “degrees” is traditionally broken into units called “minutes.” There are 60 minutes in a degree. In other words, a minute is $1/60^{\text{th}}$ of a degree.

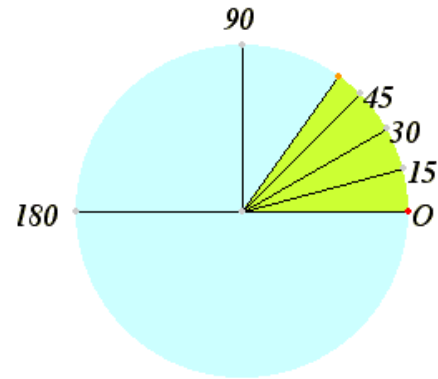


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| 1. Label a few examples of lines of latitude and lines of longitude on the globe above left. |
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Lines of latitude and longitude are named using angles. Angles are measured in units of degrees.

The Degree

The degree is the basic unit of measure for an angle. A right angle is 90° , a straight line is 180° , and there are 360° in a circle.



Fractions of Degrees = Minutes

Sometimes, we need to describe fractions of degrees, like when we are describing location on the surface of the Earth in terms of angular measurements like latitude or longitude.

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Fractions of Minutes: There are two methods:

a. Decimal Minutes: the minutes are broken into decimal units using the usual tenths, hundredths, thousandths, etc... The Monterey Bay NOAA Nautical Chart uses degrees and decimal minutes.

b. Seconds: There are 60 seconds in a minute. In other words, a second is $1/60^{\text{th}}$ of a minute. USGS topographic maps use degrees, minutes, and seconds.

To Designate areas E or W of the Prime Meridian and N or S of the Equator

We use:

the letter "E" to designate areas *east* of the Prime Meridian

the letter "W" to designate areas *west* of the Prime Meridian

the letter "N" to designate areas *north* of the equator

the letter "S" to designate areas *south* of the equator

Use of the letters "N", "S", "E", or "W" is **required** when describing angles using the minute system.

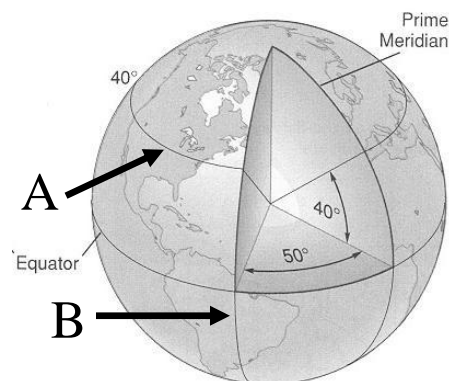
Examples:

A. Line "A" to the right, a line of latitude forty degrees and zero minutes north of the equator, is written **$40^\circ 0.0' \text{N}$** .

B. Line "B" to the right, a line of longitude fifty degrees and zero minutes west of the Prime Meridian, is written **$50^\circ 0.0' \text{W}$** .

C. The line of longitude that lies 36 degrees and 31 minutes south of the Equator is written **$36^\circ 31' \text{S}$** .

D. The line of longitude that lies 105 degrees and 15.24 minutes east of the Prime Meridian is written **$105^\circ 15.24' \text{E}$** .



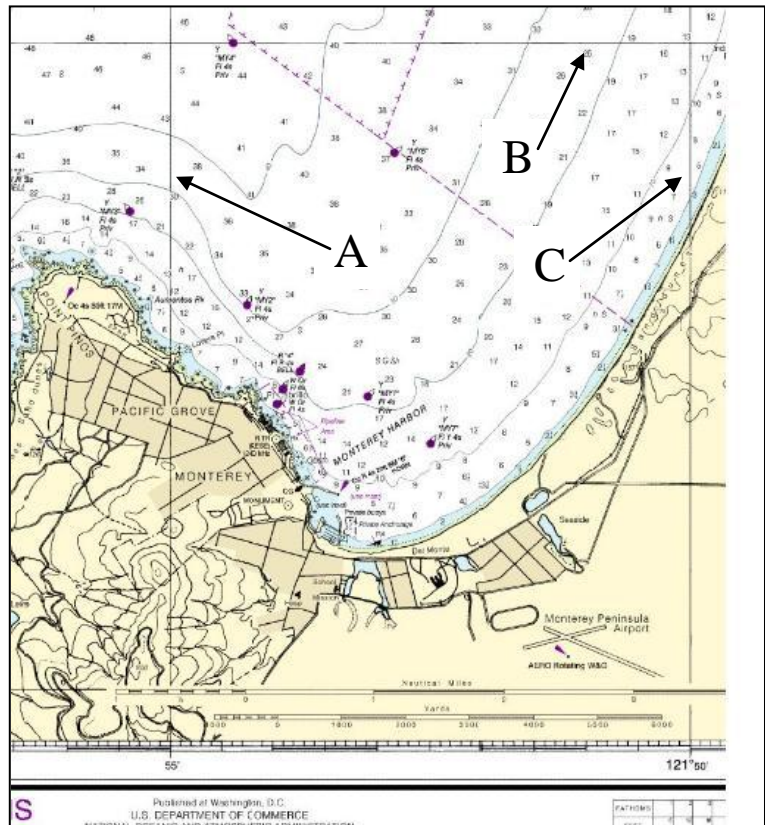
Lines of latitude and longitude on the globe

Fill in the columns on the right by writing the angle used to communicate the latitude or longitude described on the left. Use decimal minutes. First one completed as an example.

Written Description	Angle	Latitude or Longitude?
The area 60 degrees and 5.5 minutes north of the equator	60°5.5'N	Latitude
The area 79 degrees and 54.9 minutes east of the prime Meridian		
The area 36 degrees and 34.8 minutes south of the equator		
The line 175 degrees and 33.2 minutes west of the Prime Meridian		
The line 82 degrees and 46.5 minutes north of the equator		
The line 48 degrees and 21.2 minutes east of the Prime Meridian		

Lines of latitude and longitude on the Monterey Bay Chart

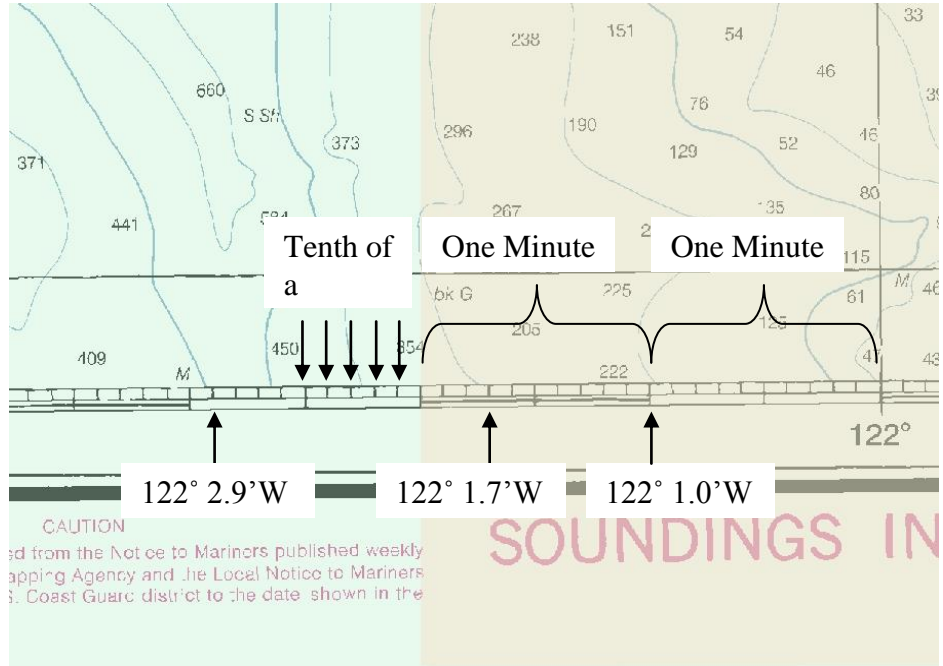
- Complete the table below. What are the latitudes or longitudes for the following solid lines of latitude or longitude printed on the chart?
- Each question refers to a solid line on the nautical charts in class.
- Use decimal minutes.
- Be sure to include a “N” or “S” for latitudes and an “E” or “W” for longitudes, as appropriate. These letters are part of the answer. The first one is done for you.



Location – all of these refer to solid lines representing lines of longitude or latitude on the chart.	Longitude or Latitude
Line of longitude that intersects Lovers Point in Pacific Grove (line A above)	121° 55' W
Line of latitude nearest the Indian Head Beach (Line B above)	
Line of longitude nearest Indian Head Beach (Line C above)	
Line of latitude that intersects the Cypress Point bouy	
Line of latitude a few miles north of Moss Landing	
Line of longitude nearest and west of Cypress Point	
Westernmost line of longitude shown as a solid line on the chart	

Reading Tenths of Minutes from the Monterey Bay Chart

The scale along the edges of the chart is divided into minutes and tenth of minutes. The minutes are shown by the solid and open areas along the scale. There are five minutes between each solid line of latitude or longitude; each of these are labeled with the number of minutes that they represent. Each of the minutes is divided into tenths of minutes by a tick mark. Examples are shown above.



1. What are the latitudes and longitudes of the boundaries of the Monterey Bay chart? Complete the table. Be sure to include a “N” or “S” for latitudes and an “E” or “W” for longitudes, as appropriate.

Chart boundary	Monterey Bay chart
Western	Longitude:
Northern	Latitude:
Southern	Latitude:

2. Why do the longitude numbers increase to the west on this chart?

3. On the Monterey Bay Chart, what is the latitude and longitude of the following places? Don't forget the “N”, “W”, “E”, or “S” where appropriate.

Place	Latitude	Longitude
Pt Pinos lighthouse		
Pt Santa Cruz lighthouse		

4. What feature is described by the following latitudes and longitudes?

Latitude	Longitude	Location
36° 36.7'N	121° 57.4'W	
36° 57.6'N	121° 58.5'W	
36° 36.3'N	121° 53.5'W	