

Physics 10

Gravity Worksheet 2 with answers

You may need the planetary data sheet posted on moodle.

1. Consider the orbit of a typical comet around the sun given in the figure below, which is marked at five different positions, A, B, C, D, and E. Using Kepler's second law of planetary motion, rank those positions in order of their relative speeds, with the position of the fastest speed first.

Fastest - E, C, A, B - Slowest

2. A year on Mercury is 0.241 earth years. How far away from the sun is Mercury?

0.387 AU or 5.8×10^{10} m

3. The distance from Saturn to the Sun is 9.534 AU. How long does it take Saturn to make 3 revolutions around the sun? In earth years, how long is a year on Saturn?

One Saturn Year = 29.4 Earth Years

Three revolutions = 88.3 Earth Years

4. Imagine that a new asteroid is discovered in the solar system with a circular orbit and an orbital period of 8 years.

- a. What is the average distance of this object from the Sun in astronomical units? In meters?

Average Distance to the Sun = 4 AU = 6.0×10^{11} m

- b. Between which planets would this new asteroid be located?

Between Mars and Jupiter

5. You wish to determine the mass of a chair. You know that the mass of a desk 51 cm away is 25 kg. Thankfully, you know that the force between the desk and the chair is 7.8×10^{-8} N. Can you find the mass of the chair? If so, find it.

$m_{\text{chair}} = 12.2$ kg

6. How strong is the gravitational field generated by Jupiter on its surface? What would be the weight of a 10.0 kg mass on the surface of Jupiter? What would be the acceleration due to Jupiter's gravity near the planet's surface?

Gravitational Field Strength = 25.94 N/kg

Force of Gravity of a 10.0 kg Mass = 259.4 N

Acceleration due to Gravity = 25.94 m/s^2

7. Bobby Magee has a mass of 90.0 kg. What is the strength of his gravitational field 2.0 m away from Bobby Magee?

Gravitational Field Strength = 1.5×10^{-9} N/kg

8. What is the acceleration due to gravity 1,000 km above Earth's surface?

Acceleration due to Gravity = 7.34 m/s^2