

CS 2500, Spring 2012

Problem Set 5

Due date: Sunday, February 12 @ 11:59pm

For Problem Set 3 and later, homework is submitted via the [automated homework server](#).

Note: Hardcopy submissions not accepted. Email submissions not accepted.

You must work on this problem set in pairs. Homework partners have been chosen randomly and posted on the Piazza discussion board. You must submit the homework with your partner. There will be a penalty for submitting without your partner.

The goal of this problem set is to study the design and processing of self-referential unions. We focus on lists for now. Soon you will see that the design recipe applies to *all* forms of self-referential data definitions. You must follow the design recipe in your solutions: graders will look for data definitions, contracts, purpose statements, examples/tests, and properly organized function definitions. For the latter, you must design templates, but be sure to comment them out.

Part 1 – HtDP Problems:

9.2.3, 9.3.3, 9.5.2, 9.5.3, 10.2.4

Part 2 –

Suppose we have the following class of data:

```
(define-struct ball (x y color))  
;; Ball = (make-ball Number Number Color)  
;; Color is one of 'red, 'yellow, 'blue, etc.
```

- Think of instances of `ball` as a Cartesian point, specifying where the ball is located, and the color of the ball.
- Provide a data definition for lists of `Balls`.
- Provide a template for processing such lists.
- Design the function `lob-length`, which counts how many `Balls` are on a given list of `Balls`.
- Design the function `lob-yellow`, which changes the color of all of the balls in a list of `Balls` to yellow.
- Design the function `lob-draw`, which consumes a list of `Balls` and adds them to an empty scene of 300 x 300 as appropriately colored circles of radius 3.
- Design `lob-member?`. The function consumes a list of `Balls`, `lob`, and a `Ball` `b` and determines whether `b` occurs in `lob`.