Problem Set 4

Assigned: Sept. 27
Due: Oct. 4

Problem 1

For the circular array implementation of FIFO queues in CircularArray.java, implement a method size() which returns the number of elements in the queue as an int.

Problem 2

For the generic ordered singly linked list in GOrderedList.java, write a generic method L.numBetween(T Lower, T Upper) which returns the number of elements in L that are strictly greater than Lower and strictly less than Upper. For instance if L is the list [2,3,5,6,10,14] then L.numBetween(5,11) should return 2, corresponding to the elements 6 and 10.

Problem 3

In the hash table implementation in MyHashTable.java, if a key KEY is already in the table, and you execute the method put(KEY,VALUE), it does nothing at all. Obviously, it would be better to have it change the value associated with KEY to be VALUE. Rewrite the method put so that it does this.

Problem 4

In the method MyHash in MyHashTable.java, if the table size is close to a multiple of 37, it chooses the multiplicative factor Mult to be 43 rather than 37. You get into particularly bad trouble if the table size is an exact power of Mult. Explain why. Hint: Delete this line from the method, create a table of length 37, and see what hash values you get for the strings “aaaa”, “aazz” “zzaa” “zzzz”, “abcd”, “zycd”, “abxw”, and “zyxw”. Do the same experiment with a table of size $37^2 = 1369$. Describe what is going on, explain why this happens, and explain why it would be a very bad thing for a hash function.

Honors Problem

Continuing Problem 4, it is also a bad thing if the table size is a power of Mult minus 1; e.g. Mult=37 and the table size is 36 or $1368 = 37^2 - 1$. Explain.