COMP 210, Spring 2000, Homework 2
Due Wednesday, September 13, 2000 at the start of class

Before you start the homework, you should remind yourself of our General Advice, Advice on Homeworks, and Grading Guidelines. All are available from the class web site (http://www.owlnet.rice.edu/~comp210).

For this assignment, you should follow all the steps of the design methodology and include the results of each step as comments or code in the final materials that you submit. (For example, write your template as a comment—at the appropriate point in the development sequence—and copy it over when you fill it in.)

1. (3 pts) **General Problem Solving**
   Houston drivers love to drive fast. Most drivers accelerate quickly from a standing stop to the de-facto speed limit of 80 miles per hour (mph) and maintain that constant speed. Write a Scheme function that takes as parameters the acceleration (in mph per second) of a car and an elapsed driving time in seconds and returns the distance traveled (in feet) by the car.

   Hint: Most physics books contain a formula relating acceleration to distance traveled. You may wish to double-check your solution against these inputs:

   (houston-driver-distance 6 5) = 110
   (houston-driver-distance 10 10) = 704

2. (3 pts) **Conditionals (and Pizza Economics)**

   In class, we have developed a series of programs intended to deal with the economic and geometric consequences of the increased pizza consumption that accompanies working on COMP 210 homework. Our set of programs, however, ignores an important consequence of increased pizza consumption–-the need for additional exercise.

   Develop a program, `WorkOut`, that computes the number of hours of exercise required to counter the excess fat from eating pizza. `WorkOut` consumes a number that represents daily pizza consumption, in slices, and returns a number, in hours, that represents the amount of exercise time that you need.

For a daily intake of	You need to work out for
0 slices	1/2 hour
1 to 3 slices	1 hour
> 3 slices	1 hour + 1/2 hour per slice above 3

   Follow the methodology. Write it all down.

3. (4 pts) **Manipulating Cartesian Coordinates**
   In lab, you developed the notion of a point in a two-dimensional space. We can develop an equivalent notion for a point in a three-dimensional space. For historical reasons, we will call the coordinates *x*, *y*, and *z*.
   a) Develop a data definition for points in 3 space; call the structure `point3`.
   b) Write a program, `point3-add,` that consumes two `point3`s and returns a `point3` whose coordinates are the sum of the coordinates of the two argument `point3`s.
   c) Write a program, `distance`, that consumes two `point3`s and produces the distance between the two points. Include the data definition for points in your answer.

   Your program may be easier to read (and to write) if you develop several helper functions for subtasks in the computation.

   The Scheme function `sqrt: number→number` computes the square root of a given number. If you need additional information on geometry, consult one of the standard references.