

## IMPORTANT NOTE ON LATITUDE & LONGITUDE

### Table of Contents

#### 1) LATITUDES AND LONGITUDES

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

ii) The shape of the Earth is 'Grecoid'. 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 68 degrees 7°E and 97 degrees 25°E whereas the latitudinal extent of India is 8 degree 4°N and 36 degrees 7°N.

#### 2) LATITUDE

##### A) Important parallels of latitude

i) Besides the equator ( $0^\circ$ ), the north pole ( $90^\circ\text{N}$ ) and the south pole ( $90^\circ\text{S}$ ), there are 4 important parallels of latitudes -

ii) Tropic of Cancer ( $23\frac{1}{2}^\circ\text{N}$ ) in the Northern Hemisphere.

iii) Tropic of Capricorn ( $23\frac{1}{2}^\circ\text{S}$ ) in the Southern Hemisphere.

iv) Arctic Circle at ( $66\frac{1}{2}^\circ\text{N}$ ) of the Equator.

v) Antarctic Circle at ( $66\frac{1}{2}^\circ\text{S}$ ) 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 Tropic of Capricorn.



## TEMPERATE ZONES

The areas bounded by the ~~topic~~ Tropic of Cancer and the Arctic circle in the northern hemisphere, and the Tropic of Capricorn and the Antarctic circle 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 southern hemisphere, are very cold. It is because here the sun does not raise much above the horizon.

## 3) LONGITUDE

### A) Longitude and Time

i) Since the Earth makes one complete revolution of  $360^\circ$  in one day or 24 hrs, it passes through  $15^\circ$  in 1 hr or  $1^\circ$  in 4 mins.

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

iii) We may thus conclude that places east of <sup>Greenwich</sup> ~~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

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



- ii) Most countries adopt their standard time from the central meridian of their countries.
- iii) In larger countries such as Canada, U.S.A, China, and U.S.S.R, it would be inconvenient to have single time zone. So these countries have multiple time zones.
- iv) Both Canada and U.S.A have 5 time zones - The Atlantic, Eastern, Central, Mountain, Pacific time zones. The difference between the local time of the Atlantic and Pacific coast nearly 5 hrs.
- v) S.S.R had eleven time zones before its integration. Russia now has nine time zones.

### C) THE INTERNATIONAL DATE LINE

- i) The traveller going eastwards gains time from Greenwich until he reaches the meridian  $180^{\circ}E$ , when he will be 12 hrs ahead G.M.T.
- ii) Similarly, in going westwards, he loses 12 hours when he reaches  $180^{\circ}W$ . There is thus a total difference of 24 hrs or a whole day between the two sides of  $180^{\circ}$  Meridian.

### D) WHY IS THE INTERNATIONAL DATELINE DRAWN IN A ZIG-ZAG MANNER

Some groups of Islands (Polynesia, Melanesia, Micronesia) fall on either of the date line. So if the dateline was straight, then 2 regions of the same Island Country or Island group would 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  $82.5^{\circ}\text{E}$  for the standard time which is 5 hrs 30 mins, ahead of Greenwich Mean Time.

#### 5) QUESTIONS

Example 1: Determine the local time of Thimpu (Bhutan) located at  $90^{\circ}$  east longitude when the time at Greenwich ( $0^{\circ}$ ) is 12:00 noon.

Statement:- The time increases at a rate of 4 mins per 1 degree of longitude, east of the Prime Meridian.

Solution:-

Diff between Greenwich and Thimpu =  $90^{\circ}$  of longitudes

Total time difference =  $90 \times 4 = 360$  mins

= 360/60 hrs

= 6 hrs \ Local time of Thimpu is 6 hrs more than that at Greenwich, i.e.

6:00 p.m.

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 ( $0^{\circ}$ ) is 12:00 noon.

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

Solution:-

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

Total time difference =  $90 \times 4 = 360$  mins

$360/60$  hrs

6 hrs \ Local time of New Orleans is 6 hrs less than that at Greenwich,

i.e. 6.00 a.m.

Why is it at 5:30 p.m. in India and 12:00 noon in London?

Prime meridian or  $0^\circ$  longitude passes from London. India located east of London of 82 degrees  $30^\circ$ E. Since the Earth takes 24 hrs to rotate on its own axis or to cross  $360^\circ$  longitudes.

$$360 \text{ degree} = 24 * 60 \text{ mins}$$

$$1 \text{ degree} = 24 * 60 / 360 = 4 \text{ mins}$$

Indian standard times passes through 82 degrees  $30^\circ$ E.

$$82 \text{ degrees} = 82 * 4 / 60 = 328 / 60 = 5 \text{ hrs } 28 \text{ mins}$$

$$30^\circ \text{E} = 1/2 \text{ degree} = 2 \text{ mins}$$

Hence : 82 degrees  $30^\circ$  = 5 hrs 30 mins.