PHYS111
HOMEWORK #2

Due : 8 Sept. 2016

1. Estimate how many marbles could fit inside a hollow sphere the radius of the Earth. State all assumptions and estimates explicitly, and estimate how many marbles could fit inside an Earth sized sphere. Show all calculations clearly.

2. Experiments show that the period (the time it takes to make one complete cycle) of a pendulum is proportional to the length of the pendulum and the acceleration due to gravity. We can write this statement mathematically as :

$$P \propto L^a g^b$$

where a and b are exponents that you will need to determine. Use the techniques of dimensional analysis established in class to determine the values of a and b.

3. Conceptual Question #12, p. 56 of the text.

4. A person drives a distance D from point A to point B along a straight line at a constant speed of 40 km/hr. On the return trip, the person covers the same distance D at a constant speed of 60 km/hr. What was the average speed for the entire trip? (Hint : The answer is not 50 km/hr)

5. A person sets off from point A and walks at a constant speed along a straight line path to point B, which is a distance D away from the starting point. After spending the night, the person leaves from B the very next day at noon, walks at a constant (but faster) speed following exactly the path taken the day before, reaching A at 3 pm.

  Is there any point along the path that the traveler reached at the same time on both days? What is the reasoning behind your answer? If you think there is such a point, determine where that point lies along the path and at what time that point was reached each day. You should find it very helpful to graph both days' motion on a single set of axes.

6. Conceptual Question #14, p. 57 of text.

7. A car travels along a straight line road. Its distance from a stop sign is given as a function of time :

$$x(t) = 2t^2 + 0.25t^3$$

where x is distance and is measured in meters, and t is time and is measured in seconds. Calculate the average velocity of the car between the following time intervals:

a) t = 0 s to t = 2 s
b) t = 2 s to t = 4 s
c) t = 0 s to t = 4 s