UNIVERSAL GRAVITY AND KEPLER'S LAWS WORKSHEET
(adapted)

Object	Mass (kg)	Radius (m)	Mean orbital radius (m)
Earth	5.98×10^{24}	$6.38x10^{6}$	1.49×10^{11}
Moon	7.34×10^{22}	1.74×10^{6}	3.80×10^{8}
Sun	1.98×10^{30}	6.95×10^{8}	

1. What is the gravitational force between a 60.0 kg student in the parking lot and the school? The distance between the two is 100 m and the mass of the school 6.5×10^{7} kg.

2. The center of masses of two people (50 kg and 70 kg) are 0.50 m apart. What is the gravitational force between them?

3. Two asteroids (m_1 = 1.00 x 10^{12} kg and m_2 = 5 x 10^{12} kg) are floating in space. The force of attraction between them is 10.0 N. How far apart are their centers of mass?

4. In a car race, the gravitational force between the 1st and 2nd place cars is 3.0 x 10^{-7} N. The 1st place car has a mass of 700 kg, and the 2nd place car has a mass of 650 kg. What is the distance between the two cars?

5. While on the surface of the Earth a student has a weight of 450 N. If she is moved twice as far from the center of the Earth, what is her new weight?

6. The force due to gravity on a spacecraft a distance X from the center of a planet is 100 N. At a distance Y, the force of gravity is 25 N. By what factor has their distance changed as they left the unknown planet?

7. The space shuttle travels at a linear speed of approximately 27 000 km/h while in orbit. What is the height above the surface of the Earth?

8. What is the linear speed of the moon as it orbits the Earth?

9. A geosynchronous orbit is an Earth-centered orbit with an orbital period that matches Earth's rotation on its axis. A 2000 kg satellite is in a geosynchronous orbit. How far from the center of the Earth is the satellite?

10. The moon takes 27.3 days to orbit the Earth once. The International Space Station orbits the Earth once every 90 minutes. How high is the International Space Station from the surface of the Earth?