ITP4510 Data Structure and Algorithms ASSIGNMENT
Deadline: 13 Apr 2025
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Test Case 1

Here is a sample of one simulation - 2 Teller, Using waitingLine

Input Name	User Input
Simulation Length	7
Number of Counter	2
Iteration 1 - Serving time:	7
Iteration 2 - Serving time:	3
Iteration 3 - Serving time:	4
Iteration 4 - Serving time:	1
Iteration 5 - Serving time:	0
Iteration 6 - Serving time:	2
Iteration 7 - Serving time:	1

Output:
Total minute simulated: 7 minutes
Number of Tellers: 2
Number of customer served: 3
Average number of customers in the queue 1.2857143
Max queue length 3

```
(base) MacBook-Air-6:DSA Assignment whitneywhalley$ javac Main.java
(base) MacBook-Air-6:DSA Assignment whitneywhalley$ java Main
----------START SIMULATION ENVIRONMENT ----------
Input simulation length (min): 7
Input number of counter: 2

----------START SIMULATION ----------

At the beginning of iteration 1 ...
Input serving time for a new customer: 7
After 1 minute ##

    Teller_1 [8]    Teller_2 [0]    Waiting Queue: [ ]

At the beginning of iteration 2 ...
Input serving time for a new customer: 3
After 2 minute ##

    Teller_1 [8]    Teller_2 [5]    Waiting Queue: [ ]

At the beginning of iteration 3 ...
Input serving time for a new customer: 4
After 3 minute ##

    Teller_1 [8]    Teller_2 [5]    Waiting Queue: [ 4 ]

At the beginning of iteration 4 ...
Input serving time for a new customer: 1
After 4 minute ##

    Teller_1 [8]    Teller_2 [5]    Waiting Queue: [ 4 1 ]

At the beginning of iteration 5 ...
Input serving time for a new customer: 0
After 5 minute ##

    Teller_1 [8]    Teller_2 [9]    Waiting Queue: [ 1 ]

At the beginning of iteration 6 ...
Input serving time for a new customer: 2
After 6 minute ##

    Teller_1 [8]    Teller_2 [9]    Waiting Queue: [ 1 2 ]

At the beginning of iteration 7 ...
Input serving time for a new customer: 1
After 7 minute ##

    Teller_1 [8]    Teller_2 [9]    Waiting Queue: [ 1 2 1 ]

----------END OF SIMULATION ----------
Total minute simulated: 7 minutes
Number of Tellers: 2
Number of customer served: 3
Average number of customers in the queue 1.2857143
Max queue length 3
```

Test Case 2

Here is a sample of one simulation – Never need waitingLine

Input Name	User Input
Simulation Length	9
Number of Counter	3
Iteration 1 - Serving time:	3
Iteration 2 - Serving time:	4
Iteration 3 - Serving time:	5
Iteration 4 - Serving time:	3
Iteration 5 - Serving time:	0
Iteration 6 - Serving time:	1
Iteration 7 - Serving time:	1
Iteration 8 - Serving time:	1
Iteration 9 - Serving time:	1

Output:

Total minute simulated: 9 minutes
Number of Tellers: 3
Number of customer served: 7
Average number of customers in the queue: 0.0
Max queue length: 0

```
(base) MacBook-Air-6:DSA Assignment whitneywhatley$ java Main
----------START SIMULATION ENVIRONMENT ----------
Input simulation length (min): 9
Input number of counter: 3

----------START SIMULATION ----------

At the beginning of iteration 1 ...
Input serving time for a new customer: 3
After 1 minute ##

    Teller_1 [4]    Teller_2 [0]    Teller_3 [0]    Waiting Queue: [ ]

At the beginning of iteration 2 ...
Input serving time for a new customer: 4
After 2 minute ##

    Teller_1 [4]    Teller_2 [6]    Teller_3 [0]    Waiting Queue: [ ]

At the beginning of iteration 3 ...
Input serving time for a new customer: 5
After 3 minute ##

    Teller_1 [4]    Teller_2 [6]    Teller_3 [8]    Waiting Queue: [ ]

At the beginning of iteration 4 ...
Input serving time for a new customer: 3
After 4 minute ##

    Teller_1 [7]    Teller_2 [6]    Teller_3 [8]    Waiting Queue: [ ]

At the beginning of iteration 5 ...
Input serving time for a new customer: 0
After 5 minute ##

    Teller_1 [7]    Teller_2 [6]    Teller_3 [8]    Waiting Queue: [ ]

At the beginning of iteration 6 ...
Input serving time for a new customer: 0
After 6 minute ##

    Teller_1 [7]    Teller_2 [6]    Teller_3 [8]    Waiting Queue: [ ]

At the beginning of iteration 7 ...
Input serving time for a new customer: 1
After 7 minute ##

    Teller_1 [8]    Teller_2 [6]    Teller_3 [8]    Waiting Queue: [ ]

At the beginning of iteration 8 ...
Input serving time for a new customer: 1
After 8 minute ##

    Teller_1 [9]    Teller_2 [6]    Teller_3 [8]    Waiting Queue: [ ]

At the beginning of iteration 9 ...
Input serving time for a new customer: 2
After 9 minute ##

    Teller_1 [11]    Teller_2 [6]    Teller_3 [8]    Waiting Queue: [ ]

----------END OF SIMULATION ----------
Total minute simulated: 9 minutes
Number of Tellers: 3
Number of customer served: 7
Average number of customers in the queue: 0.0
Max queue length: 0
```

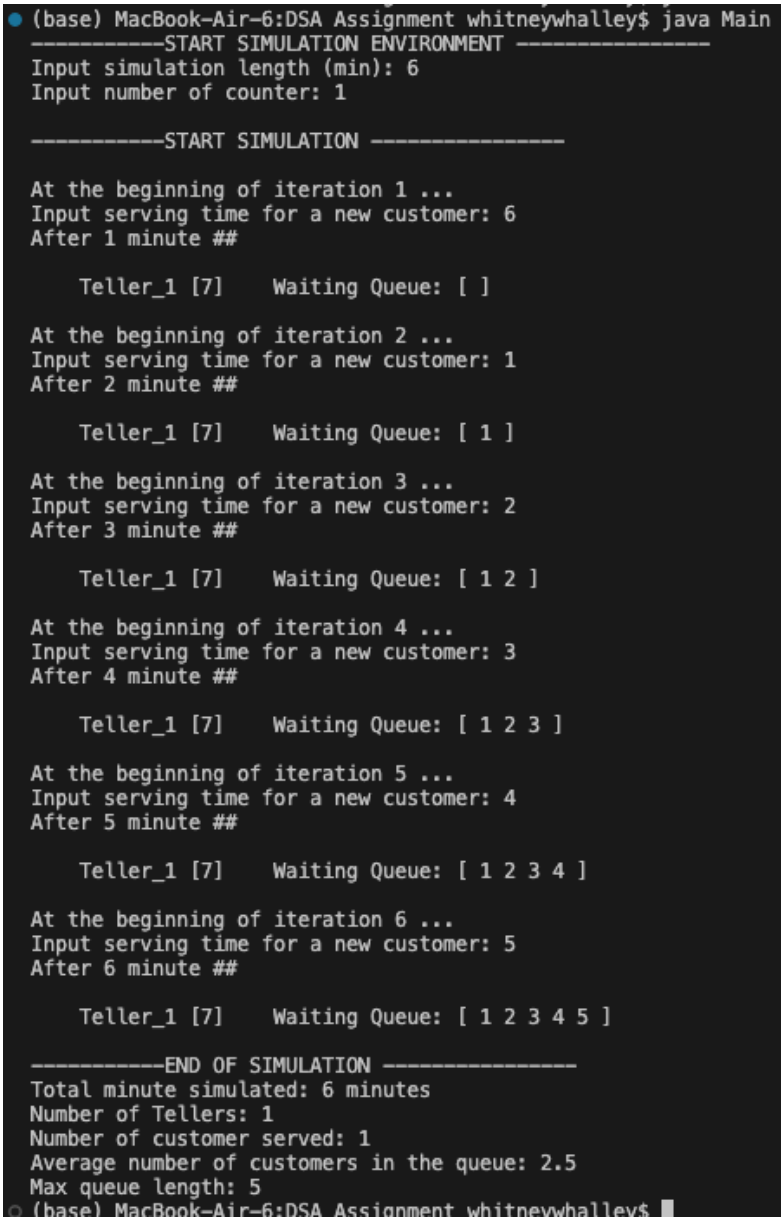
Test Case 3

Here is a sample of one simulation – One Teller, long waitingLine

Input Name	User Input
Simulation Length	6
Number of Counter	1
Iteration 1 - Serving time:	6
Iteration 2 - Serving time:	1
Iteration 3 - Serving time:	2
Iteration 4 - Serving time:	3
Iteration 5 - Serving time:	4
Iteration 6 - Serving time:	5

Output:

Total minute simulated: 6 minutes
Number of Tellers: 1
Number of customer served: 1
Average number of customers in the queue: 2.5
Max queue length: 5



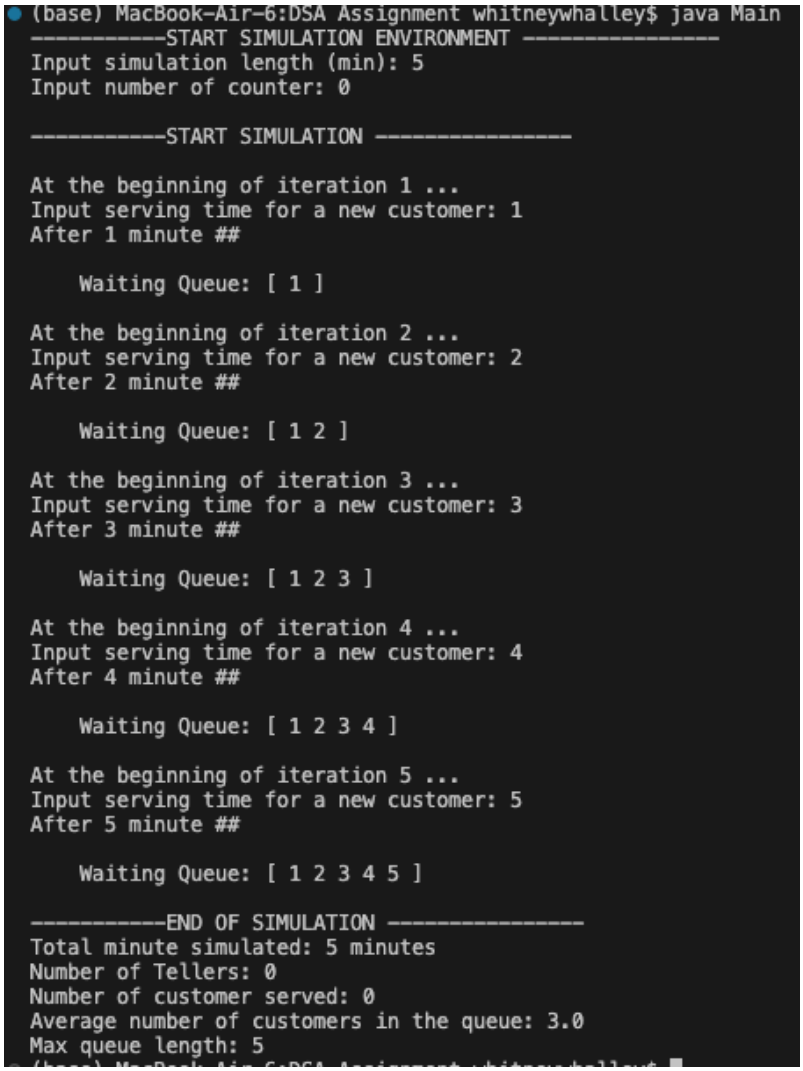
Test Case 4

Here is a sample of one simulation – No teller, all in waitingLine

Input Name	User Input
Simulation Length	5
Number of Counter	0
Iteration 1 - Serving time:	1
Iteration 2 - Serving time:	1
Iteration 3 - Serving time:	3
Iteration 4 - Serving time:	4
Iteration 5 - Serving time:	5

Output:

Total minute simulated: 5 minutes
Number of Tellers: 0
Number of customer served: 0
Average number of customers in the queue: 3.0
Max queue length: 5



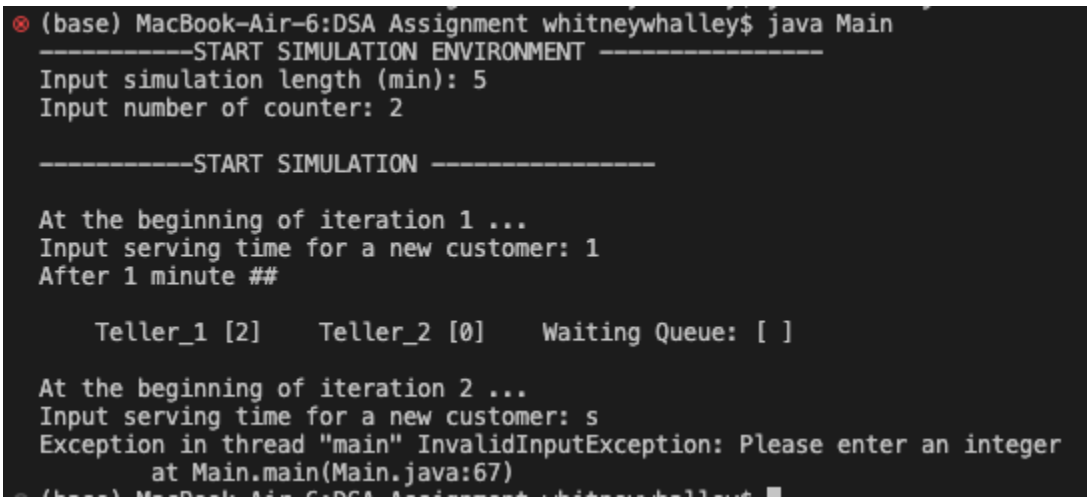
Test Case 5

Here is a sample of one simulation
– User enters any input other than an integer for any of the user input

Input Name	User Input
Simulation Length	5
Number of Counter	2
Iteration 1 - Serving time:	1
Iteration 2 - Serving time:	s

Output:

Exception in thread "main" InvalidInputException: Please enter an integer
at Main.main(Main.java:67)



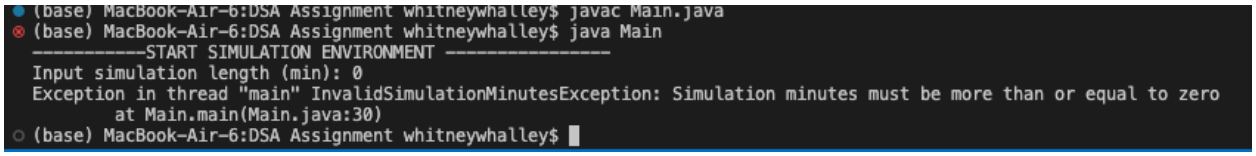
Test Case 6

Here is a sample of one simulation
– User enters 0 simulation minutes

Input Name	User Input
Simulation Length	0

Output:

Exception in thread "main" InvalidSimulationMinutesException: Simulation minutes must be more than or equal to zero
at Main.main(Main.java:30)



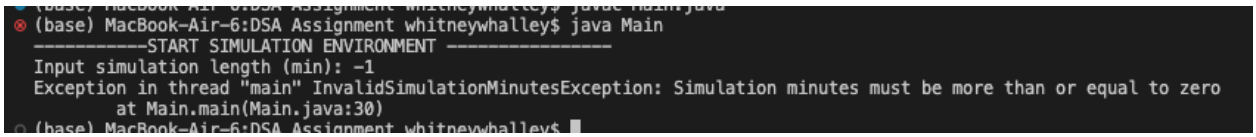
Test Case 7

Here is a sample of one simulation
– User enters -1 simulation minutes

Input Name	User Input
Simulation Length	-1

Output:

Exception in thread "main" InvalidSimulationMinutesException: Simulation minutes must be more than or equal to zero
    at Main.main(Main.java:30)



Test Case 8

Here is a sample of one simulation – Longer test case, more tellers, showing queue is working

Input Name	User Input
Simulation Length	10
Number of Counter	4
Iteration 1 - Serving time:	10
Iteration 2 - Serving time:	5
Iteration 3 - Serving time:	6
Iteration 4 - Serving time:	3
Iteration 5 - Serving time:	1
Iteration 6 - Serving time:	3
Iteration 7 - Serving time:	0
Iteration 8 - Serving time:	2
Iteration 9 - Serving time:	1
Iteration 10 - Serving time:	1

Output:

Total minute simulated: 10 minutes
Number of Tellers: 4
Number of customer served: 8
Average number of customers in the queue: 0.7
Max queue length: 2