CS 115 Fall 2012
Assignment 02
Due: Wednesday, October 10, 2012 at 9:00 am

Assignment Guidelines:

- For this and all subsequent assignments, you are expected to use the design recipe when writing functions from scratch, including helper functions.
- Do not copy the purpose directly from the assignment description. The purpose should be written in your own words and include reference to the parameter names of your functions.
- The solutions you submit must be entirely your own work. Do not look up either full or partial solutions on the Internet or in printed sources.
- Do not send any code files by email to your instructors or tutors. It will not be accepted by course staff as an assignment submission.
- Test data for all questions will always meet the stated assumptions for consumed values.
- Read the course Web page for more information on assignment policies and how to organize and submit your work.
- Download the interface file from the course Web page.
- Follow the instructions in the style guide (see the updated version posted on the course Web page). Specifically, your solutions should be placed in files `a02qY.rkt`, where `Y` is a value from 1 to 4.
- For full marks, it is not sufficient to have a correct program. Be sure to follow all the steps of the design recipe, including the definition of constants and helper functions where appropriate.
- Read each question carefully for restrictions.
- Use only material from Modules 1-3 in your solutions.

Language level: Beginning Student
Coverage: Module 3

1. Write a Scheme function `set-alarm` that consumes a day of the week `day` (an integer between 1 and 7 representing the 7 days of a week, e.g. `1` represents Monday and `7` represents Sunday), and produces the hour you intend to get up. On Mondays, Wednesdays, and Fridays, you have to get up at 7am since your first class is at 8:30am. On Tuesdays and Thursdays, you can get up at 9am since the first class is at 10:30am. On Saturdays, you have to get up at 11am, and on Sundays you can sleep until noon.

   For example, `(set-alarm 2) => 9` since you have to get up at 9am on Tuesdays.

   Note that your `cond` should have no more than four question-answer pairs for you to receive full marks.

2. An arithmetic sequence is a sequence of integers with a constant difference between one term and the next term. An example of an integer arithmetic sequence is: 13, 16, 19, 22, … . In this sequence, the difference between any two adjacent terms is 3.

   Write a Scheme function `arith-seq?` that consumes three positive integers: `item1`, `item2`, `item3`, and produces `true` or `false` depending on if the three numbers can be **re-arranged** to form an arithmetic sequence.

For example: `(arith-seq? 19 29 9) => true` since we can re-arrange the three integers to (9, 19, 29) which is an arithmetic sequence in which the difference between each pair of adjacent terms is 10.

Here are two more examples:

- `(arith-seq? 1 2 5)  => false`
- `(arith-seq? 33 27 21)=> true`

3. The grading scheme of cs115 is specified at https://www.student.cs.uwaterloo.ca/~cs115/grading and it is included below:
   The grading scheme for Fall 2012 is as follows:
   - Assignments: 30%
   - Midterm: 25%
   - Final Exam: 45%

   Notes:
   - There is one midterm this term, worth 25%.
   - You must pass the weighted exam average in order to pass the course. For example, if you get 60% on the midterm (15/25) and 40% on the final (18/45), then you will not pass the course since your weighted exam average is 33/70 (less than 50%). This is independent of your assignment grade. If instead you received 40% on the midterm (10/25) and 60% on the final (27/45), then your weighted exam average is 37/70, a passing grade. In this case, you must get at least 13/30 on the assignments to pass the course (since your final grade would be 50/100).

   Write a Scheme function `passing-cs115` that consumes three integers: `assign-mark`, `mid-mark`, and `final-mark`. These three integers represent the total marks you received for all the assignments, the midterm, and the final exam. Your function produces a symbol `` `pass `` or `` `fail `` according to the grading scheme specified above.

   Note that the maximum mark you can get for all assignments is 30, whereas the maximum mark you can get for the midterm or the final is 100.

   For example:
   - `(passing-cs115 19 88 98) => `pass`
   - `(passing-cs115 20 60 40) => `fail`
   - `(passing-cs115 13 40 60) => `pass`

4. Write a Scheme function `mango-order` that consumes an integer `weight`, measured in kg (even though strictly speaking we should be talking about mass instead of weight) and two symbols `packaging` (any of `'carton` or `'container`) and `method` (any of `'air`, `'train`, or `'truck`). This function produces the total cost for a mango order including shipping and packaging. Note that mangoes are sold in multiple of 100kg only, i.e. you can order 100kg, 200kg, 300kg, … . Therefore, you should assume that `weight` is a multiple of 100kg.

   The pricing for a mango order is calculated as follows:
   - Minimum purchase: 100 kg.
   - For every 100 kg mangoes, the cost is $180.00.
   - If mangoes are packaged in `` `carton ``, the cost is $25.00 per 100 kg.
   - If mangoes are packaged in `` `container ``, for every 100 kg, the cost is $22.00.

- The cost for shipping by `'air` is $75.00 per 100 kg.
- The cost for shipping by `'train` is $27.00 per 100 kg.
- The cost for shipping by `'truck` is $38.00 per 100 kg.
- For a purchase greater than or equal to 8000 kg, a 3% discount is applied to the total shipping cost.
- For a purchase greater than or equal to 10000 kg, a 5% discount is applied to the total mango cost only (not the total mango order).

For example: `(mango-order 10100 'container 'air) => 26840.75.` This is because the mango cost is 180*(10100/100)*0.95 = 17271 (with a discount for ordering more than 10000kg), the shipping cost is 75*(10100/100)*0.97=7347.75 (with a discount for ordering more than 8000kg), and the packaging cost is 22*(10100/100)=2222. Therefore a total of `26840.75` dollars is produced. Note that for any order that is greater than or equal to 10000 kg, two discounts are applied: one is a 3% discount for the shipping cost and the other is a 5% discount for the total mango cost.

Here are two more examples:

- `(mango-order 100  'carton 'truck) => 243`
- `(mango-order 7900 'container 'train) => 18091`