2 The Globe– Latitudes And Longitudes

Key Terms

axis	: an imaginary line joining the two poles	local time	: the time according to the longitude of a place
Equator	: an imaginary line that divides the Earth into two equal halves, known as hemispheres	longitude	: a set of imaginary circular lines drawn vertically from the North Pole to the South Pole
Greenwich Meantime	: the local time of Prime Meridian or 0° longitude	Poles	: end points of the axis
latitude	: the imaginary lines parallel to the Equator, running from west to east	Prime Meridian	: the 0° longitude passing through Greenwich near London
		Standard Time	: the local time of the standard meridian of a country

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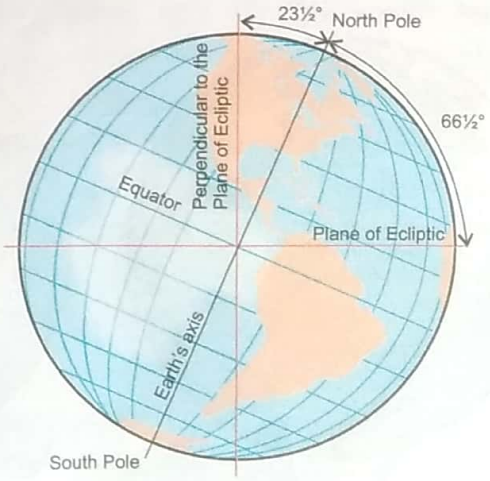
Our Earth is a unique planet. Photographs taken by astronauts and orbiting satellites prove that the Earth is spherical in shape but it is not a true sphere. It is slightly bulging at the Equator and flattened at the poles. The polar diameter (12,712 km) and circumference (40,000 km) are slightly less than the equatorial diameter (12,756 km) and circumference (40,090 km).

The spherical representation of the Earth is called the **globe**. The globe is a small model of the Earth which represents continents, oceans, countries, etc. It is very easy to locate a place on a flat surface with reference to another place. But it is difficult to locate a place on a globe because of its spherical shape. Thus, to find the location or direction of a place we need certain points of reference and lines.

The Globe

The Earth rotates or spins upon an imaginary axis. It is inclined at an angle of 23½°. We find two poles situated at the end points of the axis. **The pole pointing towards the Pole Star (North) is called the North Pole. The pole opposite to it is called the South Pole.** Between the North Pole and the South Pole, there lies an imaginary line called the **Equator**. It divides the Earth into two equal parts or hemispheres.

The part of the Earth above (north of) the Equator is called the **Northern Hemisphere**. The part of the Earth below (south of) the Equator is called the **Southern Hemisphere**. India is in the Northern Hemisphere while Australia is in the Southern Hemisphere. Thus, there are three reference



Axis, Poles And The Equator

points for describing the location of a place on the surface of the Earth:

1. The North Pole 2. The South Pole
3. The Equator

Multiple Choice Questions (Quick Revision)

Tick (✓) the correct options.

1. A spherical representation of the Earth is called a
   (a) map ☐ (b) globe ☐
   (c) sphere ☐
2. The imaginary line that divides the Earth into two equal parts is known as the
   (a) hemisphere ☐ (b) Equator ☐
   (c) axis ☐

PARALLELS AND MERIDIANS

A globe has two types of circles. The first type of circles run from west to east and are parallel to the Equator are called **parallels** or **latitudes**. The second type of circles run from north to south and pass through the North Pole and the South Pole. Half of these circles between the North Pole and the South Pole are called **Meridians** or **longitudes.**

The parallels and the meridians intersect each other at right angles (90°) and the network of these lines on a globe is called the **Earth's grid**. These lines help to locate the position and direction of a place on a globe.

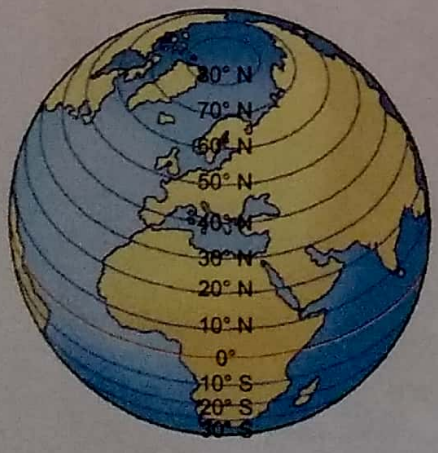
LATITUDES OR PARALLELS

The imaginary lines that run from west to east and are parallel to the Equator in the form of circles and lie on both sides of the Equator are known as **latitudes** or **parallels**. The latitude of a place is its angular distance, north or south of the Equator. It is measured in **degrees** (°). Each degree is divided into 60 equal parts called **minutes** (′). A minute is further divided into 60 equal parts called **seconds** (″).

The Equator represents the zero degree latitude. Therefore, **all parallels north of the Equator are called North Latitudes. All parallels south of the Equator are called South Latitudes**. Therefore, the value of every latitude is followed by the letter 'N' or 'S' for north and south, respectively.

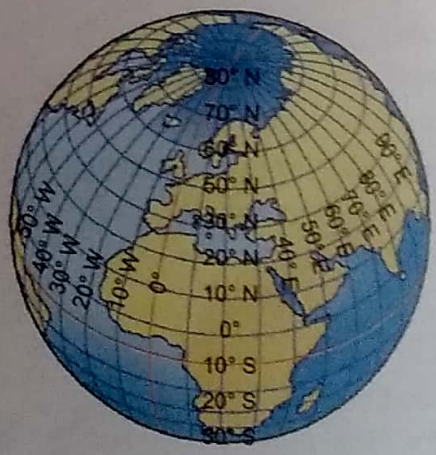
There are 90 parallels in the Northern Hemisphere and 90 in the Southern Hemisphere. These imaginary lines are used as reference points to locate a place on the globe. Thus, there are 181 parallels, including the Equator. **Cities and towns that are near to the Equator are said to be in the low latitudes. The places near the poles are said to be in the high latitudes.**

All parallels or latitudes are in the form of complete circles. **The Equator is the longest parallel**. The length of the parallels starts decreasing as one moves away from the Equator towards the poles and vice-versa. The farthest latitudes, the North Pole (90°N) and the South Pole (90°S), are in the form of imaginary points.



Parallels

Meridians



Earth's Grid

The distance between any two parallels at an interval of one degree shown on the globe is 111 km. All of them are located at an equal distance from each other.

SOME IMPORTANT PARALLELS

Some Important Parallels

We know that the Equator is a very important reference line. Besides the Equator, there are some other parallels which are important because they divide the Earth into different zones. They are:

(1) The Tropic of Cancer (23½°N)
(2) The Tropic of Capricorn (23½°S)
(3) The Arctic Circle (66½°N)
(4) The Antarctic Circle (66½°S)

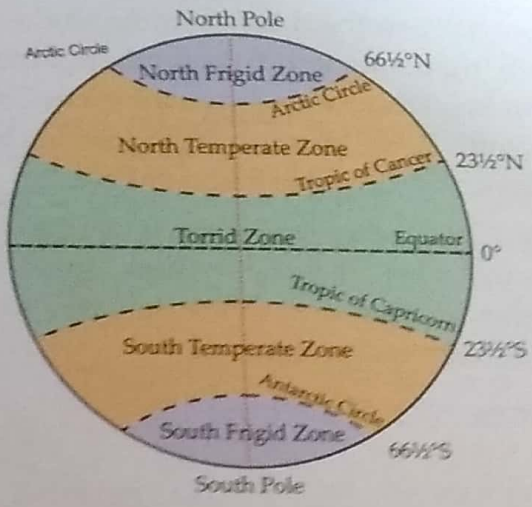
Multiple Choice Questions (Quick Revision)

Tick (✓) the correct options.

1. Lines running parallel to the Equator are called
   (a) longitudes ☐ (b) latitudes ☐
   (c) time line ☐
2. The total number of parallels are
   (a) 90 ☐ (b) 41 ☐
   (c) 181 ☐

HEAT ZONES OF THE EARTH

The above mentioned parallels help us to divide the Earth into three heat zones. The places and



Different Heat Zones

cities that lie in different heat zones have different types of climates. It is so because different heat zones receive different amounts of sunlight due to the spherical shape of the Earth. Therefore, those places that receive the greatest amount of sunlight are hotter than those places that receive less amount of sunlight.

Torrid Zone

The word 'torrid' means 'hot'. All places located between the Tropic of Cancer and the Tropic of Capricorn experience vertical rays of the Sun twice in a year. Therefore, this region receives the maximum amount of sunlight and is called the **torrid zone**. The climate in this region is very hot.

Temperate Zone

There are two temperate zones– **(1) the north temperate zone and (2) the south temperate zone**. These zones receive slanting rays of the Sun, so they receive less heat. The north temperate zone lies in the Northern Hemisphere between the Tropic of Cancer and the Arctic Circle. The south temperate zone is located in the Southern Hemisphere between the Tropic of Capricorn and the Antarctic Circle.

Frigid Zone

The word 'frigid' means cold. The places at the poles, that remain frozen throughout the year, come in the frigid zone.

There are two frigid zones in the world– **(1) the north frigid zone** and **(2) the south frigid zone**. The north frigid zone lies between the Arctic Circle and the North Pole. The south frigid zone lies between the Antarctic Circle and the South Pole.

Both frigid zones are located at the greatest distance from the Sun. These areas receive extreme slanting rays of the Sun, due to which they are extremely cold.

Wonderful To Know

Africa is the only continent through which three major parallels pass—the Tropic of Cancer, the Equator and the Tropic of Capricorn.

Multiple Choice Questions (Quick Revision)

Tick (✓) the correct options.

1. The zone that lies between the Tropic of Cancer and the Tropic of Capricorn is called the ..... zone.
   (a) frigid ☐ (b) torrid ☐
   (c) temperate ☐
2. Total number of heat zones of the Earth are
   (a) two ☐ (b) three ☐
   (c) four ☐

MERIDIANS OR LONGITUDES

Longitudes or meridians are a set of imaginary lines running from the North Pole to the South Pole. They are used as points of reference for locating places in east and west.

The meridian passing through Greenwich (a place few kilometres east of London in the UK) is known as the 0° Meridian. It is also known as the **Prime Meridian**. Actually, the longitude of a place is the angular distance of that place lying east or west of the Prime Meridian. The Prime Meridian divides the globe into Eastern and Western Hemispheres. For example, if a person is in the Eastern Hemisphere, then his/her longitude is measured in degrees east. If one is in the Western Hemisphere, then his/her longitude is measured in degrees west. There are 180 meridians to the east and 180 meridians to the west sides of the Prime Meridian. Therefore, in total there are 360 meridians or longitudes. At the Equator, the distance between two meridians is the greatest i.e., about 111 km. The distance between the meridians decreases as one travels towards the poles and vice-versa. All the meridians meet at the poles.

Wonderful To Know

Eratosthenes was the Greek geographer who invented the system of longitudes and latitudes to locate places on the Earth. He was the first person to calculate the circumference of the Earth. He also coined the term geography.

LOCATING PLACES ON THE GLOBE

Look at the globe given on page 116, the latitu and longitudes are drawn upon it. They inter each other and form a network on the surfac the globe. This network is known as grid. We find the location of any place on the globe with help of the grid. To locate the exact position o

Multiple Choice Questions (Quick Revis

Tick (✓) the correct options.

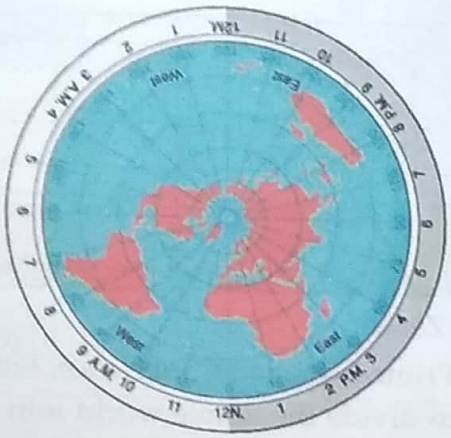
1. The word 'frigid' means
   (a) hot ☐ (b) cold
   (c) wet ☐
2. The places that remain frozen throughou year come in the ..... zone.
   (a) temperate ☐ (b) torrid
   (c) frigid ☐

place, we should know its position in terms of latitude and longitude.

Look at the location of New Delhi on the globe. The latitude of New Delhi is 28.38°N and its longitude is 77.12°E. So, the point of intersection of 28.382°N and 77.122°E is the location of New Delhi.

LONGITUDE AND TIME

We calculate the time according to the position of the Sun. The position of the Sun and the Earth keeps on changing due to the rotation of the Earth upon its axis. One rotation of the Earth upon its axis gives us the measure of the day.



Longitude And Time

There are 24 hours in a day. Due to the rotation of the Earth, the Sun appears to move across the sky from east to west. But actually, the Earth rotates from west to east direction and completes one circle which has 360 degrees. Thus, the Earth rotates through 360° of longitudes in about 24 hours. Therefore, our Earth rotates through 15° of longitudes in one hour and 1° of longitude in four minutes. As the Earth rotates, every meridian faces the Sun, once in every 24 hours. When the Sun shines exactly overhead or is at the highest point in the sky, it is midday or 12 noon at that meridian.

Wonderful To Know

The word 'Meridian' is derived from the Latin word 'Meridianus' which means midday. AM stands for **ante-meridian** which means before noon. PM stands for **post-meridian** which means afternoon.

The longitude passing through Greenwich has been taken as the standard meridian by all the countries of the world. When it is midday or noon time in Greenwich, all the places along the Prime Meridian have noon time. It also means that if any meridian is facing the Sun, all the cities located on that meridian will have noon time.

The Earth keeps on rotating on its axis from west to east. Therefore, the cities and places located towards the east of the Prime Meridian have sunrise earlier than those cities which are situated towards the west.

Cairo (31°E longitude) experiences sunrise before **Canton** (81°W longitude) and **Kolkata** (88°E longitude) experiences sunrise before **New York** (74°W longitude). Thus, the cities towards the east of Greenwich are ahead of the Greenwich time. Cities located west of the Prime Meridian will experience noon after Greenwich. Therefore, they are said to be behind the Greenwich time.

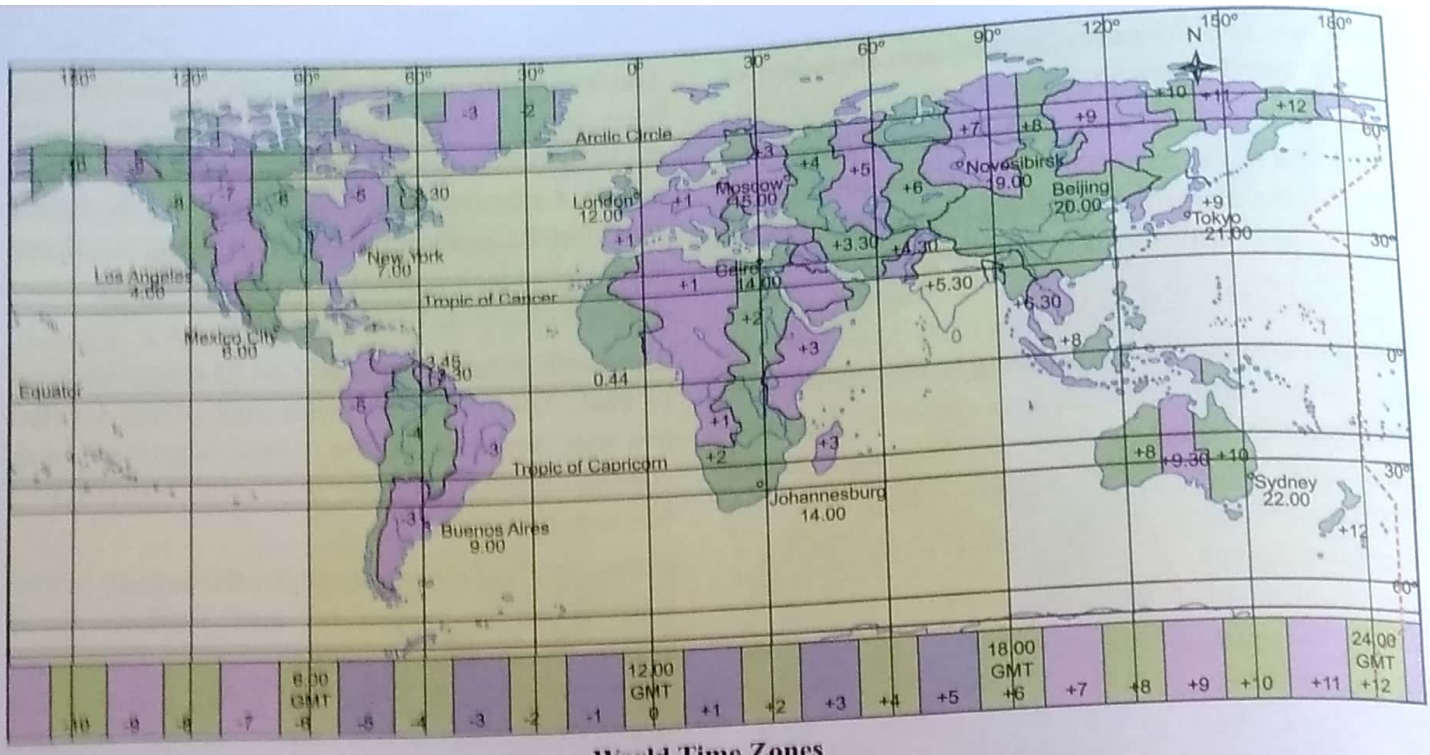
Thus, we observe that the difference in time between any two places is due to the fact that they are located at different longitudes or meridians.

LOCAL TIME AND STANDARD TIME

The local time of an area depends on its longitudes. But it differs from place to place because these places are situated on different longitudes. This causes a great inconvenience for the country as a whole.

To overcome this problem, the time of a central place situated on a particular meridian is taken as the uniform time for the whole country. This is called the **standard time** of that country. In India, the time of Prayagraj city which is situated at 82½° E longitude is used as the standard time for the whole country. Thus, the meridian 82½°E is known as the Standard Meridian of India.

As Prayagraj is located on an eastern longitude, i experiences sunrise ahead of Greenwich. Fo every degree of longitude, there is a difference of



World Time Zones

minutes. Therefore, the Indian standard time is 82½ × 4 minutes = 330 minutes ahead of GMT or we can say Indian Standard Time is ahead of GMT or Greenwich Mean Time by 5 hours and 30 minutes.

Multiple Choice Questions (Quick Revision)

Tick (✓) the correct options.

1. The Earth rotates through 360° of longitudes in about
   (a) 24 hours ☐ (b) 5 hours ☐
   (c) 365 days ☐
2. The Standard Meridian of India is
   (a) 82½°E ☐ (b) 82½°S ☐
   (c) 82½°W ☐

TIME ZONES

Some countries are very big. For example, the USA, Canada, Australia and Russia. A large number of longitudes pass through these countries. Thus, one standard time for these countries is impossible for practical purposes.

Therefore, to solve this problem, the International Prime Meridian Conference, held in 1884, agreed to divide the whole world into 24 standard time zones of one hour each. Each zone runs from north to south in the form of a narrow belt. In most cases, the west-east boundaries of every zone have been adjusted with the political boundaries of the countries.

The meridian or longitude that passes through the middle of each time zone has been chosen to represent the standard time of that time zone. In most of the cases, the standard time of time zones is ahead or behind GMT by exact number of hours. Only in the case of a few countries, the difference is half an hour. Some countries of the world fall under a number of time zones because it is not possible to select one time zone due to its large area, like Russia which has 11 time zones, while Canada has 6 time zones.

INTERNATIONAL DATE LINE

The 180° meridian is called the **International Dat Line.** 180°E and 180°W is the same meridian. But is not a straight line. It is drawn on the map in zig-zag manner to accommodate countries

Let us understand this concept of time with the help of an example. There are two places — place 1 and place 2, located at 120° E and 120° W longitudes, respectively. The time at the Greenwich or Prime Meridian is 12 noon. Find the local time at place 1 and place 2.

At Place A

- The difference of longitude between place 1 and the Prime Meridian (Greenwich) is 120 degrees towards the east.
- Therefore, the difference of time between place 1 and the Prime Meridian is 120 × 4 minutes = 480 minutes or 8 hours.
- As place 1 is located towards the east of the Prime Meridian, the local time at place 1 will be 8 hours ahead of the Greenwich Mean Time (GMT), i.e. 8.00 pm.

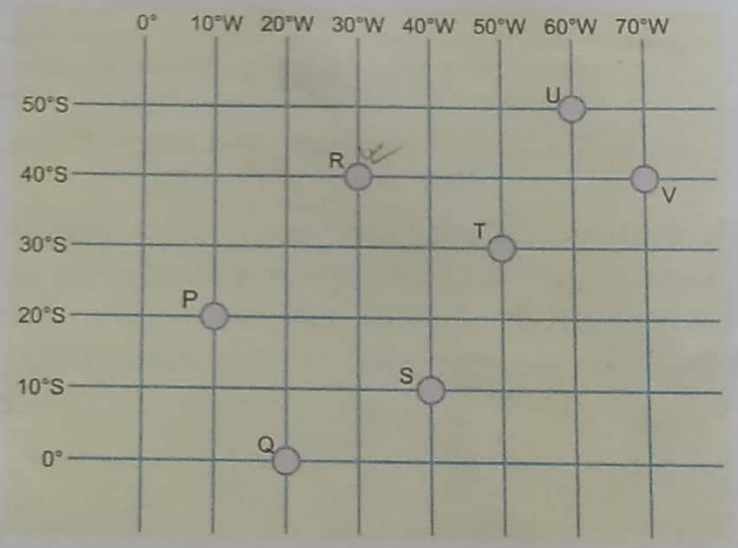
At Place B

- The difference of longitude between place 2 and the Prime Meridian is 120 degrees towards the west.
- Therefore, the difference of time between place 2 and the Prime Meridian is 120 × 4 minutes = 480 minutes or 8 hours.
- As place 2 is located towards the west of the Prime Meridian, the local time at place 2 will be 8 hours behind GMT, i.e. 4.00 a.m.

Now, find the time of places in the following latitudes. The time at Greenwich is 12 noon.

20ºE 140ºW 125ºW 109ºW 135ºE 95ºW 65ºE

- **Observe the given figure and write the geographical locations of the stations P, Q, R, S, T, U and V.**



- **Find the names of the states of India which lie on the Tropic of Cancer. Give a glimpse of their specialities — culture, capital, rivers or any other unique features. You may put the information in a colourful folder.**
- **Making A Spinning Globe**

Material required:

(a) plastic ball (b) knitting needle