CSU2500 Exam 1 HONORS SUPPLEMENT – Fall 2010

Name: _____

Student Id (last 4 digits): _____

Instructor's Name: _____

- This supplement to Exam 1 is intended for students enrolled in the Honors section of 2500.
- See the instructions on the regular exam.

Problem	Points	/out of
1		/ 5
2		/ 15
3		/ 15
4		/ 10
Total		/ 45

Good luck!

Problem 1 Recall Problem 4 from the regular portion of the exam. 5 POINTS

After the instructors looked over the students' grades, we've decided that there are not enough *top students* in the class, so we instead need you to implement a more relaxed notion of *top* and rank the students based their average grade, and then choose the top students until we've reached our "*pass quota*".

Design a function that consumes a student and computes the numeric average of his/her grades, as a percentage from 0 to 100. Remember that each exam is worth 30%, and homework is worth 25%. Assume that the students get all the possible points for quizzes and instructor whim (i.e., a free 15 points).

When formulating examples, you may use the names `s`, `m`, and `h`, as defined below, to save time writing:

```
(define s (make-student "Mr. Smarty" 90 100 97))
(define m (make-student "Ms. Middle" 64 72 68))
(define h (make-student "Dr. Hopeless" 43 52 35))
```

[Here is some more space for the previous problem.]

Problem 2 Once all the tests/homeworks are graded, the tutors will tabulate some of them (division of labor) and give them back to the instructors. 15 POINTS

When the grades are returned, they give the students with the top grades first. Your job is to compute the top students *overall*, so you're going to need to merge together the grades (i.e., `students`) each of the tutors provides.

Design a function, `merge`, that consumes two lists of students with the students in the lists are in *descending* order of their average grade (so the better students are first). Your function should produce a list that contains all of the given students, ordered with the top (highest average) students first.
For example, if given these two lists:

```
(list (make-student "Mr. Smarty" 90 100 97)
      (make-student "Dr. Hopeless" 43 52 35))

(list (make-student "Ms. Middle" 64 72 68))
```

the function should produce:

```
(list (make-student "Mr. Smarty" 90 100 97)
      (make-student "Ms. Middle" 64 72 68)
      (make-student "Dr. Hopeless" 43 52 35))
```

[Here is some more space for the previous problem.]

Problem 3 Alexander Calder (July 22, 1898 - November 11, 1976) was an American sculptor and artist most famous for inventing the mobile in 1931. A mobile is a type of kinetic sculpture constructed to take advantage of the principle of equilibrium. It consists of a number of rods, from which weighted objects or further rods hang. The objects hanging from the rods should balance each other, so that the rods remain horizontal. 15 POINTS

Here is a data definition for simple mobiles that consist of weights and rods that hang from their midpoint.

```
A Mobile is one of:
- Number
- (make-rod Mobile Mobile)
(define-struct rod (left right))
```

Design a program that determines if a mobile is balanced (all rods remain horizontal). Here are some examples of balanced mobiles to help you out:

```
15
(make-rod 15 15)
(make-rod 15 (make-rod 7.5 7.5))
```

And here are some examples of unbalanced mobiles:

```
(make-rod 15 7.5)
(make-rod 15 (make-rod 5 10))
(make-rod (make-rod 5 10) (make-rod 5 10))
```

[Here is some more space for the previous problem.]

Problem 4 Using the data definition of mobiles from the previous problem, design a program that constructs a mobile that is the mirror image of the given mobile. For example:

10 POINTS

```
15 ---> 15

(make-rod 10 5) ---> (make-rod 5 10)

(make-rod (make-rod 10 5) (make-rod 7 3)) --->
(make-rod (make-rod 3 7) (make-rod 5 10))
```

[Here is some more space for the previous problem.]