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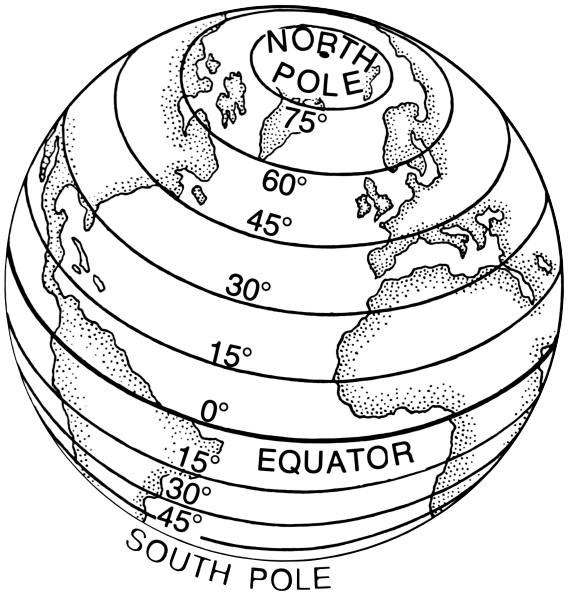
What is Latitude?

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 in half 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

a. Lines of latitude are _____ to the equator.

b. There are _____ degrees of latitude north and south of the equator.

c. The equator is _____ degrees.

d. Another name for latitude lines is _____ .

e. The equator divides the earth into _____ equal parts.

f. Write a definition of latitude.

_____

_____

_____

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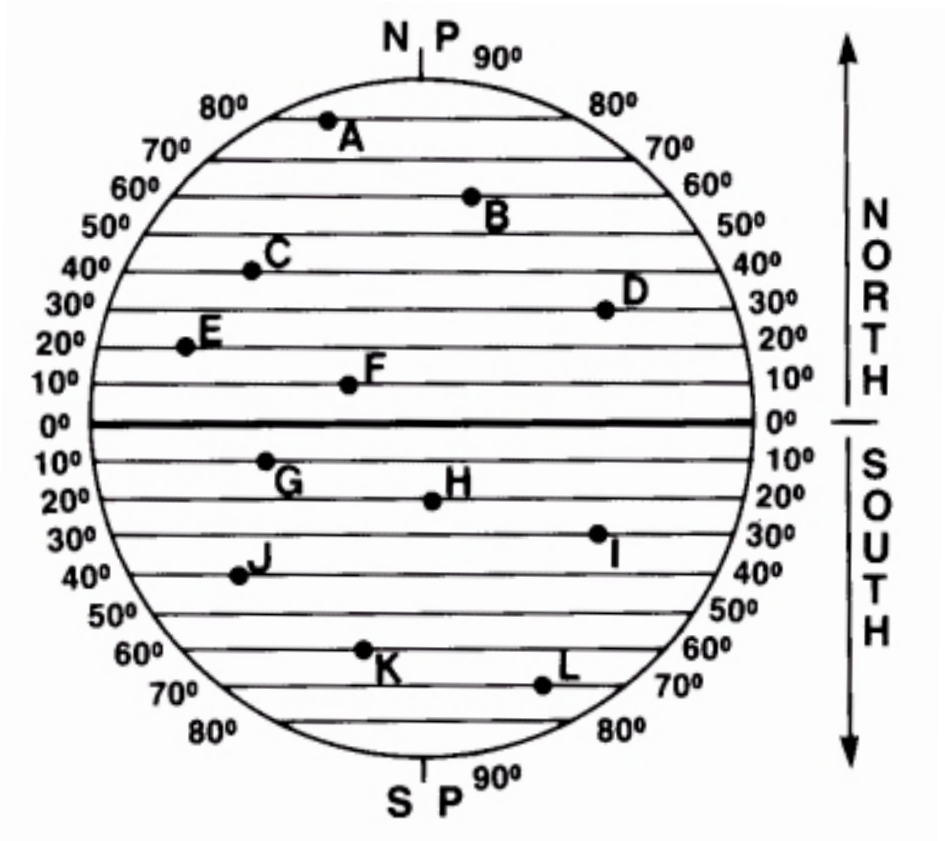
g. Practice finding the latitudes of a number of places. Place A has been given its latitude to help you get started.



A. 80°N	**D.**	**G.**	**J.**
B.	**E.**	**H.**	**K.**
C.	**F.**	**I.**	**L.**

h. You can easily determine how many degrees separate one place from another place. For example, B is on the 60°N line of latitude; C is on the 40°N line of latitude. By subtracting we find that B is 20° further north than C.

✳ **How many degrees of latitude separate:**

C from D	E from F	G from K	C from I	L from A	B from G

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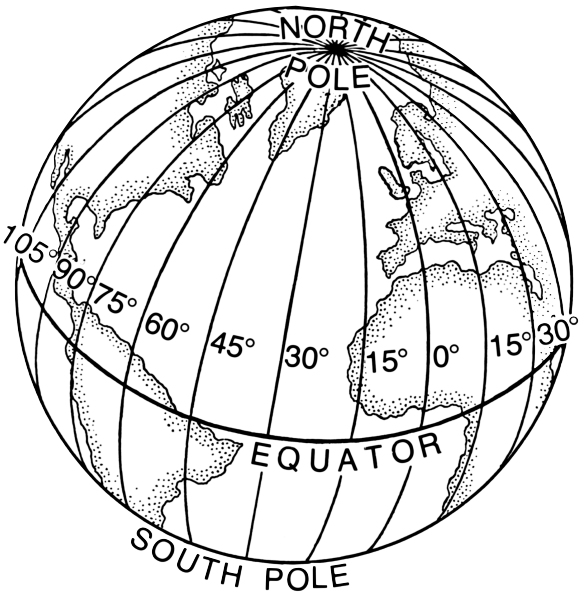
What is Longitude?

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° 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° line of longitude. It is west of the prime meridian and is written 80°W.



Complete the Following

h. Longitude lines connect the _____ with the _____.

i. The line of 0° longitude is called the _____ .

j. Longitude lines give directions _____ and _____ of the prime

k. There are _____ degrees of longitude each side of the prime meridian.

l. Longitude lines are not _____ like latitude lines.

m. Write a definition of longitude.

_____
_____
_____

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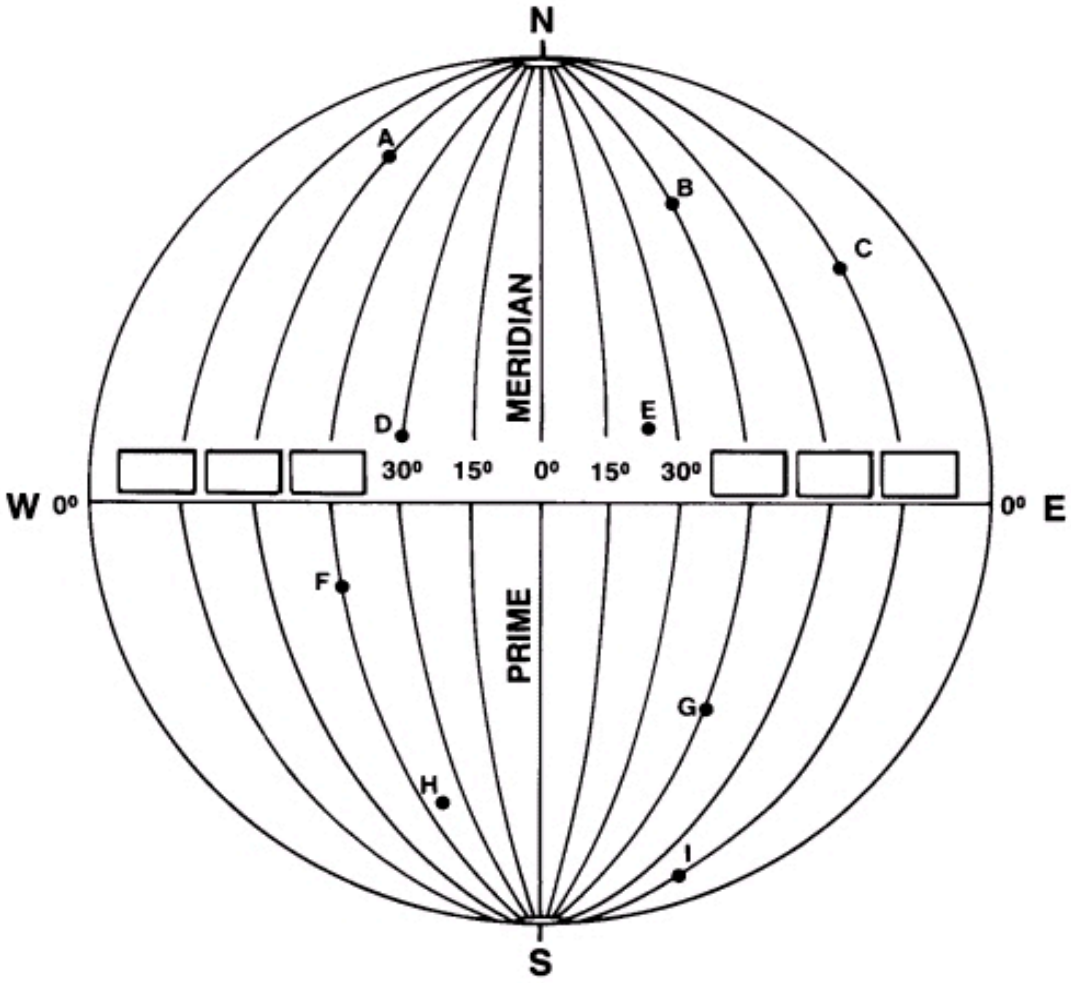
n. The lines of longitude on the diagram below are 15° apart. Notice that some of the lines are not numbered, that there are blank boxes on those lines. Study the numbers on the other lines, then print the proper numbers in the boxes.



o. What are the longitudes of the following points shown on the map? Remember: You must write E for east, or W for west to properly identify the location.

A. 60°W	**C.**	**E.**	**G.**
B.	**D.**	**F.**	**H.**

i. Every place on the earth is in two hemispheres (except for places on the prime meridian, 180° line of longitude, the equator or at the North and South Poles.

✳ **In what two hemispheres is:**

D		H		G		C	
Nort	West						

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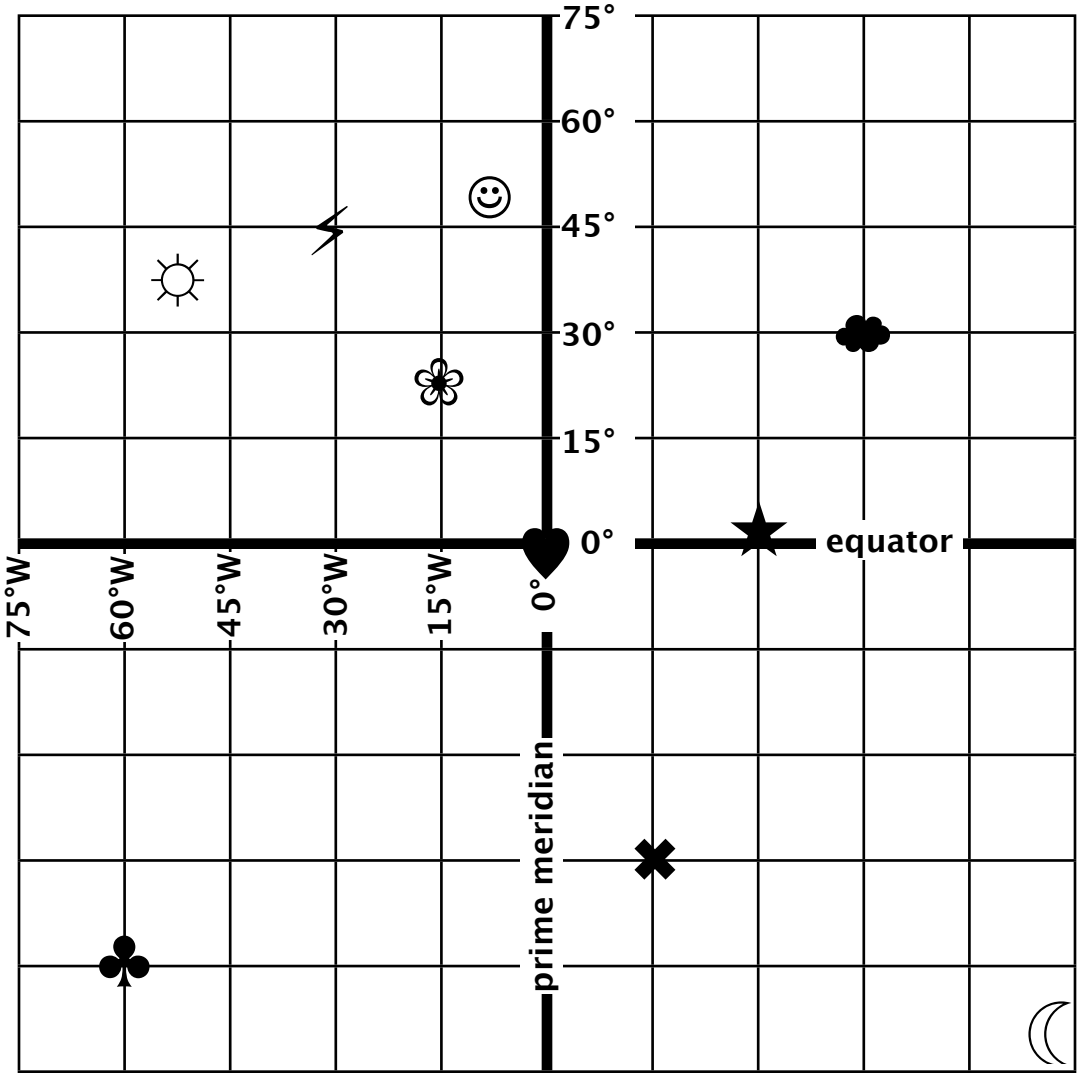

Write the approximate coordinates of the following symbols:

⚡		✖	
❀		♣	
☾		☺	
☼		★	
♥		♣	

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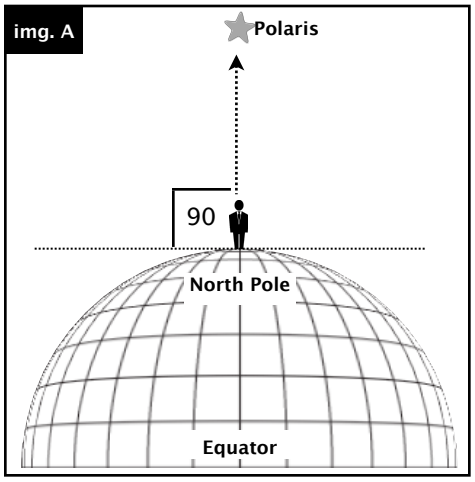
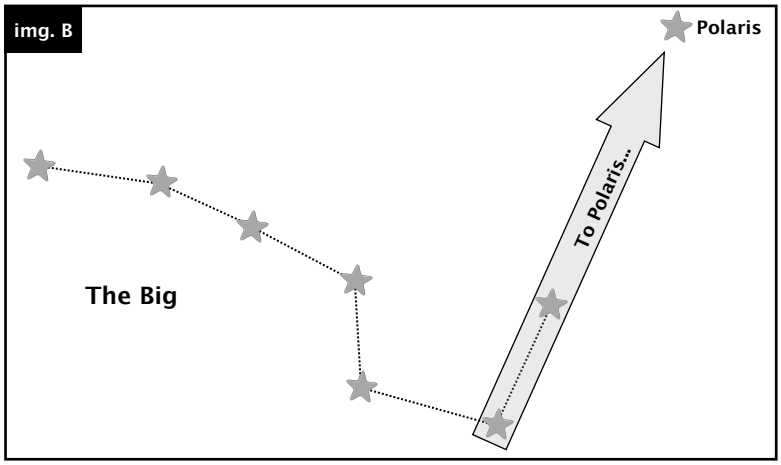
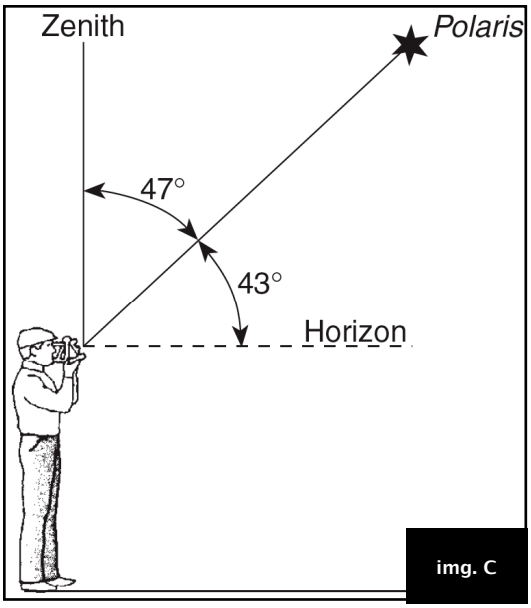
How to Determine your Latitude?

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°. 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° 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

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Latitude/Polaris Practice

1. What is the altitude of Polaris here in Mamaroneck (approx. 42°N)?
   _____
2. What happens to the altitude of Polaris as you move north in the northern hemisphere?
   _____
3. What happens to the altitude of Polaris as you move south in the northern hemisphere?
   _____
4. What happens to the altitude of Polaris as you move due west from Mamaroneck to Chicago?
   _____
5. If the altitude of Polaris in Mamaroneck is 42° tonight, what will it's altitude be tomorrow night? _____
6. How does Polaris appear to change position during the night?
   _____
7. How do stars near Polaris appear to change position during the night?
   _____
8. What is the altitude of Polaris at the North Pole? _____
9. What is the altitude of Polaris at the equator? _____
10. If you cannot see Polaris on a clear night, state something concerning your position on the Earth's surface? _____
11. If you are facing Polaris, which compass direction is at your back? _____
12. If you are facing Polaris, which compass direction is to your left?
    _____
13. Where on Earth's surface is gravity the strongest?
    _____
14. Where on Earth's surface is your weight the maximum?
    _____
15. As you move north in the northern hemisphere, what happens to your weight? _____

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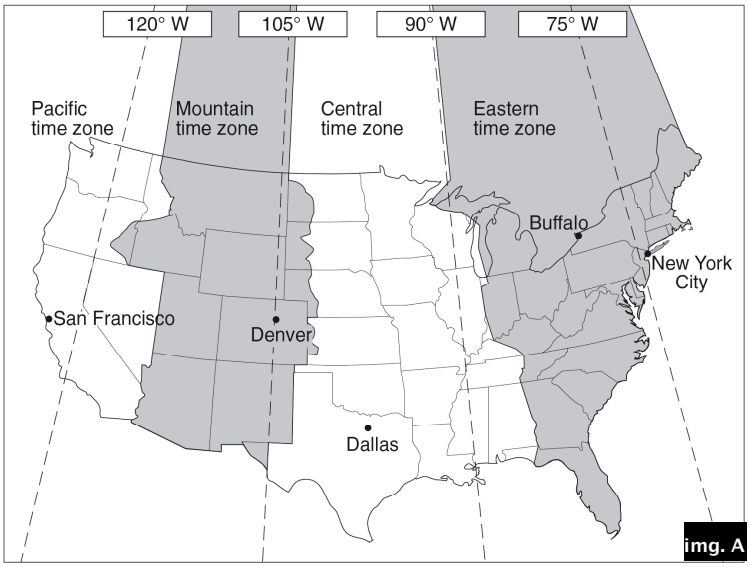
16.As you move north in the northern hemisphere, what happens to the pull of gravity?

_____

17.Where is the altitude of Polaris the maximum?

_____



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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°. If it takes us about 24 hours to spin 360°, we know that we are spinning at a rate of 15°/hour. Because of this, locations on Earth that are 15° 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 it's 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 Primer Meridian by 15°.

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°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 x 15 ° = 60°. Since your time is less, you are west.
Your longitude is 60° W.

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Longitude/Time Zones Practice

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°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°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°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°E longitude. What time is it where you are? _____

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