

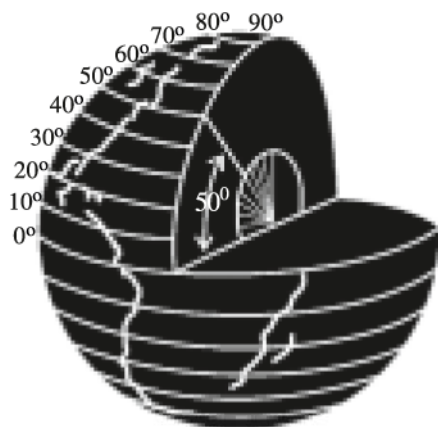
Man studies the earth as a home of mankind. Practical work is at the base of the subject matter of Geography. Fieldwork and the laboratory work are the soul of practical work. In fieldwork, the area has to be observed in person and collect necessary information for actual study. Authentic literature and Reports are consulted. Inclination to research work and capacity are necessary for a researcher. With this information and with modern cartographic techniques, a geographical report of an area along with the maps and diagrams is prepared in the laboratory. Some basic information is necessary for preparing a map of a specific geographical region. In this chapter we shall know as to what information is needed beforehand in map making.

Parallels of Latitudes and Meridians or Longitudes

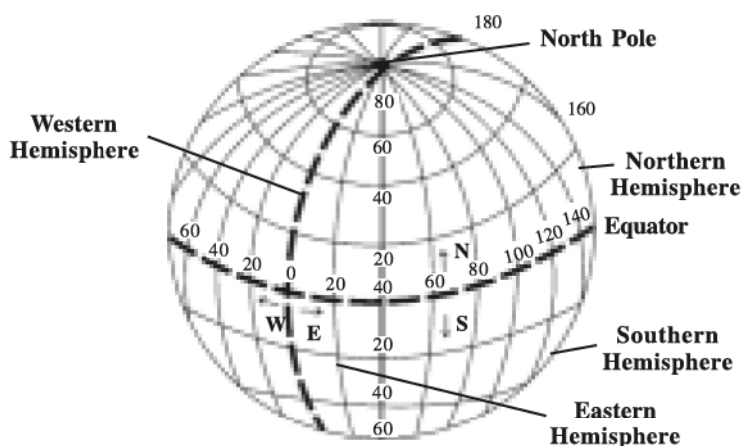
Parallels of latitudes : The earth completes one full round on its axis in twenty four hours. This is called the **daily motion** of the earth. Any place on the surface of the earth, e.g. Ahmedabad, completes one full round in twenty four hours and forms an imaginary circle. This circle is known as **parallel of Latitude**. Equator which is zero degree latitude is the main and the largest latitude. Other important latitudes are Tropic of Cancer (23.5° North latitude), Tropic of Capricorn (23.5° South Latitude), Arctic Circle (66.5° North latitude), Antarctic Circle (66.5° South latitude), North Pole (90° North) and South Pole (90° South).

Equator is the largest latitude and divides the equator into two equal parts. Latitudes are parallel to each other. The distance between two consecutive latitudes on the surface is 111 km. There are 90 latitudes to the north of equator and 90 to the south.

If any place on the surface of the earth is joined by a straight line with the centre of the earth, then the angle formed by this straight line and the imaginary equator is the latitude of this place. A circle joining all places situated at 45° north of equator is called 45° North latitude.



**16.1 Measurement of latitude
from angular distance**



**16.2 Latitudes and Longitudes
on the Globe**

Meridians of Longitudes : An imaginary half circle passing through both the poles and forming an arc of earth's circumference is called Longitude. Equator is a full circle which has 360 degrees. If a semi-circle is drawn passing through each degree joining North Pole and South Pole, then **every semi-circle**

is called a Longitude. Main longitude is called zero degree or Greenwich Longitude. It shows how many degrees a place is located to the east or to the west of main longitude. There are 180 longitudes to the east and 180 longitudes to the west of Greenwich Longitude, thus making it 360 longitudes totally. As we go towards the poles from the equator, the distance between longitudes decreases.

If any place on the surface of the earth is connected to earth's axis by a straight line, it forms an angle with the axis, and that angle is called the Longitude of that place.

Latitudes and Longitudes intersect each other and the point where they intersect is the geographical location of that place. Delhi is located at 28° 38' North Latitudes and 77° 12' East Longitudes.

Time

The earth rotates from west to east on its imaginary axis. It takes 24 hours to complete one rotation. There are 360 imaginary longitudes on the earth. Thus, the earth crosses 360 longitudes in 24 hours, 15 longitudes ($360/24 = 15^\circ$) in 1 hour and 1 longitude in 4 minutes. Thus, the time measurement has been possible due to the daily movement of the earth.

Local Time :

Due to the daily movement of the earth, every place on the surface comes in front of the sun once in every 24 hours. So the sun will shine overhead on all places on the same longitude, so all these places will have a mid-day simultaneously, and that time is 12-00 noon. This is the '**Local Time**' for all places on that longitude. All longitudes come in front of the sun alternatively, so local time of all of them is different. A longitude of a city can be known if its local time is given.

Standard Time :

Places on different longitudes have different local times. If villages, cities, mega cities on different longitudes act according to their own local time, then severe problems will be created in road, railway and air travel, trade activities, telecommunication etc. To overcome this problem, every country decides a common time for the entire country from the local time of a longitude which is centrally located in that country. This time is called '**Standard Time**' of the country and that longitude is called **Standard Meridian**.

The Standard Time of India is decided from the 82.5° longitude which passes through the middle of the country though there is no big city of India located on this longitude. Allahabad lies to its west and Varanasi to the east of this longitude.

Indian Standard Time :

Due to the longitudinal range of India, there is a difference of two hours in the local times between Arunachal Pradesh and Gujarat (Kachchh). Arunachal Pradesh is situated to the east of Gujarat, so sunrise will be earlier there. There is difference of 30 longitudes between Gujarat (Kachchh) and Arunachal Pradesh. So there is a difference of two hours in the local times, because one longitude on the earth passes in front of the sun within 4 minutes. ($30^\circ \times 4 \text{ minutes} = 120 \text{ minutes}$). So when it is sunrise in Arunachal Pradesh, it is still night time in Kachchh. That is, compared to Kachchh, the sunrise in the North Eastern States is earlier by two hours. The local time of 82.5° east longitude is considered as the Indian Standard Time (I.S.T.), which is ahead of Greenwich by 5 hours 30 minutes. This is the reason why Dibrugarh, Imphal and Lohit in the east, Bhuj in the west, Bhopal in Central India

and Chennai in south show the same time in the watch. It should be remembered that the Standard Meridian longitude of India passes by Mirzapur district of Uttar Pradesh (Kharavada village, $82^{\circ} 30'$ east longitude) and Champa (Chhattisgarh, $82^{\circ} 29'$ east longitude). It does not pass over Allahabad ($81^{\circ} 55'$ east longitude). The Local time of Greenwich (0°) in U.K. (United Kingdom) which is prime meridian, is taken as a base to decide the time for the whole world. The 180° longitude is known as **International Date Line**. While crossing this line, one day is either added or repeated according to the direction.

Countries like U.S.A., Canada, Russia etc. have more east-west span. If a standard time is decided from the central meridian for each of these countries, it will result in the difference of 3 to 4 hours in the local times of few cities. In Russia, this difference could be of 12 hours. So, in the countries with wider east-west distance, more than one **Time Zones** are decided. There are five time zones in U.S.A. and Canada, eleven in Russia, three each in Europe and Australia. The difference between every time zone is not more than 1 hour.

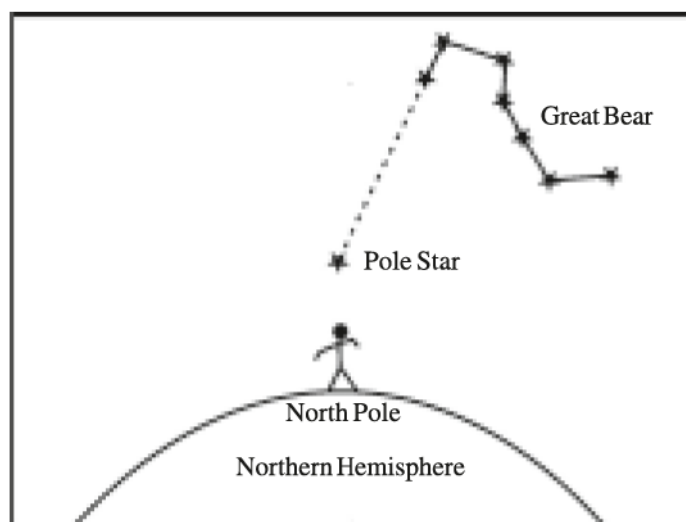
Directions :

Every day, the sun rises in the east. If we face the sun in the morning, west direction happens to be at our back, north to our left hand and south to our right hand. Direction is a relative term. The direction of any point or a place is expressed in relation to another point. Srinagar is situated to the north of Delhi and Kolkata is in the east of Mumbai.

If a map of the earth or a part of it is to be prepared, it is necessary to show north direction in the map. Direction in a map is shown by two ways : (1) By latitudes and longitudes and (2) By an arrow. While interpreting a map, if the north of the map is kept towards the North Pole, correct directions can be known. When the North Pole of the map and the North Pole of the earth are in one line, it is said that the map is oriented correctly.

North direction means the direction of North of the earth. There are some methods to know the North.

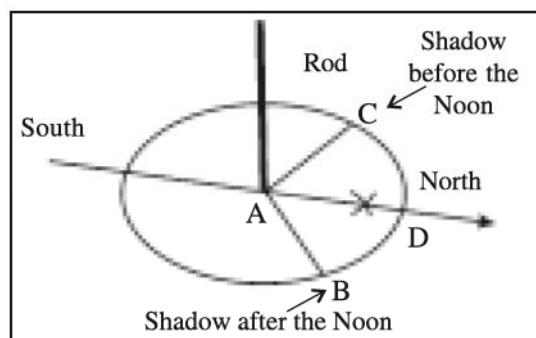
(1) With the help of Pole Star : This is a very easy and clear method of knowing the North. At night, a bright star is seen right above the North Pole. It is called North star or Pole Star.



16.3 To know Geographical North with the help of Pole Star

See the figure 16.3 attentively. Pole Star is shown at the bottom. Above it is a group of seven stars arranged in a peculiar shape. This is called Great Bear. The last two stars on the left side are called Pointers. If both the stars of the Pointer are joined by a line and is extended further, this line meets the Pole Star. This method is useful to ascertain the position of the Pole Star. The location of the Pole Star helps to know the North direction.

(2) With the help of a Rod or a Pencil : Keep a large paper on the ground. In its centre, keep a pointed stick or a pencil. Show the shadow of the rod at 11-00 by a line A. Take a radius equal to this line and draw an arc. After 12 at noon the shadow of the rod will touch on a point on the arc. Bisect the $\angle BAC$, formed from AB and AC lines. This bisector AD will show North direction.

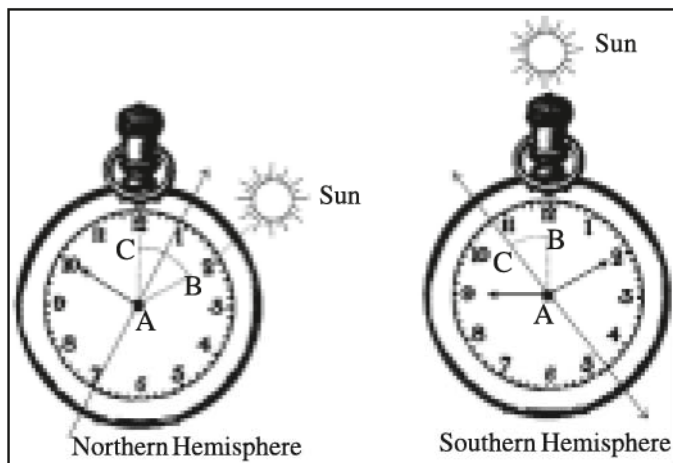


16.4 To know Geographical North through a rod

(3) Finding direction with the help of a watch :

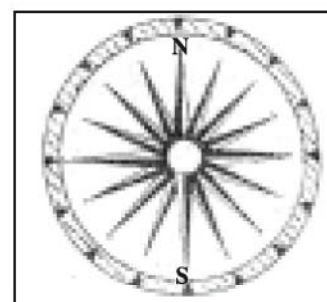
Set your watch according to the local time. Now put the watch on your palm in such a way that the shorter hour hand faces the sun. (Line AB) Draw a line touching the centre of the watch and the figure 12. Draw a bisector AD of the angle formed by lines AB and AC. When extended this line will show south direction in the northern hemisphere.

In southern hemisphere, draw a line AB connecting centre of the watch and the figure 12. Draw the bisector AD of the $\angle ABC$, formed by line AB and AC. This line will show North direction.



16.5 Finding North direction through a watch

(4) With the help of Magnetic Compass : As shown in the figure 16.6 the magnetic north of any place can be known by a compass. But there is a difference in the magnetic north and the geographical north of the earth. This is called Magnetic Declination. The North direction can be known by deducting the magnetic declination.



16.6 Finding North through Prismatic Compass

Modern techniques of map making

Information technology is a combined form of many techniques. It includes electronics, computer (hardware and software), telecommunication broadcasting, optic electronics etc. Use of information technology has added a new chapter in technology. Information technology has brought total changes in Medical diagnosis, health, transportation, teaching, map preparation, industries, agriculture and

in many other fields. Knowledge, information and telecommunication are more important which create them. With the arrival of Internet, the whole world has turned into a global village. Internet is the largest system in the world to-day. With micro computers and modems, any person by using internet facility can connect himself with the cyber space and can know latest information related to it. Cyber space is the world of electronic computers which is run by World Wide Web (WWW) technology. India has progressed very much in the field of Remote Sensing Satellites which includes IRS (Indian Remote Sensing) series of satellites. With application of satellite services, cartographic work has become easier and perfect. As a result of the collective use of satellites, computers, internet etc., new cartographic techniques have become available. This includes :

- Global Positioning System - GPS
- Geographic Information System - GIS
- Land Information System - LIS
- Space Information Technology - SIT

Besides, with Remote Sensing, Mobile Mapping, Satellite Imagery and other techniques, cartography has become a specialised science.

Let us know about modern cartographic techniques.

(1) Global Position System (GPS) : This Radio Navigation System works in all seasons. This is developed by US army. Here, 24 satellites constantly revolve around the earth. Revolution time of every satellite is 12 hours. These satellite transmit radio waves which are called ‘**Signals**’. These signals are received by the Ground Control Stations and are re-transmitted. These re-transmitted signals can be received by any individual user at his position. Here a person can see his location on the surface of the earth on the computer screen and can plan his work conveniently. This tool also shows the exact altitude from sea level. Due to this new technique it is being used in motor cars and cell phones as well and so it serves as a guide in real sense. This technique is used to manage the timing and location of BRTS in Ahmedabad.

(2) Geographic Information System (GIS) : In this system data base of many field observations of different levels are stored. GIS is a powerful tool to retain database related to the world, its reproduction whenever desired, its transformation and presentation. This is a computer based system. GIS provides opportunity for spatial analysis of physical, social, economic aspects of any region. The System is divided into two divisions : (1) Vector (2) Raster. It requires special training to use it. With this system, statistical data can be perfectly mapped.

(3) Remote Sensing Technique (RST) : Remote Sensing is a technique to acquire information about the physical properties of any matter or a phenomena with the help of tool and without coming into physical contact with it. The word ‘**Remote Sensing**’ was first coined by **Evelyn pruit**, a geographer, in 1960.

The beginning of remote sensing process can be considered with the origin of living organisms. Our five sense organs experience different sensations. Any one organ cannot sense the feelings of other organ. An eye can only see but cannot hear anything. An auditory sense organ is necessary to hear.

Whatever all organs sense, it is sent to the brain which is like a processor. It compiles the sensations of all sense organs and decides the ultimate result. Thus, every sense organ is a Sensor. This is at the base of the modern **Remote Sensing** technique, and here the objective is to gather information about the earth.

Information about the earth can be procured through ancient and modern travel descriptions, the paintings, sketches, photographs, maps, films etc. The photographs taken by satellites are called **Satellite Imageries**. These imageries are based on the photographs taken from aircrafts and planes, known as Ariel Survey, in the remote sensing technique.

The photographs taken by the cameras, fitted in a balloon or an aircraft, are called **Ariel Photographs**. Remote Sensing Satellites have two types of orbits : (1) Geo-Stationary orbit and (2) Near Earth orbit.

Mobile Mapping



16.7 Mobile mapping Van

The process of preparing maps from the information gathered from the automatic high-tech tools on a mobile van, to gather and transmit the information is called Mobile Mapping.

During last 20 years, mobile mapping process is progressing very slowly. During last two three years, some global companies have made this process very fast.

High-tech digital cameras are set on a Mobile Van. Other techniques like On-Line Mapping system, Navigation system, Computer system, Ground Profile Radar are connected to the Mobile Van thus the Mobile mapping System is made very modern.

With this system, it has become possible to prepare maps based on the survey of extensive land area, skyscrapers, much longer roads, railways, traffic, national and international boundaries, electric poles, settlements etc. This also helps

to prepare GIS and GPS information, digital maps, landscape imagery etc.

EXERCISE

1. Answer the following questions in details :

- (1) What is Standard Time ? How is the Standard Time of India decided ?
- (2) Explain latitudes and longitudes with figures.
- (3) State the modern cartographic techniques and describe Global Positioning System.

2. Write to-the-point answers of the following questions :

- (1) Write Short Notes : 'Local Time'
- (2) Explain the Pole Star method to find North direction.
- (3) Describe Geographic Information System (GIS).

3. Answer the following questions in brief :

- (1) State the methods to find directions.
- (2) What is Great Bear ?
- (3) State two characteristics of Longitude.
- (4) State four uses of Remote Sensing Technique.

4. Answer the following questions in one or two sentences :

- (1) What is the distance (in km) between two consecutive latitudes ?
- (2) Which is the largest latitude ?
- (3) By which English name is the science of map making known as ?
- (4) What is a Mobile Mapping ?
- (5) What is a Satellite Imagery ?
- (6) What is meant by Ariel Photograph ?

5. Select the correct option from the options given for all questions and write the answer :

- (1) What is the distance between two consecutive latitudes ?
(a) 139 km (b) 122 km (c) 111 km (d) 211 km
- (2) Who was first to use the word Remote Sensing ?
(a) Evelyn Pruitt (b) Mikon (c) Ptolemy (d) Aryabhata
- (3) By which name is the 0° latitude known as ?
(a) Tropic of Cancer (b) Tropic of Capricorn (c) Greenwich Line (d) Equator

