

Calculation of Local Sidereal Time

Star maps have co-ordinates of stars in terms of **right ascension** and **declination**. While declination is expressed in degrees north or south of the **celestial equator**, right ascension is expressed in time units of hours. In fact the stars on the local **meridian** will have right ascension equal to the local sidereal time. And celestial object attain their highest altitude above the horizon and so are best seen when they are on or near the meridian. So it is helpful to have an idea of the local sidereal time to select the right star map and know what portion of the celestial sphere will be visible at any particular time.

It is not difficult to calculate the sidereal time.

Let **A = 0.0657098**, **B = 19.41409**, **C = 1.002737909**

The day number is simply the (whole number of) days elapsed since the beginning of the year.

Let day number = **d**

Let the local mean time expressed in decimal hours = **t**

Then local sidereal time will be **ST = (d x A) – B + (t x C)**

If **ST** turns out to be negative add 24, and if it turns out to be greater than 24, subtract 24, so as to make ST have a value between 0 and 24.

Example:

Let us calculate the local (Trivandrum) sidereal time corresponding to 7 PM, IST, on 4th November.

4th November is the 308th day of this year. So **d = 308**

IST is the mean time on longitude 82.5 degree east of Greenwich. Trivandrum is only 77 degrees east of Greenwich. As one degree rotation of the earth takes 4 minutes, mean time at Trivandrum will be 22 minutes behind IST.

$$\text{So, } t = (7 + 12) - (22 / 60) = 18.63333$$

$$\text{And } ST = (308 \times 0.0657098) - 19.41409 + (18.63333 \times 1.0027379)$$

$$= 19.5089 \text{ hours} = 19 \text{ hour, } 30 \text{ minutes, } 32 \text{ seconds}$$

In this case ST is between 0 and 24.