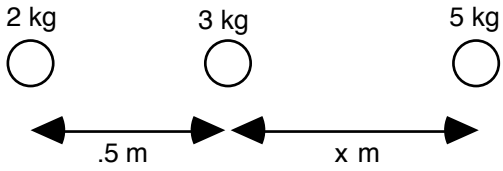
Gravity Problems I

1. Calculate the gravitational attraction between you and the person sitting next to you.

2. Three small spheres have masses as shown, and are positioned as shown in the diagram. What is the distance x so that the net gravitational force on the middle sphere is zero?



3. Mars has a mass of 6.4×10^{23} kg. If Mars was 10^8 km away from you on the day you were born, compare the gravitational effects of Mars to that of the doctor who assisted in your birth. (Assume the doctor has a mass of 70 kg and was 1 m away.)

4. A satellite orbits at an altitude of about 200 km. How fast is it traveling? How long does it take to make one orbit around the earth? ($M_{earth} = 6 \times 10^{24}$ kg and $R_{earth} = 6400$ km.)

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5. For a person who has a mass of 65 kg, how much *less* would a scale read on the equator than on the north pole? (Assume the earth is a sphere.)

6. If 1 AU is 1.5 x 10^8 km, what is the mass of the sun?

7. Calculate the constant in Kepler's Third Law, using your answer from #6, and for the semimajor axis measured in meters and the period measured in seconds.

Answers

1. 2.8 x 10^{-7} N (with m_1=m_2=65 kg and r=1 m) 2. 0.791 m 3. mars:doctor = 1:1.09

4. v = 7790 m/s & T = 5330 s 5. 2.2 N 6. 2 x 10^{30} kg 7. 2.98 x 10^{-19} s^2/m^3