

AST 120 Activity 6

The Moon

Now that we know how the Sun moves through the sky, we will focus our attention on the second most obvious object in the sky: the Moon.

1. Go to a computer and launch Stellarium. Make sure you are in Rome, GA.
2. Stop the flow of time (7) and set time to now (8).
3. Turn off the atmosphere (a), fog (f), and ground (g). You are now an observer floating freely in space with nothing to block your view (but you are still at the location of Earth).
4. Show the equatorial grid (e), celestial equator (.), and ecliptic (,).
5. Find the Moon and track (t) it. Then use the Date/Time window to find the date and time when the Moon's RA is 0^h . Record this date and time, and the Moon's Declination at this date and time, below.

date = _____ time = _____ Dec = _____

6. Now find the date/time when the Moon next has an RA of 0^h . I suggest advancing time in increments of one sidereal day until you get close, then advance time in increments of one hour to get the Moon onto the Celestial Meridian. Record the date, time, and the Moon's Dec below.

date = _____ time = _____ Dec = _____

7. How long does it take the Moon to complete one orbit around the Celestial Sphere (i.e. with respect to the background stars)? This time interval is called the *sidereal month*.

8. Does the Moon return to *exactly* the same point after it completes this orbit? Explain.

9. Approximately how many degrees does the Moon move relative to the fixed stars each sidereal day? In which general direction does it move, relative to the stars?

10. Recall that the Sun moves Eastward relative to the fixed stars at a rate of about 1° per day. You should have found that the Moon moves relative to the stars much faster than the Sun does. In which direction does the Moon move *relative to the Sun*? Approximately how many degrees does the Moon move relative to the Sun during one solar day?

11. Suppose the Moon rises at exactly the same time as the Sun on a particular day. Will the Moon rise later or earlier than the Sun on the next day? How much later or earlier (to the nearest minute)? Don't use the software for this, you can calculate it (let me know if you need help).

12. Let's continue to look at how the Moon moves relative to the Sun. Advance time in units of one (solar) day until the Moon is very close the Sun. Advance time in units of one hour until the Moon has about the same RA as the Sun. Record the date and time below.

date = _____ time = _____

13. Now advance time in units of days until the Moon goes all the way around and gets close to the Sun again. Advance time in units of hours until the Moon has the same RA as the Sun again. Record the date and time below.

date = _____ time = _____

14. How long does it take the Moon to lap the Sun? In other words, what is the time interval between two successive times at which the Moon passes the Sun? This time interval is known as the *synodic month* (synodic means "as seen from Earth").

15. Get the Moon to a time when it has the same RA as the Sun if it is not already there. This *phase* of the Moon is known as the New Moon. What does the New Moon look like? Zoom in on the Moon (/) to get a close-up view. Draw a picture to represent the appearance of the Moon. Also, record the date below.

16. Now advance time by 4 days. Draw a picture to represent the appearance of the Moon. Also, record the date below. This phase is known as *waxing crescent*.

17. Advance by another 4 days. Draw a picture to represent the appearance of the Moon. Also, record the date below. This phase is close to *first quarter*.
18. Advance by another 3 days. Draw a picture to represent the appearance of the Moon. Also, record the date below. This phase is known as *waxing gibbous*.
19. Advance by 3 days. Draw a picture to represent the appearance of the Moon. Also, record the date below. This should be close to a *full Moon*.
20. Advance by 4 days. Draw a picture to represent the appearance of the Moon. Also, record the date below. This phase is known as *waning gibbous*.
21. Advance by 3 days. Draw a picture to represent the appearance of the Moon. Also, record the date below. This phase is close to *third quarter*.
22. Advance by 4 days. Draw a picture to represent the appearance of the Moon. Also, record the date below. This phase is known as *waning crescent*.

23. Advance by 4 days. Draw a picture to represent the appearance of the Moon. Also, record the date below. This should be close to a new Moon again.
24. How many days does it take for the Moon to go through its full cycle of phases (ie from New to New)?
25. Based on your observations, does the appearance of the Moon appear to be tied to its location *relative to the stars* or its location *relative to the Sun*? How do you know?
26. Zoom back out (\) if needed and continue to advance time. This time just watch the position of the Moon relative to the ecliptic. Does the Moon follow exactly the same path through the sky as the Sun (the ecliptic)? Does it stay close to the ecliptic? Can it be found both above and below (and on) the ecliptic, or is it always found on one side?