

PROJECT 4: COPERNICAN MODELING

1 Modeling Your Solar System: Take 2

For this project you will construct a model of your solar system using Copernican principles for planetary motion. Because of the simple structure of your solar system, you can use a simplified version of Copernican astronomy that does not include eccentrics or epicycles. Therefore the motion of all bodies will be uniform circular motion centered on the Sun (Barnard's Star).

Your job is to determine the parameters for this Copernican model using the same methods used by Copernicus. Some of these parameters can be drawn directly from your observations. Others must be calculated using equations we have discussed in the course. For each parameter you determine, you must write one or more complete, grammatically correct sentences to explain how you determined the value of that parameter from your observations. Use correct terminology (ie, sidereal day, synodic period, opposition, quadrature, etc) in your explanations. Don't just give numbers, tell me what those numbers represent. Feel free to use equations, but make sure to explain what each symbol in the equation represents. Show your work for any calculations.

2 Parameters for the Copernican System

To construct the Copernican model of your solar system you should determine the following parameters:

Rotational Period: the rotational period of your home planet in hours, to two decimal places.

Orbital Periods: the orbital periods for each of the planets in your system (including your home planet) in days, to one decimal place.

Orbital Radii: the radii of each planet's orbit. You should clearly describe the distance unit you are using for these orbital radii, and give your answers to two decimal places.

Orbital Speeds the orbital speed of each planet, given in appropriate units, to four decimal places.

3 Diagram of Your Copernican System

Please construct a properly scaled diagram of your Copernican model. Your diagram should show the Sun and the orbits of all of the planets in your system. Make sure all of the orbits are properly scaled. Mark the locations of all planets on the diagram. You should also indicate the direction of all of the orbital motions using arrows. The diagram may be constructed on a computer or carefully drawn (using a compass and ruler) by hand. If you wish, you may draw or print your diagram on something larger than a letter-size piece of paper but you don't have to do so.

4 Description of Your Copernican System

Please write a description of how each object in your Copernican system moves *through space* (not on the sky). Be sure to describe any special constraints on the motion. Are some motions synchronized with others? How so?

In addition, you should discuss the ordering of the planets shown in your diagram. Are other orderings possible? Is there a relationship between a planet's distance from Barnard's Star and the planet's orbital speed? Explain your answers.

5 What You Need to Turn In

Please submit a typed report that includes the following:

- A few sentences describing how you determined each parameter value, including equations and calculations if needed. Please organize these descriptions using the headings given in the Parameters section above. Use sub-headings for different objects if necessary.
- Your Copernican diagram.
- Your written description of the motions for each object and your discussion of the ordering of the planets. Please organize these descriptions using headings for each object.

Please submit your report by October 28, 2013.