CS 2500, Spring 2013
Problem Set 2

Due date: 11:59pm, Tuesday January 22, 2012

What to submit:

Using Blackboard, submit a *single* Racket file containing all of the code and documentation for this assignment. Place your name and husky email address in a comment at the beginning of your file.

Name your file: hw2-yourlastname.rkt

Write a contract and purpose statement for each function that you design. Use check-expect to write tests for each function that you develop.

Problem 1.

a) What is the value of:

```
(cond
  [(<= (string-length s) 5) 10]
  [(string=? s “hello”) 50]
  [(string=? (substring s 1 4) “ell”) 25]
  [else 130])
```

when s is (i) “hello”, (ii) “hellos”, and (iii) “howareya”?

b) What is the value of

```
 (cond
  [(<= n 1000) (number->string n)]
  [(<= n 5000)
      (string->symbol
            (string-append "num" (number->string n)))]
  [else (substring
            (string-append "number" (number->string n)) 2 4)])
```

when n is (i) 500, (ii) 2800, and (iii) 15000?

Problem 2.

Mathematical equations in one variable are claims about an unknown number. For example, the quadratic equation $x^2 + 2x + 1 = 0$ is a claim concerning some unknown number x.

For x = -1, the claim holds: $(-1)^2 + 2(-1) + 1 = 1 – 2 + 1 = 0$

For x = 1, the claim doesn't hold because: $(1)^2 + 2(1) + 1 = 4$, not zero.

Use Racket to develop functions that test whether the proposed solution is, in fact, a solution for the following equations:

a) $8x – 2 = 14$
b) $10x – 6 = 7x + 9$
c) $2 – (-12/x) = -4$

You should test your functions with numbers that are solutions and numbers that are not solutions.

Problem 3.

The Center for Disease Control collects information on patient visits to health care providers for influenza-like illness (ILI) to estimate the level of flu activity.

The percentage of patient visits to healthcare providers for ILI reported each week is weighted on the basis of state population. This percentage is compared each week with the national baseline of 2.4%. The baseline is the mean percentage of patient visits for ILI during non-influenza weeks for the previous three seasons plus two standard deviations.

The activity levels correspond to the number of standard deviations away from the mean the percent of visits due to ILI is each week. There are 10 activity levels classified as minimal (levels 1-3), low (levels 4-5), moderate (levels 6-7), and high (levels 8-10). An activity level of 1 corresponds to values that are below the mean, level 2 corresponds to an ILI percentage less than 1 standard deviation above the mean, level 3 corresponds to ILI more than 1, but less than 2 standard deviations above the mean, and so on, with an activity level of 10 corresponding to ILI 8 or more standard deviations above the mean.

Develop a program called `flu-activity` that consumes a flu activity level and produces its classification.

For instance `(flu-activity 6)` produces "moderate"

Problem 4.

a) The text function provided from 2htdp/image constructs an image that draws the given string, using the font size and color.

For instance:

`(text "Hello" 24 "olive")` produces the image

Use the `big-bang` expression to develop a program that "grows" the image of “Hello World” using the text function on a 500 x 300 canvas. The image should be placed in the center of the canvas. Start the text size at 1 and stop growing when the size reaches 80. You will need a function that draws the text on the scene and a function that represents how the text will look after one "tick."

b) Add a function that returns the text to size 1 when the mouse is clicked anywhere in the canvas. You can read about mouse events in DrRacket’s Help Desk—the on-mouse clause of big-bang is a good place to start.