Problem Set 3

Assigned: Feb. 13
Due: Feb. 27

The grader for this homework will be Marianna Contantinou. Her email address is mariannaco.ds@gmail.com

Exercise 1

In this exercise, you will write a method for duplicating one element in a list. For example, if $l$ is the list [2,3,5,7] and you duplicate the element 5, $l$ becomes the list [2,3,5,5,7].

A. For the class MyList1 in the class notes, write a method $l$.duplicate($n$) that duplicates node $n$ in list $l$. Note: You may assume, without checking, that $n$ actually is a node in list $l$ and is not the header node.

B. Write the same method for the class MyList2. Note: You must be sure that the first and last fields of $l$ remain correct. You do not have to worry about what happens to any other list that shares the same structures.

Exercise 2

A. For the class OrderedArray, write a method public int numBetween(int bottom, int top) such that $l$.numBetween(bottom, top) returns the number of elements of list $l$ that are greater than bottom, and less than top. For instance, if $l$ is the list of ints [2,3,5,7,11,13], then $l$.numBetween(5,12) returns 2, corresponding to elements 7 and 11. You should use the method search or search1 as subroutines, so that numBetween runs efficiently. If top is less than bottom, then return 0.

B. For the class GOrderedList, write a generic method public int numBetween(T bottom, T top) that works in the same way. For instance if $l$ is the list of Strings ["a", "baboon", "doesnt", "eat", "moldy", "potatoes"], then $l$.numBetween("doesnt", "north") should return 2, corresponding to the two words "eat" and "moldy".

Honors Exercise

For the class MyList1, write a method

public MyList1<T> collapse(MyList1<MyList1<T>> l)

does the following: When the method is called, $l$ is a list of lists of T’s. What collapse does is to return all the sublists in $l$ strung together as a single list. The method collapse should work destructively; that is, it should not be necessary to include any calls to new. It is OK for the input variable $l$ to be completely trashed; we don’t care what happens to $l$.

The owner of the method can be an arbitrary list of T’s. Its value is not used; its only function is to get the Java generic classes to work out the right way.

Note: some of the sublists in $l$ may be empty (i.e. the next field of the header is null.) These should simply vanish when you call collapse. This will probably require some additional coding.

For example, if $l$ is the list of list of Integers, [3,1,4],[1,5,6],[9,2,6], and $n$ is any list of Integers whatever, then $n$.collapse($l$) should return the list [3,1,4,1,5,9,2,6].