Easier Problems

1. Compute the force of gravity between two .3 kg masses whose centers are 1.5 meters apart.

2. Compute your mass (in kilograms) by dividing your weight (in pounds) by 2.2.

   a. The mass of the earth is 5.98×10^{24} kg and the radius of the earth is 6.38×10^{6} m. Use the Law of Universal Gravitation to calculate the gravitational force of attraction between you and the earth.

   b. Convert your answer in (a) to pounds by multiplying by .2245. How does this answer com pare to your weight?

3. Two masses m_1 and m_2, are separated by a distance r. The force of attraction between the two masses is F

   a. If m_1 is doubled, how does F change?
   b. If neither of the masses were changed, but r was doubled, how would F change?
   c. If r was not changed but both masses were doubled, how would F change?
   d. If r was halved and both masses were doubled, how would F change?

4. The mass of the moon is 7.35×10^{22}kg and the radius of the moon is 1.74×10^{6}m. Compute the acceleration due to gravity of an object of mass, m, on the moon.

5. Calculate the distance between two 75 kg masses that have a gravitational attraction of 8.34×10^{-7} N.

6. What is the acceleration of gravity 2250 km above the Earth's surface?

7. What is the period for a satellite orbiting the Earth 1.55×10^{7} m from the Earth's center?

8. How far above the Earth's surface would you have to go for your weight to be reduced to one-sixth of what it is on the Earth's surface?

9. How fast would an object be going if it were at the distance described in problem number 8?

10. Determine the acceleration due to gravity, the period, and the tangential velocity, of an object orbiting the Earth 3,885,000 m above the Earth's surface.

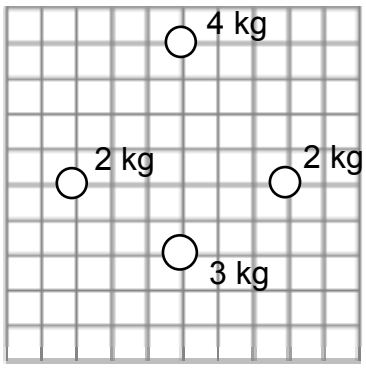
More Interesting Problems

Here are a few more gravitation problems to perfect your skills.

1. Given the radius of the earth's orbit is 1.47×10^{11} and the period is one year, find:

   a) The speed of the earth
   b) The mass of the sun

2. Four masses are placed in the configuration shown below. Determine the net force on the top object.



3. Jemi (m = 3M) stands 4 meters away from Nathan (m = 4M). At what point between Jemi and Nathan would Kristen (m = 0.1 M) have to stand to experience no gravitation force?

4. If this were a 2 dimensional world, would gravity decrease with the square of the distance still? Why or why not?

5. A planet of mass m orbits the sun (mass = M) at a radius of R and with a period of T. Show that the following relationship is true.

$$\frac{R^3}{T^2} = \frac{GM}{4\pi^2}$$

6. The wobble in the motion of a star is evidence that a large planet orbits that star. If the star's wobble is 2R and its period is T, find:

   a) What is the radius of the star's orbit?
   b) What is the distance between the star and the planet?
   c) Draw a free body diagram of the star.
   d) Determine the speed of the star in terms of R, T, and constants.
   e) Set up a net force equation for the star.
   f) Determine the mass of the planet in terms of R, T, and constants.