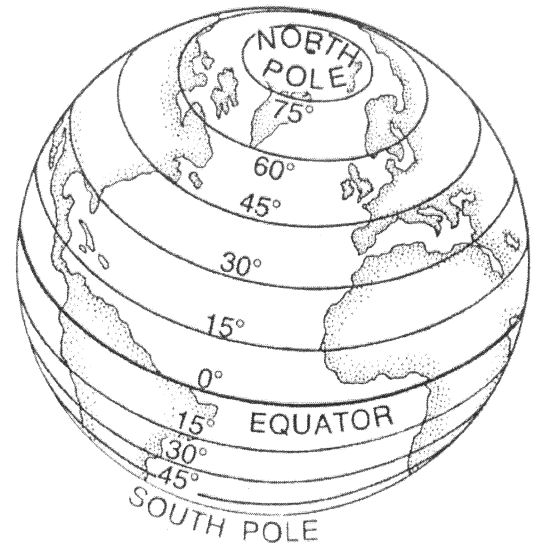


**W.S. – Latitude and Longitude**

Notes

**What is Latitude?**

Latitude is defined as a measurement of distance in degrees north and south of the equator. There are 90 degrees of latitude from the equator to each of the north (90°N latitude) and south (90°S latitude) poles. Latitude lines are pictured on the globe to the right. Latitude lines are parallel, that is they are the same distance apart. In fact, they are sometimes called **parallels**. At 7,926 miles (12, 756 km) in length, the **equator** is the longest of all lines of latitude. It divides the earth into two halves and is measured as 0° (zero degrees). Positions on latitude lines above the equator are called “north” and are in the **northern hemisphere**. Miami, Florida, for example, is nearly twenty-five degrees north of the equator. Its approximate latitude is written as 25°N. Positions on latitude lines below the equator are called “south”. Brisbane Australia, for example, is near the thirty degree latitude line too, but in the **southern hemisphere**. Its latitude is written as 30°S.



**Complete the Following**

1. Lines of latitude are \_\_\_\_\_ to the equator.
2. There are \_\_\_\_\_ degrees of latitude north and south of the equator.
3. The equator is \_\_\_\_\_ degrees.
4. Another name for latitude lines is \_\_\_\_\_.
5. The equator divides the earth into \_\_\_\_\_ equal parts.
6. Write a definition of latitude.

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## What is Longitude?

Longitude is defined as measurement of distance in degrees east or west of the prime meridian. The prime meridian divides the earth in half and is referred to as  $0^\circ$  longitude. The **prime meridian**, as do all other lines of longitude, pass through the north and South Pole. This is shown in the diagram to the right. Longitude lines are not parallel. They make the earth look like a peeled

orange. There are 180 lines of longitude on the each side of the prime meridian. On the opposite side, the prime meridian is not zero degrees but 180

degrees. Here, it is called the **International Date**

**Line**. Longitude lines to the left of the prime

meridian give locations west, in the **western**

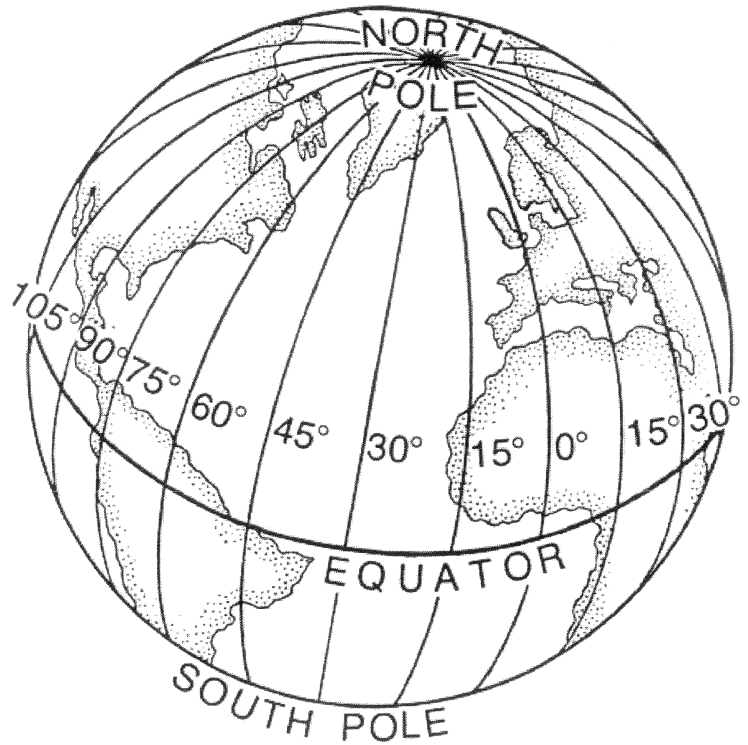
**hemisphere**. Longitude lines to the right of the

prime meridian give locations east, in the **eastern**

**hemisphere**. Miami, Florida, for example, is near

the  $80^\circ$  line of longitude. It is west of the prime

meridian and is written  $80^\circ\text{W}$ .



## Complete the Following

10. Longitude lines connect the \_\_\_\_\_ with the \_\_\_\_\_.
11. The line of  $0^\circ$  longitude is called the \_\_\_\_\_.
12. Longitude lines give directions \_\_\_\_\_ and \_\_\_\_\_ of the prime meridian.
13. There are \_\_\_\_\_ degrees of longitude each side of the prime meridian.
14. Longitude lines are not \_\_\_\_\_ like latitude lines.
15. Write a definition of longitude.

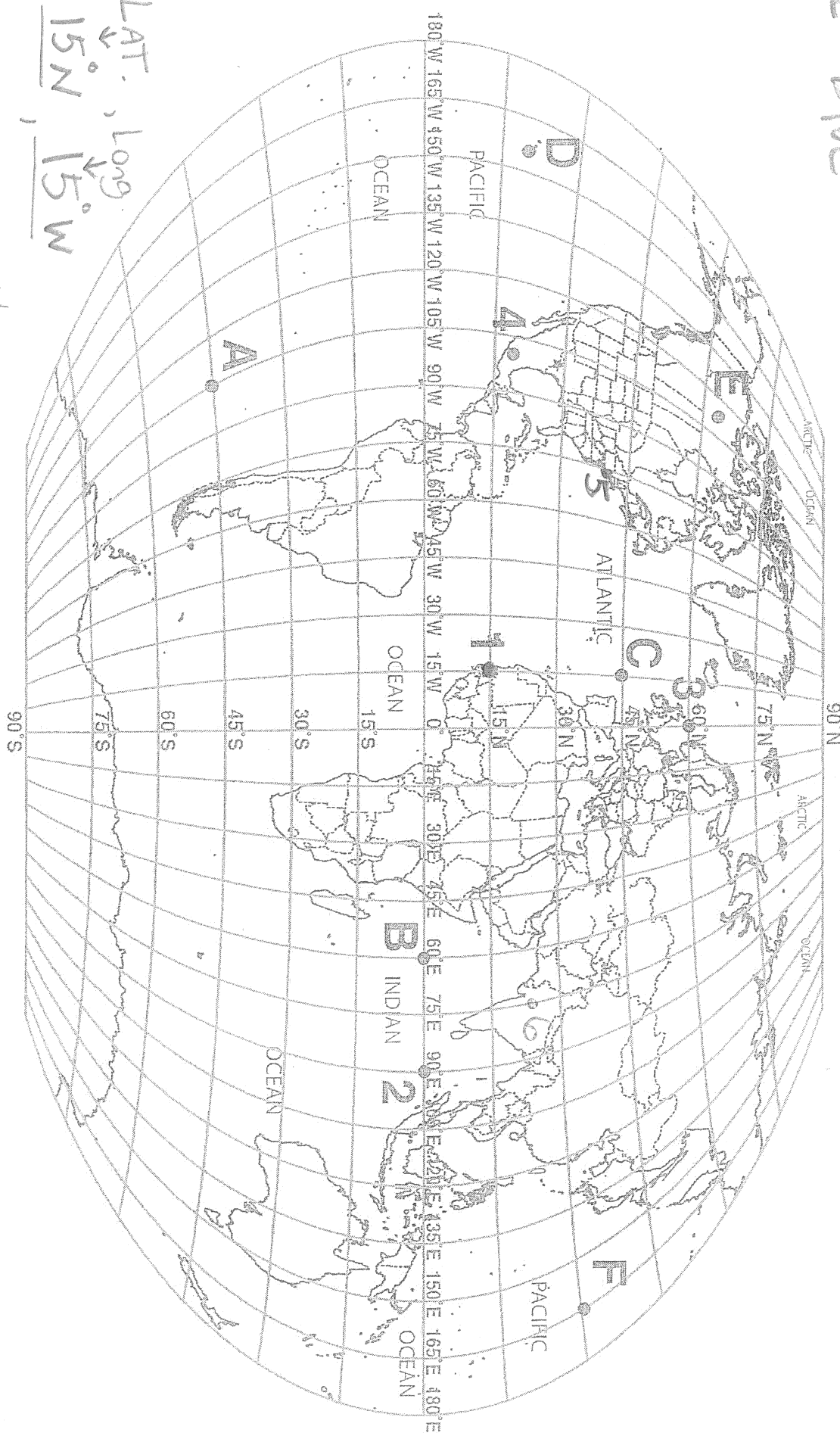
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Equator = red  
 Prime meridian = Blue  
 TDL = Blue

A. \_\_\_\_\_ D. \_\_\_\_\_  
 B. \_\_\_\_\_ E. \_\_\_\_\_  
 C. \_\_\_\_\_ F. \_\_\_\_\_

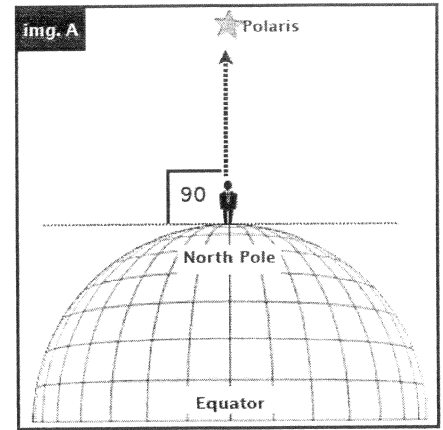


LAT. Long  
 1. 15°N , 15°W

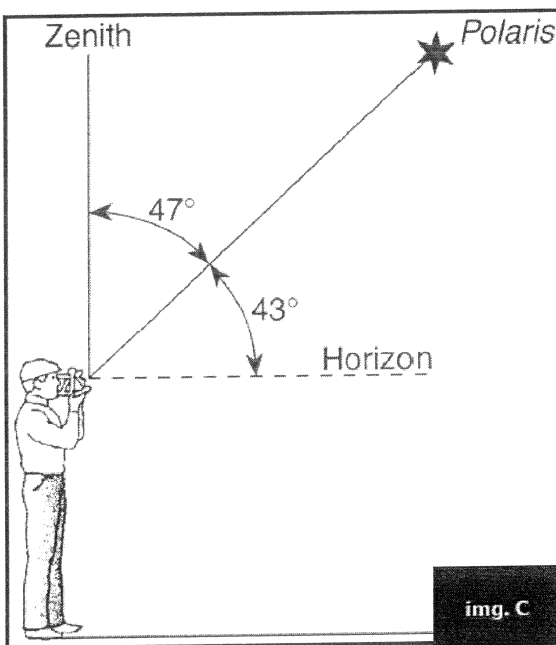
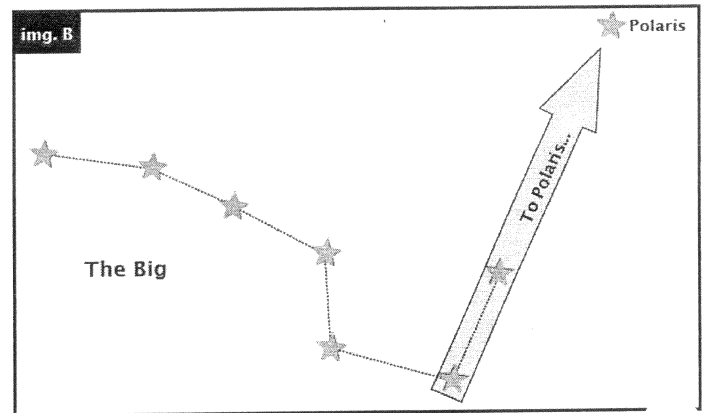
2. \_\_\_\_\_ , \_\_\_\_\_  
 3. \_\_\_\_\_ , \_\_\_\_\_  
 4. \_\_\_\_\_ , \_\_\_\_\_  
 5. \_\_\_\_\_ , \_\_\_\_\_

## How to Determine your Latitude?

If you stand at the North Pole and look directly up above your head, you will see a star called **Polaris**, or **the North Star** (img. A). This star is visible from any location in the Northern Hemisphere, though it will be visible at different heights in the sky depending on where you are. **If you measure the angle between the horizon and Polaris, that angle will be**



**equal to your latitude.** Before you can do this, you must be able to locate Polaris amongst the many stars visible in the night sky. In order to do this, you must locate the constellation **Ursa Major**, also known as **the Big Dipper**. This constellation “points” directly to Polaris (img. B). Once you find Polaris, you need to use an instrument called an **astrolabe** (img. C) to measure the angle between the horizon and Polaris. This angle is equal to your latitude.



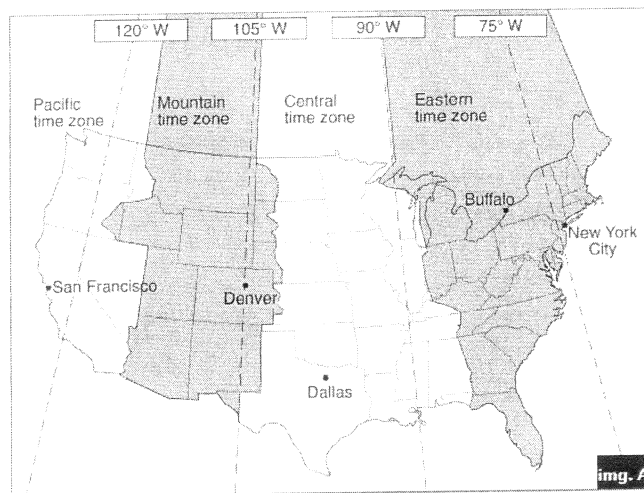
Look at the image on the left. This man is using an astrolabe to measure the angle between the horizon and Polaris, which, in this example, is equal to  $43^\circ$ . Notice, the angle between Polaris and the observer's **zenith** (the point directly above the observers head) is also shown. This number is irrelevant and meaningless. The latitude of this observer is  $43^\circ$  N. It must be north because this technique does not work in the Southern Hemisphere as Polaris is not visible south of the equator.

**\*KEY IDEA\***  
**YOUR LATITUDE IS EQUAL TO THE ALTITUDE OF POLARIS IN THE NORTHERN**

21. What is the altitude of Polaris here in Mamaroneck (approx.  $42^{\circ}\text{N}$ )? \_\_\_\_\_
22. What happens to the altitude of Polaris as you move north in the northern hemisphere?  
\_\_\_\_\_
23. What happens to the altitude of Polaris as you move south in the northern hemisphere?  
\_\_\_\_\_
24. What happens to the altitude of Polaris as you move due west from Thornwood, NY to Chicago?  
\_\_\_\_\_
25. If the altitude of Polaris in Mamaroneck is  $42^{\circ}$  tonight, what will it's altitude be tomorrow night?  
\_\_\_\_\_
26. How does Polaris appear to change position during the night? \_\_\_\_\_
27. How do stars near Polaris appear to change position during the night? \_\_\_\_\_
28. What is the altitude of Polaris at the North Pole? \_\_\_\_\_
29. What is the altitude of Polaris at the equator? \_\_\_\_\_
30. If you cannot see Polaris on a clear night, state something concerning your position on the Earth's surface?  
\_\_\_\_\_
31. If you are facing Polaris, which compass direction is at your back? \_\_\_\_\_
32. If you are facing Polaris, which compass direction is to your left? \_\_\_\_\_
33. Where is the altitude of Polaris the maximum? \_\_\_\_\_

### How to Determine your Longitude?

The Earth is not sitting still, it is both **rotating** on it's axis and **revolving** around the Sun. It takes one **day** (23 hours, 56 minutes and 4 seconds) to complete a rotation and one **year** (365.26 days) to complete one revolution. One rotation is equal to one complete spin, or  $360^{\circ}$ . If it takes us about 24 hours to spin  $360^{\circ}$ , we know that we are spinning at a rate of  $15^{\circ}/\text{hour}$ . Because of this, locations on Earth that are  $15^{\circ}$  of longitude apart, also have a time difference of one hour. This is the basis of our system of **time zones** (img. A). As a result, we can use time to help us to determine our longitude.



**Step 1:** Determine when it is solar noon at your location by waiting until the Sun reaches its highest point in the sky.

**Step 2:** Identify how many hours difference there is between solar noon at your location and the time at the Prime Meridian. To do this, you need a **chronometer**, a type of very accurate clock (see left).

**Step 3:** Multiply the number of hours between the time where you are and the time at the Prime Meridian by  $15^\circ$ .

**Step 4:** If the time where you are is **less** than the time at the Prime Meridian, you are **west** of the Prime Meridian. If the time where you are is **later** than the time at the Prime Meridian, you are **east** of the Prime Meridian.

**“If time is less, you are west, if time did increase, you are east”**

**Example...**

You are sailing on a ship and have lost your way. You have determined your latitude to be  $35^\circ\text{N}$  by observing Polaris last night. Now you need to calculate your longitude. You observe the Sun to be directly overhead. At that instant, your chronometer reads 4:00 pm (the time at the Prime Meridian). What is your longitude?

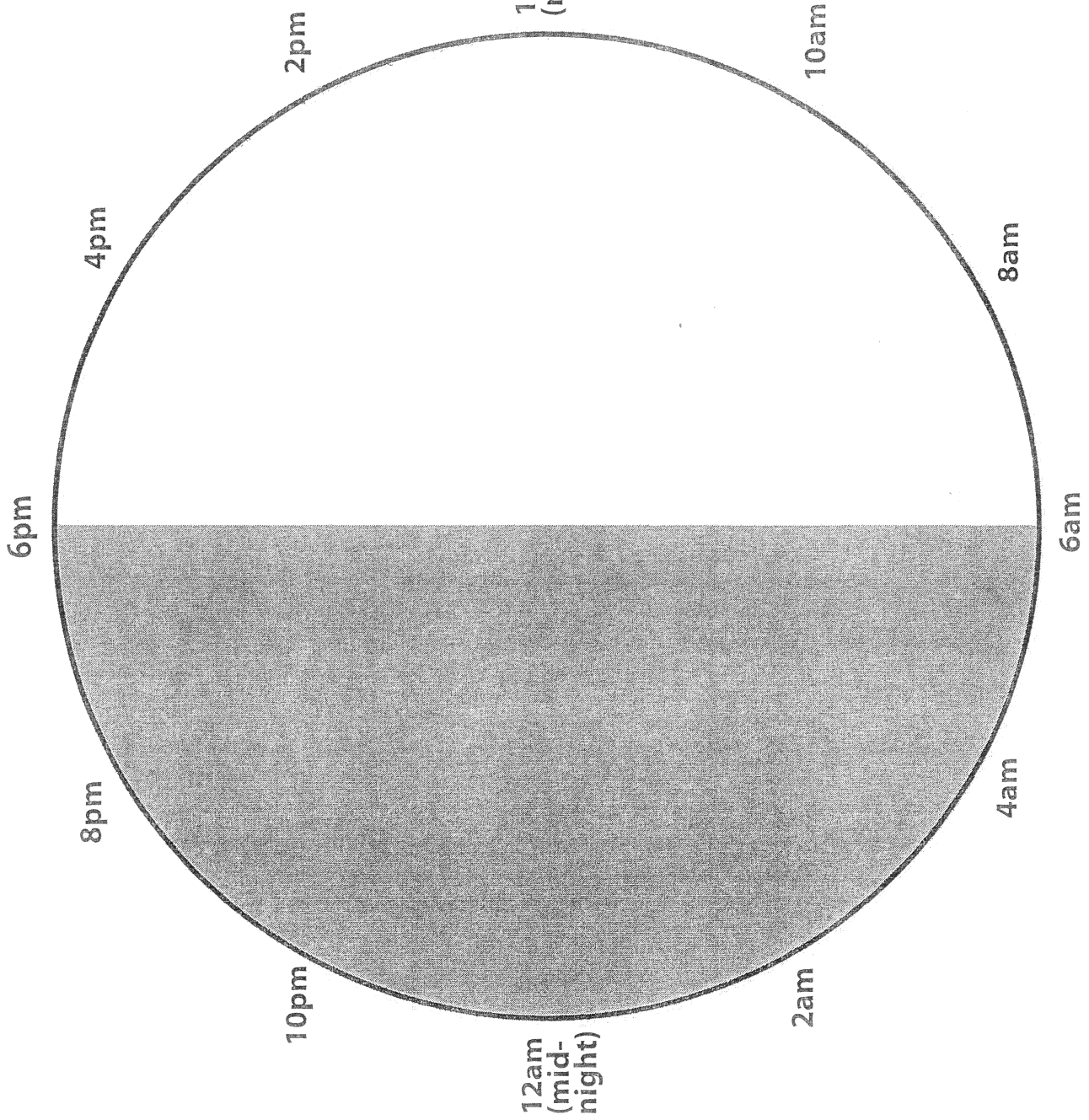
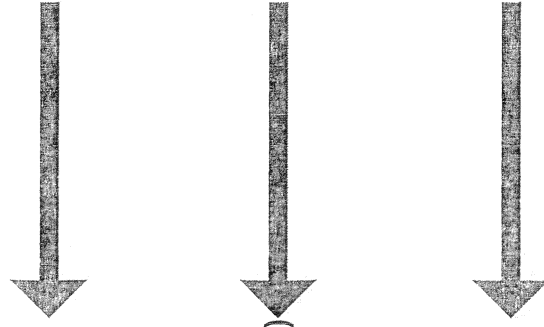
**There is a 4 hr. difference between your time and Prime Meridian time.**

**Four hours  $\times 15^\circ = 60^\circ$ . Since your time is less, you are west.**

**Your longitude is  $60^\circ\text{W}$ .**

1. Your time is 2:00 pm, Prime Meridian time is 10:00 am. What is your longitude? \_\_\_\_\_
2. Your time is 9:00 am, Prime Meridian time is 3:00 pm. What is your longitude? \_\_\_\_\_
3. Your time is 5:00 pm, Prime Meridian time is 4:00 pm. What is your longitude? \_\_\_\_\_
4. Your time is 9:00 pm, Prime Meridian time is 2:00 pm. What is your longitude? \_\_\_\_\_
5. It is 2:00 pm at the Prime Meridian and you are located at  $30^\circ\text{W}$  longitude. What time is it where you are?  
\_\_\_\_\_
6. It is 2:00 pm at the Prime Meridian and you are located at  $45^\circ\text{E}$  longitude. What time is it where you are?  
\_\_\_\_\_
7. It is 10:00 am at the Prime Meridian and you are located at  $60^\circ\text{W}$  longitude. What time is it where you are?  
\_\_\_\_\_
8. It is 10:00 am at the Prime Meridian and you are located at  $90^\circ\text{E}$  longitude. What time is it where you are?  
\_\_\_\_\_

SUN



$1^\circ = 60'$  !

Name \_\_\_\_\_

NYS Latitude and Longitude

↑ degree      ↑ minutes

NYS Latitude and Longitude Map in Reference Table (pg. 3)

Location	Latitude (degrees and minutes)	Longitude (degrees and minutes)
Mount Marcy		
Buffalo		
Plattsburgh		
Slide Mtn.		
Massena		
Binghamton		
Kingston		

Latitude	Longitude	Location
42° 30' N	76° 30' W	
43° 15' N	77° 30' W	
43° N	75° 15' W	
43° 30' N	76° 30' W	
43° 15' N	79° W	

