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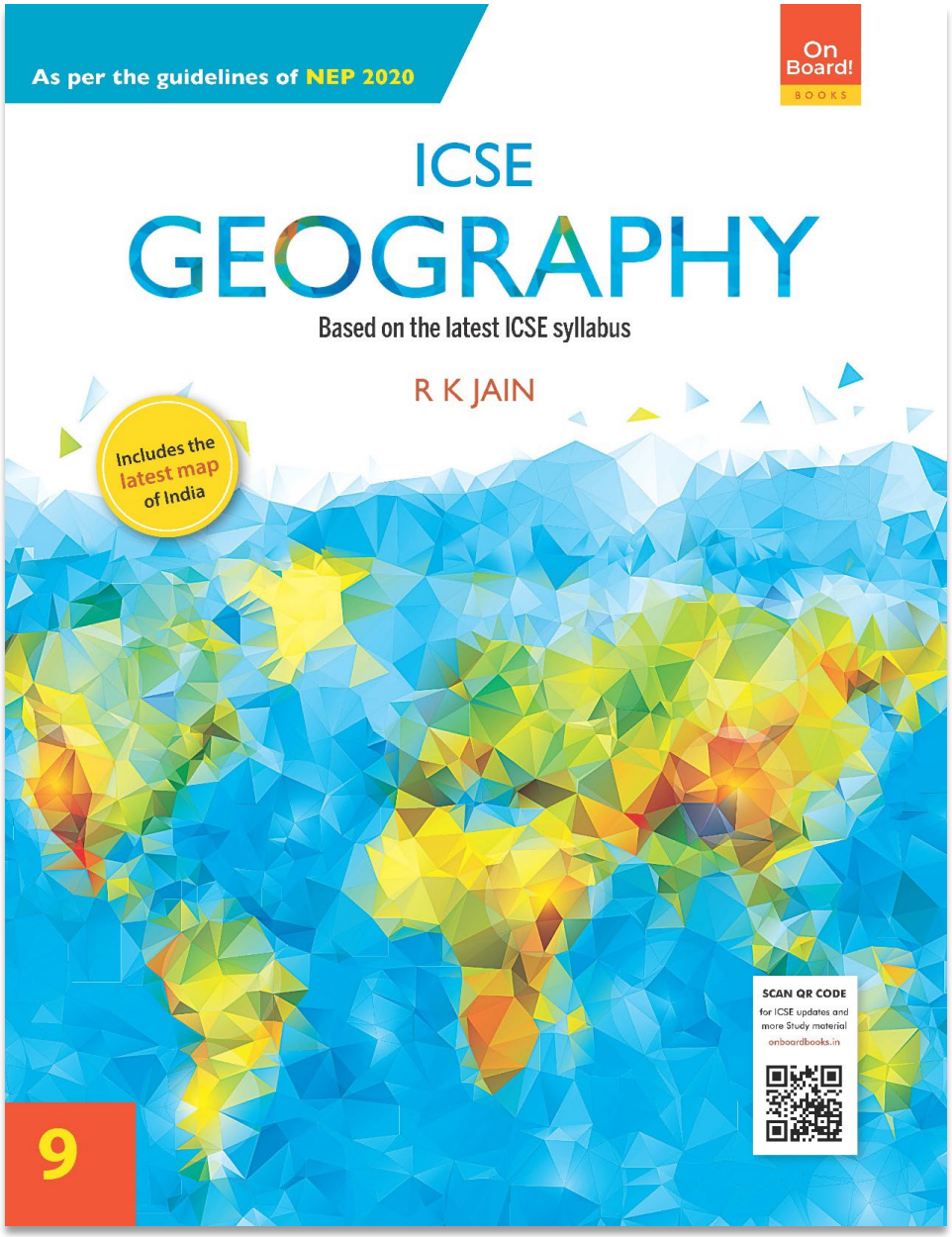
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CONTENTS

ICSE GEOGRAPHY

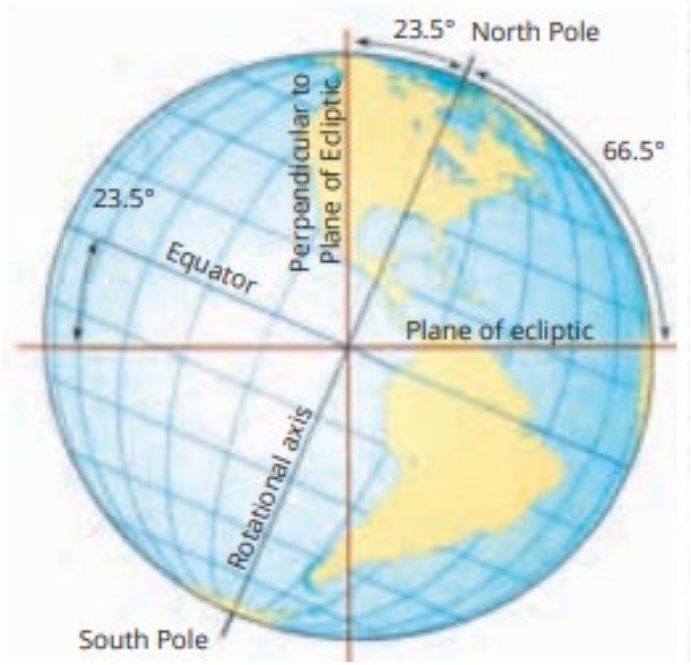
Class 9

Chapter 2: The Geographic Grid – Latitudes and Longitudes

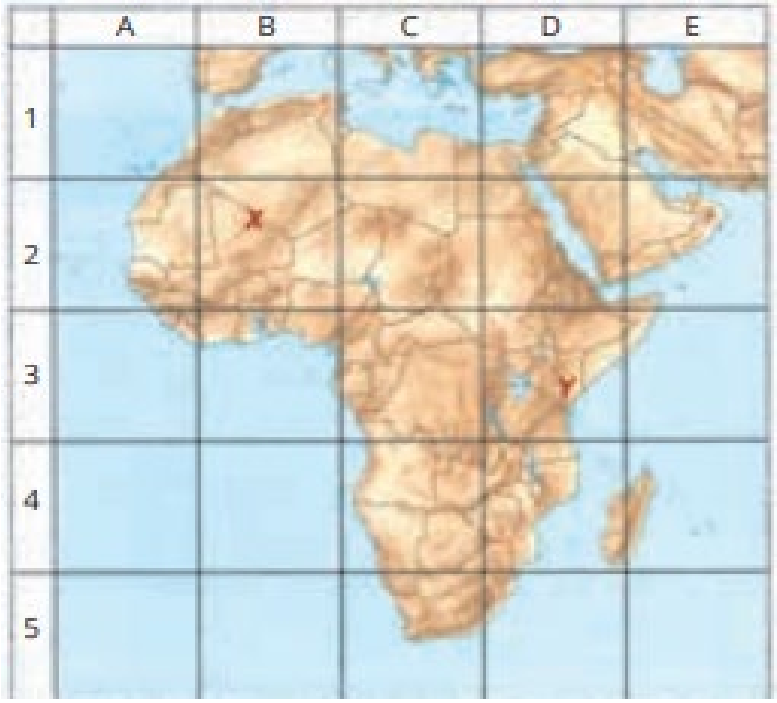
The actual measurements proved that the Earth is not a perfect sphere, as its equatorial diameter is bigger than its polar diameter. However, this difference is so small, that for all practical purposes, we consider the shape of the Earth as a sphere.

THE GEOGRAPHIC GRID

A ball can truly represent the spherical Earth. It neither has a top or a bottom nor has sides or corners. We need some system for locating places accurately. The simplest way is to design two sets of lines that intersect at right angles. Such a network of vertical and horizontal lines is referred to as the **grid system.**



Axis and equator of the Earth



The grid system

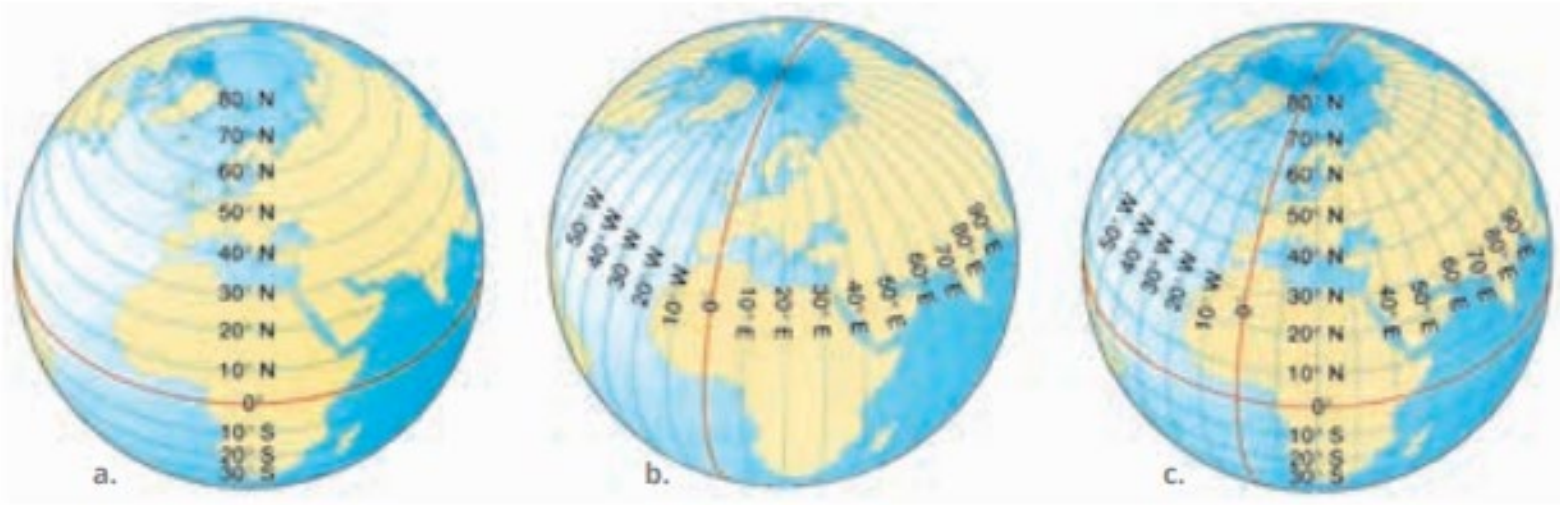
- Earth rotates on its own axis, and the end points of the imaginary axis of earth are called the North Pole and the South Pole.

- The poles are taken as fixed points on the surface of the Earth and can be used as reference points for developing a system for locating places on the Earth.
- If we visualise a plane passing through the Earth halfway between the North Pole and the South Pole, and perpendicular to the axis of the Earth, we get another valuable reference, i.e. the Equator.
- The part of the Earth which is towards the north of equator is called the Northern Hemisphere and the other portion which is towards the south of equator is called the Southern Hemisphere.

Now we have the following references for describing and measuring any location on the surface of the Earth:

1. The axis of the Earth 2. The North Pole 3. The South Pole 4. The Equator

THE PARALLELS AND THE MERIDIANS



a. Parallels, **b.** Meridians, **c.** Earth's grid

• Every globe has two sets of circles.
• In one set, the circles run from east to west. They are all parallel to the equator. These are called the **parallels**.

• In the second set, the lines run from north to south. They also pass through the North Pole and the South Pole. This line between the North Pole and the South Pole is called the **meridian.**
• These parallels and meridians can be used to define the location and direction of any place on the globe.
• The parallels and meridians intersect each other at right angles.
• The network of parallels and meridians on a globe is called the **Earth's grid** or the **geographic grid**.

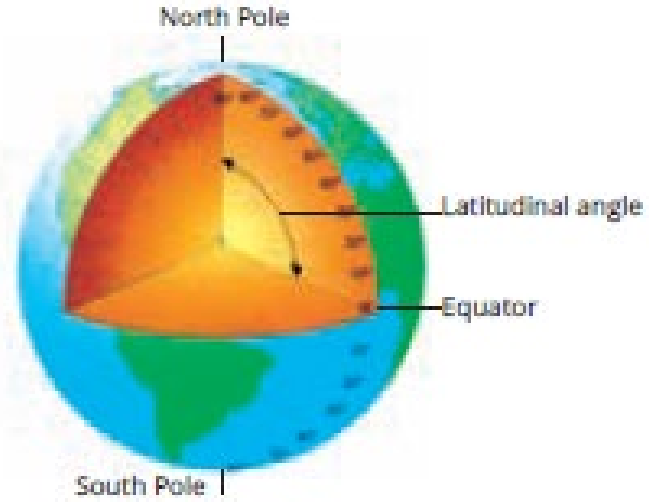
CONCEPT OF LATITUDES

Latitude is defined as the angular distance of a place north or south of the equator measured as an angle, whose apex is at the centre of the Earth.

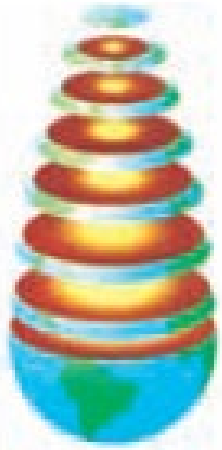
- Like any other angular measurement, latitude is expressed in degrees, minutes and seconds.
- There are 360 degrees in a circle, 60 minutes in a degree, and 60 seconds in a minute.
- The Equator is taken as the starting line and thus marked as the 0° latitude.
- The distance between the equator and the North Pole is one-fourth of a circle.
- Thus the latitude of North Pole is 90° N and that of the South Pole is 90° S.

An imaginary line connecting all points on the same latitude is called a **line of latitude** or a **parallel**. The equator at 0° is the largest parallel.

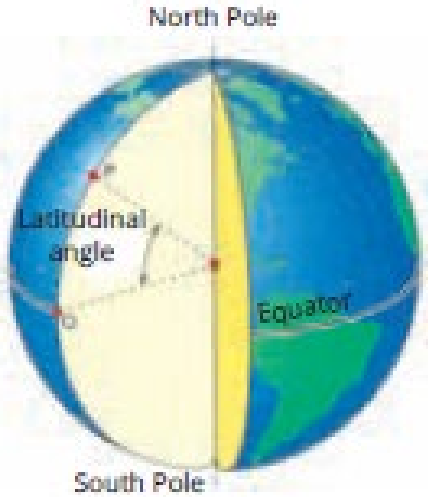
If parallels are drawn at an interval of 1° of latitude, there will be 90 parallels in the Northern Hemisphere and 90 parallels in the Southern Hemisphere. Thus including the equator, there will be a total of **181 parallels** drawn on the Earth.



Measurement of latitudes



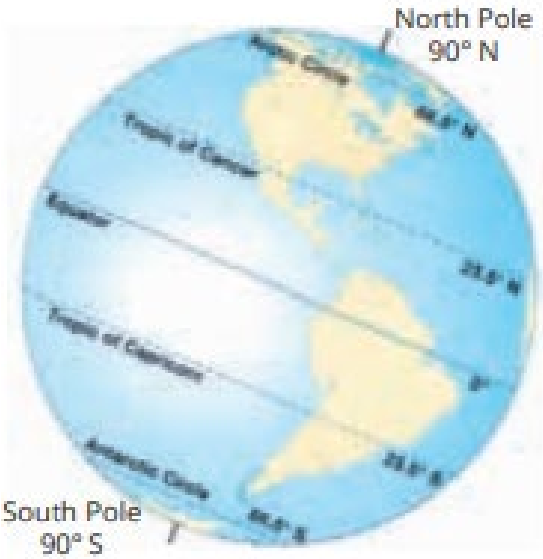
The parallels divide the Earth into 'slices'



The angle of latitudes

Although it is possible to draw an unlimited number of parallels according to our need on the globe, but the seven parallels are of great significance in the general study of the Earth. They are:

1. Equator – 0°
2. 2. North Pole – 90°N
3. South Pole – 90°S
4. Tropic of Cancer – 23½°N
5. Tropic of Capricorn – 23½°S
6. Arctic Circle – 66½°N
7. Antarctic Circle – 66½°S

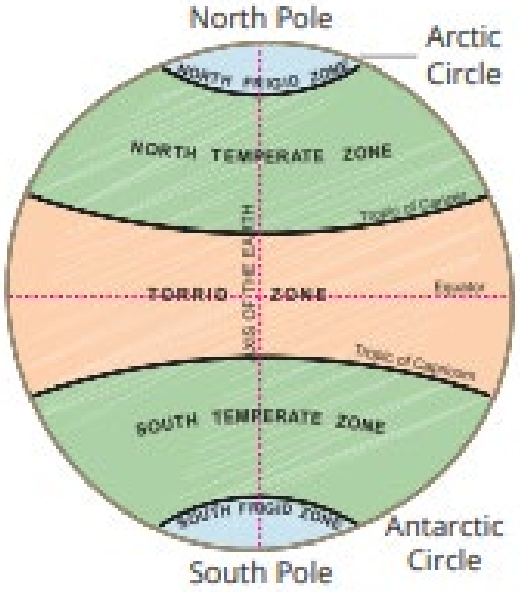


Important parallels

Characteristics of Parallels

- All parallels are complete circles except 90°N and 90°S, which are only points.
- Equator is the largest parallel and the length of other parallels decreases as one moves away from the equator towards the poles.
- All parallels are located at an equal distance from each other.
- The length of a degree of latitude along a meridian on the surface of the Earth is about 111 km.

- Some important parallels help in dividing the Earth roughly into three heat zones – the Torrid Zone, the Temperate Zone and the Frigid Zone.
- The equator is the only Great Circle, while others are Small Circles.
- The places which are to the north of the equator are in the north latitudes, while the places which are to the south of the equator are in the south latitudes.



Heat zones of the Earth

- The places which are located near the equator are in the low latitudes, while those which are located near the poles are in the high latitudes.

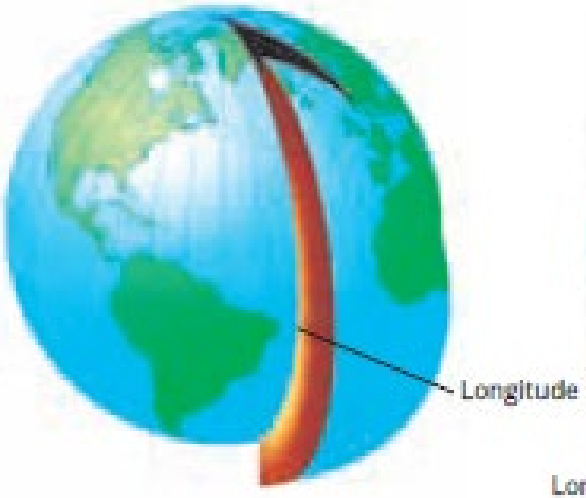
CONCEPT OF LONGITUDES

In 1884, some countries mutually agreed to fix Greenwich, a place few kilometres east of London (UK), as the starting point for the meridians. This meridian is called the **Prime Meridian**. It passes through the old Royal Observatory at **Greenwich**. It is also referred to as the **Greenwich Meridian**.

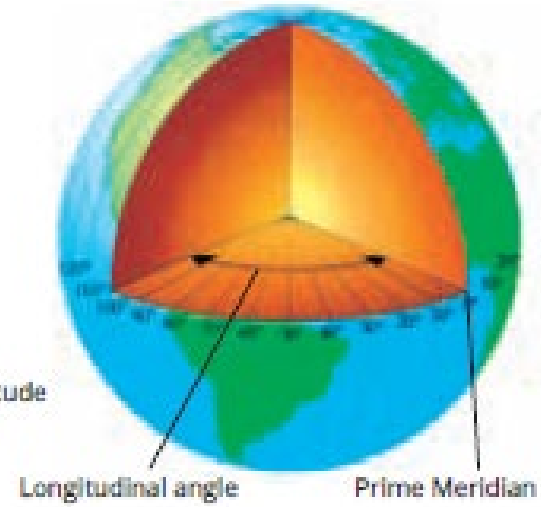
The lines joining the North Pole with the South Pole are called **meridians or lines of longitude**.

Longitude is defined as the angular distance of a place east or west of the Prime Meridian measured as an angle whose apex is at the centre of the Earth.

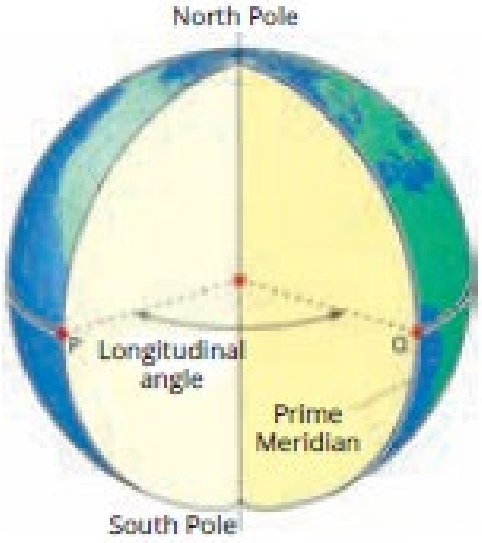
- The longitude is expressed in degrees, minutes and seconds.
- The Prime Meridian is taken as the starting line and is thus marked as the 0° longitude.
- A full circle has 360 degrees.



Lines of longitude divide the world into



Measurement of longitude



The angle of longitude

- There are 180 degrees towards the east of the Prime Meridian and 180 degrees towards the west of the Prime Meridian. These are written as 180° E and 180° W respectively.

If the meridians are drawn at an interval of 1° of longitude, there will be 180 meridians towards the east of the Prime Meridian and 180 meridians towards the west of the Prime Meridian. The meridian of 180° E and 180° W is the same line. Thus, the total number of meridians including the Prime Meridian is 360.

Characteristics of Meridians

The meridians or the lines of longitude have the following characteristics:

- The length of all the meridians is the same as all of them are **semicircles** joining the North Pole with the South Pole.
- Any two opposite meridians, when taken together, (say 10° E and 170° W) form a complete circle which is a **Great Circle**.
- The maximum distance between any two meridians at the equator is about 111 km for 1° of longitude.
- The distance between any two meridians decreases as one moves away from the equator towards the poles. All the meridians meet at the poles.
- East of the Prime Meridian up to 180° is the **Eastern Hemisphere**, whereas west of the Prime Meridian up to 180o is the **Western Hemisphere**.

LONGITUDE AND TIME

- The apparent movement of the Sun across the sky is due to the rotation of the Earth on its axis. The rotation of the Earth, also known as the daily motion of the Earth, gives us the measure of a day, i.e. 24 hours.

- We know that the Earth rotates on its axis from west to east and makes a full circle. Thus, the Earth rotates through 360° (longitudes) in 24 hours or 15° in one hour or 1° in 4 minutes.
- The time when the Sun is at the highest point in the sky. We call it the midday or noon at that meridian.
- As the Earth is rotating from west to east, the places situated in the east will have sunrise earlier than those situated in the west. This means that Tokyo experiences sunrise before Delhi and Delhi experiences sunrise before Paris. This also means that for every difference of 15° of longitude, the sunrise would be one hour later or earlier.

Longitude and time

Greenwich Mean Time

As the Earth rotates from west to east, the places lying to the east of Prime Meridian (say Delhi) will be ahead of the Greenwich Mean Time or the GMT (for it already would have had noon) and those places which are to the west of Prime Meridian (say New York) will be behind GMT (they are yet to experience noon).

The difference of time between any two places, with reference to the Greenwich Mean Time, is according to difference in longitudes of those places.

LOCAL TIME

The time calculated by the position of the Sun at noon at a given place is called its local time. In other words, the time according to the longitude of a place is the local time of that place. The local time of any place can also be calculated, provided we know the longitude of the place and the local time and longitude of another place.

Calculation of local time

STANDARD TIME

Through an international agreement, the local time of the standard meridian is linked to the GMT. The local time of the standard meridian is known as the standard time. For example, the GMT is the standard time for England.

The standard meridian for India has been fixed at 82½°E longitude, which passes through Allahabad. The difference of time between Prime Meridian and 82½°E is 5 hours and 30 minutes. As 82½°E is towards the east of the Prime Meridian, the Indian Standard Time (IST) is 5½ hours ahead of GMT.

TIME ZONES

Some countries in the world such as Russia, Canada, the USA, Australia, etc. have a large longitudinal extent. One standard meridian for each of these countries was not enough to provide uniformity of time.

- Keeping the above problem in mind, the International Prime Meridian Conference held in 1884, in Washington DC agreed to divide the world into 24 Standard Time Zones, each extending over 15° of longitude.
- The local time of the Prime Meridian was chosen as the standard for the entire system.
- The Prime Meridian became the centre of the time zone extending from 7½ ° W to 7½ ° E longitudes.
- Each time zone is a narrow belt running from north to south, with an east-west extent of 15 ° longitudes.

World – Time zones

- In a few cases, the east-west extent is the multiple of 7½ ° of longitudes.
- The east-west boundary of each time zone is adjusted with the political boundaries of the countries falling in that time zone.

Some countries in the world, which have a very big longitudinal extent, fall under a number of time zones. It is not convenient for them to select one standard time for the whole country. For example, Russia has 11 time zones and the USA (mainland) has 4 time zones.

INTERNATIONAL DATE LINE

In 1519, Ferdinand Magellan set out westward from Spain, sailing for East Asia with 241 men in his five ships. Three years later, they successfully circumnavigated the Earth. Although a careful schedule of dates had been maintained, the crew found that their calendar was one day short of the correct date. This was the first human experience of time change on a global scale. The realization of this, eventually, led to the establishment of the **International Date Line.**

The International Date Line is in the middle of a time zone. Thus there is no hourly change at that point, but a change only of the date. The International Date Line does not follow the 180° meridian exactly. It makes some adjustments to accommodate those countries and island groups (under the same administration) which are lying across or close to this line.

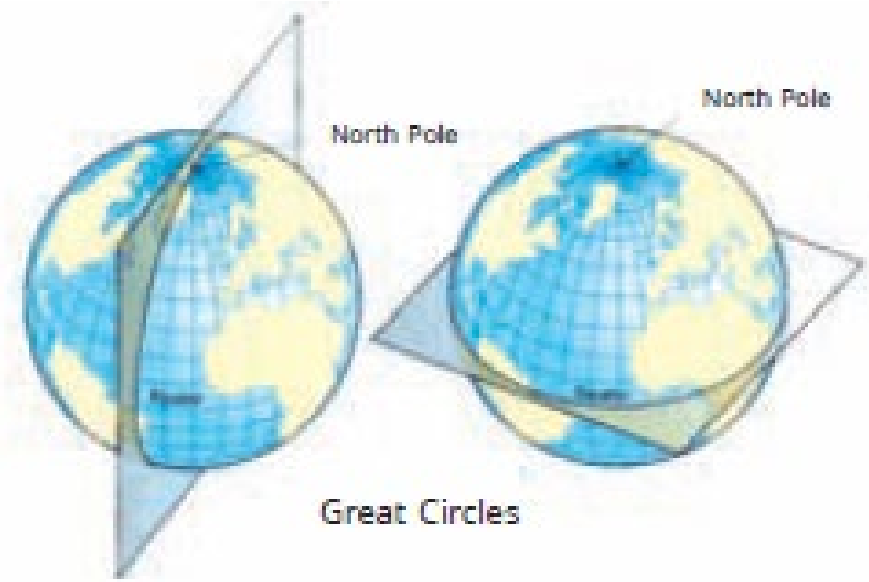
International Date Line

LOCATING PLACES ON THE EARTH

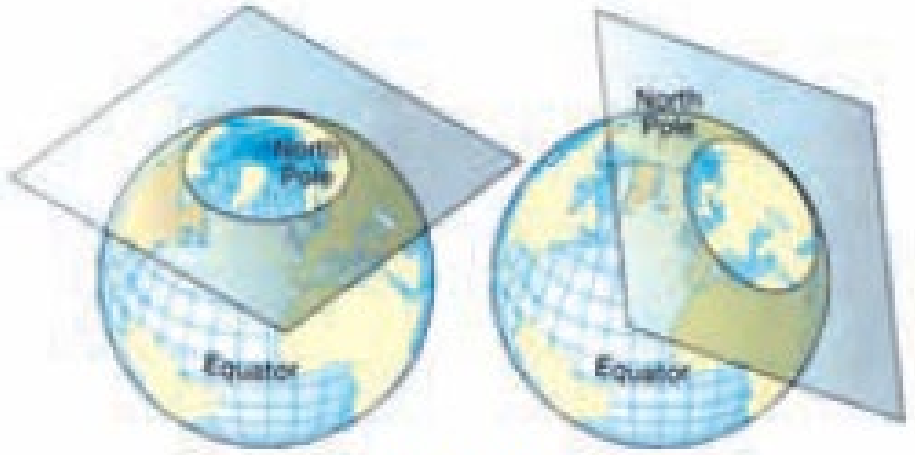
The network of parallels and meridians on the surface of the globe is known as the **Earth's grid** or the **geographic grid**. We can locate any place on the surface of the Earth with the help of this grid. To find the exact location of a place on the Earth's surface, we should know its position in the north-south direction (latitude) and in the east-west direction (longitude).

THE GREAT CIRCLE AND THE SMALL CIRCLE

We know that when a plane passes through the centre of a sphere, it divides the sphere into two equal parts. The line, where the plane intersects the surface of a sphere, creates a **Great Circle**. When a plane passes through a sphere, but not through its centre, the line where the plane intersects the surface of the sphere, creates a **Small Circle**



Great Circles



Small Circles

The Great Circle has the following characteristics:

- The centre of the Great Circle always coincides with the centre of the sphere.
- It is the largest circle that can be drawn on a sphere.
- The Great Circle represents the circumference of the sphere.
- The Great Circle can be aligned in any direction of the sphere.
- A Great Circle can be drawn to include any two points on the surface of a sphere. It connects these two points in the shortest distance between these points on the surface of the sphere.
- The routes along the Great Circle are the shortest routes and are called the Great Circle Routes.

THANK YOU