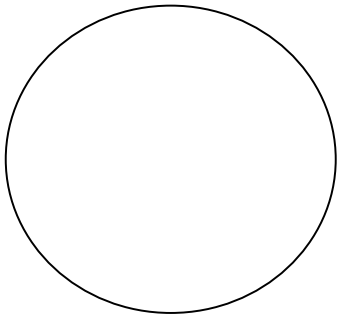
Topic 2: Measuring the Earth

(Chapter 2 and 7 in your text book)

A. Size and shape of the Earth

Model
def:_____

Earth's Actual shape is a _____-_____(pg 18)



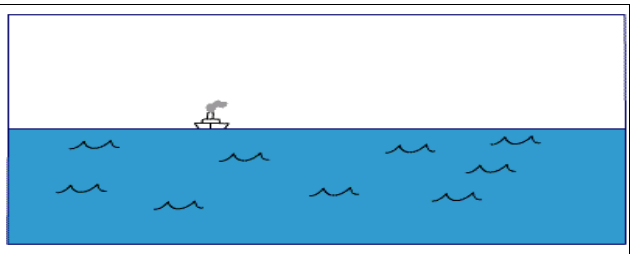
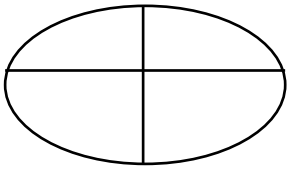
(Page 20 in your textbook)

This means that the equatorial diameter is _____ than the polar diameter

- The polar circumference is _____km
- The equatorial circumference is _____km

What would cause the Earth to have this type of shape? (Forces)

B. Evidence of the shape of the earth (page 17 of your textbook)

 1. _____	2. 
3.  _____	4.  The closer to the center of the Earth the _____ the gravitational pull.

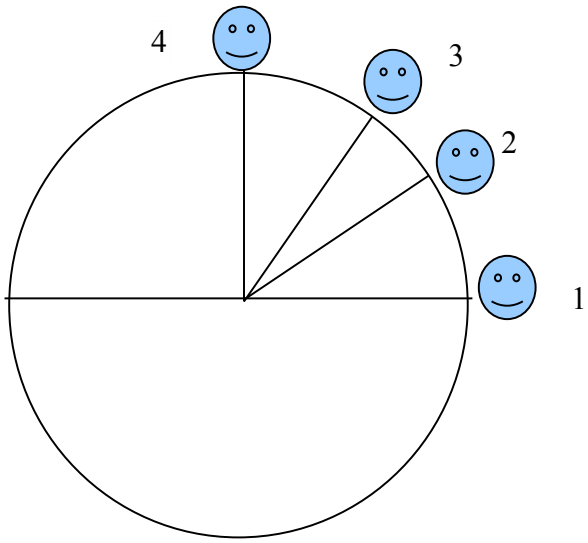
5. Observation of the North Star, Polaris

a. The altitude of Polaris Changes as an observer moves north or South (in the Northern Hemisphere); this is because Earth is _____, and surface is _____.

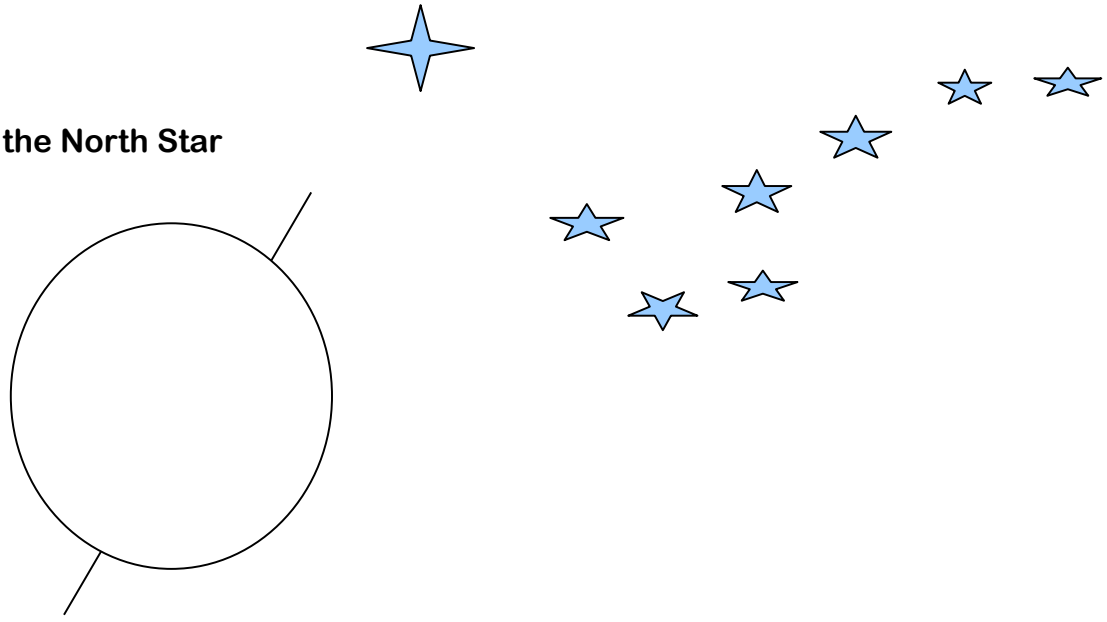
<u>Altitude</u> – is the height, measured in degrees that a heavenly body is above the horizon of the observers.

b.

Observer	Latitude	Altitude of Polaris
1		
2		
3		
4		



c. Locating the North Star

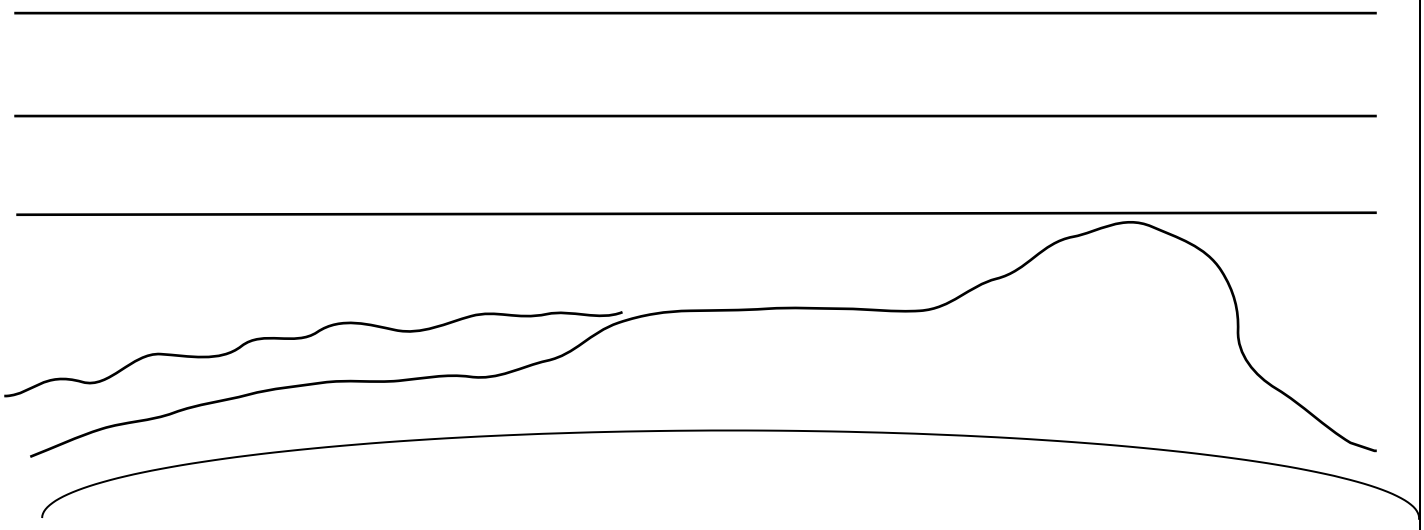


To find the Polaris, use the two end stars of Ursa Major "Big Dipper" and they point to Polaris! These are called the "pointer stars"

C. Outer Spheres of the Earth

The Earth is separated into different sections called spheres. These are held together by gravity and arranged from lowest to highest density moving toward Earth's center.

There is a model below that represents these spheres please *note it does not show actual size or thickness*.



1. Atmosphere: Turn to page 14 in the ESRT

Def. _____

- **The two compounds that make up most of the atmosphere (front cover of ESRT)**

1. _____ 2. _____

- **Also includes Aerosols-**

- **The Atmosphere is the thickest of the three, _____km, but most of the mass is contained in the lower level troposphere. All the weather occurs in the troposphere.**

- **It is *stratified* –**

Scale Model of the Atmospheric Layers

Materials: paper, pencil, and metric ruler, color pencils (blue and red) and reference tables

To make a scale model of the atmospheric layers you must follow the directions word for word. You should not have to ask me for help.

1) Use the metric side of your ruler. Keep in mind the small lines are mm and your ruler should go up to 30 cm.

2) Place your paper vertically on your desk. (portrait)

3) Open your reference tables to page 14, and look at the top of the page for the selected properties of the Earth's Atmosphere.

4) At the bottom of your paper draw a horizontal line (across) 5.5cm. This is your base line. Label zero elevation on the left-hand side of the base line.

5) Vertically (up + down) you are going to measure in millimeters.

6) The first layer is the Troposphere, all weather occurs in this layer. You live in it. It is the densest.

7) Measure up and mark 6mm from your base line. This is the top of the troposphere called the tropopause.

8) Draw a horizontal line the same width of your base line at this height label this the tropopause. Label this 6-km on the left-hand side of the diagram.

9) The temperature in the troposphere ranges from15 to -55^0 C. On the right hand side of the diagram label the base line 15^0C and the tropopause -55^0C.

10) The next layer is the stratosphere. The ozone layer is present here, as is the Jet stream.

11) From the tropopause line measure up 39 mm and mark. This is the top of the stratosphere called the stratopause. Draw a horizontal line at this mark to represent the stratopause. Make it the same width as your base line.

12) Label the line you just drew the stratopause. It actually warms up in the stratosphere. Form $-55\ ^0$C to O^0C. Label on the right side of the stratopause O^0C. On the left -hand side of the stratopause label the height 45-km.

13) From the stratopause measure up 31 mm and mark. Draw another horizontal line same the width as your base line and label it mesopause.

14) It really cools down in this layer. On the right hand at the mesopause, label the temperature -90^0C. On the left1 hand side of the mesopause label it 76km.

15) From the mesopause line measure vertically 84-mm mark this point and draw a horizontal line representing the top of our atmosphere. This layer is called the Thermosphere. Temperature increases drastically in this layer. On the top line of the diagram label the right side 100^0C and the left side label 150km.

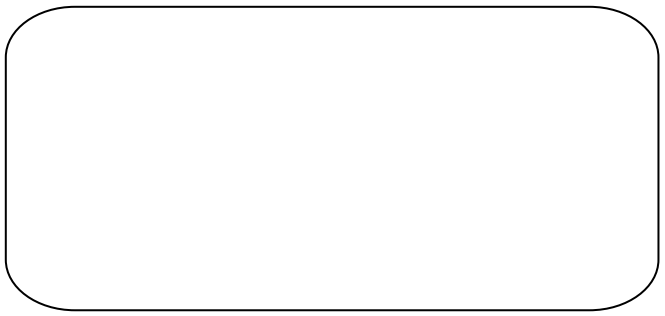
16) Now you should have a scale model of the thickness of each layer of the atmosphere.

Questions and Tasks

1. **Label each layer of the atmosphere on your diagram.**
2. **Color Blue any layer in which the temperature decreases as altitude increases.**
3. **Color Red any layer in which the temperature increase and altitude increase**
4. **Copy the gradient formula from the front page of the reference table in the space to the side**
5. **Calculate the temperature gradient for each layer of the atmosphere below**

Troposphere

Stratosphere



2. Hydrosphere Turn to page 4 in your reference tables

Def. _____

- **Actually, it is the thinnest of the three spheres. _____Km.**
- **It covers _____% of the earth's project.**
- **It contains more species of life than the land and is the beginning of the food chain.**
- **It also produces more oxygen than the tropical rain forest in South America and Africa combined.**

3. Lithosphere-

_____

- **It is broken up into _____.**
- **There are roughly about seven major plates that make up the earth.**
- **The upper portions of these plates are called _____.**
- **Out of the three outer spheres it is the densest, think about it is rock.**

D. Locating Positions on Earth

To fix a location on the Earth we use a Coordinate System.
Def:_____

(Chapter 7 in your textbook (page 111)

Latitude and Longitude

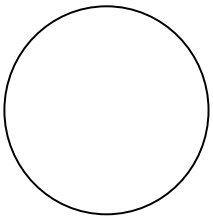
A. Latitude- _____

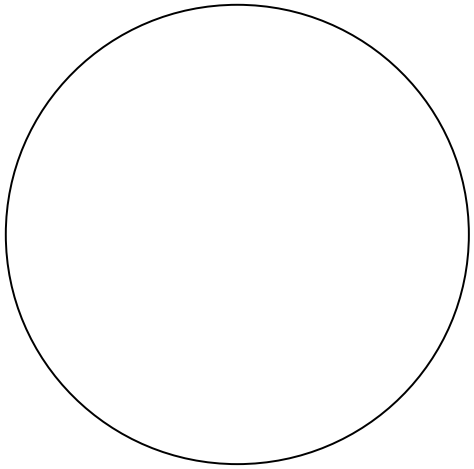
1. Parallels-- _____

2. Equator --_____

3. North/ South Pole- _____

From above NP





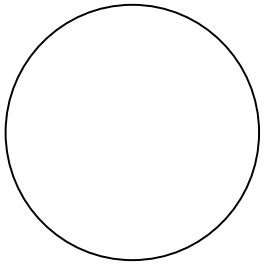
B. Longitude-(Pg 111 in text)_____

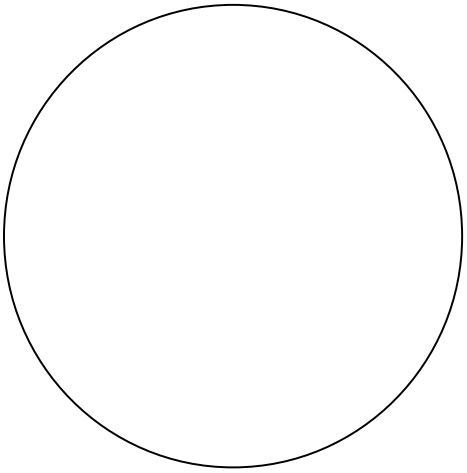
1. Meridians- _____

2. Prime Meridian (Pg 112) _____

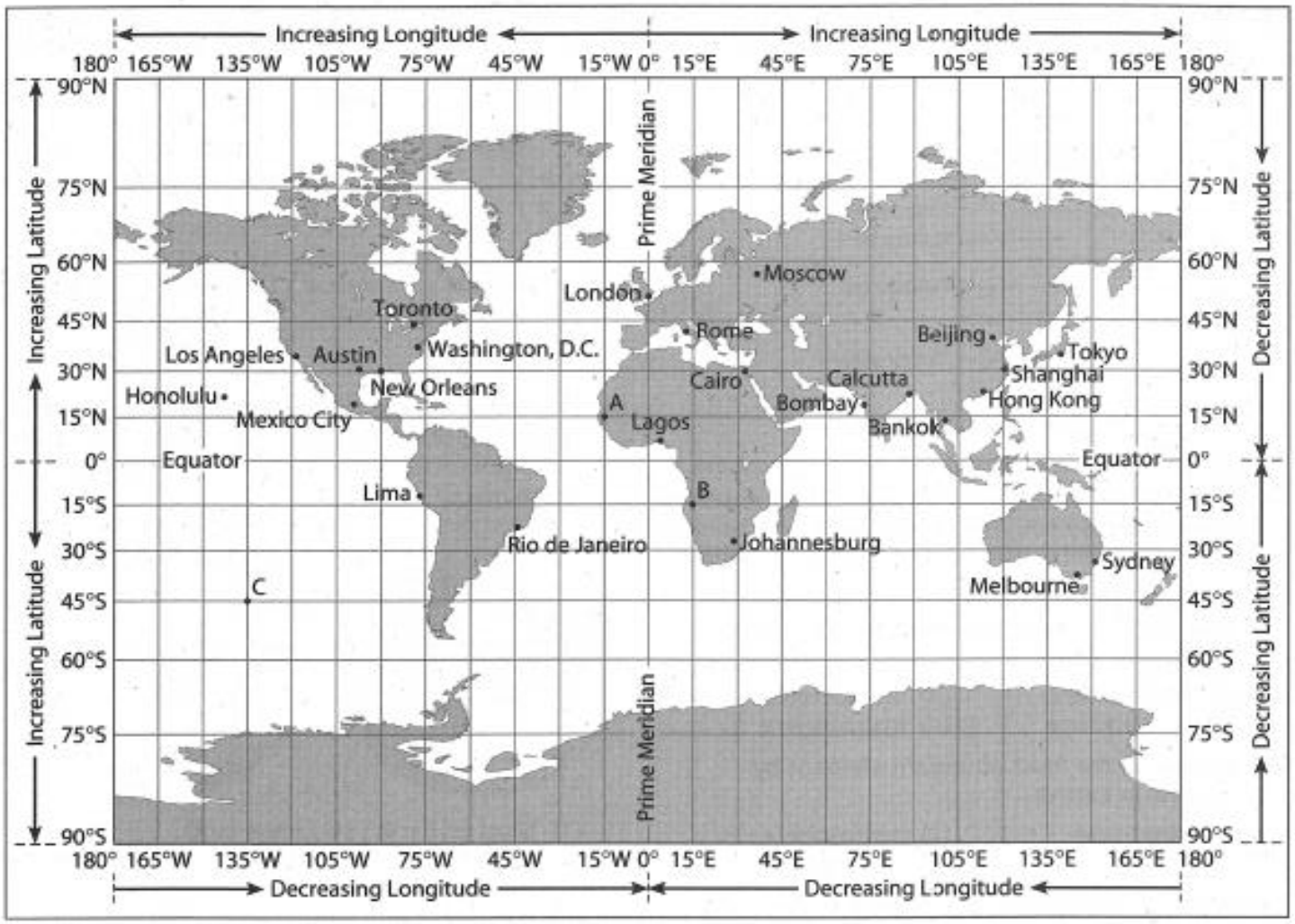
3. International Date Line - _____

From above NP





c. Determining Latitude and Longitude: Write down the latitude and longitude of the following cities



Location	*Latitude and Longitude*	*Location*	*Latitude and Longitude*
A		**New Orleans**	
B		**London**	
C		**Melbourne**	

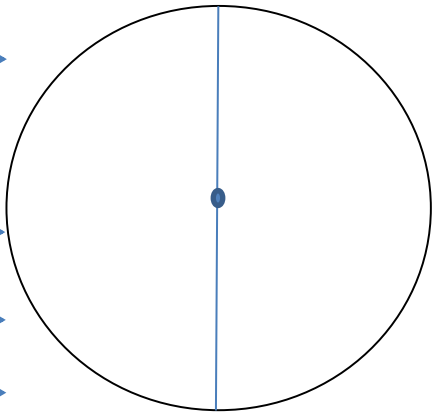
latitude and Longitude of New York

Directions: Degrees of latitude and longitude can be broken into smaller units called minutes. There are 60 minutes in 1 degree. So instead of stating half of a degree it is more accurate to say 30 minutes.

By referring to your reference table page 2, determine the latitude and longitude for the places listed below. Your numerical values should be in degrees an minutes with an accuracy of + or – 5' of the accepted value . Also remember to properly label the direction of each as north or south and east or west.

	Latitude	Longitude
1. Buffalo	_____	_____
2. Mt Marcy	_____	_____
3. Slide Mt.	_____	_____
4. Albany	_____	_____
5. Rochester	_____	_____
6. Plattsburgh	_____	_____
7. Elmira	_____	_____

E. Earth's Time Zones



1. As Earth's rotates on its axis, half of
Earth's is facing the sun and is experiencing daylight:
the other half is in darkness and is experiencing night

2. When the sun is directly over a certain meridian,
It is 12 noon at that location at or near that meridian.

3. Think!
Earth is a sphere, so how many degrees in a circle = _____

How many hours does the earth take for one complete turn = _____
Now what is the number of degrees per hour? _____

4. Number of time zones on Earth = _____

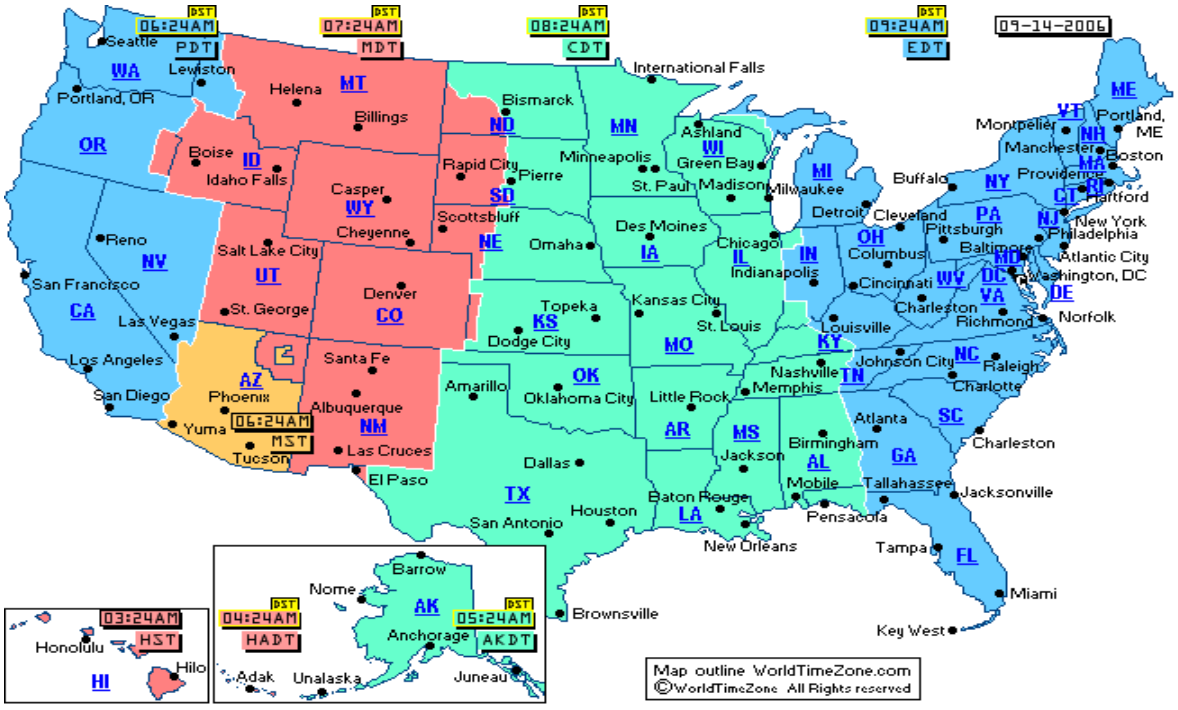
5. In America how many time zones are there?_____

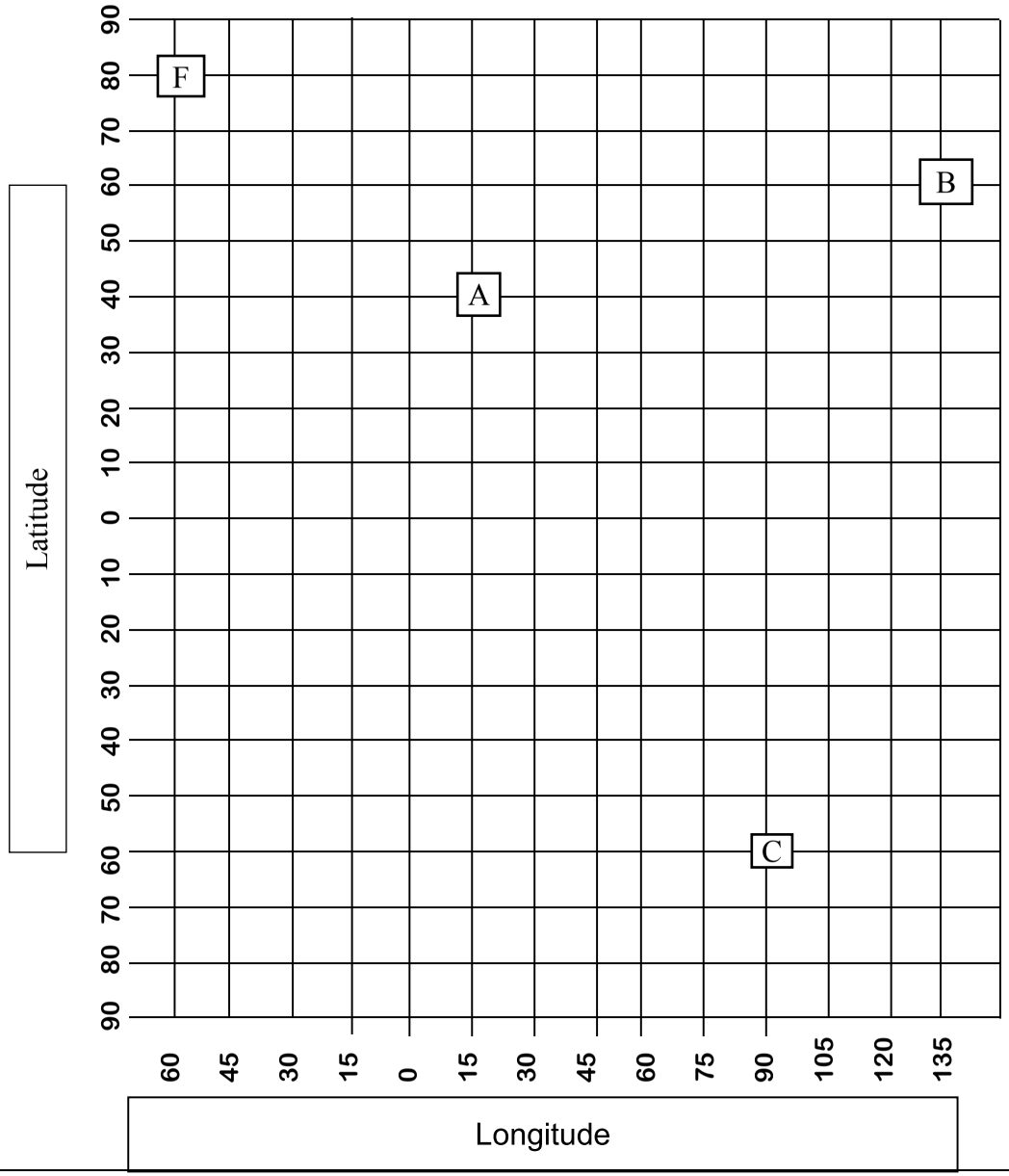
Reading the map below answer the following questions

A. Is it earlier or later in California compared to New York? _____

B. If it is 8:00 PM EST, what time is it in PST? _____

C. It is 6:oo am MST, What time is it in EST? _____





1. List the Latitude and Longitude for location A.
2. List the coordinates for Location C.
3. What are the coordinates at location F?
4. If it is 10:00 am at location A What time is it at location C?
5. If it is 8:00 PM at location B, What is the time at location C?
6. If it is 2:00 PM at F, What is the time at location B?
7. What is Polaris's Altitude at location A?
8. Would Polaris be overhead at any of the letter locations on this map?

Fields: _____

ISOLINES: _____

To the right is a isoline map of New York. Answer the following questions using the map

The map aside shows precipitation amounts across New York

According to the map where in New York is the highest amount of precipitation?_____

What about the lowest?_____

Estimate the amount of rainfall for Plattsburg._____

stimate the amount of rainfall for lake shore central?_____

The Field map below shows the average yearly number of thunderstorms in the United States
Approximately how many thunderstorms occur each year in:

1) Albany, New York -

_____

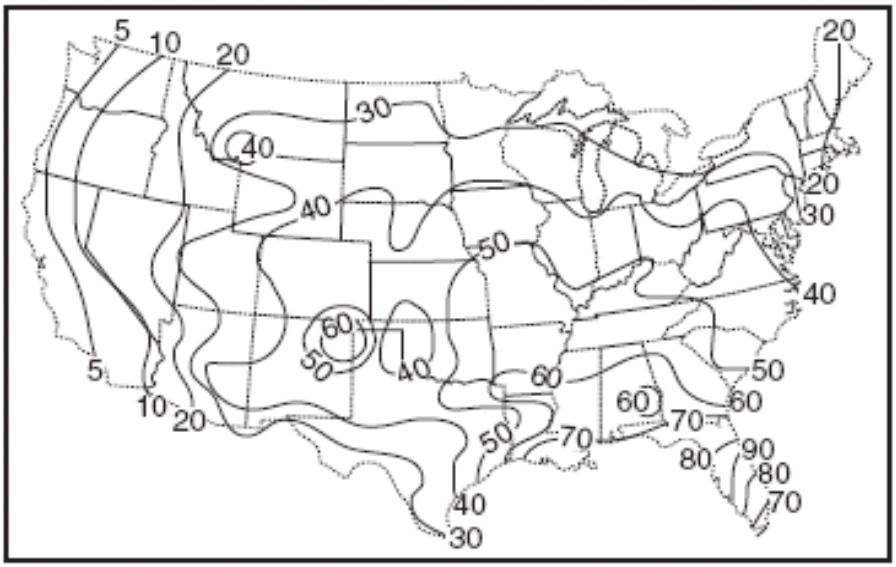
2) Los Angeles, California

_____

3) New Orleans, Louisiana-

_____

Average Number of Thunderstorms Each Year



Drawing Isolines:

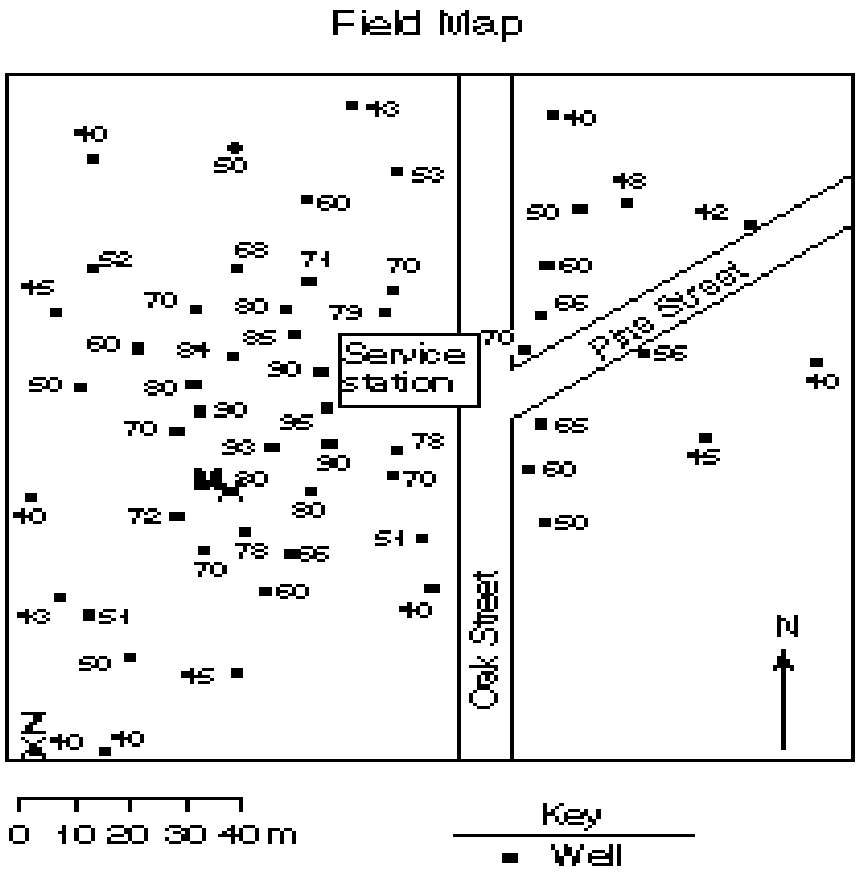
This can be difficult for students but if you pay attention to what you are doing and practice it becomes easy.

Step 1 identify what field value you are connecting

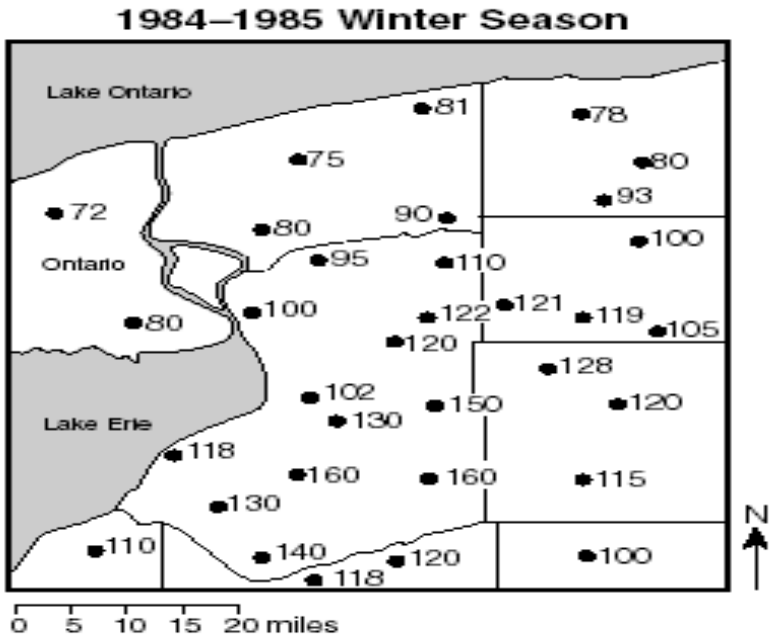
Step 2 find the interval that you want

Step 3 trace your line carefully where the value should be if you see the actual value your line must cross in that value

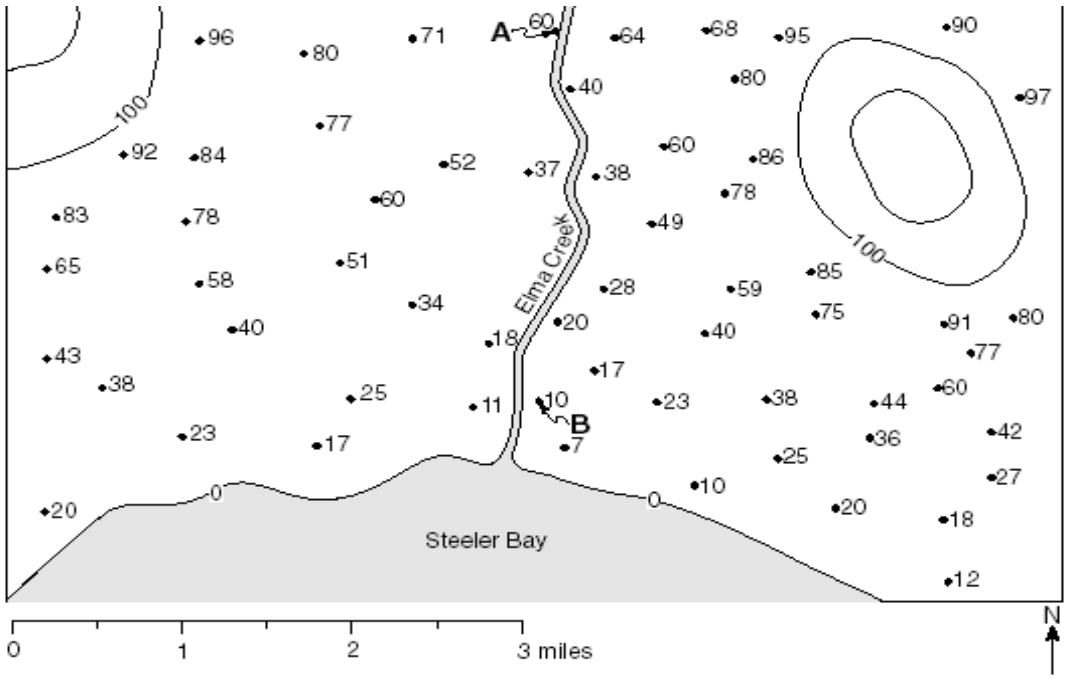
Warning: never go outside given boarders with your isolines



- **The map above shows a gasoline spill that has seeped into the ground. On the field map above draw in the 40 field line on the map. After this draw in the interval of 10 the 50, 60 and 70 field**



- **On the map above draw in the 100 and 120 isoline for snow depth.**



- **On the map above draw in the 60 ft line. Then the 20 ft line.**
- **Calculate the Gradient between A-B**

Interpreting and Applying

Mr. Jones wants to make some improvements in the backyard of his new home, so he had the land surveyed. The surveyor's data are shown on the grid in Figure 7.1. Each labeled point on the grid represents the exact elevation in feet of a point in the backyard. Help Mr. Jones interpret the data by drawing contour lines on the map. Use a contour interval of one foot and the following procedures.

1. Start with any two points of elevation. Determine what contour lines (in increments of 1 foot) will go through the points or will pass between the two points. For example, in the upper left corner of the map are two points at 4.0 feet and 5.2 feet. The 5-foot contour line will pass between 4.0 and 5.2 feet and the 4-foot contour line will pass through the 4.0-feet elevation point.

2. Sketch in the approximate positions of the beginning segments of these two contour lines. (This is already done for you for the 4- and 5-foot contours.) Remember that the 5-foot contour will occur much closer to the point at 5.2 feet than to the point at 4.0 feet.

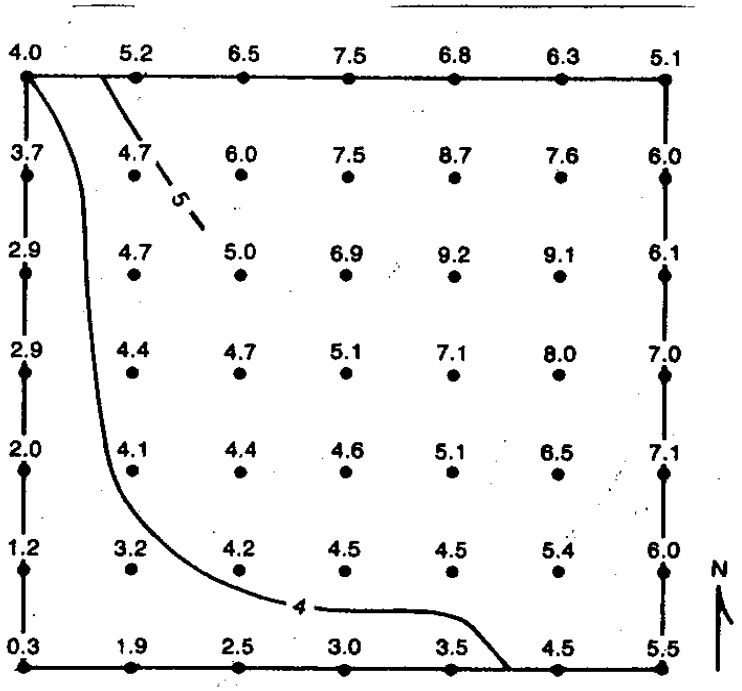
3. To continue sketching your contour lines, move on to two new adjacent points, such as 4.0 and 3.7 feet. Will any contours pass between these two points? The answer is No, so the 4- and 5-foot contours must move in another direction. Four occurs between 3.7 and 4.7, so the 4-foot contour passes between these two points next. After this, the 4-foot contour can either pass between 2.9 and 3.7, 2.9 and 4.7, or 4.7 and 4.7. Four is between 2.9 and 4.7, so the contour passes between these two points. It will pass slightly closer to the point at 4.7 feet.

4. The 4-foot contour line and the beginning segment of the 5-foot contour line are already provided on the map. Continue the 5-foot contour. Fill in the remaining contour lines using smooth curves and label them.

5. Mr. Jones wants to put a satellite dish in his backyard in the area of highest elevation. Where would you suggest that he place it? Mark the spot on the map with an "X."

6. Mr. Jones also wants to build a small above-ground pool on the most level or most gently sloping part of his yard. Where should he put it? Mark the spot on the map with a "Y."

7. Describe the relief you would encounter if you walked along a straight line from the northeast corner to the southwest corner of Mr. Jones' backyard.

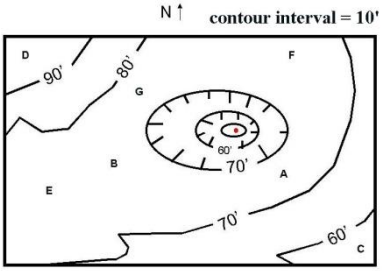


Topographic Maps
(Pg. 115 in text)

---- Maps of elevation fields.

A. Topographic Maps show the elevations of the land by using contour lines, and show other natural and man–made features by using symbols.

B. Contour lines- _____

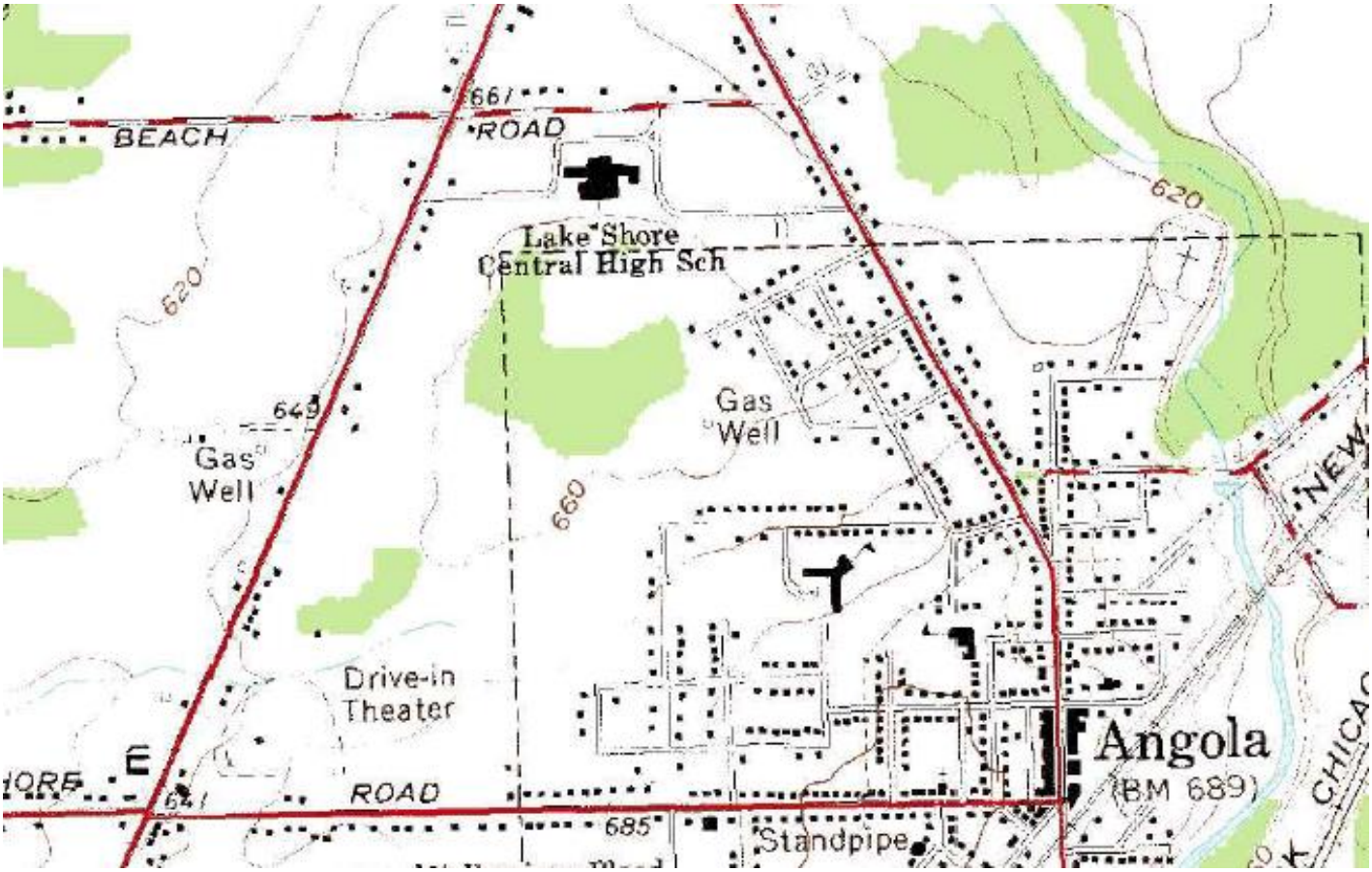


C. Depression Contour line (pg 116) -- Special contour lines used to show a hole or crater on Earth's Surface. These lines are drawn like contour lines but are marked on the inside.

D. Bench Mark X (B.M pg 116)

_____

E. Spot Elevations – are the elevations of such places as road intersections, hilltops, Lake Surfaces and other points of special interest. These points are located on the map by a small cross (+), unless the locations is obvious, such as certain road intersections or hilltops.

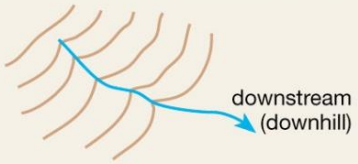


RULES FOR CONTOUR LINES

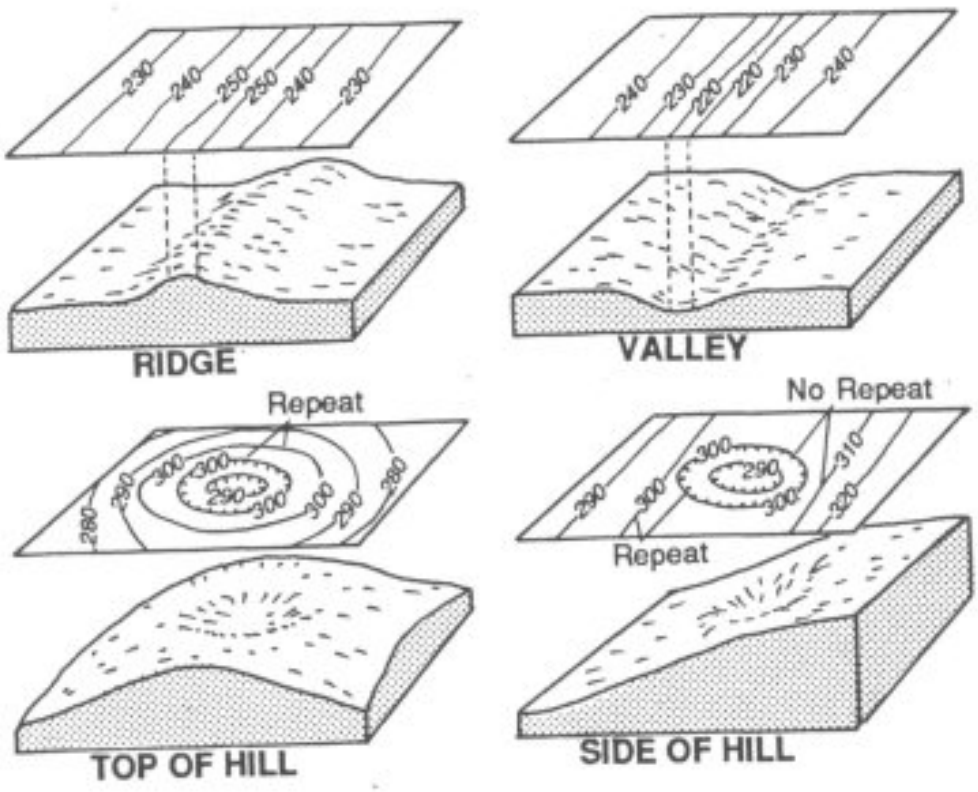
1. Every point on a contour line is of the exact same elevation; that is, contour lines connect points of equal elevation.
2. Contour lines always separate points of higher elevation (uphill) from points of lower elevation (downhill). You must determine which direction on the map is higher and which is lower, relative to the contour line in question, by checking adjacent elevations.
3. Contour lines always close to form an irregular circle. But sometimes part of a contour line extends beyond the mapped area so that you cannot see the entire circle formed.
4. The elevation between any two adjacent contour lines of different elevation on a topographic map is the *contour interval*. Often every fifth contour line is heavier so that you can count by five times the contour interval. These heavier contour lines are known as *index contours*, because they generally have elevations printed on them.
5. Contour lines never cross one another except for one rare case: where an overhanging cliff is present. In such a case, the hidden contours are dashed.
6. Contour lines can merge to form a single contour line only where there is a vertical cliff.
7. Evenly spaced contour lines of different elevation represent a uniform slope.
8. The closer the contour lines are to one another the steeper the slope. In other words, the steeper the slope the closer the contour lines.
9. A concentric series of closed contours represents a hill:

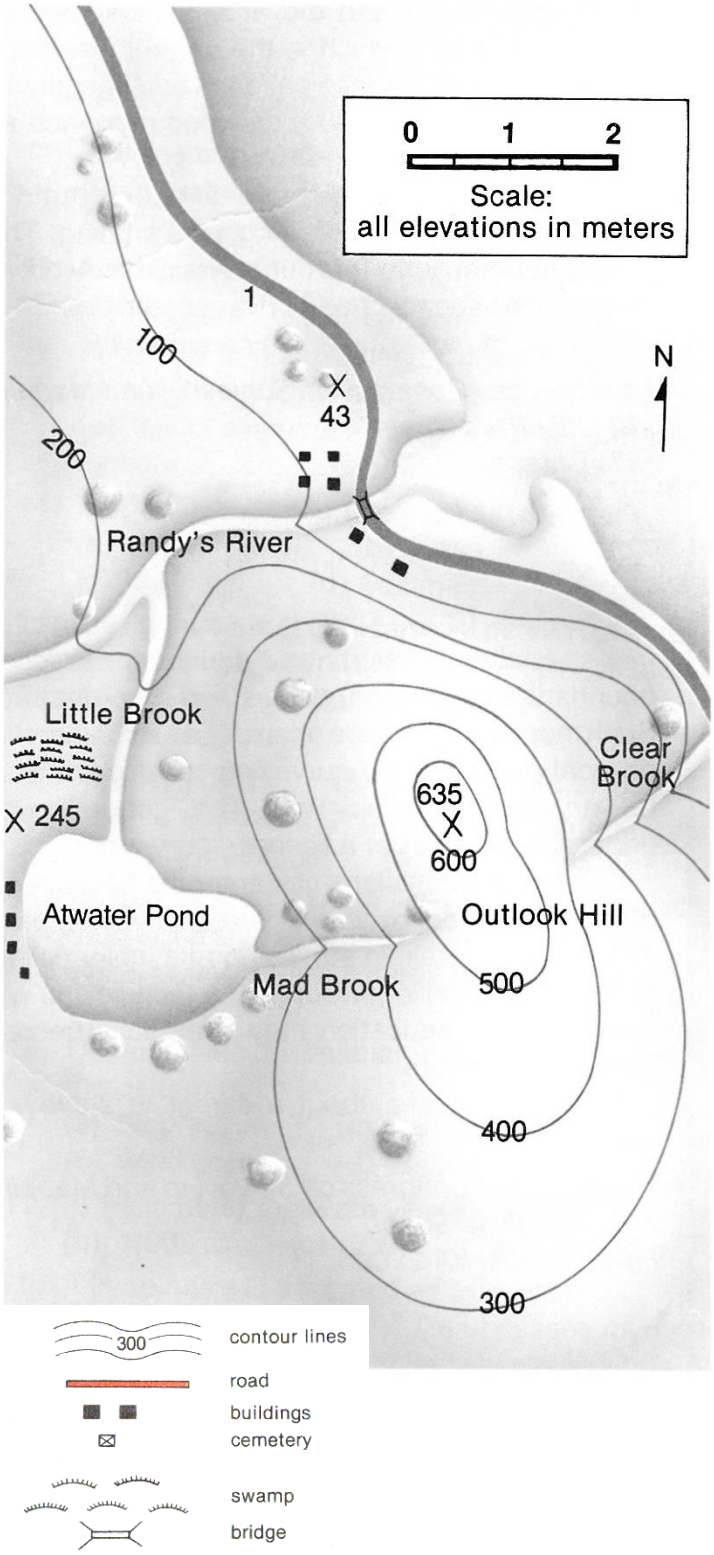
10. *Depression contours* have hachure marks on the downhill side and represent a closed depression:

11. Contour lines form a V pattern when crossing streams. The apex of the V always points upstream (uphill):



12. Contour lines that occur on opposite sides of a valley always occur in pairs.
13. Topographic maps published by the U.S. Geological Survey are contoured in feet or meters referenced to sea level.





1. What is the highest elevation on the map? What is the lowest elevation?

2. How many bench marks are there on the map? What elevations do they mark?

3. What is the contour interval?

4. What is the highest contour line?

5. Why are the contour lines closer together on one side of Outlook Hill?

6. In what directions do you find steep slopes on the map?

7. Study the Randy's river. In which direction is it flowing?

8. Find Outlook Hill. Which is its steepest side?

9. How many buildings are shown on the map?_____

10. What is the length of Route 1 on this map?_____

Profiles discussed on page 120 in your textbook and page 30 of Review Book

Step one: Line the top edge of a piece of paper along the bottom of the profile line.

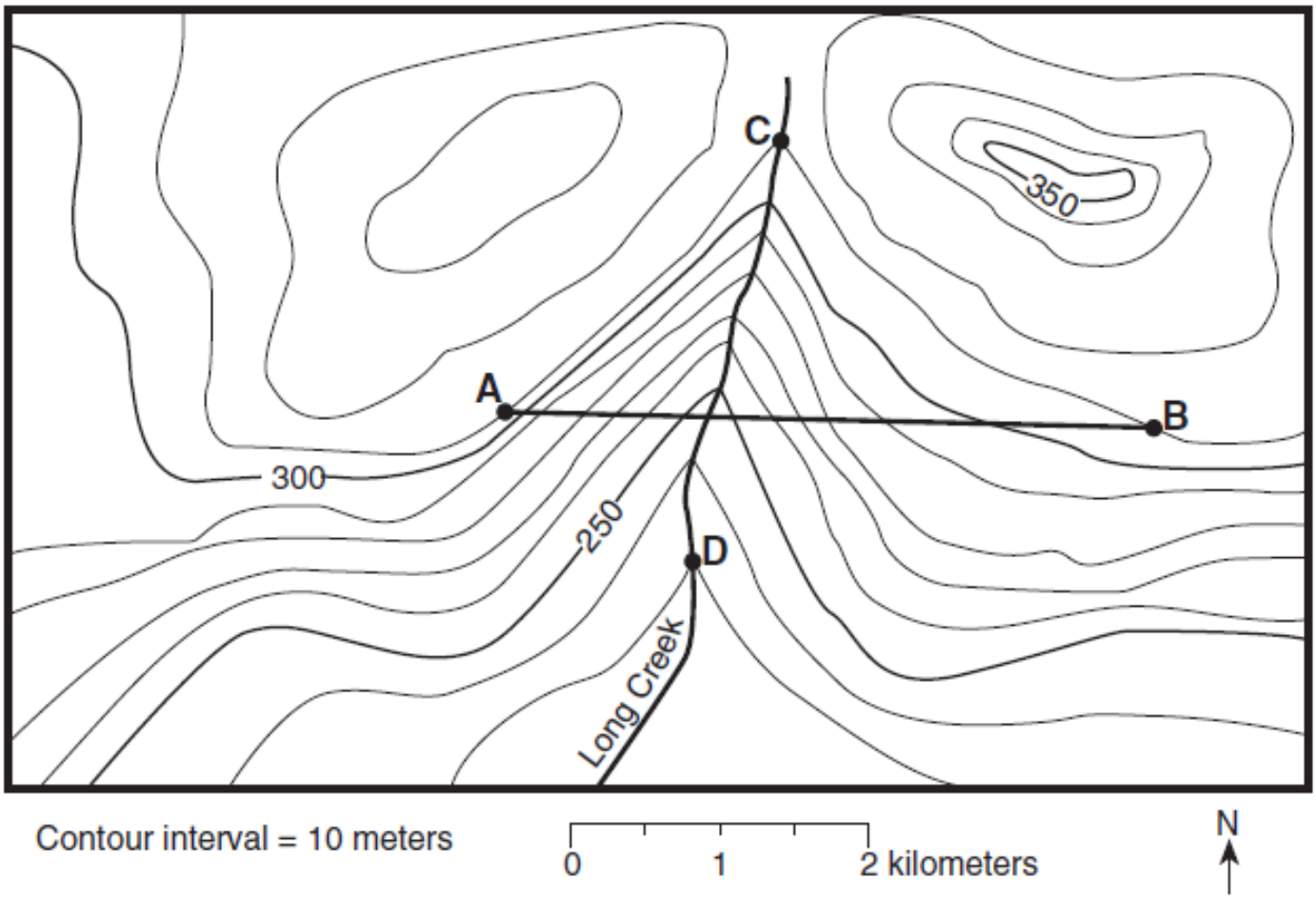
Step two: Using a pencil mark the piece of paper at the top where each contour line the intersects the profile line. Make sure you also write down the elevation as you mark the contour line on your paper!!!!!!DO NOT DO IT AFTER YOU MADE YOUR MARKS

Step Three: Move the piece of paper to the bottom of your profile graph

Step Four: Directly above the mark that you made place an X at the elevation that you recorded.

Step five: Connect the dots with a smooth line

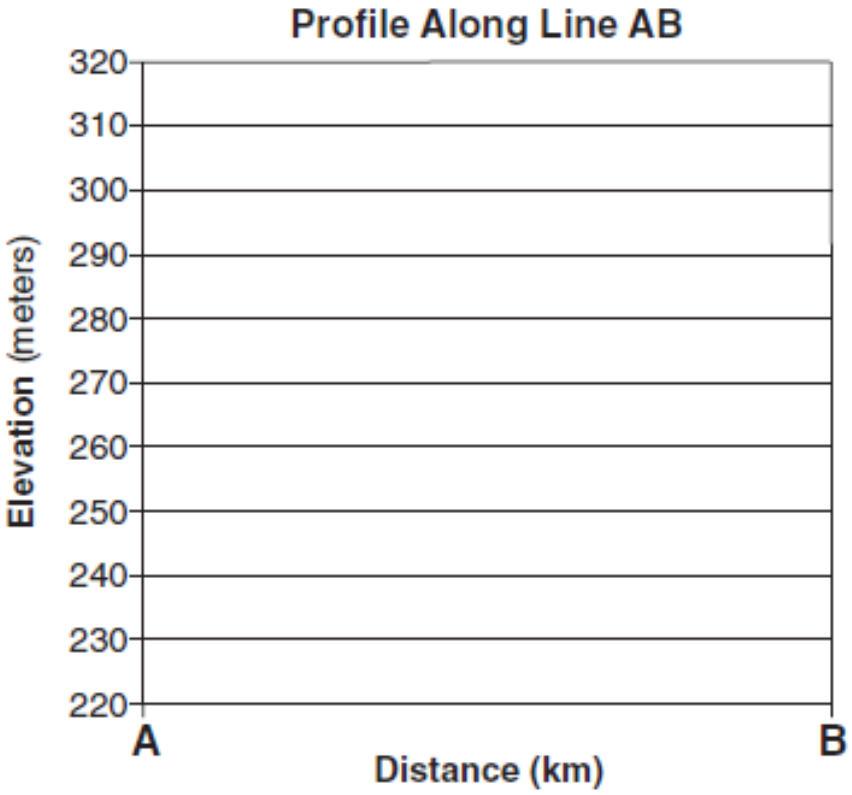
Step six: Make sure you go just above the highest marks for a mountain, or just below the marks for a valley.



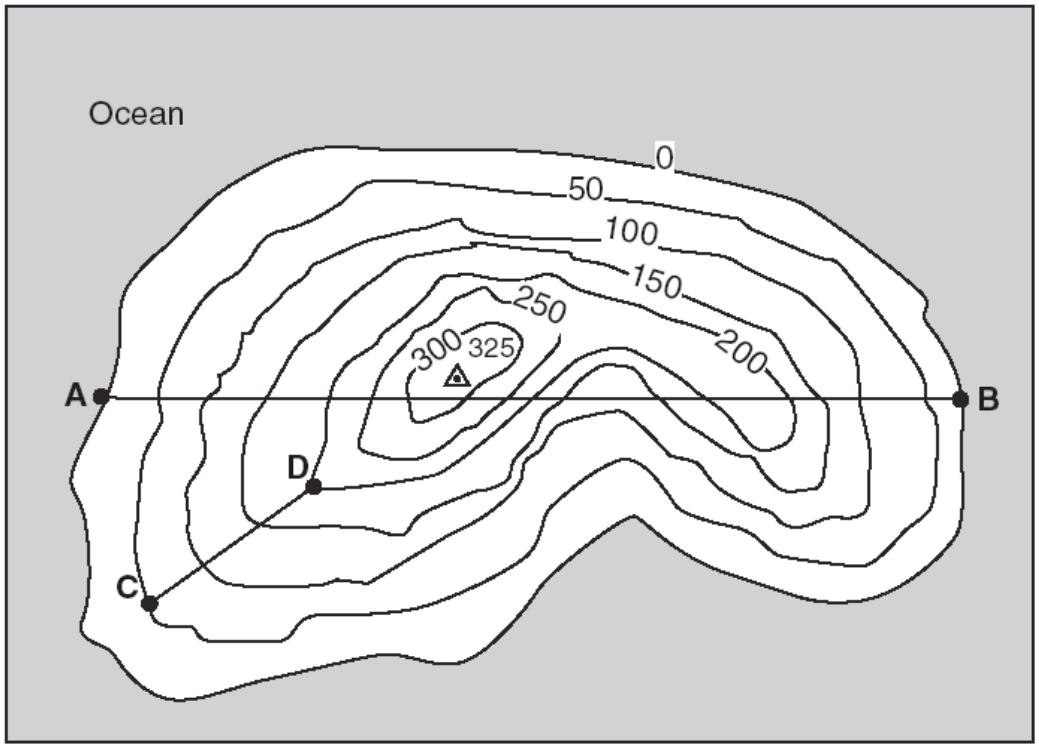
64 On the grid provided *in your answer booklet*, construct a topographic profile along line *AB*, by plotting a point for the elevation of *each* contour line that crosses line *AB* and connecting the points with a smooth, curved line to complete the profile. [2]

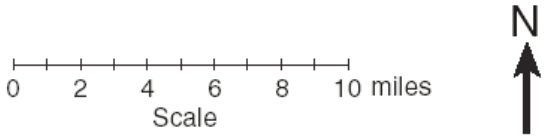
65 Calculate the gradient of Long Creek between points *C* and *D* and label the answer with the correct units. [2]

64



65 Gradient = _____



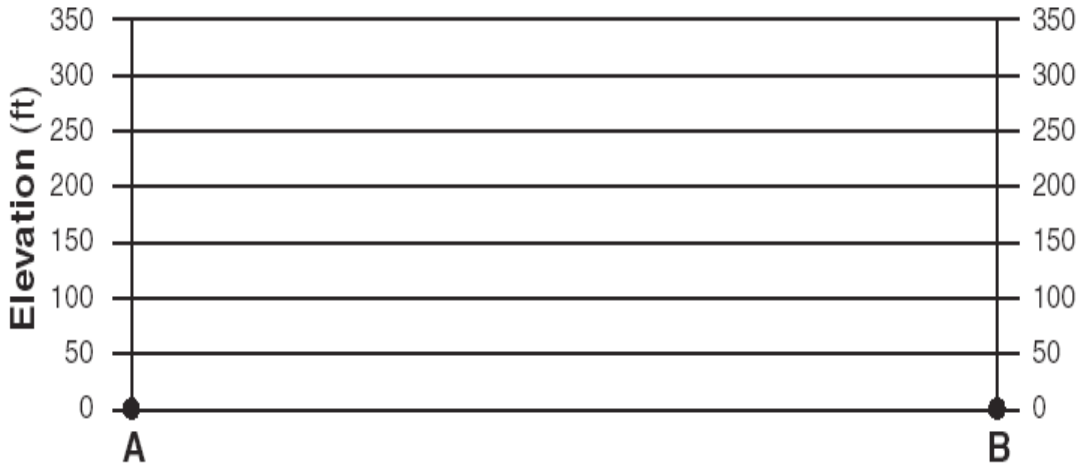


51 On the grid provided *in your answer booklet*, construct a topographic profile representing the cross-sectional view between point *A* and point *B*, following the directions below.

a Plot the elevation of the land along line *AB* by marking, with a dot, the elevation of *each* point where a contour line is crossed by line *AB*. [2]

b Connect the dots with a smooth, curved line to complete the topographic profile. [1]

52 What is the average gradient, in feet per mile, along the straight line from point *C* to point *D*? [1]



52 _____ ft/mi