Homework #6  Data Structures            Due:  October 20 (Wednesday at 11:59 PM)

Drive-Up Bank Discrete-Event Simulation
Write a drive-up bank simulation to determine:  (1) how long customers had to wait in line on average, (2) the number of customers served during the simulation time, and (3) the number of customers waiting in line(s) at the end of the simulation. Write the simulation so you can produce six tables similar to the one below for the number of teller-windows varying from 1 to 6.

Assume the transaction times for each customer can vary as:
20% of the customers take 2 minutes
50% of the customers take 4 minutes
30% of the customers take 7 minutes

Use an integer counter as a simulated “wall clock.” Time stamp each customer with this simulated wall-clock time upon their arrival at the rear of the line. When a customer reaches a teller, the difference between their time-stamp and current “wall clock” determines how long they had to wait in line.

Run each simulation with arrival time probabilities of 0.6, 0.5, 0.4, 0.3, 0.2, and 0.1. For each of the arrival time probabilities, run the simulation for 120, 240, 360, 480, 600 minutes. For each simulation with a different number of tellers, your program should generate a table similar to the following:

2-Teller SIMULATION
AVERAGE WAITING TIMES FOR CUSTOMERS
(NUMBER OF CUSTOMERS SERVICED)
(NUMBER OF CARS WAITING AT END OF SIMULATION)

<table>
<thead>
<tr>
<th>Simulation Duration, min</th>
<th>Arrival Probabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>0.6 0.5 0.4 0.3 0.2 0.1</td>
</tr>
<tr>
<td>240</td>
<td></td>
</tr>
<tr>
<td>360</td>
<td></td>
</tr>
<tr>
<td>480</td>
<td></td>
</tr>
<tr>
<td>600</td>
<td></td>
</tr>
</tbody>
</table>

The parking lot is designed as a common line that splits into a smaller line(s) for each open teller window.

Hints:
1) Use FIFO queues to store the “cars” waiting in each line.
2) All you need to store in your queue is the time stamp of when a car arrived.
3) Start early and see me if you get stuck!

Submit all program files as a single zipped file (called hw6.zip) electronically at:
https://www.cs.uni.edu/~schafer/submit/which_course.cgi