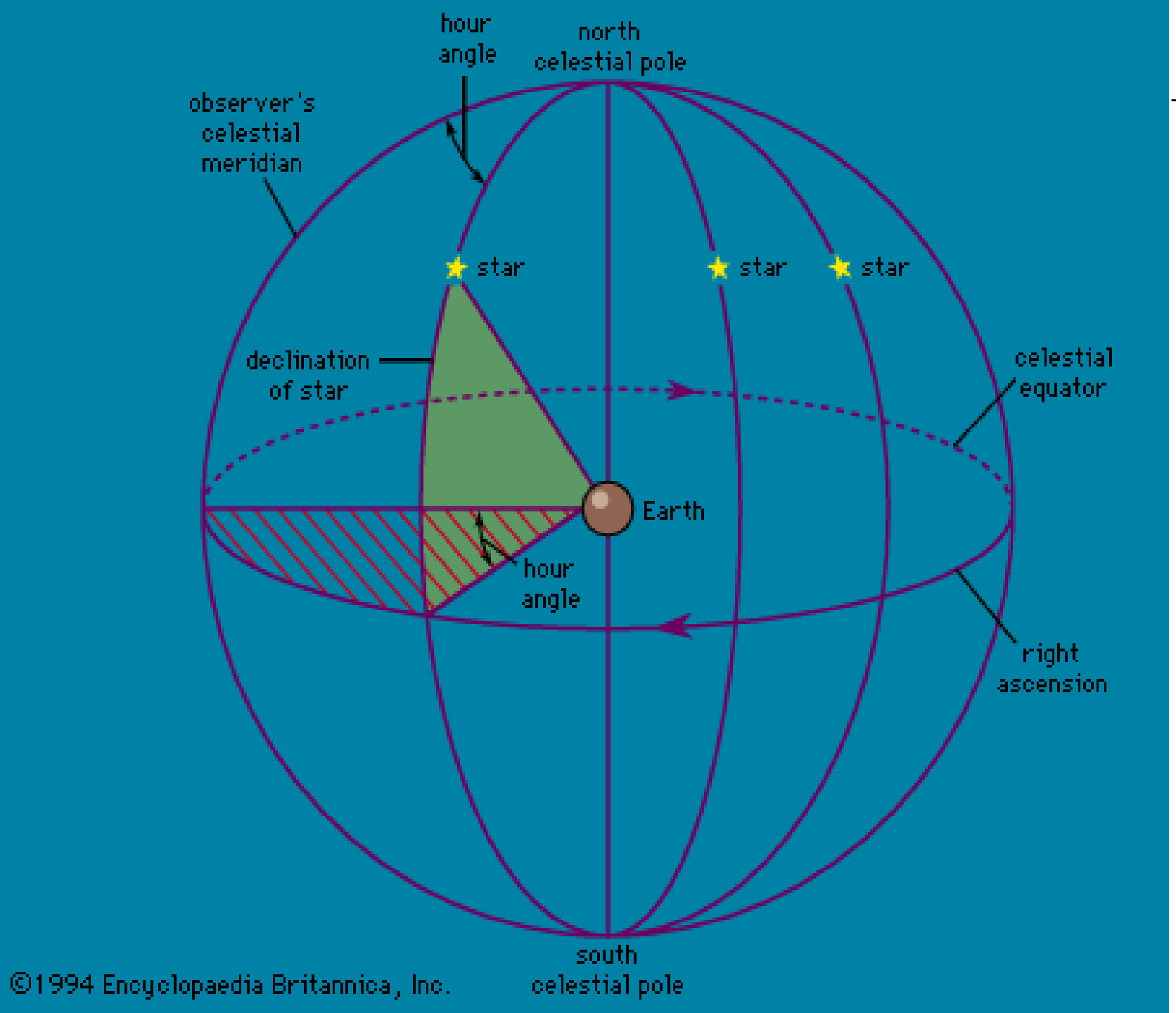
Topic 6: Celestial Observations Part Two



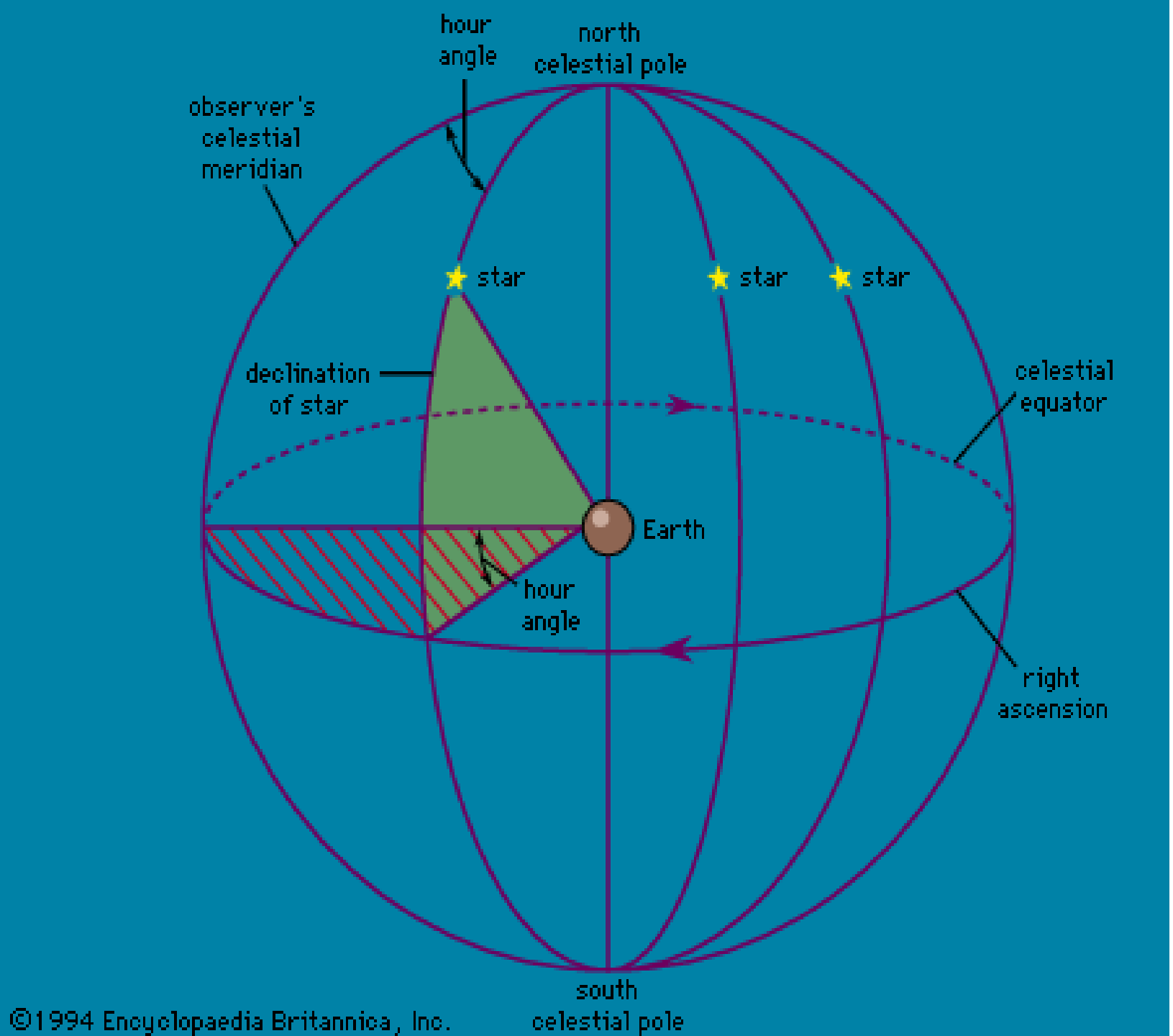
Coordinates

Meridian

A meridian is an imaginary line Between north and south poles through the observer's (or object's) position.

The prime meridian (an imaginary line running from N-S through Greenwich) is used as a reference for time conventions.

The meridian is where the sun will be highest at local midday.



More Coordinates

Hour Angle

This is the angle between the meridian of the observer and the meridian line on which the star is.
We call this line the **Hour Circle**.

We calculate how long it will take for that star to transit the meridian of the observer.

Let's say an observer is looking at a star due west of their position at 9pm.
The star transits the observers meridian at 11.30pm.
This is easy – there is a difference of **2 hours 30 minutes**. That's the hour angle

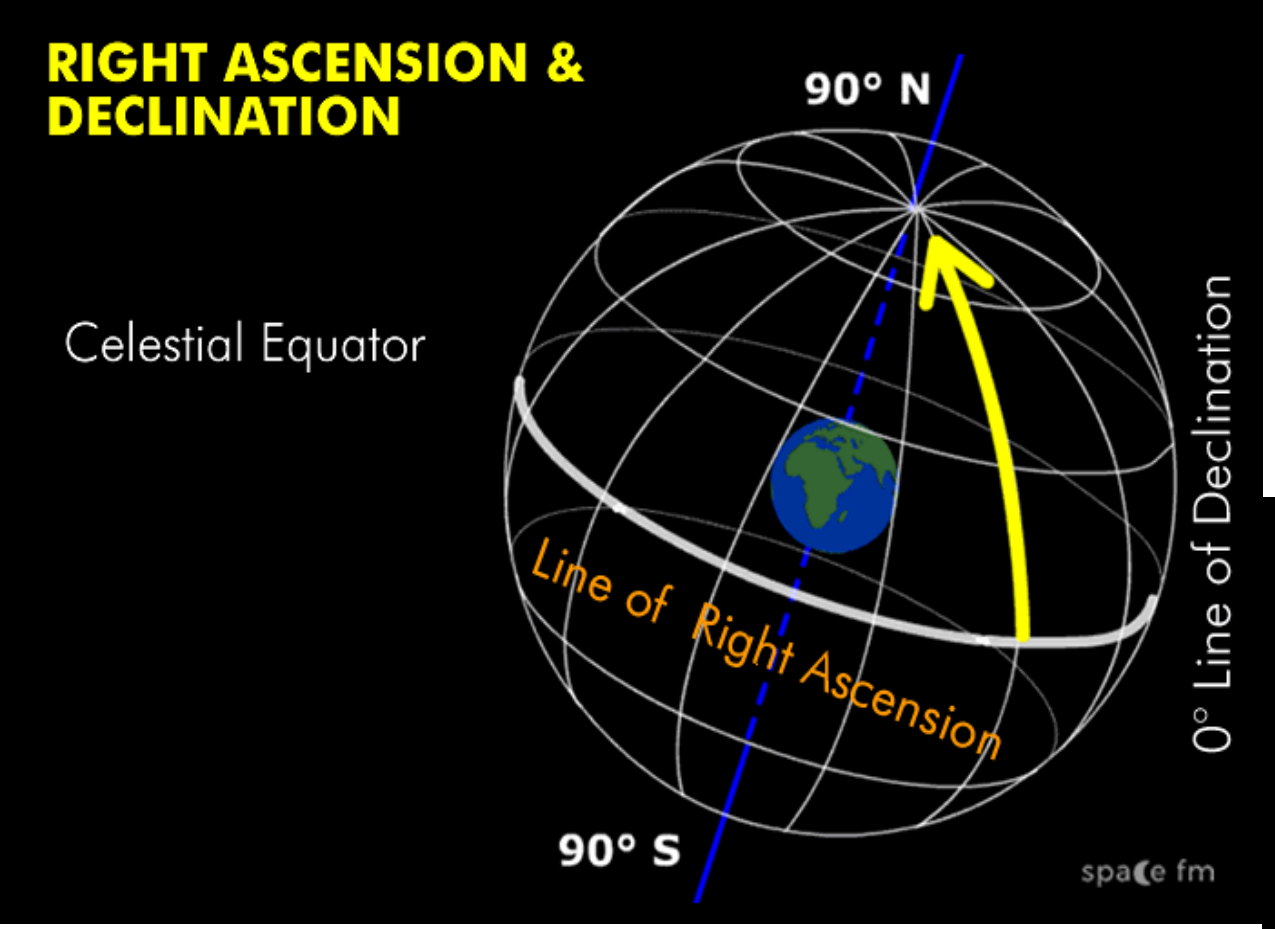
Hour Angle of star = Local Sidereal Time - Right Ascension of star

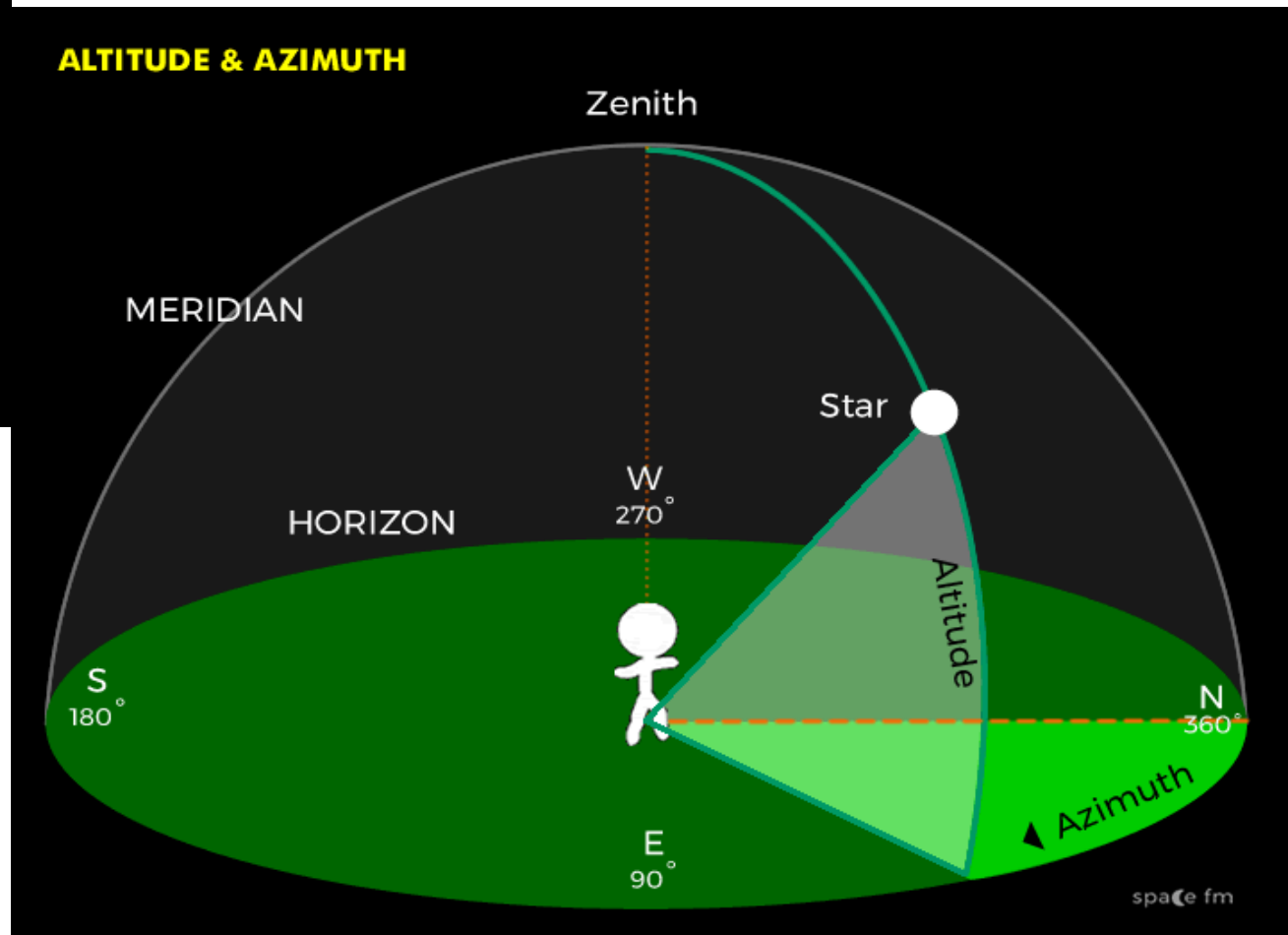
HA=LST-RA.

Celestial Coordinates

Equatorial:

- Declination [**dec** or **δ**] (º ‘ “)
- Right Ascension [**RA** or **α**] (h m s)



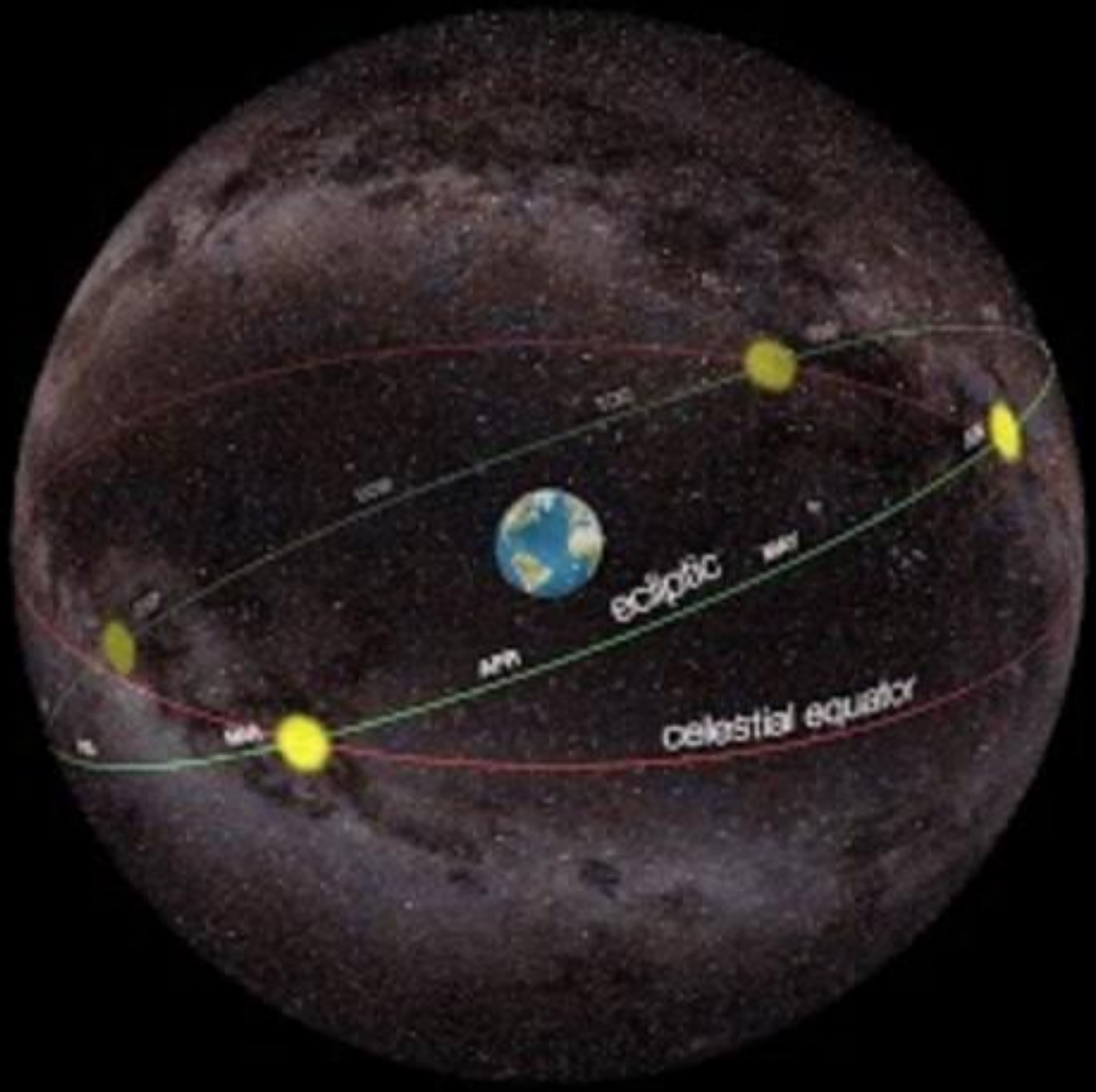


Horizontal:

- Altitude (º)
- Azimuth (º)

Sun Altitude = Sun Declination + (90º – Latitude)

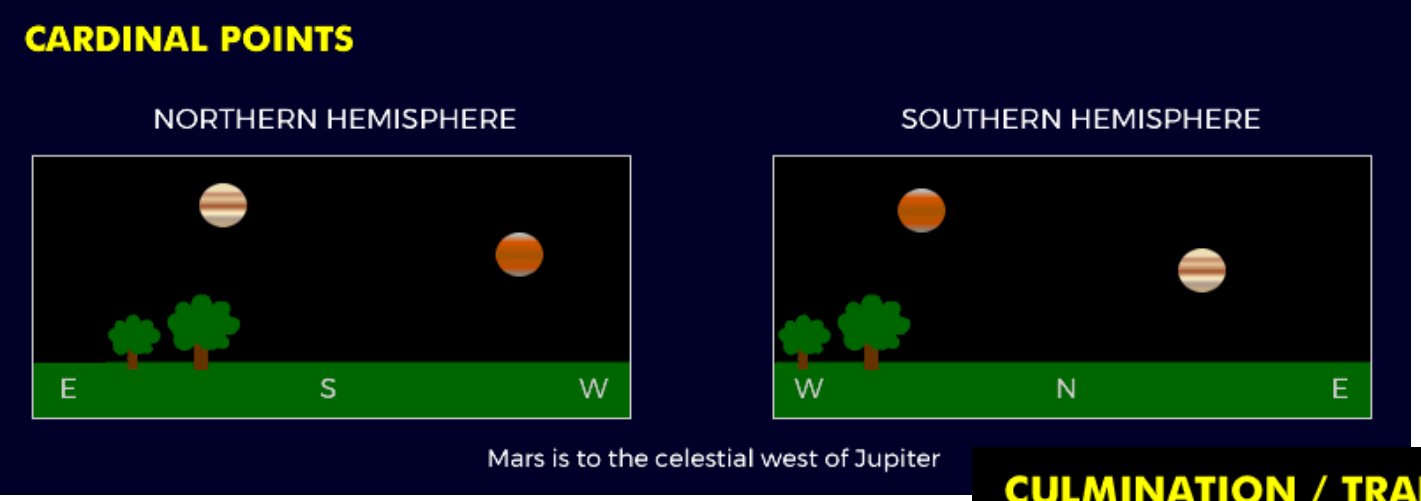
RA?
DEC?



ALT?
AZ?

Celestial Terms

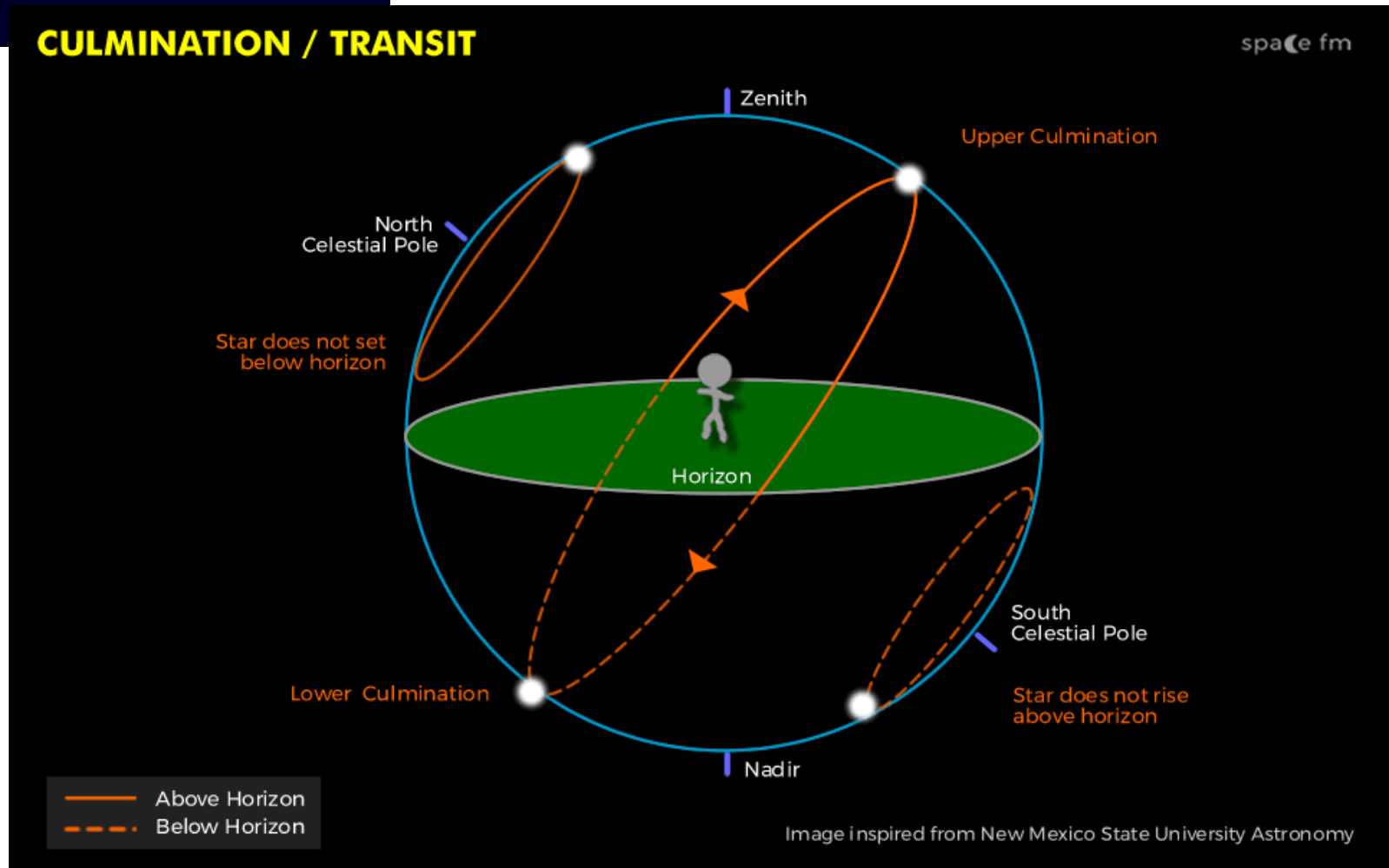
A cardinal point is the same as compass points. We refer to north as celestial north, south as celestial south etc.



Culmination is when an object reaches the observer's meridian.

At upper culmination it has an hour angle of 0h.
At lower culmination it has an hour angle of 12h.

These will mean different views depending on the location of the observer.



- **Co-declination**

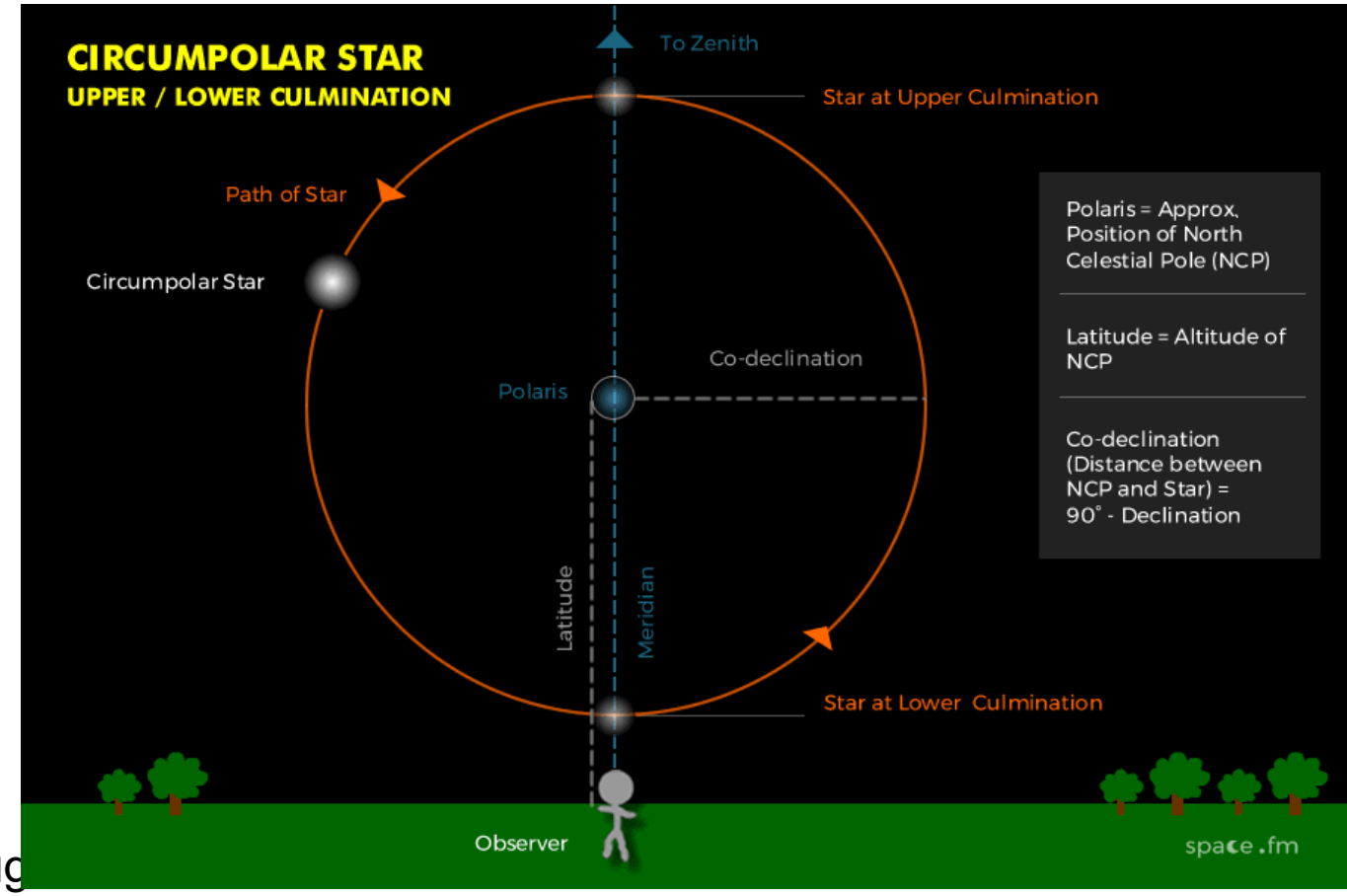
  This is the distance between North Celestial Pole (NCP) and Star **= 90° - Declination**

  An object's altitude (*A*) in degrees at its upper culmination is equal to:

  A* = 90° − *L* + *δ.

  (Upper Culmination takes place when **Right Ascension = LST)**

- **Meridian:** Imaginary line passing from N to S throug the zenith. (covered above)



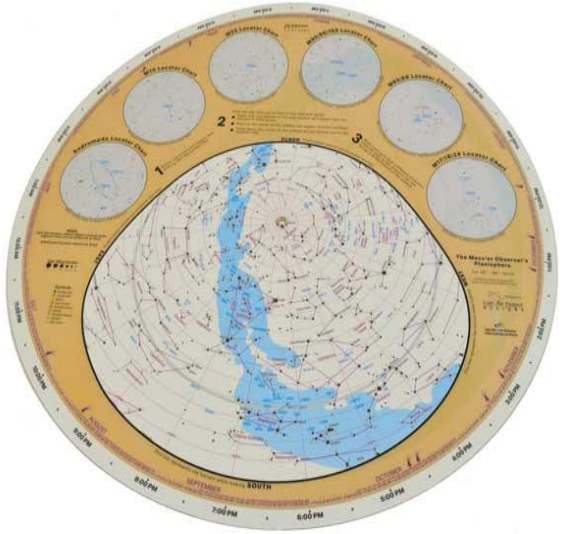
More Celestial Terms

- **Zenith**

  The **Zenith** is the point directly above the observer's head. 90° perpendicular to the ground.

  The opposite of Zenith is the **Nadir**, the point directly below the observer's feet. Imagine if the Earth was transparent and you could see the stars directly below you.

Use **star charts or apps** to determine when objects are highest in the sky (upper culmination).
Best viewing conditions occur when an object is **near the meridian** (highest altitude).



Planning observations

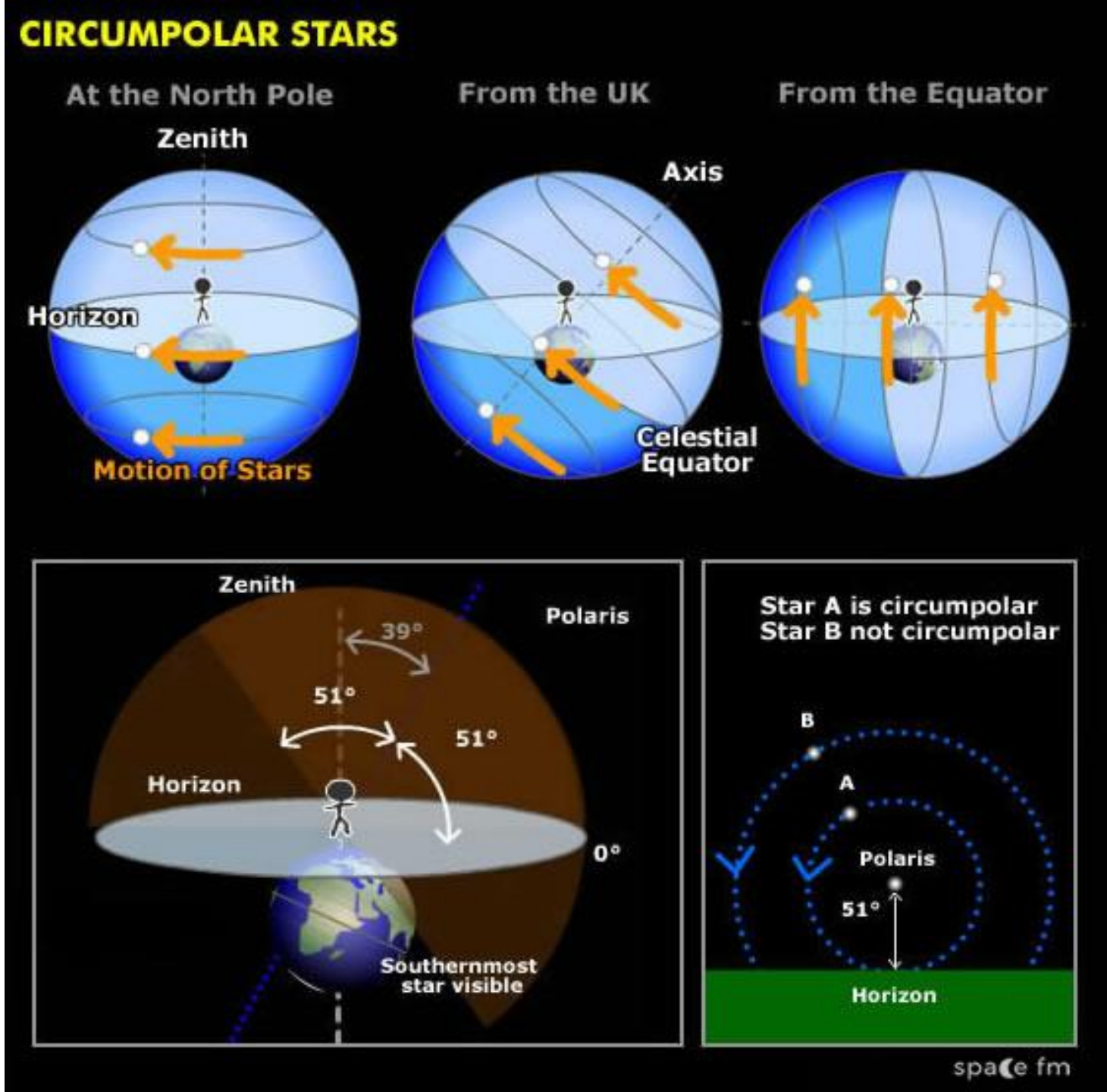
Circumpolar Stars

Orion is visible from October to February in the night sky. It is in the sky in June but we can't see when it rises as it is daylight.

Circumpolar stars are stars that can be seen from one location throughout the year. Other stars are usually only seen for a month or two.

They are stars that never seem to set below the horizon, so the nearer you are to a pole, the more stars you'll see that are the same throughout the year, and the less seasonal stars. When you're nearer the Equator you'll see less circumpolar stars but more seasonal stars.

(Stars appear to revolve around Polaris in the Northern Hemisphere.)

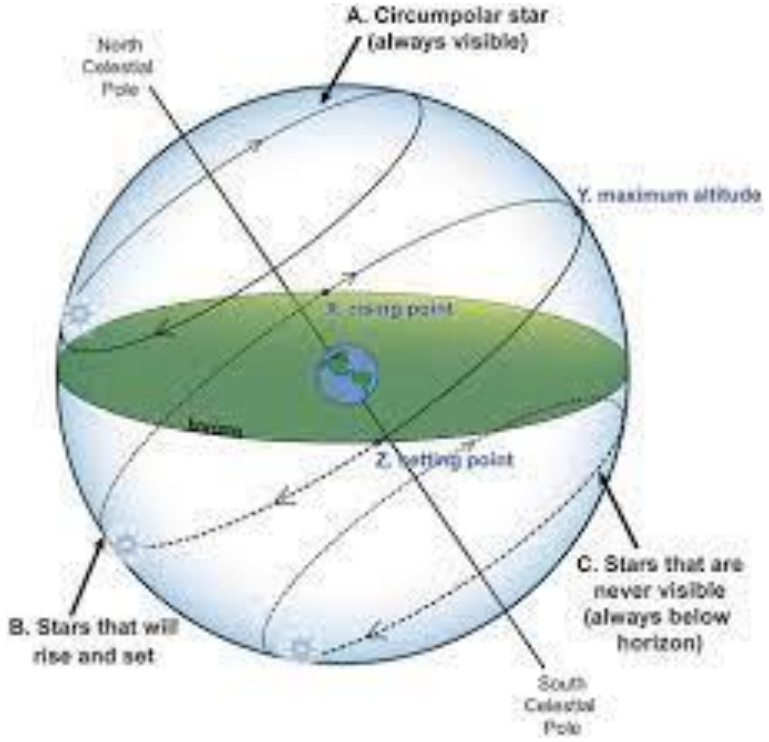


A star is circumpolar if the following formula is true:

Declination of Star >= 90° - Latitude of Observer

What if we don't know a stars declination?

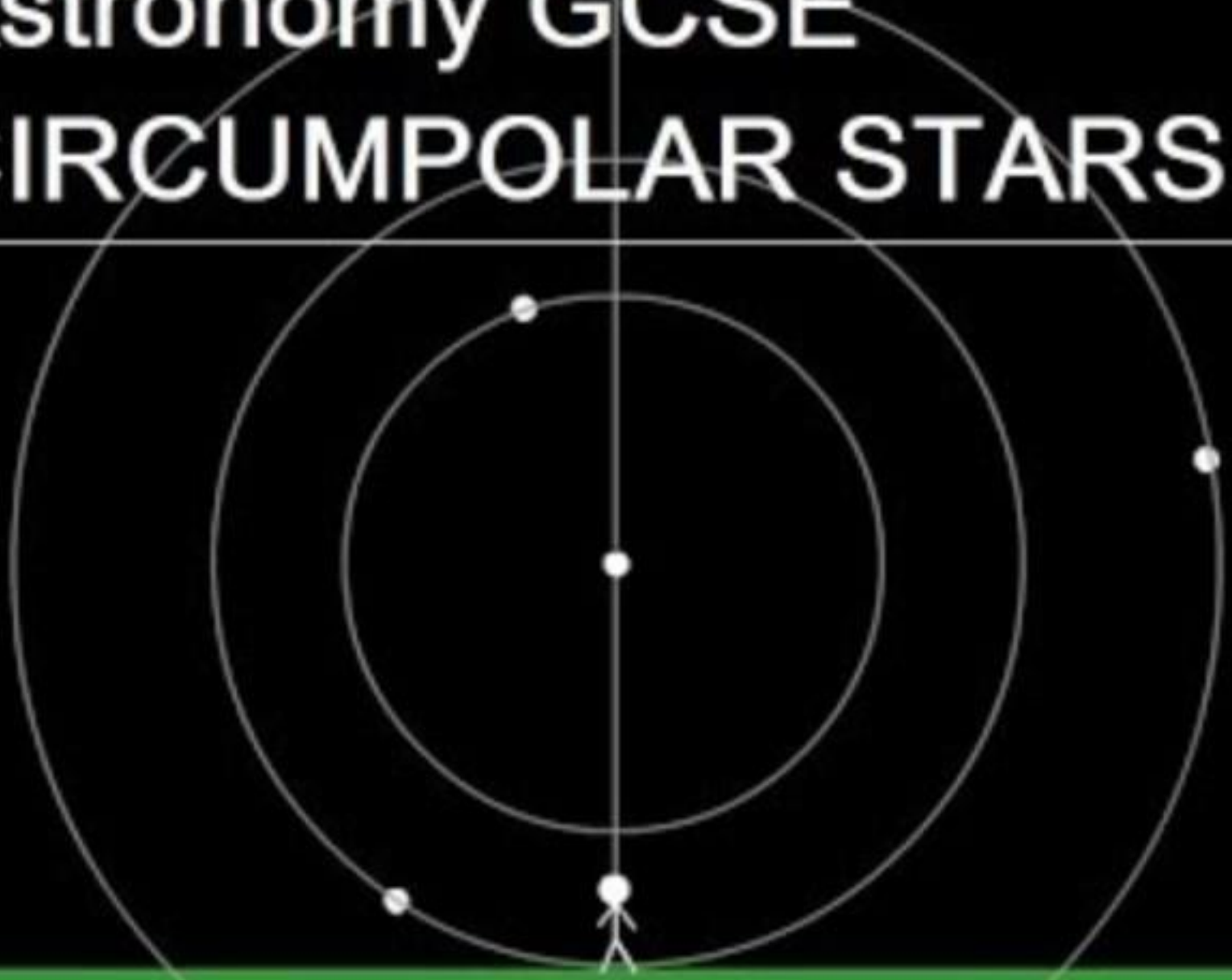
We can measure its **altitude** at upper and lower culmination we can tell if the star is circumpolar by using:
Observer's Latitude ± Co-declination of star



In the exam you may be asked to determine:

- *Which stars are circumpolar and which are not.*
- *What latitude you would have to be at in order to see a certain star*
- *The smallest or largest Declination a star would be at from a given latitude*

Astronomy GCSE
CIRCUMPOLAR STARS



Diurnal Motion

Astronomical objects in the sky move through the course of the day and night and move position through the course of the year.

Diurnal motion is the apparent daily motion of celestial objects, like stars and the Sun, across the sky from east to west. This motion is caused by Earth's rotation on its axis from west to east, which makes the celestial sphere appear to move in the opposite direction.