

HOMEWORK #10 (due start of class February 12) (copyright D. McCarthy)

LEARNING GOALS:

1. Continue recording observations in your journal.
2. Practice using your Solar Motion Demonstrator to understand seasonal effects at different places on Earth.

TO RECEIVE FULL CREDIT:

1. If you submit multiple pages, staple them together.
2. To receive any credit on these problems, you must **show how** you derived your answer by writing all the logical steps that led you to it.
3. All sentence responses must be **typewritten and in complete sentences**. You may handwrite any arithmetic. Use good English grammar.
4. **If you work more than three hours on this assignment, you should stop, record your work here, and contact Dr. McCarthy.**

1. Keep observing the sky (day & night) and record notes, pictures, and measurements in your journal.

Dr. McCarthy has posted a new link, describing journal content and requirements, on our Web site. Stay up-to-date! On a typical day, you should be spending ~1-2 hours observing and recording.

2. Reading: The Solar Analemma

<https://www.universetoday.com/113328/having-fun-with-the-equation-of-time/>

In comparison to Earth, the planet Jupiter a smaller tilt of its rotation axis (3.1 vs 23.5 degrees), a 3x more oval (i.e., “eccentric”) orbit, and a longer orbital period around the Sun (11.9 years). Describe how you think Jupiter’s analemma would differ from Earth’s. Use a schematic diagram to illustrate your predictions.

3. Seasons: Your Solar Motion Demonstrator (SMD)

During the course of our semester (January through April) the Sun will change its motion in our sky. Answer the following questions using the SMD you built as a tool to estimate angles and directions. These questions are similar to the ones we practiced in class.

a. For Tucson (latitude 32 deg N), what is the approximate range of azimuth for sunrise over the course of a year from January through December?

b. For Tucson, in what month will the Sun rise exactly in the East? How about in Minneapolis (45 degrees N)? Use your understanding of the cause of the seasons to explain any differences or similarities in the location of sunrise between these two cities. Consider making a drawing as part of your explanation.

c. Barrow, Alaska (latitude 71 deg N) is the northernmost city in the United States. In what month will residents of Barrow first see the Sun rise and not set until 84 days later? (This phenomenon is called “the midnight Sun.”)

d. In the city of Barrow, the Sun will not rise between Nov.18 and Jan. 23. However, the sky will not be perfectly dark. Explain some phenomena that can brighten the sky even though the Sun will not rise above the horizon.

4. FITS Viewer Software

Install SAO DS9 on your computer: <http://ds9.si.edu/site/Download.html>