

OpenStax Astronomy, Ch.3: WS Problems (Apr-2021)

Review Questions

1. State Kepler's three laws in your own words.
2. Why did Kepler need Tycho Brahe's data to formulate his laws?
3. Why do we say that Neptune was the first planet to be discovered through the use of mathematics?
4. Why was Brahe reluctant to provide Kepler with all his data at one time?
5. According to Kepler's second law, where in a planet's orbit would it be moving fastest? Where would it be moving slowest?
6. What was the great insight Newton had regarding Earth's gravity that allowed him to develop the universal law of gravitation?
7. Pluto's orbit is more eccentric than any of the major planets. What does that mean?
8. Why is Tycho Brahe often called "the greatest naked-eye astronomer" of all time?
9. Is it possible to escape the force of gravity by going into orbit around Earth? How does the force of gravity in the International Space Station (orbiting an average of 400 km above Earth's surface) compare with that on the ground?
10. A body moves in a perfectly circular path at constant speed. Are there forces acting in such a system? How do you know?
11. Two asteroids begin to gravitationally attract one another. If one asteroid has twice the mass of the other, which one experiences the greater force? Which one experiences the greater acceleration?
12. How does the mass of an astronaut change when she travels from Earth to the Moon? How does her weight change?
13. If there is gravity where the International Space Station (ISS) is located above Earth, why doesn't the space station get pulled back down to Earth?
14. By what factor would a person's weight be increased if Earth had 10 times its present mass, but the same volume?
15. Suppose astronomers find an earthlike planet that is twice the size of Earth (that is, its radius is twice that of Earth's). What must be the mass of this planet such that the gravitational force (F_{gravity}) at the surface would be identical to Earth's?
16. What is the average distance from the Sun (in astronomical units) of an asteroid with an orbital period of 8 years?
17. In 1996, astronomers discovered an icy object beyond Pluto that was given the designation 1996 TL 66. It has a semimajor axis of 84 AU. What is its orbital period according to Kepler's third law?



