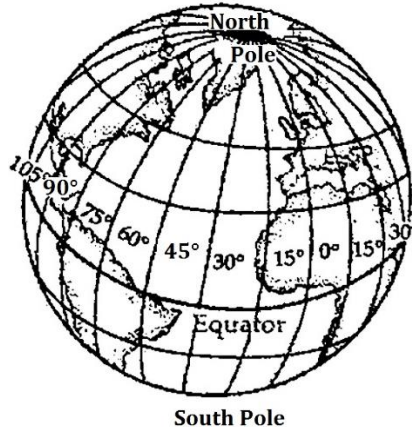


## Latitude and Longitude

Any location on Earth is described by two numbers - its latitude and its longitude.



### Latitude

Lines of latitude are circles of different size on the Globe of Earth. the equator is the longest line and its latitude is zero. the poles at latitudes  $90^\circ$  north and  $90^\circ$  south the circles shrink to a point.

### Longitude

Lines of constant longitude extend from pole to pole on the globe. the longitude (meridian) passing the old Royal Astronomical Observatory in Greenwich, England and it is known as zero longitude.

Longitude line is also called a meridian, derived from the Latin, from meri, a variation of '**medius**' which denotes '**middle**', and diem, meaning '**day**'. The word once meant "noon", and times of the day before noon were known '**ante meridian**', while times after it were '**post meridian**'. Today's abbreviations **a.m.** and **p.m.** come from these terms, and the Sun at noon was said to be "**passing meridian**".

### Local Time and Time Zones

Longitudes are measured from zero to  $180^\circ$  east and  $180^\circ$  west and both  $180^\circ$ -degree longitudes share the same line in the middle of the Pacific Ocean.

Earth rotates around its axis at any moment one line of longitude "the noon meridian" faces the Sun, and that time it will be noon everywhere on it. the Earth has undergone a full rotation with respect to the Sun in 24 hours and the same meridian again faces noon. each hour of the Earth rotates by  $360/24 = 15$  degrees.



  
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## The Date Line and Universal Time

- Longitude determines only the hour of the day. The international date line has been established most of it following the 180th meridian-where by common agreement, whenever we cross it the date advances one day (going west) or goes back one day (going east).
- That line passes the **Bering Strait** between Alaska and Siberia, which thus have different dates, but for most of its course it runs in mid-ocean and does not inconvenience any local time keeping.
- The Greenwich Mean Time, the astronomical time at Greenwich is generally used here. It is sometimes called Universal Time.

## Indian Standard Time (IST)

- Longitude  $82\frac{1}{2}^{\circ}$  E passing through Naini near Allahabad, Uttar Pradesh and it is the Standard Meridian of India.

## Torrid Zone

- This is also referred to as Tropical zone. The Tropics is a region on the Earth surrounding Equator by the Tropic of Cancer in the northern hemisphere at  $23^{\circ}26'16''$  N (approx.) and the Tropic of Capricorn in the southern hemisphere at  $23^{\circ}26'16''$  S (approx.). The Tropics include all the areas on the Earth where the sun reaches a point directly overhead at least once in a year.
- This area receives maximum heat and is called the Torrid or hot Zone.

## Frigid Zone

- Near the polar regions, the rays of the Sun are very slanting and so it is very cold.
- The region/area between the Arctic Circle and the North Pole in the Northern Hemisphere is called the Frigid zone.
- There are similar regions in the Southern Hemisphere between the Antarctic Circle and the South Pole, also called the Frigid Zone.

## Rotation of the Earth

- The Earth spins or rotates from west to east on its axis once in 24 hours approximately.
- The Earth's axis is not vertical. It makes an angle of  $23^{\circ}30'$  with the vertical or  $66^{\circ}30'$  with the plane of the Earth's orbit.
- The Earth's axis always remains pointed in the same direction towards the Pole Star as the Earth moves around the Sun. The tilt of the Earth's axis is known as the inclination of the Earth's axis.
- Movements of tides are mostly determined by rotation of the Earth.

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### Tilted Axis effect on Day and Night

- Rotation of the Earth on its tilted axis causes days and nights to be of different length on the Earth.
- The Earth's axis is tilted in the same direction and the orientation of the Earth's axis to the Sun's rays is constantly changing as the Earth moves around the Sun. This changes the length of days and nights throughout the year.

### Perihelion

- It is the position of the earth in its orbit when it is at its nearest point to the sun.
- The earth reaches its perihelion about 3rd January at a distance of about 147 million kilometers near one extremity of the major axis of the earth's elliptical orbit,
- the axis being called Apside line.

### Aphelion

- It is the position of the earth in its orbit when it is at its distant point from the sun.
- The earth reaches its aphelion on 4th July when the earth is at a distance of 152 million kilometer near the other extremity of the major axis.

### Solstice

- Solstice is one of the two dates in the year on which the sun reaches greatest altitude north or south of the equator and is directly overhead along one of the lines of the tropics.

### Summer Solstice

- On June 21, the earth is so located in its orbit that the sun is overhead on the Tropic of Cancer ( $23\frac{1}{4}^{\circ}$  N).
- On this date the northern hemisphere is tipped towards the sun having the **longest day**, while the southern hemisphere is tipped away from the sun having the shortest day.

### Winter Solstice

- On December 22, the earth is in an equivalent position on the opposite points in its orbit, so the southern hemisphere is tipped towards the sun and the northern hemisphere away from it.
- The sun is overhead on the Tropic of Capricorn ( $23\frac{1}{2}^{\circ}$ S), resulting in the shortest day in the northern hemisphere.

### Equinoxes

- Two days in a year when day and night are equal throughout the world are equinoxes.
- Falling midway between the dates of solstices on these dates, the earth's axis lies at  $90^{\circ}$  to the line joining the centres of the earth and the sun and neither the northern nor the southern hemisphere is inclined towards the sun.
- The '**vernal equinox**' occurs on **March 21** and it is also called the **spring equinox** in the northern hemisphere.
- The '**autumnal equinox**' occurs on September 23.

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