**Unit 1 Patterns in the Sky Fill in Notes Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Block\_\_\_**

**Coordinates: Altitude and Azimuth**

**Coordinate System**

Coordinates

Terrestrial coordinates

Equator

Prime meridian

**Angular Measurements**

Degree = a circle’s divided into \_\_\_\_\_\_\_ degrees

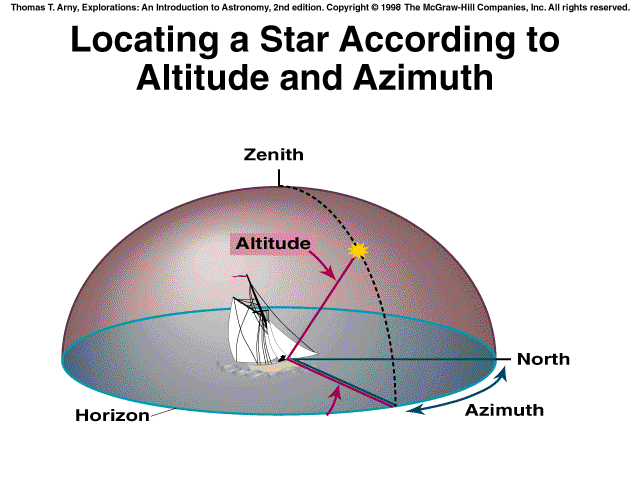
minute of arc = \_\_\_\_\_\_\_\_ of a degree

second of arc = \_\_\_\_\_\_ of a minute (…. Or 1/3600 of a degree)

Hold finger out at arm’s length = ~\_\_\_ degrees

Hold fist out at arm’s length = ~\_\_\_\_ degrees

Moon and sun are only 0.5 ° (stays constant--if it looks bigger...it’s an illusion)



**Horizon system**

**Zenith**

**Altitude**

**Azimuth**

**Problems...**

* 1. Stars change position over the course of the night because of rotation of Earth—stars rise and set like the sun
* 2. Stars occupy different positions in the sky at different points on the earth (N vs. S hemispheres)

**Rotation of the Earth**

The Earth spins on its axis and rotates around once every \_\_\_\_ hours. This causes…

1. the Sun to rise and set.

2. stars to rise and set

**Day vs Night**

**Rotation:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

-Example: earth rotates on its axis once a day

**Revolution**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

-Example: earth revolves around the sun once a year.

**The Seasons** are caused by the fact that:

-Earth’s axis of rotation tipped by**\_\_\_\_\_\_\_\_** from the perpendicular to its orbit (causes the **seasons**).

-The Seasons are a result of **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** the sunlight is that strikes Earth.

-They are **not** related to Earth’s distance from the sun. In fact, Earth is slightly closer to the sun in (northern-hemisphere) winter than in summer.

-Northern summer = more \_\_\_\_\_\_\_\_\_\_ light, sun \_\_\_\_\_\_\_\_\_\_ in sky, daytime sunlight is \_\_\_\_\_\_\_\_\_\_

-Northern winter = less \_\_\_\_\_\_\_ light, sun \_\_\_\_\_\_\_\_\_\_ in sky, daytime sunlight is \_\_\_\_\_\_\_\_\_\_

**What is an ecliptic?**

**Definition #1**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Definition #2**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

How the path of the sun changes over the course of the year (this is at \_\_\_\_ degrees latitude)

Earth circles (\_\_\_\_\_\_\_\_\_\_\_\_\_\_) around the sun in \_\_\_\_\_\_\_\_\_ days, and the sun appears to circle the sky in the same period.

The sun, traveling \_\_\_\_\_\_\_\_ degrees around the ecliptic in 365.25 days, travels about \_\_\_ degree eastward each day…seasons

**The Celestial Sphere**

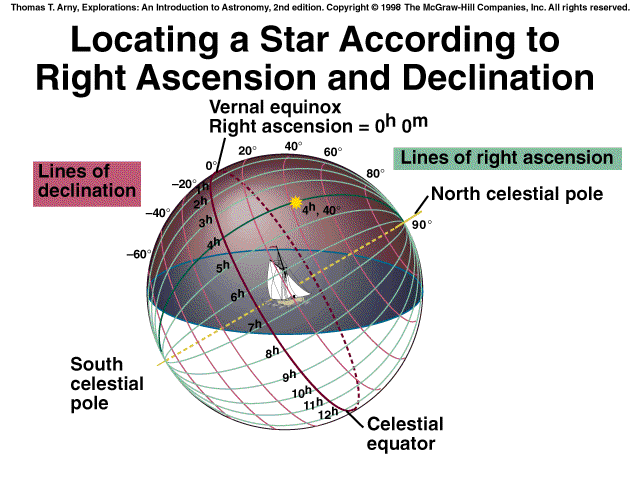
**Celestial Sphere**

**North Celestial Pole**

**Polaris**

**Why use it?**

* The Celestial sphere is an easier way to locate stars because they are \_\_\_\_\_\_\_\_\_\_ coordinates on this map



**Right ascension (RA)**

**Declination (dec)**

If you are standing at the North Pole, your view of the celestial sphere looks like this…

Diurnal Circles (daily “star trails”) from North Pole; Polaris at 90 degrees altitude

If you are standing at the equator, your view of the celestial sphere looks like this…

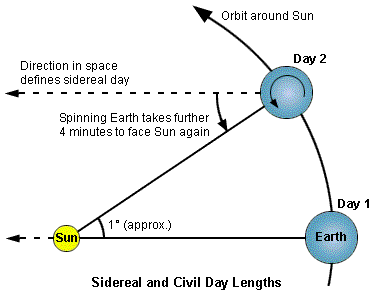
Diurnal Circles from Equator; Polaris at 0 degrees altitude

If you are standing in Atlanta, your view of the celestial sphere looks like this…

Diurnal Circles from Mid-Latitude

**Circumpolar stars**

**Latitude and Polaris**



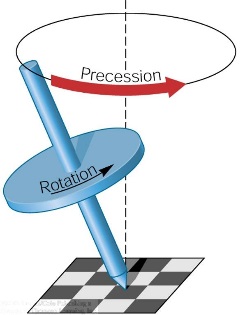
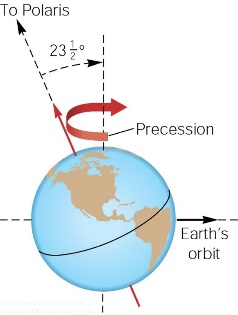
**Sidereal Day**

The time it takes a star to line back up with Earth 23 hours, 56 minutes, 4 seconds   
(~\_\_\_\_\_\_\_ minutes shorter than a 24 hr day)

Therefore stars rise

**~ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Mean Solar Day** =

**Precession** 

At left, gravity is pulling on a slanted top. Wobbling around the vertical.

The Sun’s gravity is doing the same to Earth.

The resulting “wobbling” of Earth’s axis of rotation around the vertical w.r.t. the Ecliptic takes about 26,000 years and is called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

As a result of precession, the celestial \_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_ follows a circular pattern on the sky, once every \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ years.

It will be closest to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ~ A.D. 2100.

There is nothing peculiar about Polaris at all (neither particularly bright nor nearby etc.)

~ 12,000 years from now, it will be close to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in the constellation Lyra.

The positions of the stars change over the course of the year because the Earth orbits the Sun…

Off-season constellations are “\_\_\_\_\_\_” during the daytime

Notice that between June and August, the Sun is directly “in” Gemini

Notice that June to August, Sagittarius is prime viewing during summer nights

**Positioning of the Planets**

Notice that the planets lie along the \_\_\_\_\_\_\_\_\_\_\_\_ because the solar system is in the same plane (a flat disc)

The planets are orbiting the sun almost exactly in the plane of the Ecliptic.

The Moon is orbiting Earth in almost the same plane (Ecliptic).

The Sun, Moon and planets can always be found in a Zodiac \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ on the ecliptic.

Planets "\_\_\_\_\_\_\_\_\_\_\_\_\_" across the celestial sphere and through the stars in two ways:

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Motion - normal eastward movement of planets

2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Motion - occasional westward movement of planets

Retrograde motion occurs when an inner planet passes by an outside planet and the outside planet appears to go “backwards” in the sky for a few weeks (this doesn’t happen in a night)

The movement is **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**—Mars does NOT really move like that in space. The position of mars shifts against the backdrop of distant stars.

**Moon Phases**

Phases of the moon occur because we see only a portion of the lit side of the moon from different angles

Half the moon is always lit and half the moon is always dark, but we might only see a portion of the lit side

Phases of the Moon are NOT because of the Moon going in and out of shadows

EVENING SKY OBSERVATION

MORNING SKY OBSERVATION

* The Moon orbits Earth in a **sidereal period** of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ days.
* The Moon’s *synodic period* (to reach the same lunar phase) is \_\_\_\_\_\_\_\_\_\_\_\_ days   
  (~ 1 month).

Lunar Eclipses: Earth’s shadow falls across Moon

* partial shadow is the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**, and a zone of full shadow is the **\_\_\_\_\_\_\_\_\_**
* If the entire surface of the moon enters the Umbra, the \_\_\_\_\_\_\_\_\_ eclipse is \_\_\_\_\_\_\_\_\_\_\_.

Solar Eclipses: Moon’s shadow falls across Earth

* The sun appears approx. as large in the sky (same angular diameter ~ 0.50) as the moon.
* When the moon passes in front of the sun, the moon can cover the sun completely, causing a \_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_ eclipse.
* A \_\_\_\_\_\_\_\_\_ eclipse can only occur if the moon passes a node near \_\_\_\_\_ moon.
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