

# Important Notes on Latitudes & Longitudes

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1) Latitudes and Longitudes

Latitudes and Longitudes are imaginary lines used to determine the location of a place on the earth.

ii) The shape of the earth is 'Geoid'.  
And the location of a place on the earth can be mentioned in terms of latitudes and longitudes.

iii) Example: The location of India - The longitudinal extent of India is  $88^{\circ}$  degrees  $7'$  E and  $97^{\circ}$  degrees  $25'$  E whereas as the latitudinal extent of India is  $8^{\circ}$  degrees  $4'$  N and  $36^{\circ}$  degrees  $7'$  N.

2) Latitude (The parallels of latitude refer to the angular distance, in degrees, minutes and seconds of a point north or south of the Equator. Lines of latitude are often referred to as parallels.)

### A) Important Parallels of latitudes

ii) Besides the equator ( $0^{\circ}$ ), the north pole ( $90^{\circ}$  N) and the south pole ( $90^{\circ}$  S), there are four important parallels of latitude -

a) Tropic of Cancer ( $23\frac{1}{2}^{\circ}\text{N}$ ) in the northern hemisphere.

b) Tropic of Capricorn ( $23\frac{1}{2}^{\circ}\text{S}$ ) in the southern hemisphere.

c) Arctic Circle at  $66\frac{1}{2}^{\circ}$  north of the equator.

d) Antarctic Circle at  $66\frac{1}{2}^{\circ}$  south of the equator.

### B) Latitudinal Heat Zones of the Earth.

#### \* Torrid Zones

The mid day sun is exactly overhead at least once a year on all latitudes in between the Tropic of Cancer and the Tropic of Capricorn.

#### \* Temperate Zones

The areas bounded by the Tropic of Cancer and the Arctic Circle in the northern hemisphere, and the Tropic of Capricorn and the Antarctic

Circles in the Southern hemisphere have moderate temperatures.

### \* Frigid Zones

Areas lying between the Arctic Circle and the North pole in the northern hemisphere and the Antarctic Circle and the South pole in the southern hemisphere, are very cold. It is because here the sun does not rise much above the horizon.

3) Longitude (Longitude refer to the angular distance in degrees, minutes, and seconds, of a point east or west of the Prime (Greenwich) Meridian. Lines of longitude are often referred to as meridians.)

### A) Longitude and Time

1) Since the earth makes one complete revolution of  $360^\circ$  in one day or 24 hrs it passes

through  $15^\circ$  in one hour or  $1^\circ$  in 4 minutes

2) Earth rotates from west to east, so every  $15^\circ$  we go eastwards, local time is advanced by one hour. Conversely, if we go westwards local time is retarded by 1 hour.

3) We may thus conclude that places east of Greenwich see the sun earlier and gain time, whereas places west of Greenwich see the sun later and lose time.

## B) Standard Time and Time zones

1) To avoid all these difficulties, a system of standard time is observed by all countries.

2) Most countries adopt their standard time from the central meridian of their countries.

3) In larger countries such as Canada, USA, China and USSR it would be inconvenient to have single time zone, so, these countries have multiple time zones.

4) Both Canada and USA have 5 time zones - the Atlantic, Eastern, Central Mountain and Pacific time zones. The difference between the local time of the Atlantic and Pacific coasts is nearly 5 hours.

5) S.S.R had eleven time zones before its disintegration. Russia now has 9 time zones.

### c) The international date line

1) A traveller going east-wards gains time from Greenwich until he reaches the meridian  $180^\circ$  east, when he will be 12 hrs ahead of G.M.T.

2) Similarly in going west-wards he loses 12 hrs when he reaches  $180^\circ$ .

co. There is thus a total difference of 24 hours or a whole day between the two sides of the  $180^\circ$  meridian.

Q) Why is the International date line drawn in a zig-zag manner?

A) Some groups of islands (Polinania, Melanania, Micronasia) fall on either of the date line. So, if the date line was straight then two regions of the same island country or island group could fall under different date zones. Thus, to avoid any confusion of date, this line is drawn through where the sea lies and not land. Hence, the IDL is drawn in a zig-zag manner.

4) Indian Standard Time

The Indian Government has accepted the meridian of  $82.5^\circ$  east for the standard time which is 5 hrs 30 min, ahead of Greenwich mean time.

## Questions

5) Example-1: Determine the local time of Thimpu (Bhutan) located at  $90^\circ$  east longitude when the time at Greenwich ( $0^\circ$ ) is 12 noon.

⊗ Statement:- The time increases at a rate of four minutes per one degree of longitude east of the prime meridian.

Ans. Solution:

Difference between Greenwich and Thimpu =  $90^\circ$  of longitudes

Total time difference =  $90 \times 4 = 360$  minutes  
=  $360/60$  hours

= 6 hours | Local time of Thimpu is 6 hours more than that at Greenwich, i.e. 6:00 pm.

Example: 2: Determine the local time of New Orleans (the place, which was worst affected by Katrina Hurricane in October 2005), located at  $90^\circ$



West longitude when the time at Greenwich (00) is 12:00 noon.

Statement: The time decreases, at a rate of 4 minutes per one degree of longitude, west of the prime meridian.

Ans Solution:

Difference between Greenwich and New Orleans =  $90^\circ$  of longitude.

Total time difference =  $90 \times 4 = 360$  minutes  
=  $360/60$  hours

= 6 hrs / Local time of New Orleans is 6 hrs less than that at Greenwich, i.e. 6:00 am.

Why is it at 5:30 pm in India and 12:00 noon in London?

Prime meridian or 0-degree longitude passes from London. India located east of London at 82 degrees 30' E. Since the earth takes 24 hrs to rotate on its own

axis or to cross 360-degree longitudes.

$$360 \text{ degree} = 24 \times 60 \text{ minutes}$$

$$1 \text{ degree} = 24 \times 60 / 360 = 4 \text{ minutes}$$

Indian Standard Time passes through 82 degrees 30' E.

$$82 \text{ degrees} = 82 \times 4 / 60 = 328 / 60 = 5 \text{ hrs and } 28 \text{ minute}$$

$$30' \text{ E} = 1/2 \text{ degree} = 2 \text{ minute}$$

hence: 82 degrees 30' = 5 hours and 30 minutes.