HOMEWORK #3 (due start of class September 4)  My Star Name is: _____________  
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LEARNING GOALS for this assignment:  
1. Understand why we see different “phases” of the Moon.  
2. Mentally visualize the Earth-Moon-Sun system in a 3-D “model” as the Moon orbits the Earth and as the Earth and Moon together revolve around the Sun.  

TO RECEIVE FULL CREDIT:  
1. Read and utilize the “Daily Skills” #1-3 in both communication and numbers.  
2. All sentence responses must be **typewritten and in complete sentences**. You may handwrite any arithmetic. Use good English grammar.  
3. If you work more than two hours on this assignment, you should stop, record your work here, and contact Dr. McCarthy and your Teaching Assistant for help.

Part I. Reading in your online textbooks  
In the book “Astronomy” – Chapter 4, section 4.5 (“Phases and Motions of the Moon”)  

Part II. Prepare for Wednesday’s class.  
After completing Part I, you should be able to answer the following questions on your own. If these problems seem too difficult or if you would like to check your answers, please contact Dr. McCarthy or your Teaching Assistant during their office hours, study sessions, or by appointment.  

**Answer any three of the following questions that relate to the pictures below.**  
Remember to write in clear sentences.  

QUESTIONS:  
1. Why do half of the Moon, and half of the Earth, always experience daytime while the other halves experience night?  

2. In the left-hand picture the woman’s head again represents the Earth. For imaginary people at her nose, the time would be noon. Where on her head (right ear, left ear, back of head) would imaginary people experience noontime and midnight?  

3. In the right-hand picture the Sun is located to the far right, and the Moon is in a different part of its orbit (now at right-angles to the Sun). In contrast to the left-hand picture, the woman sees a different proportion of sunlight, i.e., a different “phase.” What phase would she see: New, First Quarter, Full, or Third Quarter?  

4. In the right-hand picture the woman’s head again represents the Earth. What time of day would it be for someone at her left ear? Similarly, for her right ear? What phase(s) of the Moon would each of those locations see: New, First Quarter, Full, or Third Quarter?  

5. The diagram below shows that the Moon “**revolves**” in an orbit around the Earth and that the Earth-Moon system revolves together around the Sun. The Moon’s orbit around the Earth is tilted with respect to the Earth’s orbit. The Moon and the Earth have shadows that always point in the opposite direction from the Sun. Study the diagram and be able to explain why people on Earth seldom see eclipses of the Moon and Sun.
In left-hand picture above, imagine that the woman’s head represents the Earth and the small ball in her arm represents the Moon. The Sun illuminates both objects. The circle surrounding the woman’s head indicates that the Moon revolves around the Earth. In this picture the Moon is nearly aligned with the Sun so the woman would see a nearly “New” phase of the Moon. Think about the middle and right-hand pictures and imagine how people on Earth would see the day/night portions of the Moon change as the Moon orbits the Earth (i.e., different “phases”).