Comprehensive Worksheet – Unit 3: Force

Worksheet: Gravity I

It will be necessary that you utilize the data from "Gravity Stats" for you calculations.

1. Find the force of attraction between the Moon and the Earth.
2. Find the force of attraction between the Sun and the Moon.
3. If the Moon was positioned collinearly between the Sun and Earth, what would be the net force on the Moon? (Note: Given distances are from the center of mass, do not worry about a body's radius for this problem.)
4. There are two masses initially 1.00 m apart. Mass 1 is 1.50 x 10^6 kg. Mass 2 is 1.00 x 10^6 kg. Create a data table and graph for the following situations:
   a) Force vs Mass
      Mass 2 increases from 1.00 x 10^6 kg to 2.00 x 10^6 kg, 3.00 x 10^6 kg, 4.00 x 10^6 kg, and 5.00 x 10^6 kg.
   b) Force vs distance
      Distance increase from 1m to 2 m to 3 m to 4 m to 5 m apart.
5. Using the Earth's radius and mass, find the acceleration due to gravity of a mass (m) at the Earth's surface. Remember, F_g=mg.
6. Explain what part of your calculations in question # 5 demonstrates that all objects accelerate towards the earth with the same acceleration.

Gravity Stats

Gravitational Constant	G	6.67 x 10^{-11} N m^2/kg^2
Mass of the Earth	Me	5.98 x 10^{24} kg
Mass of the Moon	Mm	7.35 x 10^{22} kg
Mass of the Sun	Ms	1.99 x 10^{30} kg
Radius of the Earth	Re	6.38 x 10^6 m
Radius of the Moon	Rm	1.74 x 10^6 m
Radius of the Sun	Rs	6.96 x 10^8 m
Earth to Sun Distance		1.49 x 10^{11} m
Earth to Moon Distance		3.84 x 10^8 m
Sun to Moon Distance		1.50 x 10^{11} m

Worksheet: Problems with Weight...

1. A high school student has a mass of 60 kg. What will be the student's:
   a. weight on Earth?
   b. weight on the moon, where the acceleration due to gravity is 1.62 m/s^2 (~1/6 that of the earth's)?
2. An object that weighs 10 Newtons on the earth's surface weighs only 9.98 Newtons on top of a very high mountain. What is the acceleration due to gravity atop this very high mountain?
3. An astronaut weighs 750 Newtons on the earth. What is the astronaut's mass?
4. A newspaper reporter traveling on board a space ship weighs 82 Newtons in a region where the earth's gravitational force is 1.1 m/s^2. What is the mass of the newspaper reporter?
5. How much does a person weigh on the earth if they weigh 60 Newtons at an altitude where the acceleration due to gravity is 1.2 m/s^2?
6. Joe has a weight of 850 N on Earth. What is his weight where g is 11.2 m/s^2?
7. Susan has a weight of 350 N on Planet Z and a weight of 500 N on Earth. What is g on Planet Z?