

CS 2500 Exam 1 HONORS SUPPLEMENT – Fall 2013

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		/ 8
2		/ 9
3		/ 12
4		/ 13
Total		/ 42

Good luck!

Problem 1 Design the function `even-dogs?` that takes a list of symbols and returns true if the symbol 'dog' occurs in the list an even number of times.

8 POINTS

Problem 2 Design a function `shift-x` that given a list of `Posns` and a number `n` (which may be negative or positive), shifts each `posn` in the list by `n` along the `x`-axis, *unless* the `posn` is the origin `(0,0)`.

9 POINTS

You should design helper functions as needed, but they should be designed according to the recipe.

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

Problem 3 The local meteorological society keeps a list of records about the weather each day. They track the following attributes: zip code, humidity (as a percentage), and high and low temperatures (in Fahrenheit) for the day.

12 POINTS

Here is the data definition for a weather record:

```
(define-struct weather (zip humidity hi lo))
; A Weather is a structure:
;   (make-weather String Number Number Number)
; interpretation: (make-weather z hum high low) is a
;   day's weather record where:
; - z is the 5-digit zip code where data was collected
; - hum is the humidity as a percentage
; - high and low represent the day's high and low
;   temperatures in degrees Fahrenheit, and high is
;   greater than or equal to low
```

The meteorological company has just been informed of a problem with temperature readings at all locations in zip code 02138. The high and low temperatures on file for this zip code are 4 degrees higher than the actual high and low temperatures of the day. Design a function `adjust-temps` that takes a list of weather records, a string representing the zip code, and a number `adjustment`, and produces a list of weather records that contains all the records in the input list but with the high and low temperatures in any record with the given zip code replaced by `high+adjustment` and `low+adjustment`, respectively.

Using your function, the meteorological society can fix its list of weather records for October 17th, called `lowr-oct-17-2013`, by running `(adjust-temps lowr-oct-3-2012 "02138" -4)`.

Again, design helper functions as needed, but they should be designed according to the recipe.

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

Problem 4 Note the similarities and differences between `shift-x` from Problem 2 and `adjust-temps` from Problem 3. Design a function that abstracts over the differences and then use it to re-implement `shift-x` and `adjust-temps`.
[Here is some more space for the previous problem.]

13 POINTS