Dear Phys133 Students:

Your first written assignment (HW#1) will require you to become familiar with the UD Scale Model Solar System, for which you can info and a map at:

http://www.bartol.udel.edu/~owocki/phys133/planet_walk.html

NOTE: The plaque for Earth was removed during reconstruction last year and has not yet been replaced. Thus you will not be able to use this as one of the planet choices in exercises below.

The assignment is to do the following:

1. Determine the scale factor of the model. The easiest way to do this is to determine the diameter of the model sun or a model planet, and then compare this to the actual diameter listed in your textbook or other resource. The ratio of the actual size to this measured scale-model size gives the "scale factor" of the model. You'll need this scale factor in the later parts of the assignment.

2. Pick 2 inner planets (Mercury, Venus, and Mars) and 2 outer planets (Jupiter, Saturn, Uranus, Neptune). Walk from one inner planet to the other, and then walk from one outer planet to the other. Count your paces while doing this, and also keep careful track of the time it takes to walk between each planet pair.

3. Compute the campus distance (in meters) between the 2 inner planets and between the 2 outer planets. This can be done by determining how long your pace is, and then multiplying that distance by the number of paces between the 2 planets. One good way to measure your pace is to walk about 10 paces, measure that distance (e.g. with a tape measure), and divide by 10.

4. Multiply the distances by the determined scale factor to calculate how far apart the planets would be in the actual solar system. Give your answers in both KM and AU. (Note that this will likely be a bit larger than the minimum distance between these planets in their orbits, since your walk was likely not direct, and since the model planets are not all perfectly lined up.)

5. Determine both your average campus speed (in m/s) and the associated solar system speed (in km/s). Remember, speed = distance / time, and you have 2 different distances to use (campus distance and solar system distance). Compare your two solar system speeds with the speed of light.

Remember that it will be best to determine your pace in meters, since the speed of light is commonly quoted in this standard metric measure. (If you measure your pace in feet you will have to find the appropriate conversion.) If the math involved here gives anyone trouble, come ask for help in after-class office hours.

You are allowed, and indeed encouraged, to collaborate with your classmates, comparing and checking your numbers; but under no circumstances should you use the pace measurements of other students. Above all, have fun, and be sure to read the information on each of the plaques.

You will fulfill the assignment by handing in the (hardcopy) completed datasheet below at start of class time on the due date listed in the header. Be sure to SHOW ALL WORK at a level that will make clear the steps you took to reach your results.

NOTE: All measurements and computations need only be accurate to 2 significant digits, using scientific notation when appropriate for large numbers.
HW#1 DATA SHEET

Name: _________________________

1. Plaque object(s) used to measure scaled size (e.g. Sun, Jupiter, etc.): ________________

Scale Factor = ____________________ = _______________ = _______________

Measured Diameter

2. Chosen Two INNER Planets: _______________ and _________________

Paces between them: __________________

Time to walk paces between them: _________________

Chosen Two OUTER Planets: _______________ and _________________

Paces between them: __________________

Time to walk paces between them: _________________

3. Method used to convert paces to distance:

Resulting average pace size: _________________

Implied campus distance between INNER planet plaques: _________________
Implied campus distance between OUTER planet plaques: ______________

What do you notice about the distances between the inner vs. outer planets?

4. Conversion to ACTUAL distance between the two INNER planets in the solar system. (Give this in both KM and AU):

Conversion to ACTUAL distance between the two OUTER planets in the solar system. (Give this in both KM and AU):

Compare each of these distance to the differences between average orbital distances from the sun, e.g. as given in Appendix E.2

5. Campus walk speed between INNER planets (campus distance/time, in e.g., m/s):

Associated Solar System speed between INNER planets (in km/s):

Campus walk speed between OUTER planets (campus distance/time, in e.g., m/s):

Associated Solar System speed between OUTER planets (in km/s):

How do these solar system speeds compare with the speed of light?