

NAME _____

SCORE _____

EXERCISE 1
GEOGRAPHY, SPACE AND PLACE

The Geographic Grid

The geographic grid is based on angular measurements from the center of the earth. Latitude measures the angular distance north and south of the plane of the earth's equator. Longitude measures the angular distance east and west of the prime meridian. Both longitude and latitude are measured in degrees (°), minutes (') and seconds (") of arc. Figure 1 shows the latitude and longitude coordinates of the earth in 10 degree intervals.

There are 60 minutes of arc in 1 degree. There are 60 seconds of arc in 1 minute of arc. One could therefore express the latitude and longitude of a place as $39^{\circ}50' 10''$ N, $77^{\circ}35' 15''$ W.

1. Using latitude and longitude coordinates, determine the location of the following places:

a) Toronto, Ontario (Canada) _____

b) Billings, Montana _____

c) Chicago, Illinois _____

d) London, England _____

e) Rome, Italy _____

f) Baghdad, Iraq _____

g) Beijing, China _____

2. Provide the name of the following places located at the given coordinates below:

a) 20° N, 75° W _____

b) 32° S, 116° E _____

c) 28° N, 87° E _____

d) 42° N, 88° W _____

The geographic grid uses circles of two different types, great circles and small circles. All great circles pass through the geographic center of the earth. All meridians, the equator, and the circle of illumination are great circles. All parallels other than the equator are small circles. The direction of any grid lines (meridians and parallels) can be determined as either a azimuth or bearing. Azimuths are read as a clockwise rotation in degrees ranging from 0° at north, to 90° at east, to 180° at south, to 270° at west, and to 360° back at north, Azimuths only give a direction such as 45° . Bearings are read as quadrants from either the north or south poles. Hence east is either 90° from north or south, west is also 90° from north or south. A bearing shows the direction one is traveling hence an azimuth of 45° is read as a bearing of N 45° E. Figure 1.2 shows the relationship between azimuths and bearings.

3. Convert the values below in degrees and minutes.

Bearing	Azimuth
	$20^{\circ} 10'$
S $50^{\circ} 20'$ E	
	$265^{\circ} 30'$
N $20^{\circ} 20'$ W	

Longitudinal and Latitudinal distances vary as a result of trying to fit a true Cartesian grid onto a spherical surface such as the earth's surface. The grid is constant in a north-south direction, but varies in an east-west direction. The data below shows how the grid values vary rounded off to the nearest mile.

1 of longitude at the equator	= 69 miles
1 of longitude at the 30th parallel	= 60 miles
1 of longitude at the 60th parallel	= 35 miles
1 of longitude at the 90th parallel	= 0 miles
1 of latitude along any meridian	= 69 miles

4. Determine by calculation the angular and linear distances between the following places:

From	To	Angular	Linear
Quito, Ecuador 0° S, 78° W	Macapa, Brazil 0° N, 51° W		
Cairo, Egypt 30° N, 31° E	Shiraz, Iran 30° N, 52° E		
Seward, Alaska 60° N, 149° W	St. Petersburg, Russia 60° N, 30° E		
Hamhung, North Korea 39° N, 127° E	Ankara, Turkey 39° N, 32° E		
Detroit, Michigan 42° N, 83° W	Morristown, Tennessee 36° N, 83° W		

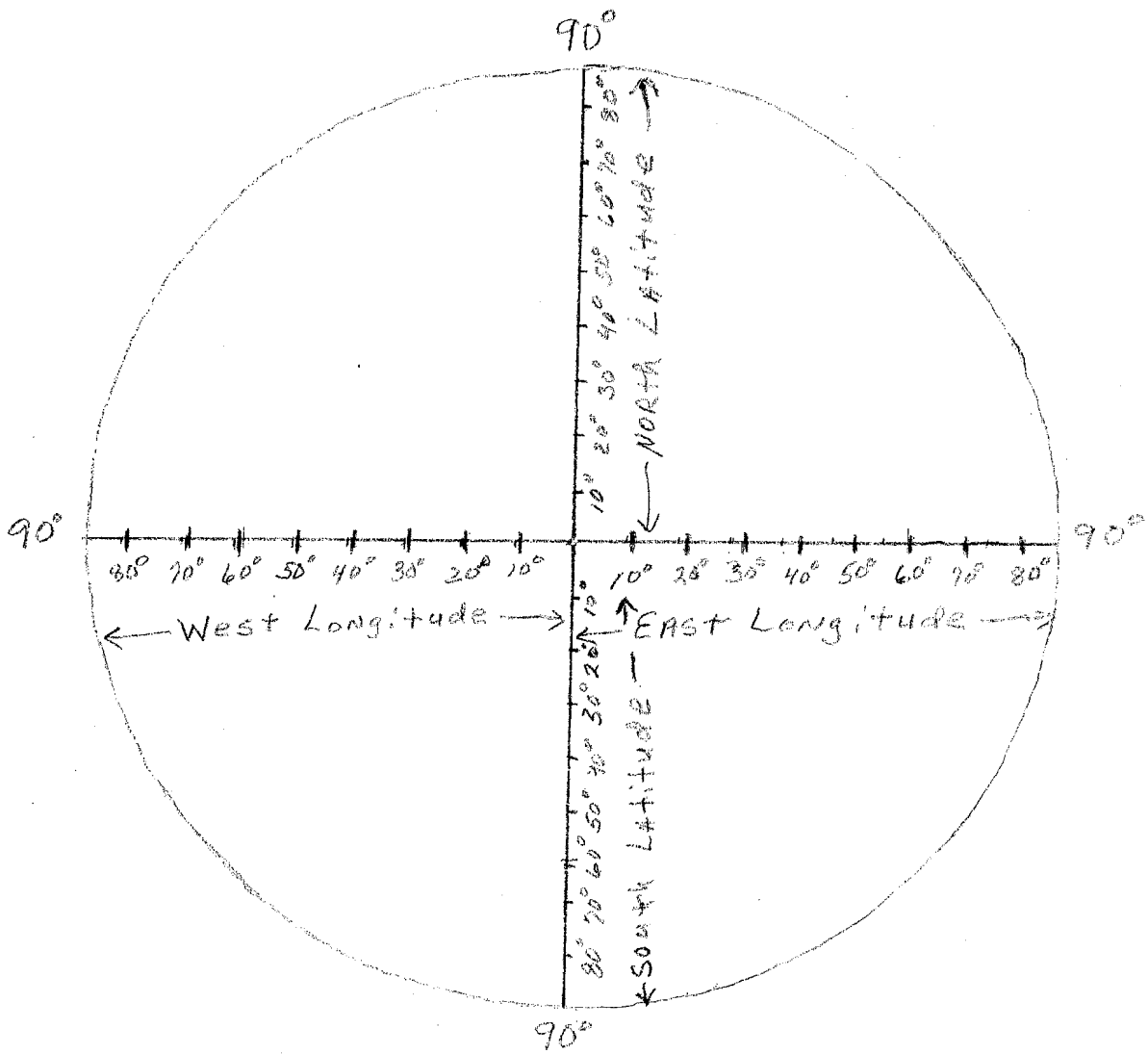
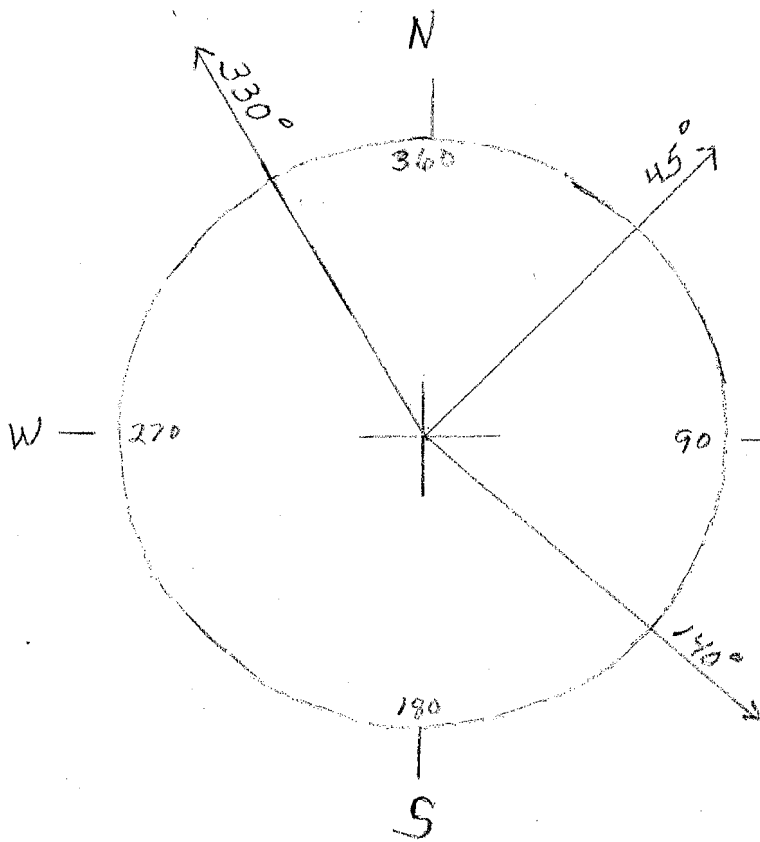
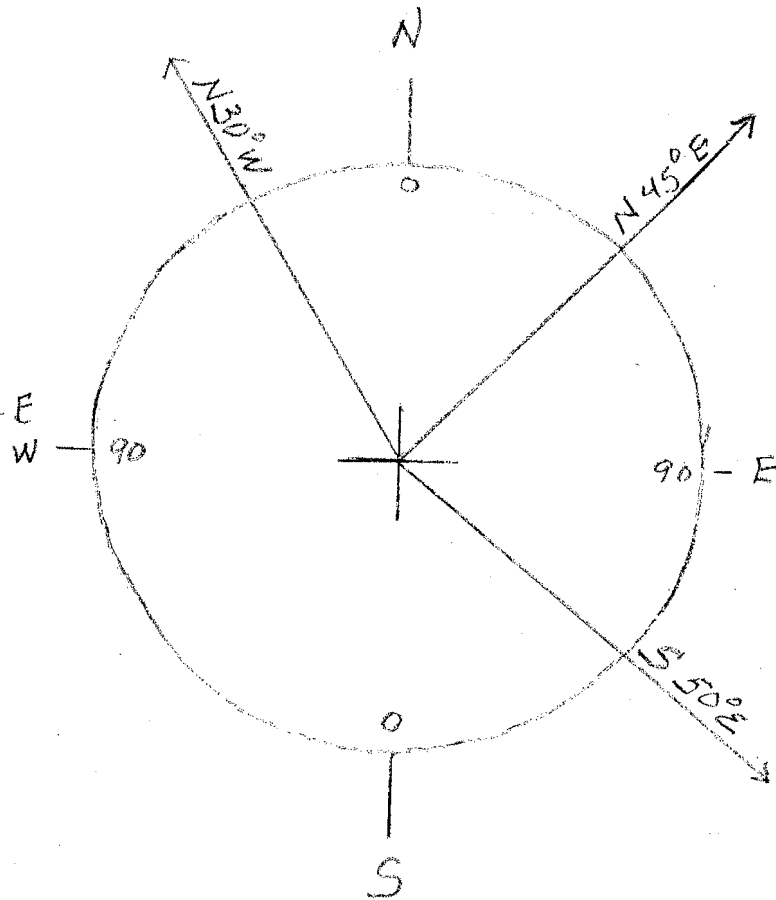


Figure 1



Azimuths



Bearings

Figure 1.2