LAB C - GEOGRAPHIC GRID AND TIME

Introduction

In this lab the student will learn to determine latitude and longitude, to plot the location of various places on a geographic grid, and to calculate the difference in time between various locations on the globe.

Materials needed: atlas, pencil and calculator

Part I. Geographic Grid - Latitude and Longitude

Latitude is distance measured in degrees **N**orth or **S**outh of the Equator. Lines connecting points of equal latitude are termed *parallels*. The horizontal lines on a globe, each parallel to the others, represents one axis of our earthly grid system. The **Equator** is the base parallel and assigned a **value of 0°**. All other parallels are assigned some value, up to 90°, North or South of the Equator.
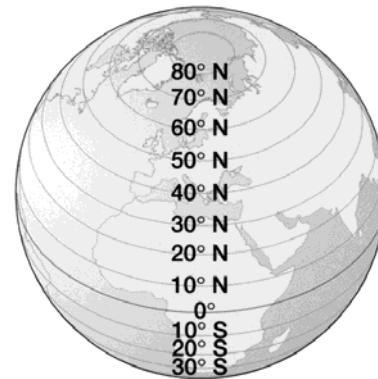
Longitude is distance measured in degrees **E**ast or **W**est of the Prime Meridian. Lines connecting points of equal longitude are termed *meridians*. The vertical lines on a globe represent a second axis on our earthly grid system. The **Prime Meridian**, which passes through **Greenwich, England**, is the base meridian and assigned a **value of 0°**. All meridians, except the Prime Meridian and the **International Date Line (180°)** are assigned a value East or West of the Prime Meridian.
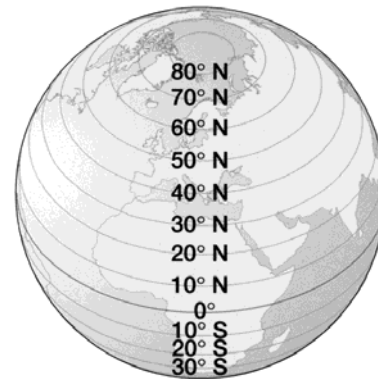
Any spot on the Earth's surface can be identified with a set of coordinates based on latitude and longitude. In Figure C-1, **Paris**, France is located **48° N**orth of the Equator and **2° E**ast of the Prime Meridian.
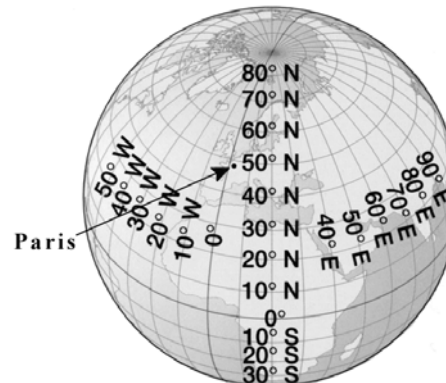
Figure C-1: Latitude and Longitude

A. Answer the following questions using Figure C-2: The Geographic Grid.

    1. Mark in the values of all of the unlabelled parallels and meridians.
    2. What is the **interval** between parallels on this grid? _____
    3. What is the **interval** between meridians on this grid?_____
    4. Are these intervals standard for all world maps? _____
    5. Why isn't the 180th meridian labeled **E**ast or **W**est? _____

    _____

Figure C-2: The Geographic Grid
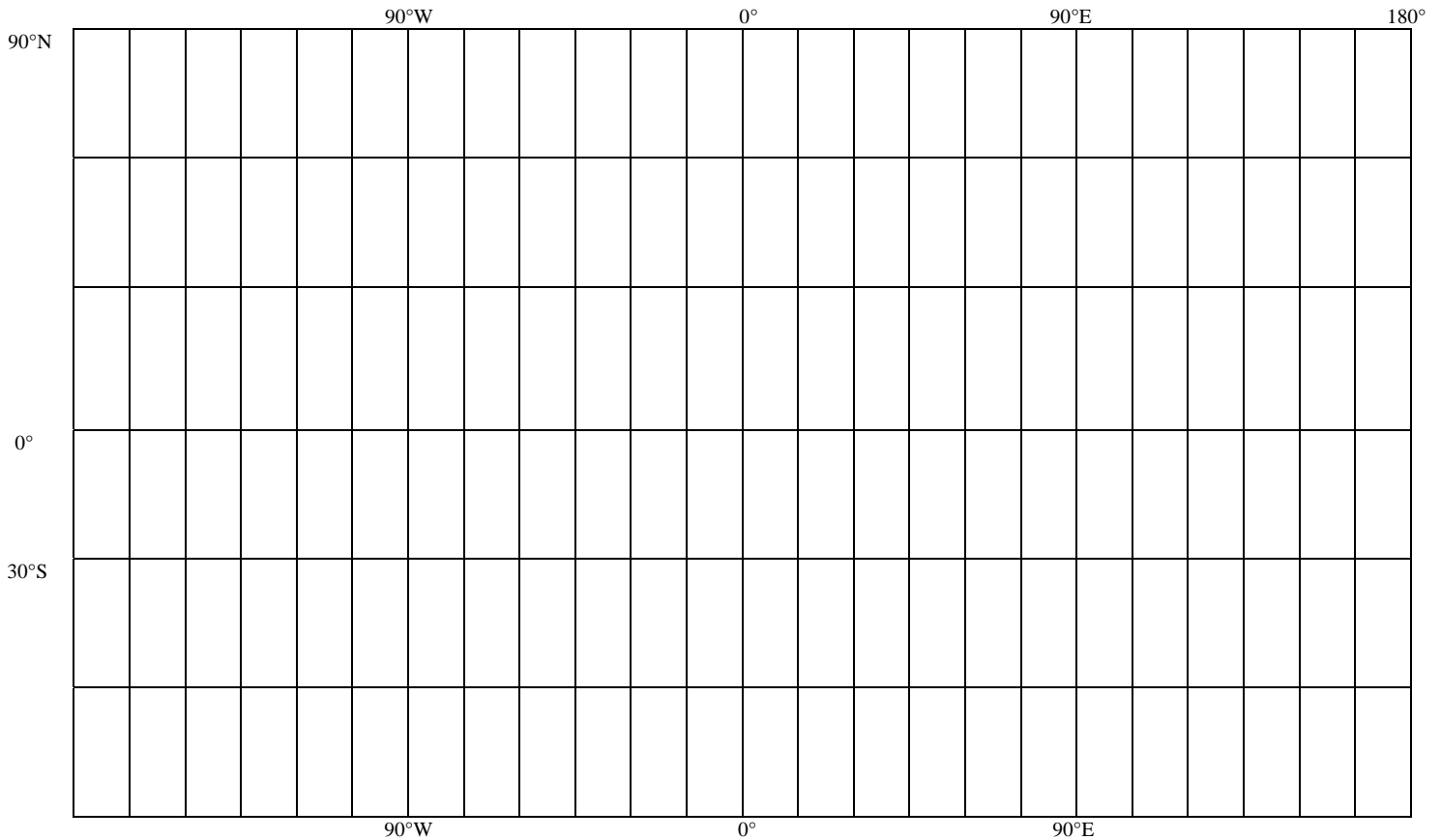
B. Using Figure C-2 - The Geographic Grid (above), draw in and label the following parallels and meridians: (Hint: see page 12 of your textbook.)

Tropic of Cancer   Tropic of Capricorn
Arctic Circle   Antarctic Circle
Prime Meridian   International Date Line (IDL)
Equator

C. Using an atlas, determine the latitude and longitude of the following cities. Give latitude & longitude to the **nearest degree**.

CITIES	LATITUDE	LONGITUDE
1. Tokyo, Japan	_____	_____
2. Beijing, China	_____	_____
3. Los Angeles, CA, U.S.A.	_____	_____
4. Johannesburg, South Africa	_____	_____
5. Honolulu, HI, U.S.A.	_____	_____
6. Melbourne, Australia	_____	_____
7. New York, NY, U.S.A.	_____	_____
8. Ho Chi Minh City, Vietnam	_____	_____
9. Phoenix, AZ, U.S.A.	_____	_____

10. **Plot each location on Figure C-2: The Geographic Grid**

D. Using an atlas or available wall maps, answer the following questions:

1. Name the three South American countries located along the Equator.

2. Name at least four Asian countries located along the Tropic of Cancer?

3. Name the four South American countries located along the Tropic of Capricorn.

4. Identify the three European countries located along the Prime Meridian.

5. What are the five African countries that the Prime Meridian passes through?

6. Through which two continents does the 180th meridian pass?   Circle two.
     Africa, Antarctica, Asia, Australia, Europe, North America, South America

7. List three countries through which the 180th meridian passes.

E. Name the countries at the following coordinates:

1. 60° N, 100° W	_____	7. 18° S, 45° E	_____
2. 30° N, 30° E	_____	8. 23° N, 75° E	_____
3. 63° N, 15° E	_____	9. 30° S, 30° E	_____
4. 0° , 32° E	_____	10. 25° S, 135° E	_____
5. 10° S, 75° W	_____	11. 43° N, 11° E	_____
6. 45° N, 105° E	_____	12. 10° N, 84° W	_____

Part II. Time and Time Zones

The daily rotation of the Earth on its axis causes the Sun to appear to pass from east to west over the 360° surface of the Earth in one 24 hour period. Therefore, in one hour, the Sun appears to pass over 1/24th of this 360° surface, or 15 degrees of longitude.

With the development of aircraft, travel between cities and various parts of the globe has become much faster. It is now possible to conduct business in person on two continents in one day and, with telecommunications, to conduct business around the world from one's office. In order to accomplish any of the above, one must know how to calculate the difference in time between two locations. To assist in this task, the world is divided into 24 one-hour time zones. Agreement was reached on this zone system by the United States and leading European nations during an 1884 conference held in Washington, DC. The baseline for this system was established at the Prime Meridian, an imaginary line designated 0 degrees that passes through the observatory at Greenwich, England. At a location 180 degrees distant from the Prime Meridian, the International Date Line was established, an imaginary line that determines where one 24 hour day ends and another begins.

Essentially, as one **moves east** from the Prime Meridian (or any meridian), **time is advanced** one hour for each 15 degrees of longitude. **Moving west, time is subtracted** an equal amount. If one crosses the International Date Line from the **east longitudes to the west longitudes**, the date becomes one day earlier (**subtract one day**). Crossing the International Date Line from the **west longitudes to the east longitudes**, the date becomes one day later (**add one day**). Using this information, answer the following questions.

Show all work for each problem.

A. Calculate the time difference (rounded off in hours) between Greenwich, England and Portland, Maine (longitudinal data needs to be obtained from an atlas).

B. Calculate the time difference (rounded off in hours) between Ho Chi Minh City (Saigon), Vietnam and Melbourne, Australia.

C. Calculate the time difference between Los Angeles, California and Tokyo, Japan. If it is 2 p.m. Tuesday, February 1 in Los Angeles, what time/day/date is it in Tokyo?

D. All the manual calculations performed in problems A-C can be avoided by using a time zone map such as that found on **page 84** of Goode's World Atlas **22ⁿᵈ edition** or **page 22** of your textbook (**McKnight, 10ᵗʰ edition**). Using this map, check answers for questions A, B and C. Does the atlas support the calculations?   Now, answer the following questions with this map.

1. Why does the continental United States have four time zones?

2. It is Tuesday, July 25 at 4:30 p.m. and you sail across the International Dateline from east to west. Just after passing the dateline, what would be the day, date, and time?

3. Notice that the International Date Line is not a straight line. Why the deviation?

E. Assume a business person in New York City is scheduled to fly to Tokyo, Japan for a major conference. The travel agent books a direct flight leaving JFK International Airport at 2 p.m. Wednesday. If the flight time is 15 hours, what time and day will this person arrive in Tokyo?