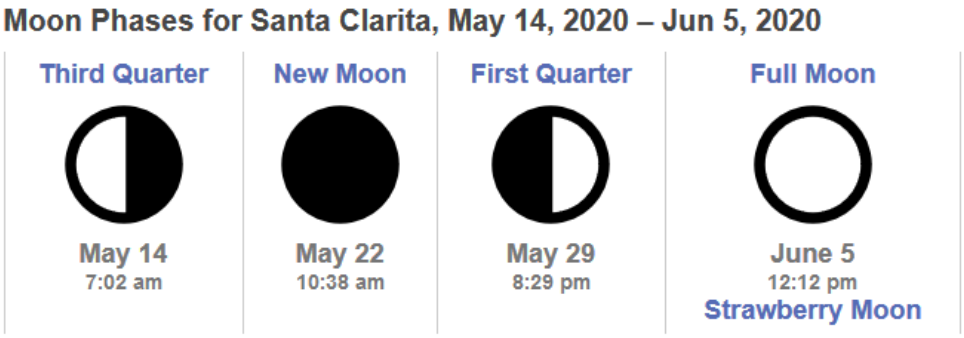
Observing Project

Objective: to use the tools of astronomy to observe, analyze and draw conclusions of celestial motion.



Note: Weather and bright moons happen. Plan accordingly.

Materials:

- Star viewing app (you can find a variety of free apps, however IF you can purchase any of them (usually around $2) you can view planets and satellites.
    - I prefer SkyView and StarWalk2 (iPad version is rad)
    - **Note on app locations**: apps use an algorithm, and may *slightly* differ from your view. Be sure to use your **EYES** first, app second.
- Your eyes
- Measuring device (your hands)
- For moon observing-use this site: **rise/set link**
- Compass to locate North (phone compass is fine)

Location:

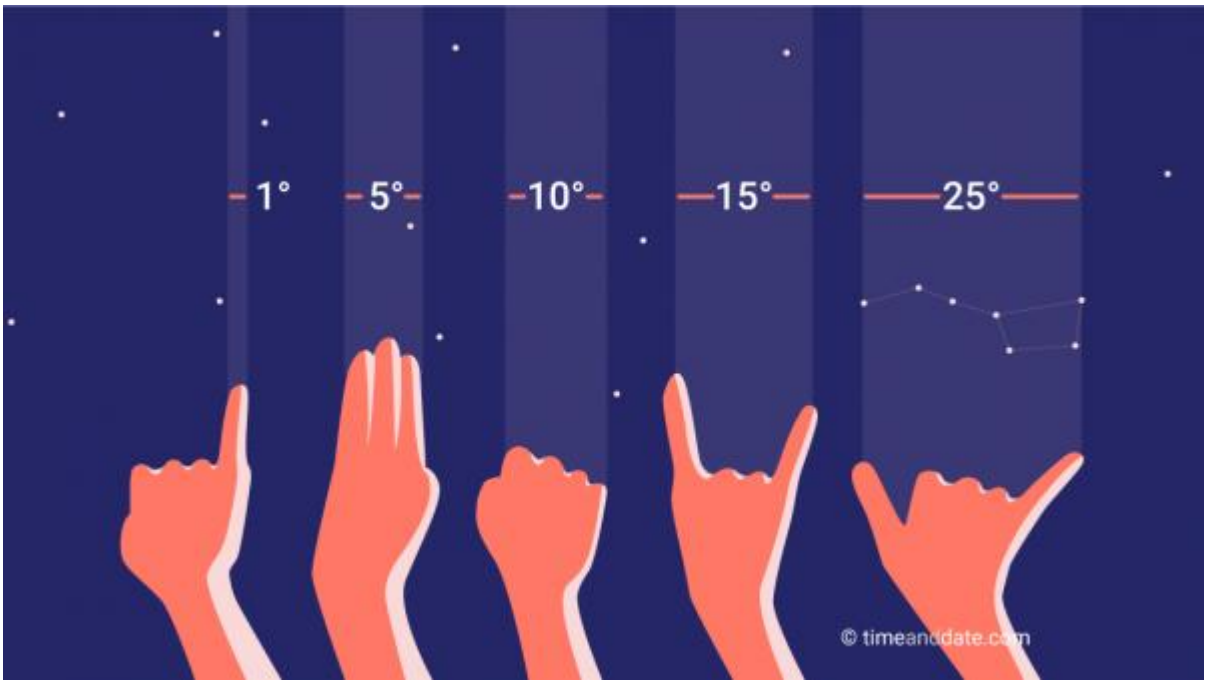
- Choose a clear night-no clouds. Plan accordingly-clouds happen.
- Choose a dark location, with minimal street lights (more important for your star observations)
- Choose a location free of as many horizon obstructions as possible.

Time:

- Star observations: 1 clear night.
- Planet observations: 1 clear night, 2 separate times (at LEAST an hour apart)
- Moon observations: 1 DAY (yes day-unless you happen to be up at the wee hours), 2 separate times, at least an hour apart).

Measurement tools- Astronomy with your fingers:

- Stretch your arm out.
- Spread your hand. From the pinky fingertip to the thumb tip is about 20 degrees in the sky.
- Each finger is about one degree.
- Make a fist – that's 10 degrees across, and the distance between adjacent knuckles is about 2 degrees.



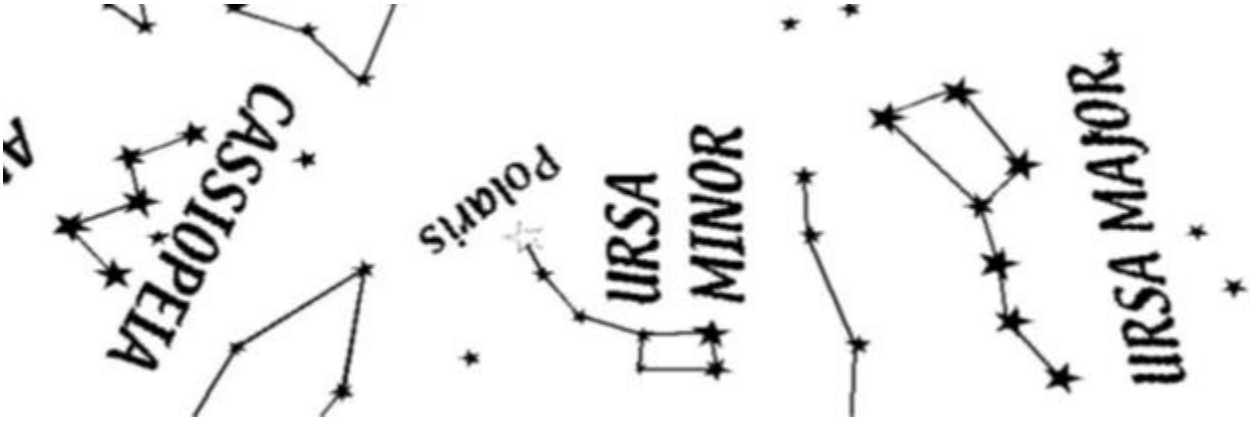
Estimate the size of the bowl of the Big Dipper and Cassiopeia

Part 1:

Polaris (only do this portion ONCE)

Find Polaris (North Star) in the sky using the surrounding constellations as guides. (The stars at the end of the bowl of the Big Dipper (Ursa Major) point towards Polaris.)

➔ Tip: SkyView won't help you much for this one! Actually FIND it.



1. Approximately how many degrees above the horizon is Polaris?

2. Record 3 general observations.

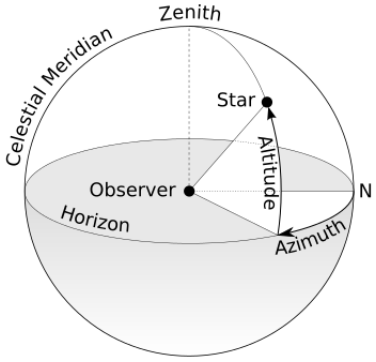
3. What stellar object is the closest to Polaris? Use your eyes to find the object first, then use the app to check what the object is.

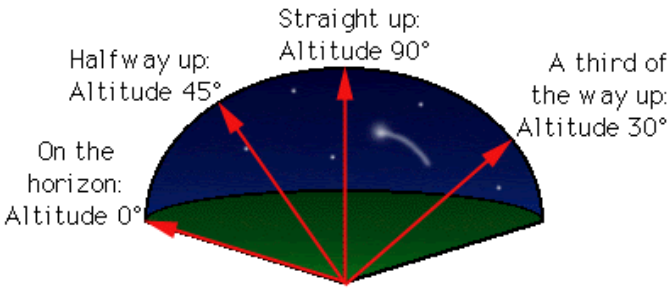
4. The **<u>altitude</u>**, or height above the horizon of Polaris is equivalent to the latitude of the observer. Knowing this, how could Polaris have been used for navigation?

5. **<u>Azimuth</u>** is measured as degrees around a circle, starting at North (0). Using *Altitude* and *Azimuth* measurements can always tell us where to look in the sky for a particular object. For example, if we wanted to find something at an azimuth of 90, we would look East, because North is 0.
   A. Knowing this, what is the azimuth of polaris?_____

   B. What would the azimuth be of an object directly opposite the sky as polaris (due South)?

Review the pictures below prior to moving on if you are still unclear.





Polaris: so what?

Polaris is special because at this time, Earth's rotation axis points toward it (within one degree). As a result, Polaris doesn't appear to move at all. The other stars appear to do circles around Polaris, and the stars in Polaris's vicinity do not set for observers in northern latitudes

Part 2:

Star Observations

Find 3 bright stars, use your app to identify and your distance tools to identify the distances.

For each star, fill in the following in the table below:

1. Name: Ensure this is the name of the actual star (from your app) not the cluster. The star name may include a Greek letter afterwards. This indicates the brightness within a given constellation.
2. General observations, compared to neighbor stars. Think about the general color, relative size and how much it twinkles compared to other stars in the sky. The goal is to make observations which reflect a more scientific understanding, not surface level, such as bright or twinkly or in the sky.
3. Hand measurements- Altitude above horizon, and azimuth degrees from North. I realize these will be approximate, but try and be as specific as possible.
4. App coordinates: these may NOT be in altitude azimuth! Record the coordinates AND the units.
5. Two facts about your star: Your app may have this info, or you may need to look it up.

Star name, date and time	General observations	Altitude	Azimuth (approximate)	App Coordinates: What are the units?	Fact 1:	Fact 2:

Part 3: Planets:

1. Find 2 of the following planets. Be sure to plan ahead so that you know they will be out. These observations do not have to be done at the same time as part 2.
2. Observe each of your chosen planets an hour apart. Again-make sure your selection will be out at each time. If you have too, you can observe them on two separate nights.
3. Record 3 observations of your planet. Think about the movement, color, brightness, size.

Planet	Time/date	General location at first observation; (altitude and azimuth)	General location at second observation; (altitude and azimuth)	List 3 observations
Mars				
Jupiter				
Venus				
Saturn				
Mercury				

Part 4: The Moon

1. Make two separate observations of the moon, at least an hour apart.
   a. **NOTE**: you may make these DURING THE DAY!!!!
2. Complete the table. For measurements-use your hand measurements only-NOT your app!

Date/Time	Altitude of Moon	Azimuth of Moon	Sketch	Description

Analysis:

1. Which object moved more throughout the night-stars, planets or the moon?
    a. Approximately how many degrees did this object move between observations?(use your table and simple subtraction)
    b. Why do you think this particular object moved more than the rest?
2. Which object moved the least?
    a. Approximately how many degrees did this object move between observations?
    b. Why do you think this particular object moved less than the rest?
3. Which moon phase was it? (you can look this up)
4. In the rise/set data base; what do you notice about the changing time of moon rise each night?
    a. Would you have been able to make the same observations tomorrow?
    b. In a week?
    c. Why or why not?
5. Describe the differences you noticed between the planets appearances.
6. Describe the differences you noticed in the planets locations':
    a. Did both of your planets move at the same rate, from your perspective? Why or why not?

7. Would you be able to observe all of your chosen stars and planets in 6 months, from the same location?
    a. Why or why not?

8. Describe how the seasonal motion of Earth affects the sky we see, and the positions of stellar objects, based on your observations. Include at LEAST one observation from this assignment as evidence, and highlight or underline.