COMP 210, Spring 2002, Homework 2
Due Wednesday, January 30, 2002 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**

   COMP 210 meets in room 1070 of Duncan Hall– a building notorious for having rooms with idiosyncratic shapes. Taking DH 1070 as a model classroom, develop a program Like1070 that consumes three dimensions and computes its size in square feet. The three dimensions are (1) its east-west width (parallel to the markerboard), (2) its north-south width (perpendicular to the markerboard), and (3) the side-length of its triangular corners. [Assume that the front corners are triangular rather than truncated for the doors.]

   Write a brief explanation of your formula for computing the area.

   Develop and test the program. Be sure to include the approximate dimensions of DH 1070 as one of your test inputs. [Hint: count the two-foot square ceiling tiles.]

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.