

Universal Law of Gravity & Satellite Motion Worksheet

Name: _____

Date: _____

Mod: _____

Directions: Answer the following questions below using information from the circular motion unit. Pay close attention to units and show all work.

$$G = 6.673 \times 10^{-11} \frac{\text{Nm}^2}{\text{kg}^2}$$

Radius of Earth = 6.37×10^6 mMass of Earth = 5.98×10^{24} kg

1. The military wants to place a new spy satellite into orbit around the Earth at a height of 750 km above the Earth's surface. At what speed should the satellite be released from the rocket to achieve this orbit?
2. Dish Network sent a satellite into orbit about 36000km above the Earth's surface. What is the speed of the satellite in miles per hour?
3. Verizon has a satellite in an out of control orbit around the Earth traveling at a speed of 7095 m/s. What should the height of the satellite be off the surface of the earth in order to stabilize the orbit?
4. A rocket scientist is trying to determine the mass of a mysterious planet in a nearby solar system. So a satellite is sent into orbit around the unknown planet and it achieves a speed of 5600 m/s at a height of 2500 m above the ground. If the radius of the planet is 3.78×10^4 m, what is the mass of the unknown planet?

5. Two students are sitting 1.5 m apart. One of the students has a mass of 90.0 kg and the other student has a mass of 73.0 kg.
- What is the gravitational force between the two students?
 - If the distance between them is doubled, what would the force be then?
 - How much smaller or larger is the force compared to the first value? (express in a ratio)
 - Instead of doubling the radius, what is the force if the distance is cut in half?
 - How much smaller or larger is the force compared to the first value? (express in a ratio)
6. The Sun has a mass of 1.99×10^{30} kg. What is the force of gravity between the Sun and the Earth if the radius between the two is 1.5×10^8 km?