



Wherever You Go, There You Are!

Use with page 10.

The earth has a grid system for locating the addresses of cities around the world. The "streets" running east-west are called *lines of latitude*, or *parallels*, and the "streets" running north-south are called *lines of longitude*, or *meridians*. These are imaginary lines.

The zero line for latitudes is the *equator*, which circles the earth midway between the poles. Imaginary lines run parallel to the equator both north and south until they reach the poles, which are 90 degrees north (North Pole) and 90 degrees south (South Pole). For better accuracy, each degree is divided into 60 minutes. Honolulu, Hawaii, is located at 21 degrees, 19 minutes north, (21°.19'N). The N tells us it is in the Northern Hemisphere.

The zero line for the north/south longitude lines is the *prime meridian*, chosen because it runs from the North Pole to the South Pole through the Royal Observatory in Greenwich, England. The longitude lines also continue in degrees east and west until they reach the midway point on the other side of the earth opposite the prime meridian, which is 180 degrees and is called the *International Date Line*. These lines are not parallel because they all run through the North and South Poles. Honolulu, Hawaii, is located at 157 degrees and 50 minutes west (157°.50'W). The W tells us it is in the Western Hemisphere. The complete address for Honolulu is 21°.19'N, 157°.50'W. Notice that the latitude is written first and the longitude last. These numbers are called the coordinates.

In the following activities we will only use measurements of degrees, not minutes.

Use the map on page 10 to find the approximate coordinates for these cities:

1. Tokyo, Japan _____
2. Los Angeles, CA _____
3. Bombay, India _____
4. Mexico City, Mexico _____
5. Quito, Ecuador _____
6. London, England _____
7. Paris, France _____
8. Rio de Janeiro, Brazil _____
9. Bangkok, Thailand _____
10. Sydney, Australia _____

What cities are located at these coordinates?

1. 6°S, 106°E _____
2. 33°S, 18°E _____
3. 1°S, 36°E _____
4. 64°N, 21°W _____
5. 53°S, 70°W _____
6. 30°N, 31°E _____
7. 40°N, 3°W _____
8. 49°N, 123°W _____
9. 55°N, 37°E _____
10. 41°S, 174°E _____

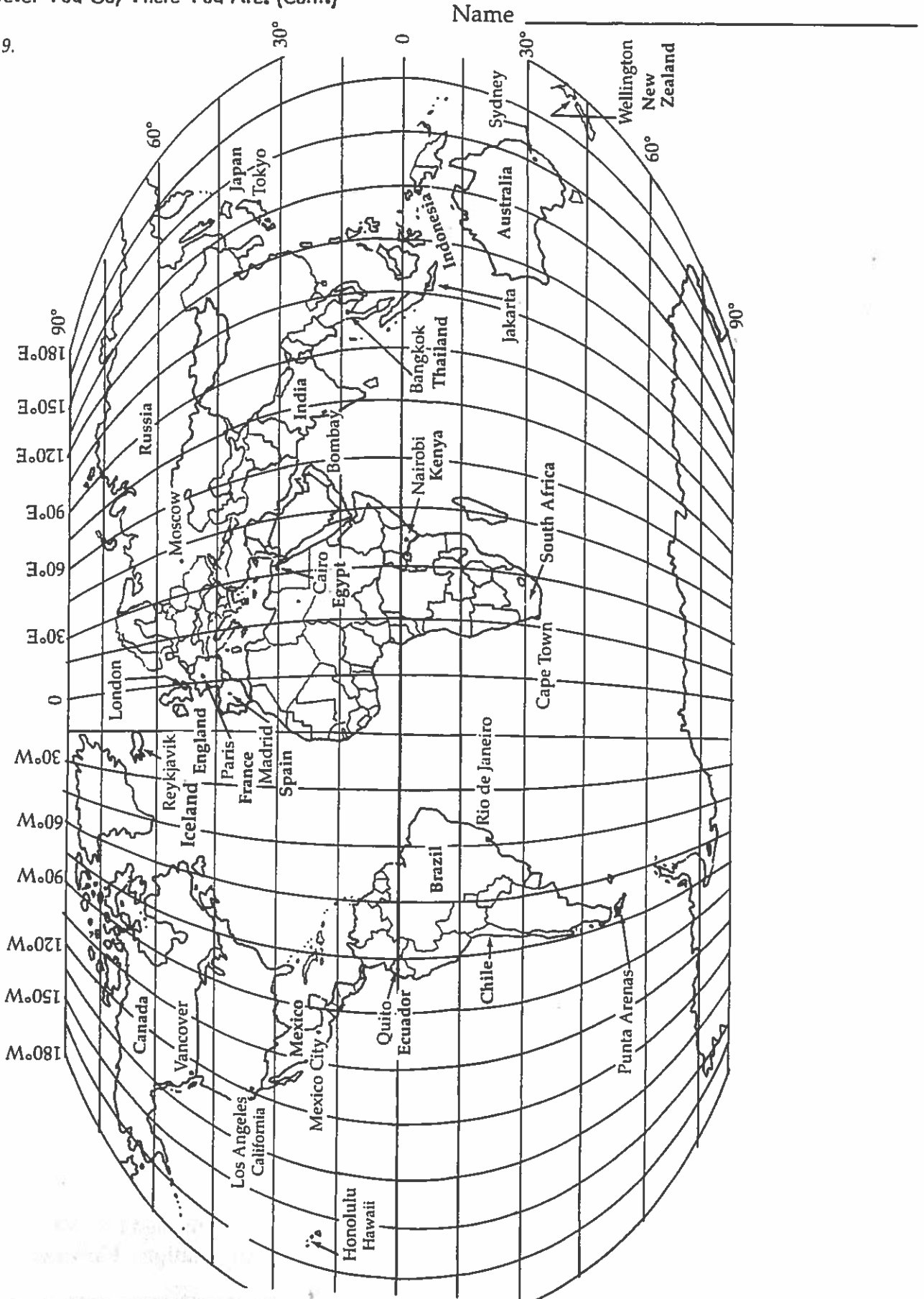
Challenges

- Who invented the grid system of latitude and longitude?
- There are 360 degrees of latitude around the earth. Each degree is divided into 60 minutes. Each minute is further divided into 60 seconds for extremely accurate locations. How many miles are in a degree? a minute? a second?



Wherever You Go, There You Are! (Cont.)

Use with page 9.

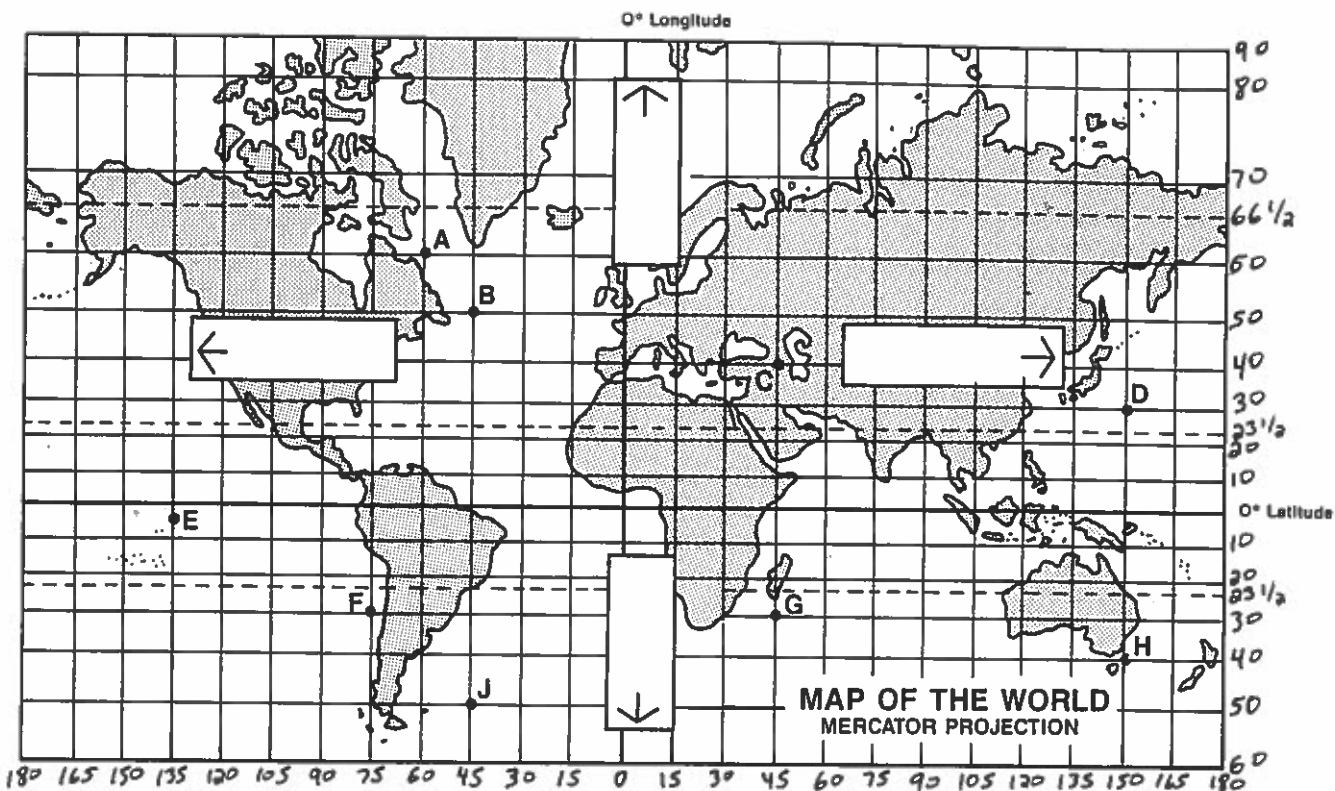


Name _____

Name _____

Date _____

LOCATING PLACES WITH LATITUDE AND LONGITUDE



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1. Write the latitude and the longitude of the following places shown on the map.

A _____ B _____ D _____
 E _____ F _____ J _____

2. How many degrees of latitude are there between:

A and B? _____ B and J? _____
 C and G? _____ D and H? _____

3. How many degrees of longitude are there between:

G and F? _____ G and H? _____
 E and F? _____ B and C? _____

4. Challenge: Start at Point A on the map.

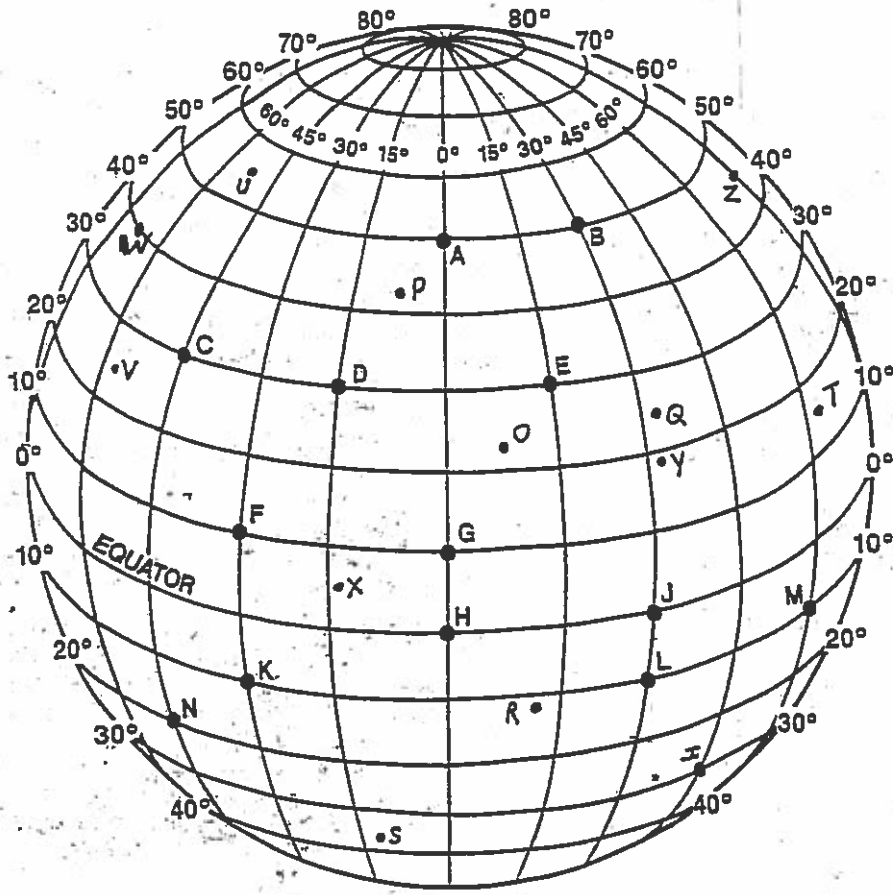
- a. Go south 30°. Write a *w* at that point.
 - b. Go east 45°. Write an *x* at that point.
 - c. Go north 40°. Write a *y* at that point.
 - d. Go west 30°. Write a *z* at that point.
- What is your latitude and longitude at *z*?

5. Suppose a ship is sinking at sea. The radar operator sends a message: "We need help. Sinking fast. Location is 30°S - 45°W." Draw a small ship at that location.

6. Color the following lines:

- Prime Meridian - Green
- Equator - Red
- Tropic of Cancer - Yellow (23 1/2° N)
- Tropic of Capricorn - Blue (23 1/2° S)
- Arctic Circle - Orange (66 1/2° N)

USING LATITUDE AND LONGITUDE



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A
B
C
D
E
F
G
H
I
J
K
L
M

N
O
P
Q
R
S
T
U
V
W
X
Y
Z



What Time Is It?

Use with page 14.

If you lived in San Francisco and at 9:00 P.M. you called your grandma in New York City, why might she sound sleepy? Where are you likely to be if she called you at 8:00 A.M. from New York City? You might have guessed that you would catch each other in bed because there is a 3-hour time difference between San Francisco and New York City. When it is 9:00 P.M. in San Francisco, what time is it in New York City?

_____ When it is 8:00 A.M. in New York City, what time is it in San Francisco? _____

Have you ever wondered who decided what time it would be in each place and how the dividing lines between time zones were selected? Time zones are connected to the earth's rotation around the sun. Whenever the sun is directly overhead, it should be 12:00 noon. The earth completes one rotation every 24 hours (1 day). Each rotation makes a circle which is

360 degrees. If we divide the distance the earth rotates (360 degrees) by the amount of time it takes (24 hours), we can find out how far the earth rotates each hour.

$(360 \text{ degrees} \div 24 \text{ hours} = 15 \text{ degrees per hour})$

Therefore, the earth is divided into 24 15-degree time zones. Since the longitude lines begin in Greenwich, England, time begins there as well. It is called Greenwich Mean Time (GMT). Since the earth rotates from east to west, subtract 1 hour for each 15 degrees going west, and add 1 hour for each 15 degrees going east. When you reach 180 degrees west or east, you've reached the International Date Line. The east is 12 hours ahead and the west is 12 hours behind, so there is a difference of 24 hours or 1 day. If you cross the line from west to east, you gain a day; but if you cross from east to west, you lose a day.

If it were 12:00 noon in Greenwich, England, what time would it be in each of these cities? Use the map on the next page to help answer. Notice that all the lines do not follow the longitude lines exactly, but rather follow political boundaries.

What time is it?

Dallas, Texas, USA _____

Mexico City, Mexico _____

Moscow, Russia _____

Oslo, Norway _____

Tokyo, Japan _____

Honolulu, Hawaii _____

Paris, France _____

Nairobi, Kenya _____

Challenges

• If you left Tokyo on December 31, 1996 and traveled east to San Francisco on the same date, what would be the date when you arrived? If on the same day you left San Francisco and traveled the shortest route to Moscow, what would the date be in Moscow? Would the date be different if you traveled the long route from San Francisco to Moscow?

• Write your own problem to try to stump your friends.



What Time Is It?(Cont.)

time zones

Name _____

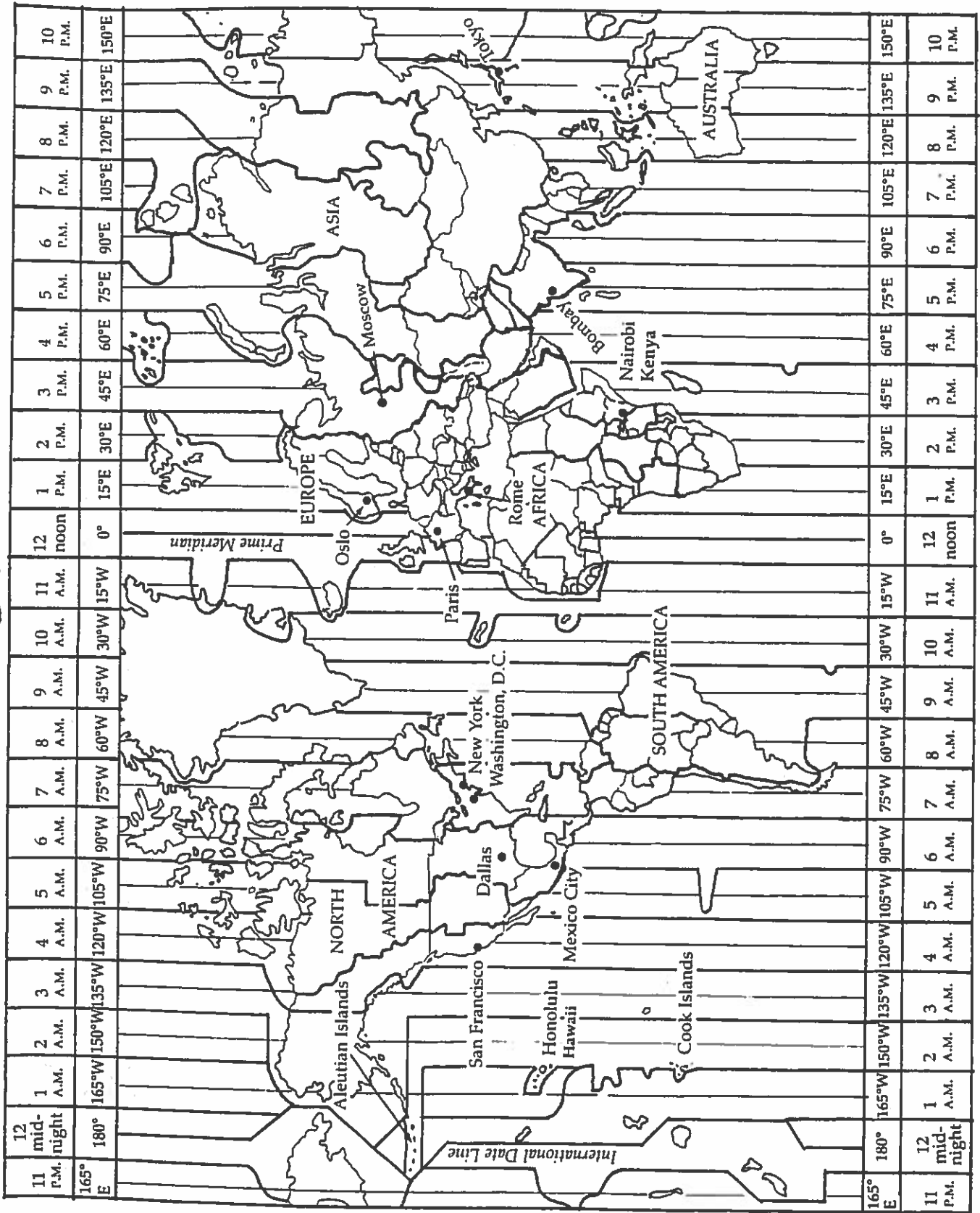
Use with page 13.

World Time Zones

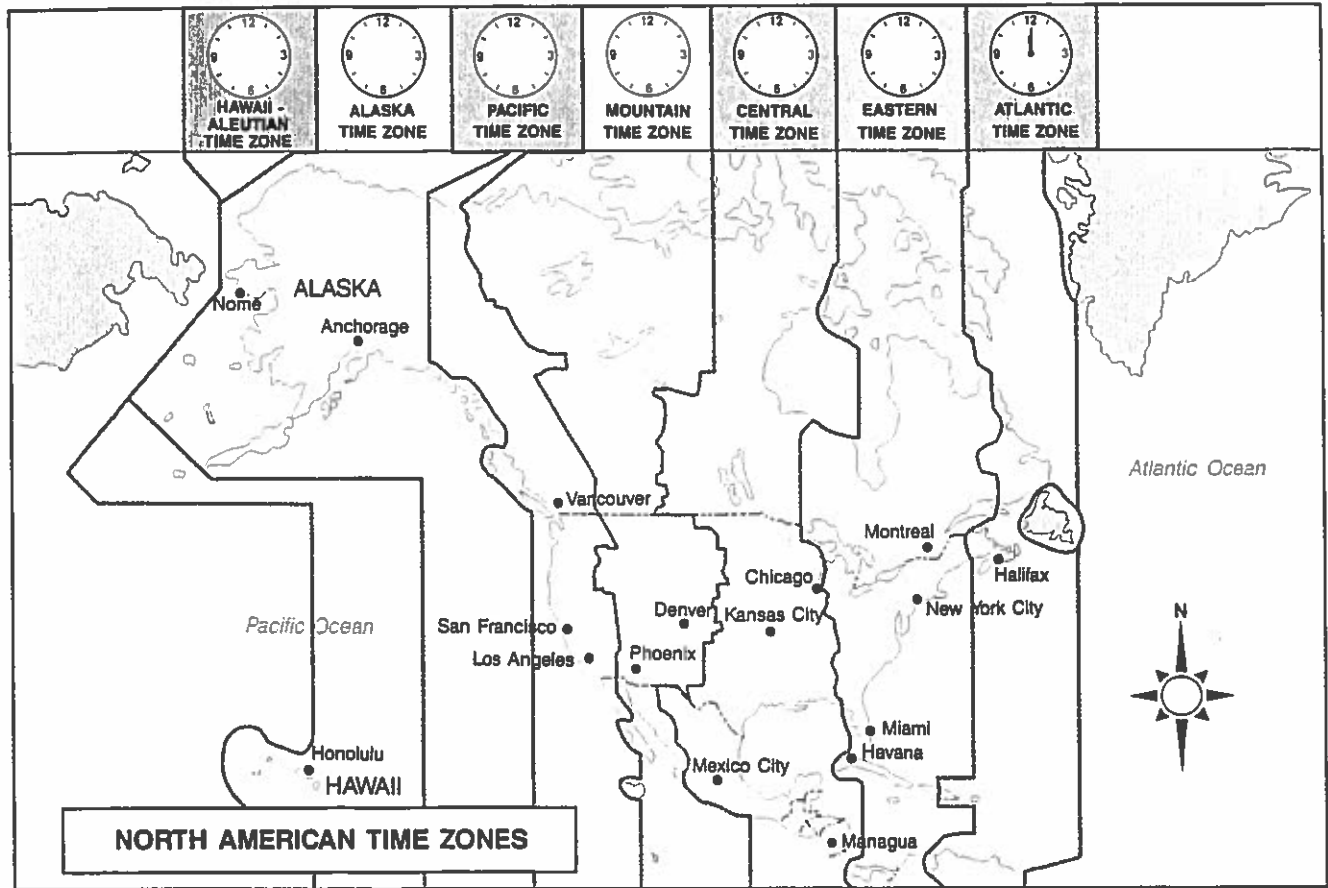
Wieviel uhr ist es?

Quelle heure est-il?

Que hora es?



Reading a Time Zone Map

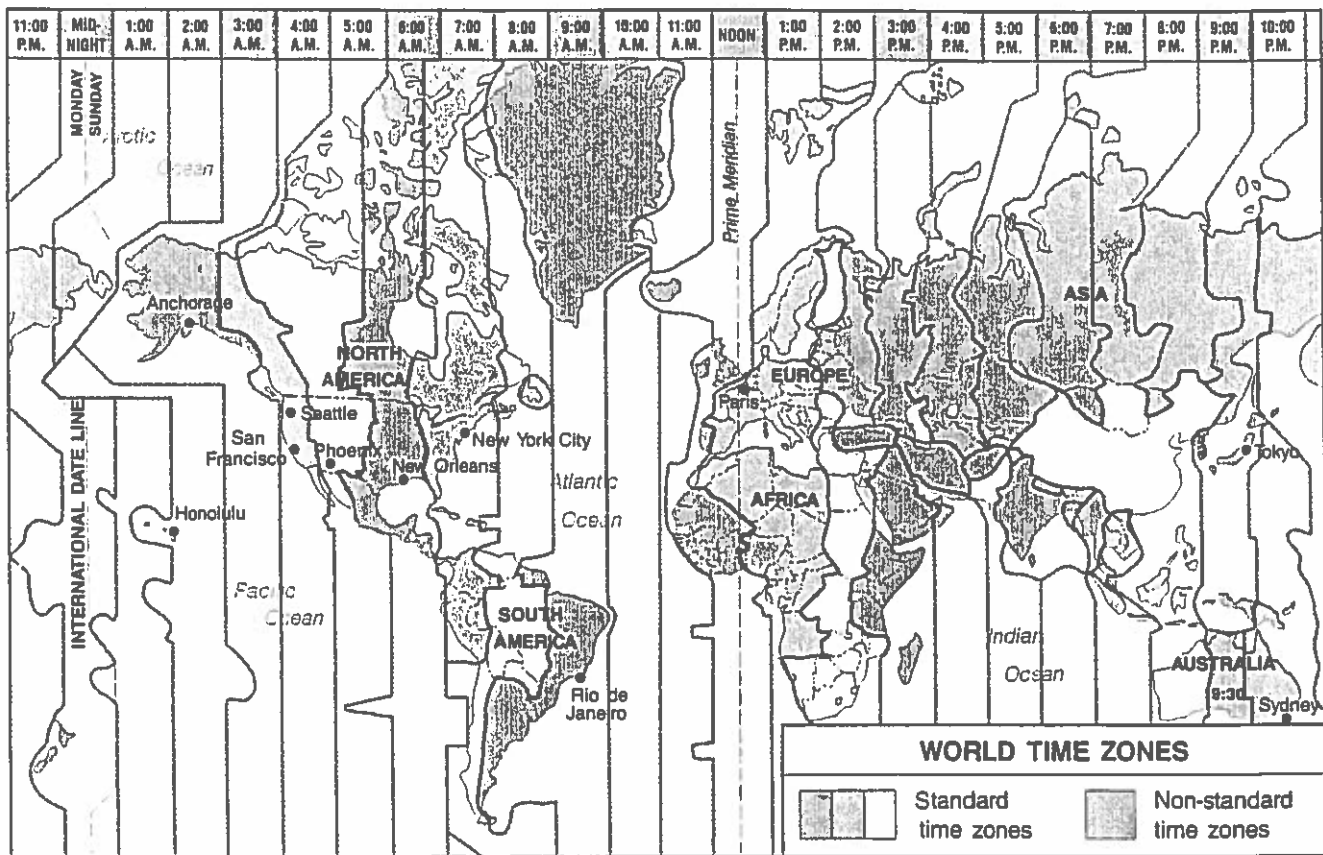


- Lightly color the time zones. Match the colors at the top of the map. Follow the lines along state boundaries or physical features.
- It is 12:00 noon in the Atlantic Time Zone. Write the correct times on the clocks for the other time zones. Remember, the time is one hour earlier as you travel west.
- If it is 8:00 A.M. in Los Angeles, what time is it in each city listed below?

a. Vancouver	_____	e. Miami	_____
b. Kansas City	_____	f. Denver	_____
c. Honolulu	_____	g. New York City	_____
d. Anchorage	_____	h. Halifax	_____
- The World Series is at 6:00 P.M. in New York City. What time is it in each city listed below?

a. Montreal	_____	d. Phoenix	_____
b. Mexico City	_____	e. San Francisco	_____
c. Nome	_____	f. Honolulu	_____

Mastering World Time Zones



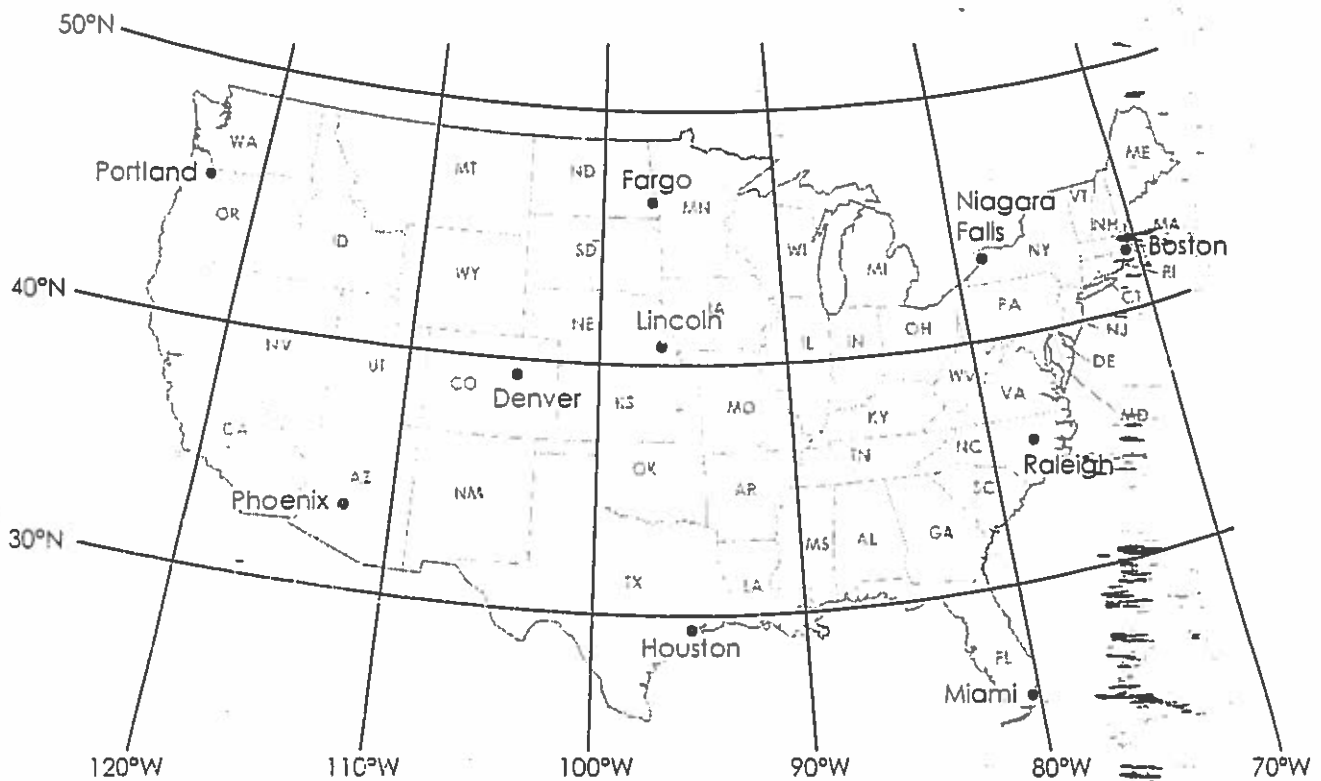
- Which continents have a large area without standard time? Look at the colors in the map key.

- How many time zones does each of these continents have?
a. Africa _____ b. South America _____
- If you go from Tokyo to Sydney, how many time zones do you cross?

- If you go from Seattle to Rio de Janeiro, how many time zones do you cross? _____
- If you go from Honolulu to New Orleans, how many time zones do you cross? _____
- It is 7:00 A.M. in Phoenix. What time is it in Paris? _____
- It is 3:00 P.M. in Rio de Janeiro. What time is it in San Francisco?

- Suppose you fly from Anchorage to New York City. Do you move your watch ahead or back? _____ How many hours? _____

Latitude and Longitude



1. latitude, longitude Phoenix, Arizona
2. latitude, longitude Raleigh, North Carolina
3. latitude, longitude Fargo, North Dakota
4. latitude, longitude Portland, Oregon
5. latitude, longitude Houston, Texas
6. latitude, longitude Niagara Falls, New York
7. latitude, longitude Miami, Florida