

Homework #3
AS101 Summer 2006
Dr. Withers

GRADE SHEET

Assigned: 2006.05.24
Due: 2006.05.25, start of class

1) Read Chapter 3

2) The Moon takes $27 \frac{1}{3}$ days to complete one orbit of Earth. How far away from Earth is the Moon (in km) and how fast is the Moon going as it orbits Earth (in km per hour)? Show all your calculations.

Moon is 384.4×10^3 km, or 3.844×10^5 km, from Earth (Table E.3). The circumference of the Moon's orbit is 2.4×10^6 km. The number of hours per orbit is $24 \times 27 \frac{1}{3} = 656$. The Moon's speed is 2.4×10^6 km / 656 hours = 3700 km per hour.

5 points for each of the following:

Moon's distance from Earth is stated as anything between 3.5×10^5 km and 4×10^5 km

Distance per orbit is calculated correctly from student's Moon-Earth distance

The duration of the orbit is stated in hours as anything between 650 and 660 hours

Speed is calculated accurately from student's Moon-Earth distance and orbital period.

Speed is between 3000 and 4000 km per hour

3) If an asteroid's closest distance from the Sun is 4 AU and its greatest distance from the Sun is 8 AU, what is its semi-major axis and what is its eccentricity?

Semi-major axis = 6 AU 10 points

Semi-major axis = 6 5 points

Anything else 0 points

Eccentricity = $1/3 = 0.33$ 15 points

Eccentricity = 2 AU 5 points

Anything else 0 points

4) Why did astronomers hope that careful measurements of the positions of stars in the sky would tell them whether Earth orbited the Sun or the Sun orbited Earth?

Positions of stars should change if Earth orbits the Sun 10 points

Positions of stars should not change if the Sun orbits Earth 10 points

Use of phrase "stellar parallax" 5 points

5) List three observations that convinced people from the time of Copernicus, Tycho, Kepler, and Galileo that the heavens were not "perfect and unchanging"

5 points for one valid answer, 15 points for two, and 25 points for three.

Tycho's supernova

Tycho showing that comets were part of the heavens, not part of Earth's atmosphere

Kepler's success at using ellipses, not circles, to describe planetary orbits

Galileo seeing sunspots

Galileo seeing mountains and craters on the Moon

NOT: Stellar parallax, Galileo seeing stars in the Milky Way, the moons of Jupiter, or the phases of Venus