

# Astro 150



## Lab 1: Apparent Positions of the Planets

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Section B06



# Information

- Time: 2:30pm to 5:20pm on Thursdays
- Lab reports should be handed in beginning of following lab. Can also be handed in earlier in drop box.
- Drop boxes are in first floor hallway of Elliot Building, with TA names.
- Labs turned in late will be docked points, unless given permission.
- Labs will be graded based on rubric, which I will post on CourseSpaces.

# **ASTR150 Planets Rubric**   /15 +   /6 +   /9 +   /6 +   /36 +   /12 +   /6 +   /10(neatness) =   /100

Grade Value	0	1	2	3	Weight
Objective & Introduction	Content missing	Basic content. Non-scientific jargon and wording. Difficult to understand sentences.	Acceptable content. Some attempt at scientific terminology. Sentences acceptable.	Excellent content. Proper use of jargon and scientific wording. Assumptions noted and justified.	5
Grade Value	0	1	2	3	Weight
Procedure	Content missing	Basic content. No special equipment described, minimal description of procedure, no discussion of measurement uncertainties.	Acceptable content. Special equipment noted, important points of procedure noted, basic discussion of measurement uncertainties.	Excellent content. Special equipment addressed and discussed, procedure detailed and informative, measurement uncertainties noted.	2
Grade Value	0	1	2	3	Weight
Observations, Tables & Graphs	Content missing	Basic content. Incomplete information. Tables missing title, or other details. Graphs missing titles, labels, and/or too small. Sketches lacking detail.	Acceptable content. Minor details missing from graphs, tables and sketches, but all major details present.	Excellent content. Tables and graphs complete. Observations thorough.	3
Grade Value	0	1	2	3	Weight
Calculations	Content missing.	Basic content. Many calculations missing. Units and significant figures ignored. No detailed calculations at the end of the report.	Acceptable content. Most calculations present, but some details missing. Units and significant figures use inconsistent.	Excellent content. All calculations included. Units and significant figures present in all calculations.	2
Grade Value	0	1	2	3	Weight
Answers	Content missing.	Basic content. Questions answered simplistically; answers show lack of insight. Results not clearly discussed. Units neglected. No link between objective and results.	Acceptable content. Questions mostly answered correctly. Results mentioned, with spotty units. Weak link provided between objective and results.	Excellent content. Questions answered in detail. Clear connection between objective and results. Units clearly included.	12
Grade Value	0	1	2	3	Weight
Discussion	Content missing.	Basic content. Lacking discussion about expectations, assumptions, and consistency. No discussion about broader context.	Acceptable content. Limited discussion of expectations, assumptions and consistency. Limited discussion of broader context.	Excellent content. Expectations, assumptions and consistency clearly and correctly addressed. Broader context discussed.	4
Grade Value	0	1	2	3	Weight
Conclusion & References	Content missing.	Basic content. Conclusion unclear or lacking insight. References limited or missing.	Acceptable content. Correct conclusion but limited. Some references included.	Excellent content. Conclusion correct and focused. Detailed references included.	2

# Integrity

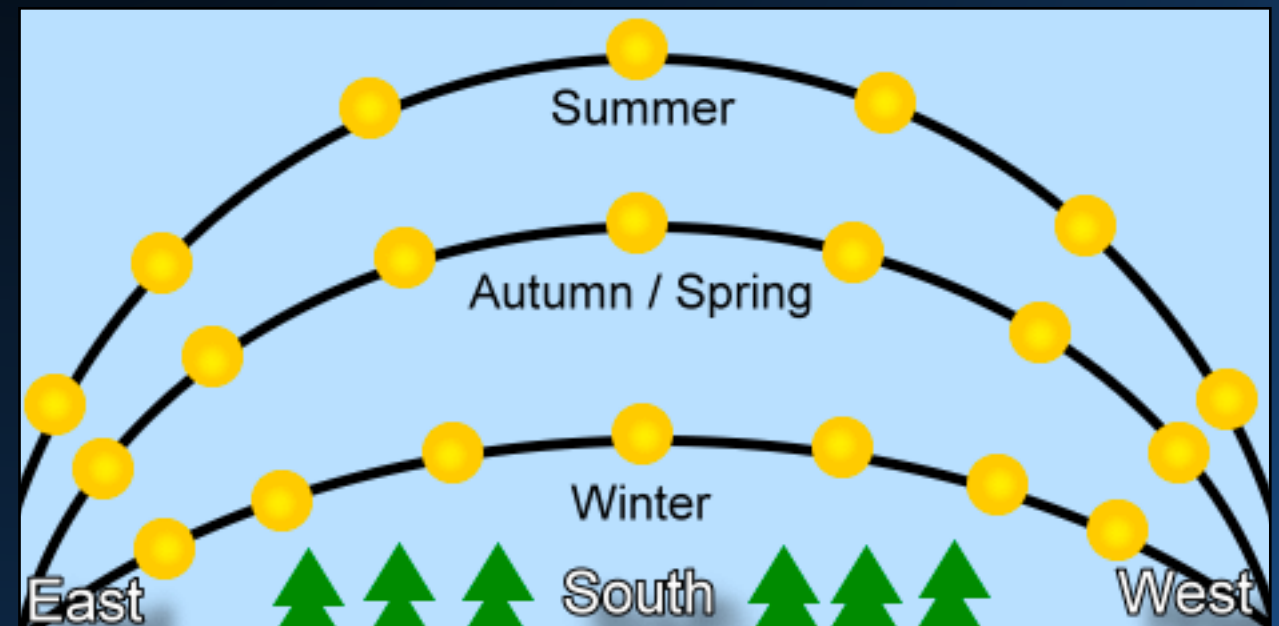
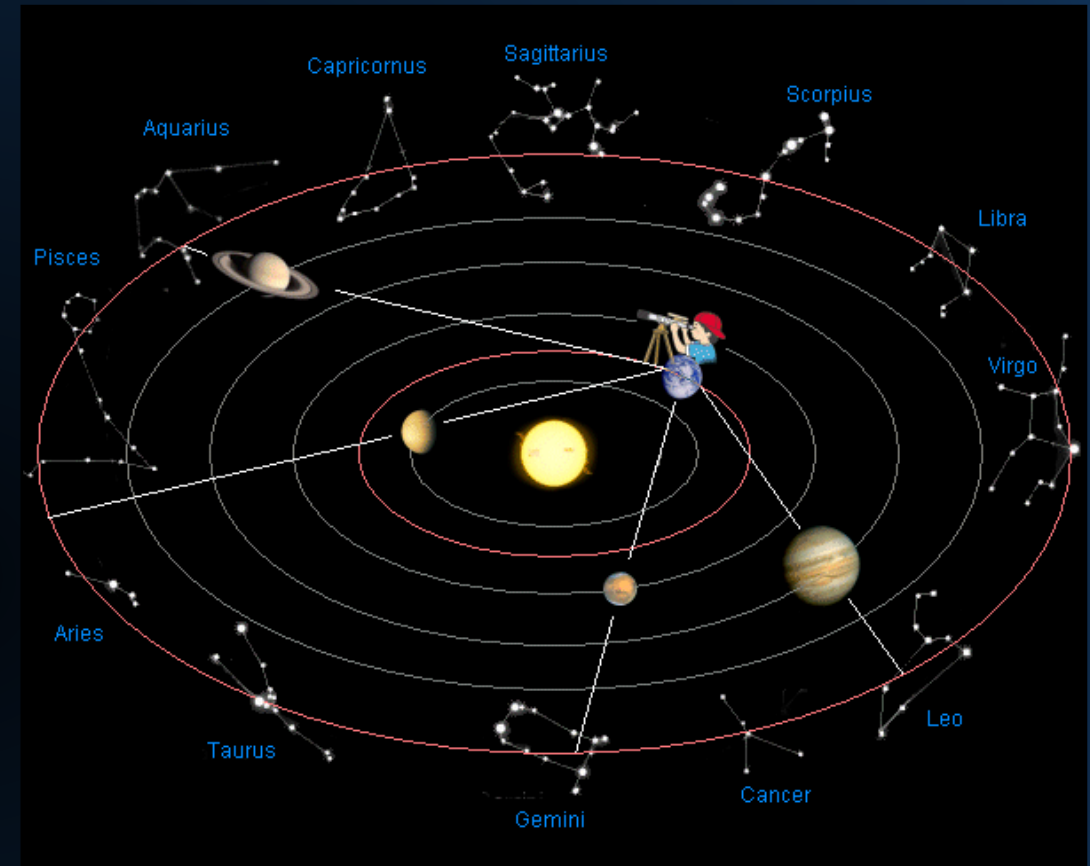
**VERY IMPORTANT!**

- Do not copy and paste from the internet.
- Always cite your sources.
- Do not copy from your friends.
- Do not copy from the lab manual.



# Introduction

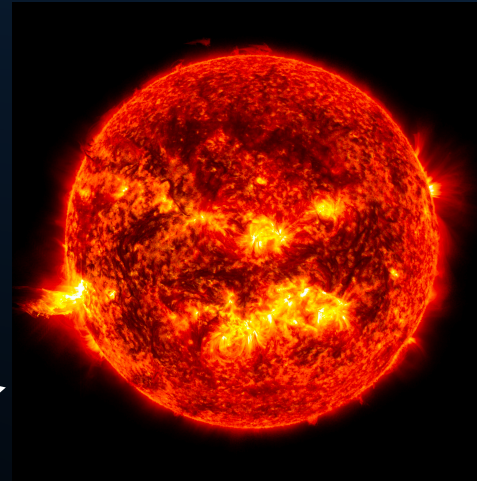
- Earth orbits the sun with a period of one year.
- As an observer on Earth, it appears that the sun moves in the sky.
- The sun's path is called the ecliptic.
- Other planets also follow this path, as they all orbit approximately on the same plane.
- Earth is tilted 23.5 degrees w/ respect to the ecliptic. This creates seasons.



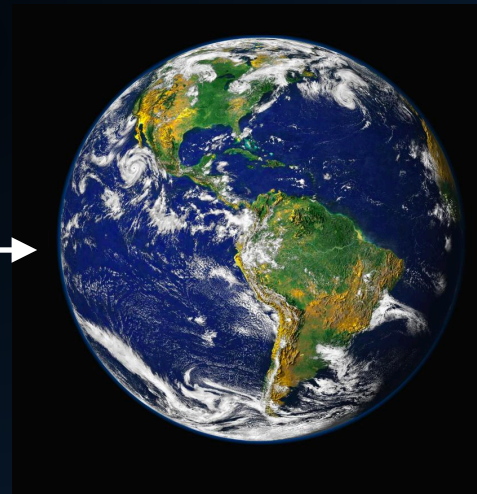


# 3 main coordinate systems

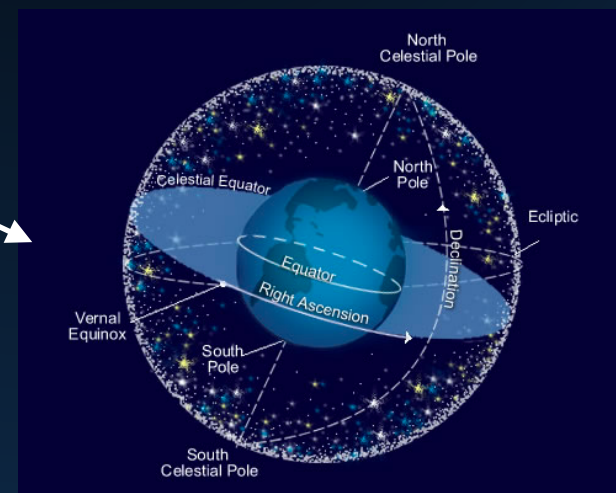
- Heliocentric



- Geocentric



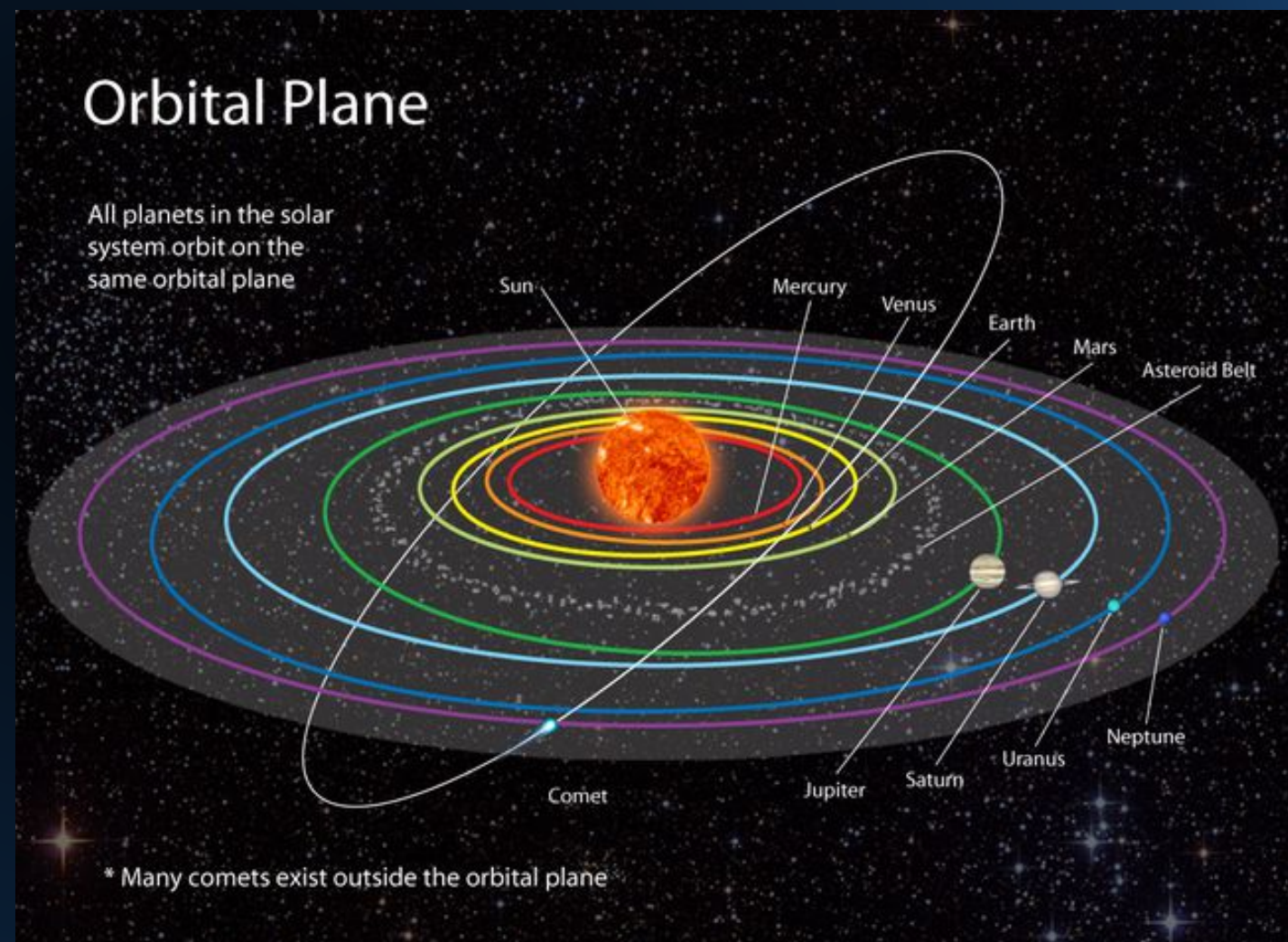
- Equatorial





# Heliocentric

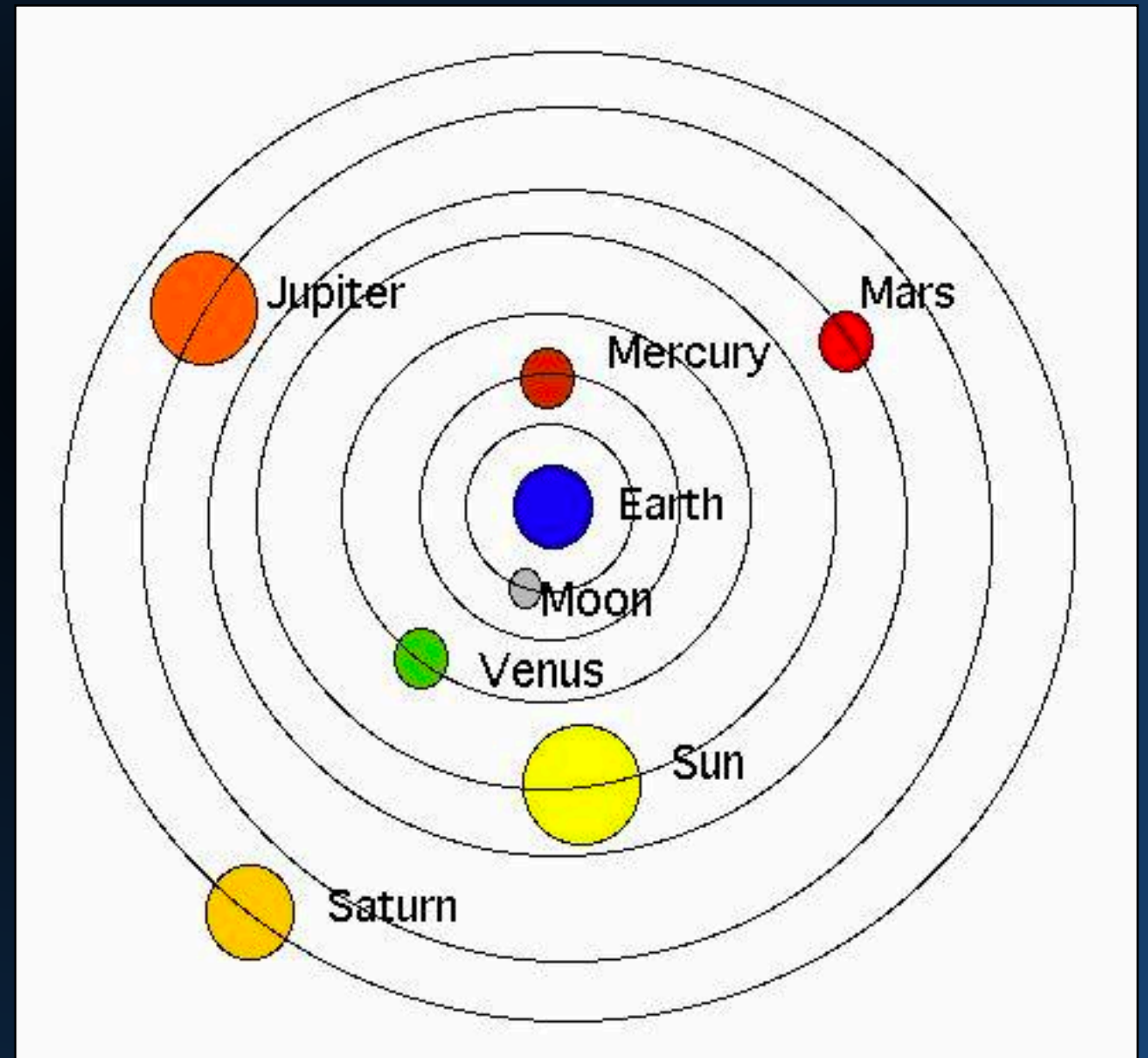
- Centered around the sun.
- Longitude is counterclockwise from 0 to 360 degrees.
- Latitude is -90 to 90 degrees.
- 0 degrees longitude is with respect to the First Point of Aries.





# Geocentric

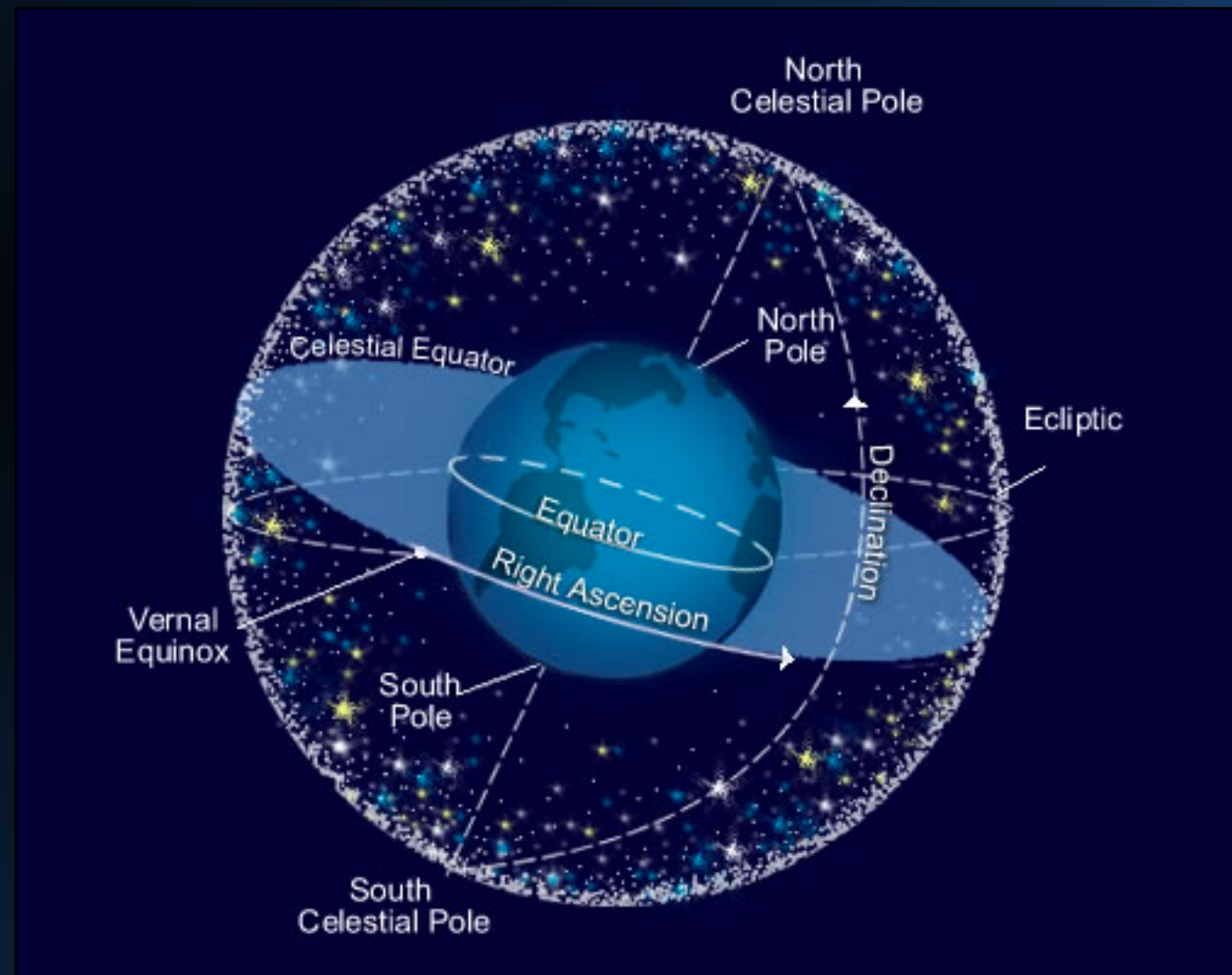
- Earth is at center.
- Longitude and Latitude are similar to the heliocentric model.
- 0 degrees longitude is also respect to the First Point of Aries.





# Equatorial

- Earth is again at the center.
- Imagine inflated sphere around the Earth, w/stars fixed on it.
- Right Ascension is 0 to 24 hours, 1 hour = 15 degrees.
- Declination, like latitude, goes from -90 to 90 degrees.
- RA = 00 is again, respect to the first point in Aries.





# Part 1:

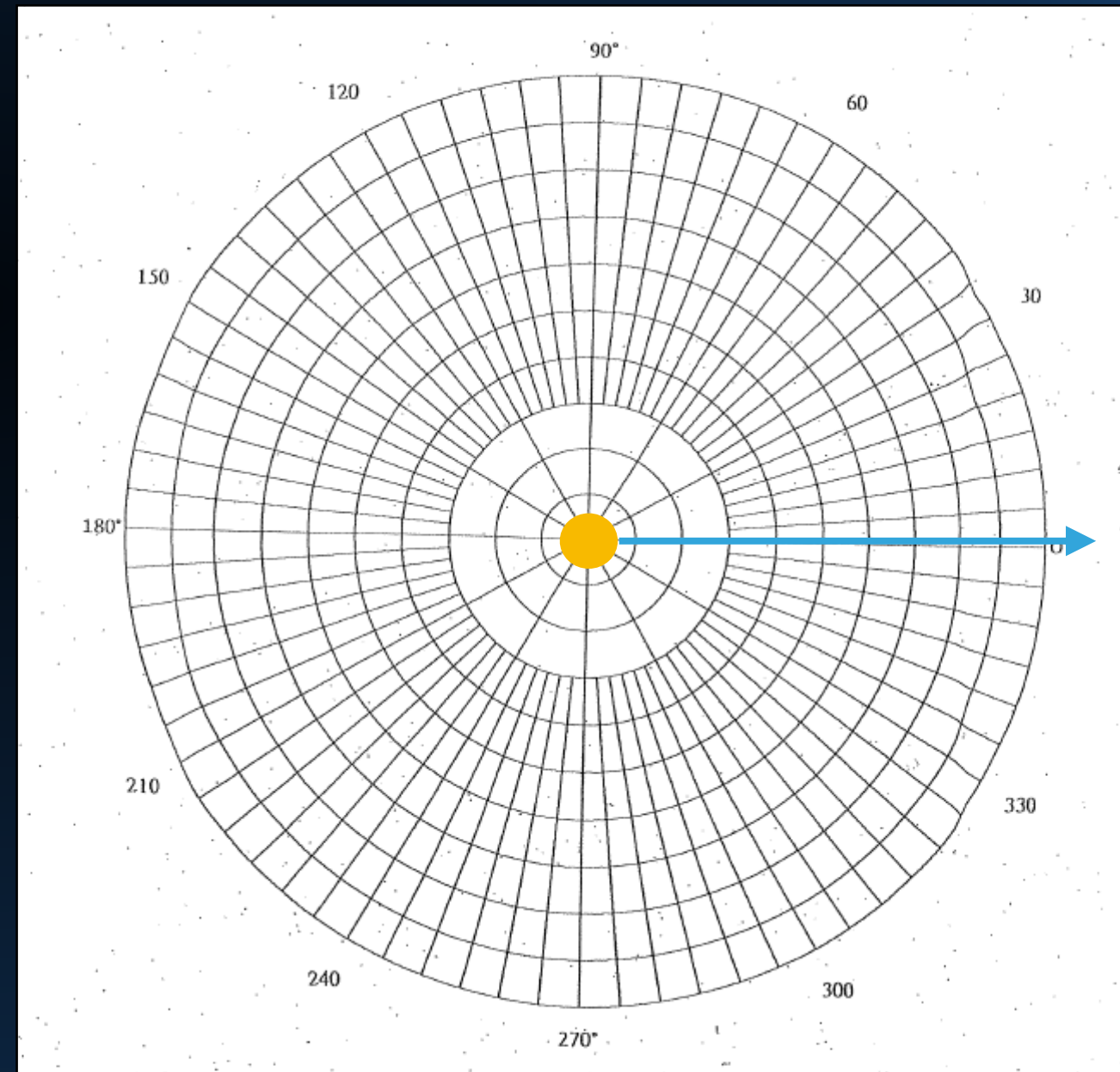
- Calculate mean motion of each planet, and heliocentric longitudes
- Fill in Table 2/Answer question 1.

Table 1: Orbital radii, orbital periods, and heliocentric longitudes on 21 September 2019 of Earth and four other bright planets.

Planet	Symbol	Orbit Radius (A.U.)	Period (years)	Helio. Long.(degrees)
Venus	♀	0.72	0.6152	202°
Earth	⊕	1.00	1.000	357°
Mars	♂	1.52	1.881	168°
Jupiter	♃	5.20	11.86	267°
Saturn	♄	9.58	29.67	289°

Table 2: Mean motion and heliocentric longitudes of Earth and four bright planets.

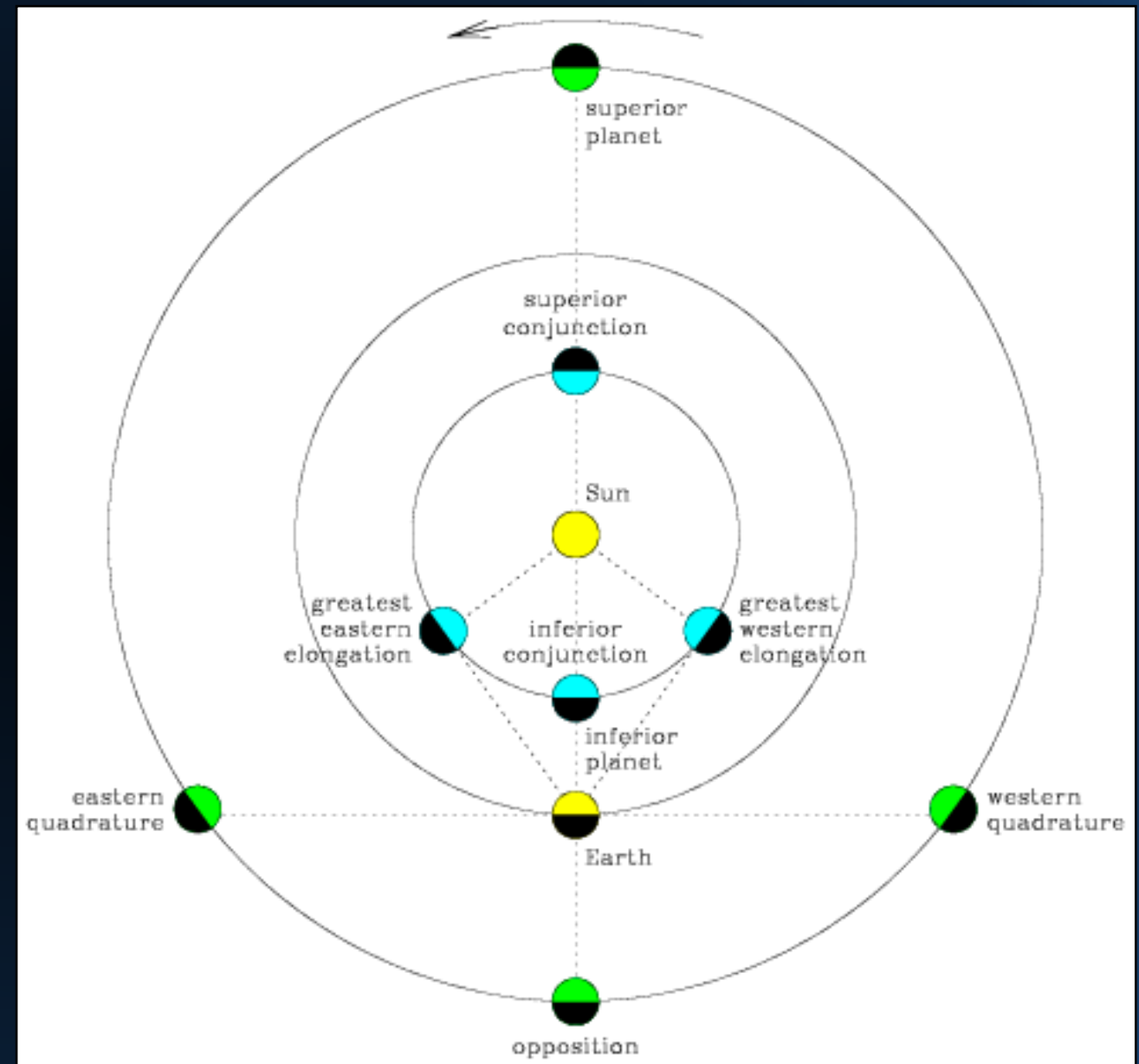
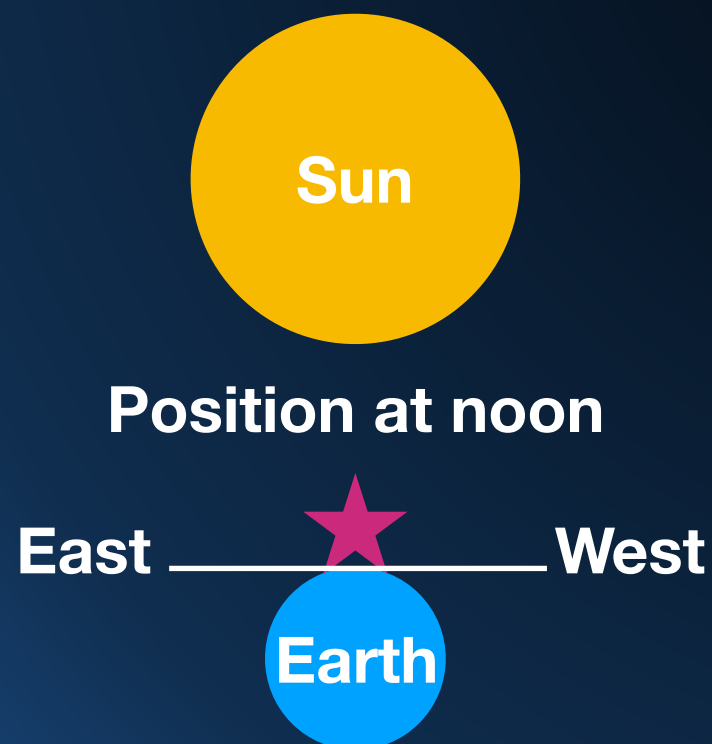
Planet	MM	HL (today)	HL (+30 days)	HL(+60 days)
Venus				
Earth				
Mars				
Jupiter				
Saturn				





# Part 2:

- Fill in table 3 the configurations for each planet.
- Fill in table 3, whether each planet is visible from Earth in the East, West, or Not Visible, during certain parts of the day.
- Answer questions 2-5.





**Dawn**



**Dusk**

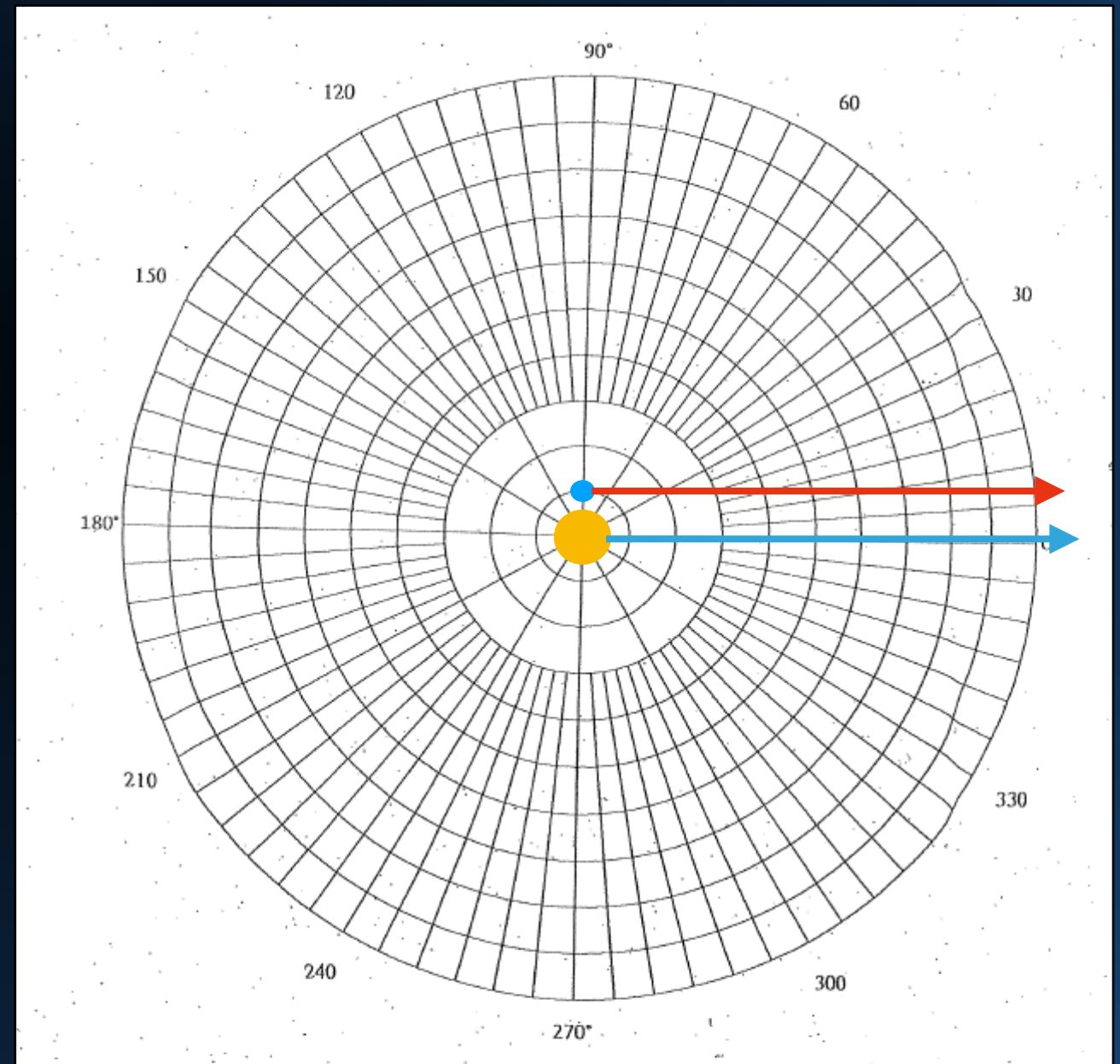


**Midnight**

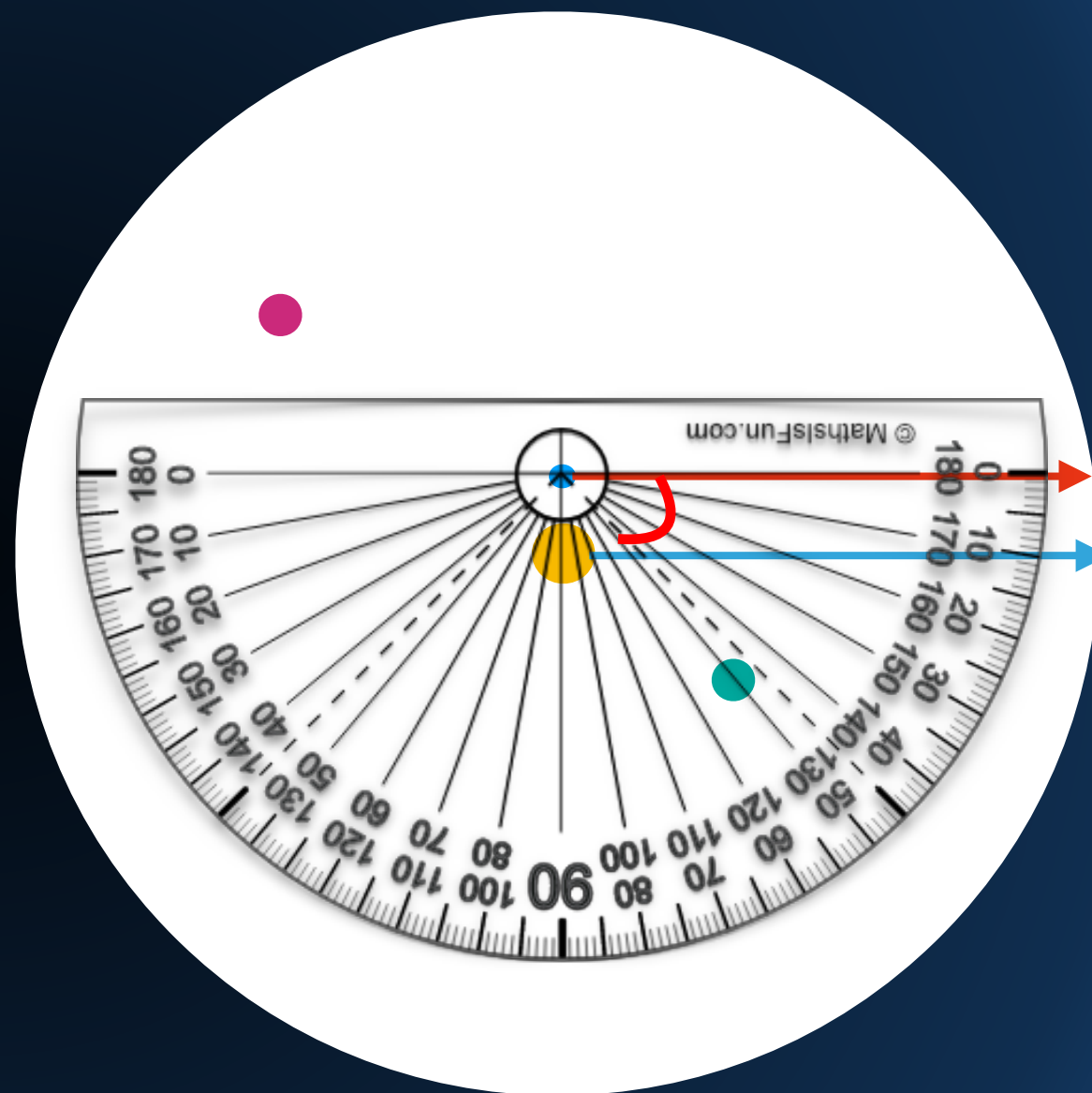
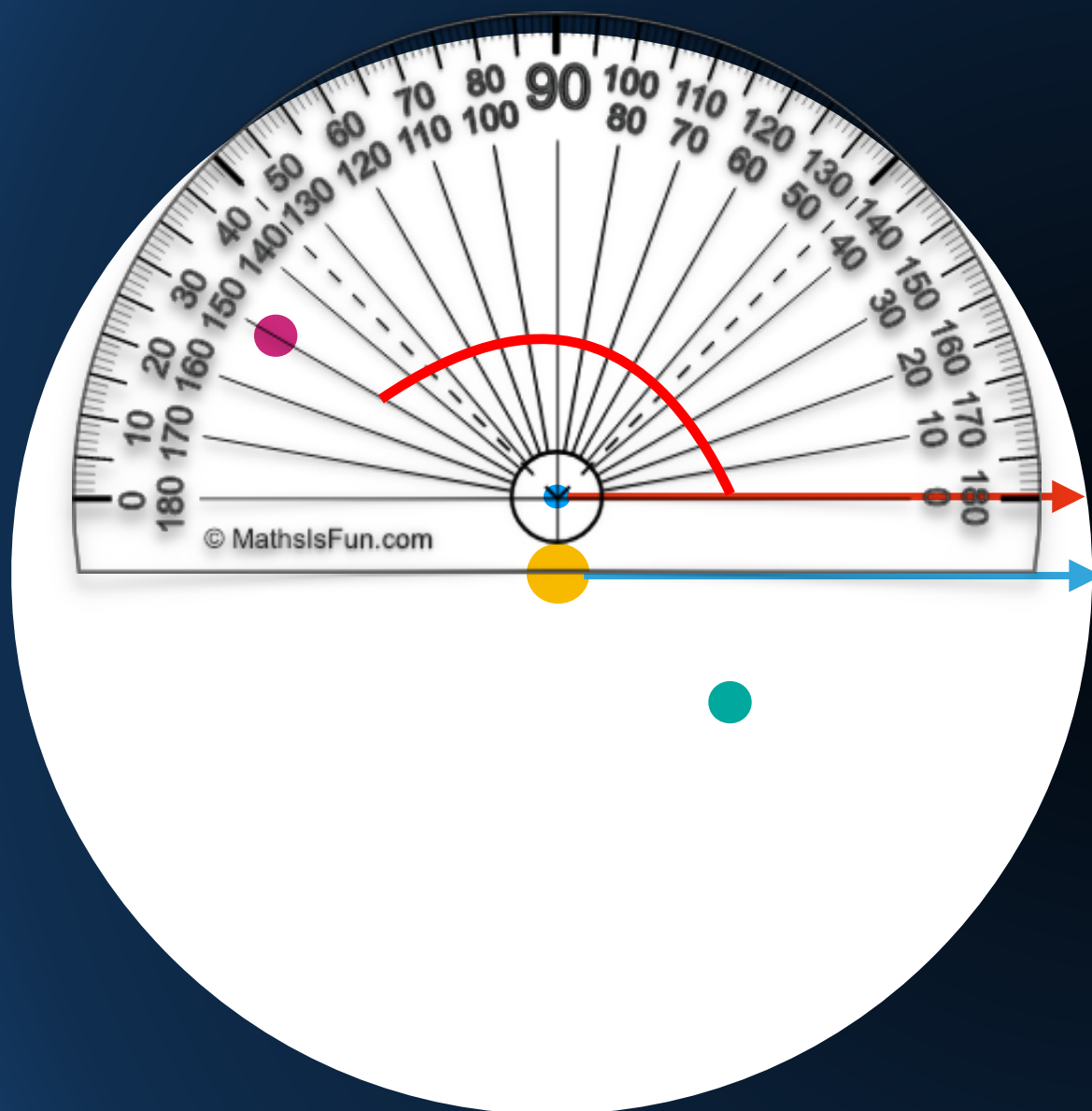


# Part 3:

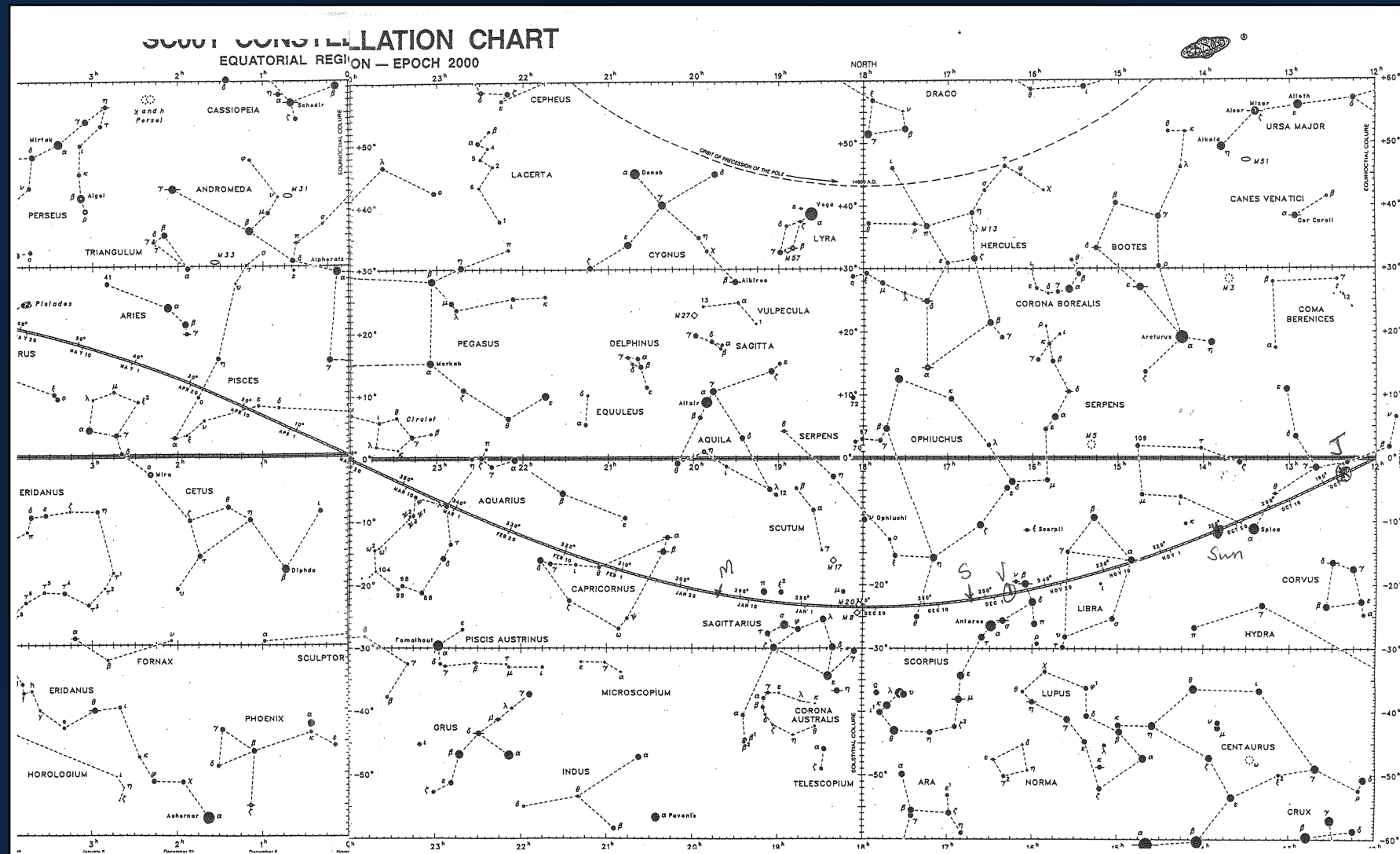
- Find the Geocentric ecliptic longitude of the planets.
- Draw a new First Point of Aries line from Earth, parallel to that of the heliocentric line.
- Use a protractor to measure the longitude angles of the planets based on this new line.
- Write down Geocentric angle in Table 4/Answer Question 6.







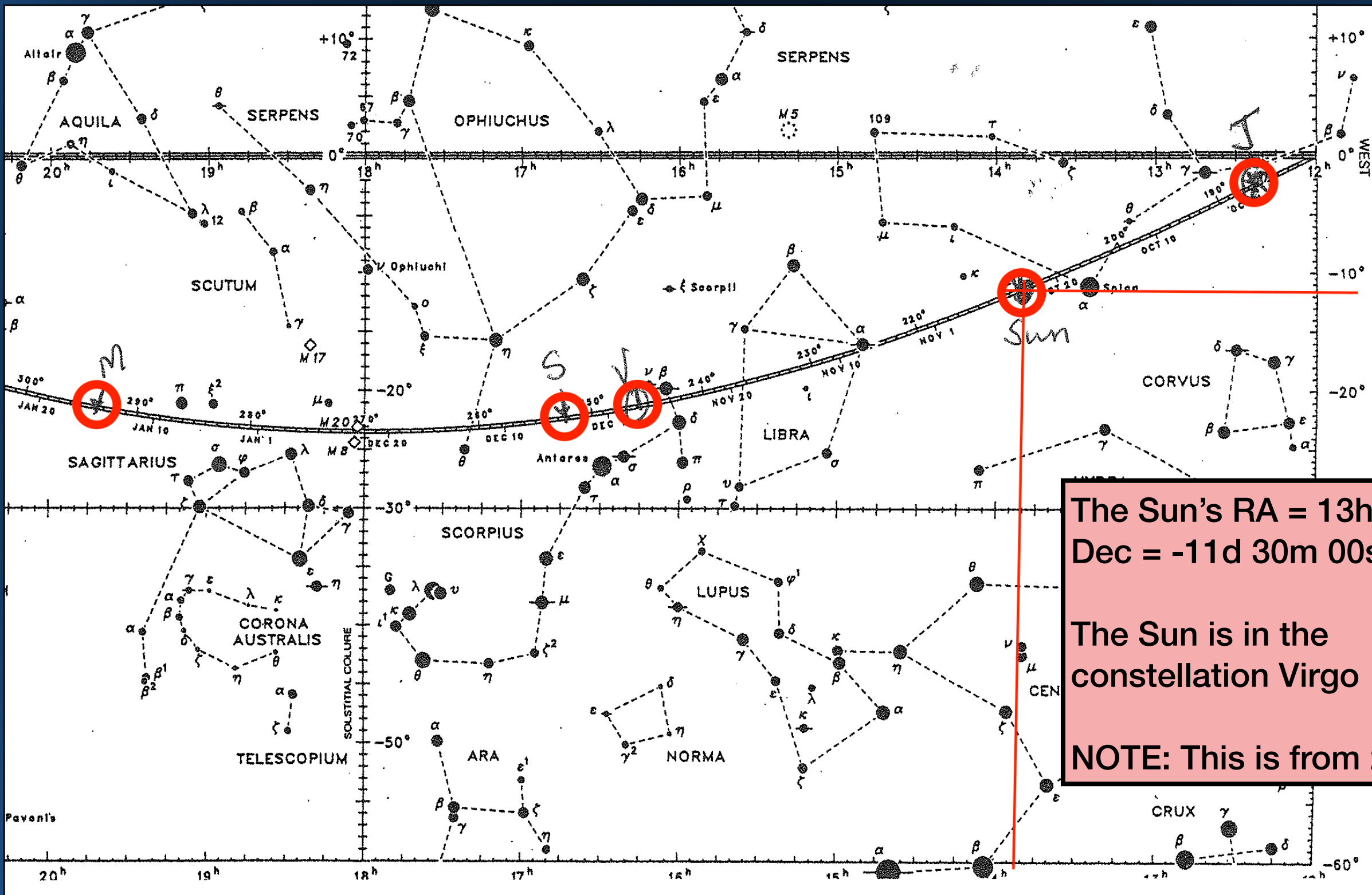
# Part 4:



- Cut and paste the two halves of the constellation chart together
- Use constellation chart to plot the planets and sun on the ecliptic.
- Note which constellation the sun and each planet are in. (Hint: You'll need to look up the constellation boundaries).
- Answer questions 7-9.



- Use the constellation chart find and record that RA and Dec for the sun and each planet in Table 3.



The Sun's RA = 13h 55m 00s,  
Dec = -11d 30m 00s

The Sun is in the  
constellation Virgo

NOTE: This is from 2016!

# Part 5:

- Cut out and put together your star finder.
- Mark the position of the planets on the ecliptic on the star guide, using the constellation chart.
- Answer questions 10-17.

