Lab #8
15 points

Modify the set of classes (Carwash, Averager, ClientGenerator, and Server) that constitute the simulation program discussed in class so that it creates a richer simulation environment.

- Add a priority queue class that includes an array of pointers to ordinary queues, as described in the lecture notes
- Add a peek( ) method to your Queue class – look at the API documentation for the LinkList class, as it is likely there is already such an implementation; if not, see the documentation in the Queue interface to get the specifications
- Modify the main( ) and simulate( ) methods so that your program can simulate multiple servers.
  - In simulate( ), create a priority queue of servers sized to accommodate the specified number of servers and fill the queue with servers
  - When a client appears, the front of the server queue should be checked (using the peek( ) function). If the server at the front is not busy, dequeue it, start it serving the client at the front of the client queue, then enqueue it on the back of the server queue
    Each iteration of the loop will now mean that each server on the server queue will have to process one second.

Modify the program so that there is a maximum queue length that potential customers will tolerate. For example, if there are already 10 customers in the queue, other customers will see this and leave without ever entering the queue. For this option, the program should print out the number of customers who left because the line was too long.

Extra credit options (5 points each)
- Modify the program so that each server can serve a customer in a different amount of time (specified for each one by the user). One server might be able to service a customer in 180 seconds, for example, while another requires 210 seconds.
- Add the ability for Servers to take breaks
- Add a disaster method that randomly generates (rare) disastrous events that disrupt service from time to time
- Add (and document) your own simulation parameters beyond those suggested here; each major revision will be worth 5 points (your instructor reserves the right to define the term “major”