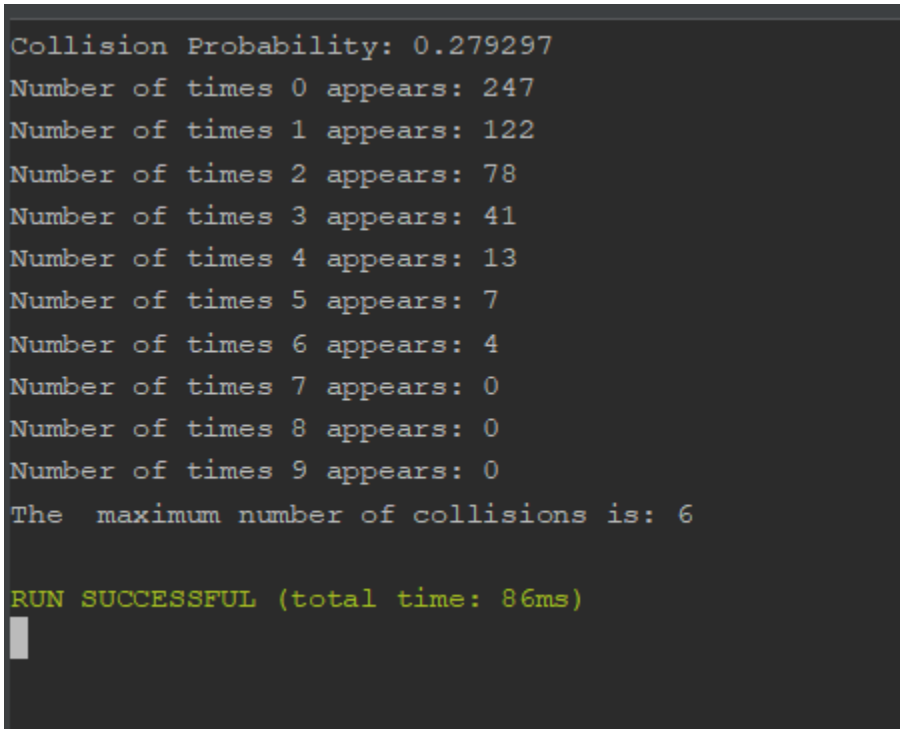
GITHUB: https://github.com/Eduardo-Murillo22/17C-C-Final

Problem #1
Hashing:

Do both results agree with the hashing statistics distribution?
Yes they both do

Show the comparison and analysis? Analysis is attached in the problem folder

Does it compare to theory?
Yes is does since the calculations demonstrate in the simulation how there is a 27% possibility of collision and the simulation proves it



Problem #2
Stacks:

Compare table output values to input? What do you see and why. What does Theory say about recursions?

Recursions go incrementing respectively to the second function called the first function that is called will always be 1 step in front of the secondary recursive function called

0	0	0	1
0.1	0.100167	4180	6764
0.2	0.201336	6764	10945
0.3	0.30452	10945	17710
0.4	0.410752	10945	17710
0.5	0.521095	10945	17710
0.6	0.636654	17710	28656
0.7	0.758584	17710	28656
0.8	0.888106	17710	28656
0.9	1.02652	17710	28656

RAD	Results CosH	Cos calls	Sin calls
-1	1.54308	10946	17710
-0.9	1.43309	10946	17710
-0.8	1.33743	10946	17710
-0.7	1.25517	10946	17710
-0.6	1.18547	10946	17710
-0.5	1.12763	6765	10945
-0.4	1.08107	6765	10945
-0.3	1.04534	6765	10945
-0.2	1.02007	4181	6764
-0.1	1.005	2584	4180
0	1	1	0

Problem #3
Queues:

What is my average customer wait time? 0.0535536 min

What is the max number of customers in the line? 5

```
Average Customer Wait Time: 0.0535536 minutes
Maximum Number of Clerks: 3
Customers left in line: 2
```

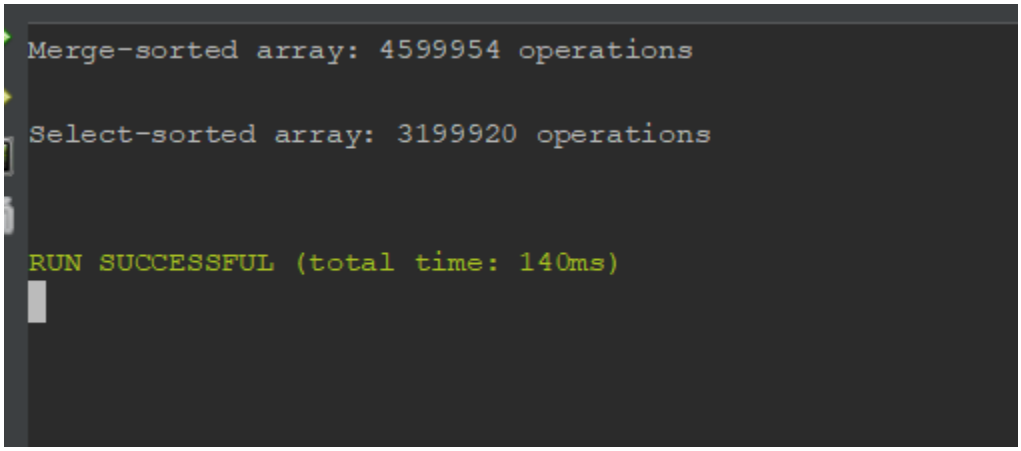
If you randomize servicing and arrival times by +-50% how does this change the results?
It changes the amount of clerks from 3 to 4 that will be added and also makes the wait time differ

```
Average Customer Wait Time: 0.0513013 minutes
Maximum Number of Clerks: 4
Customers left in line: 2
```

Problem #4

Sorting:

Does the size of p change the analysis and when does 1 sort outperform the other. The p when sepsis a average of p = 160 is when the merge sort goes faster then the select sort.



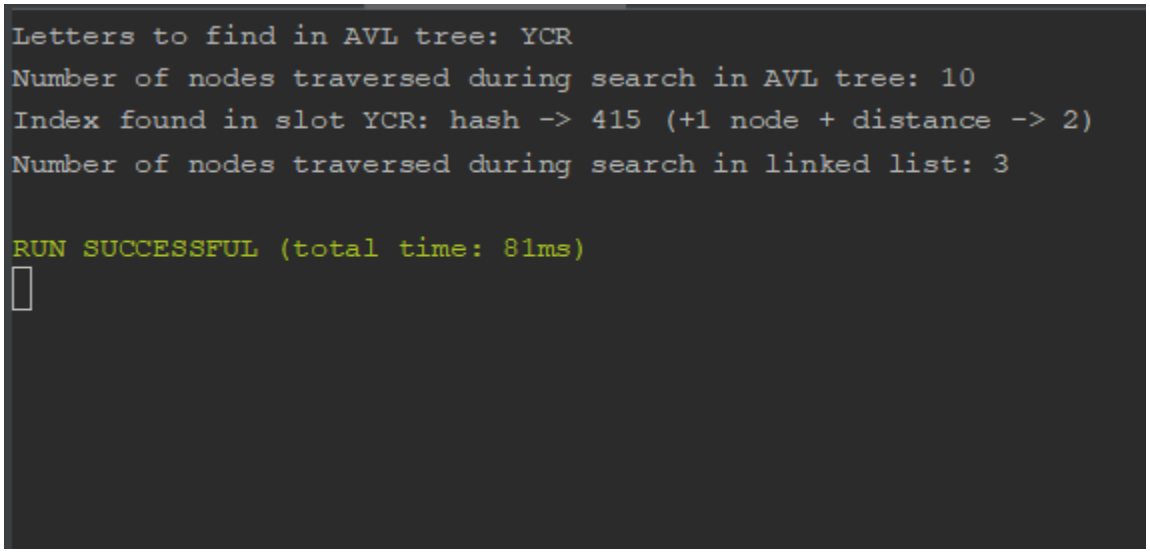
```
p = 151
Merge sort: 43 milliseconds
Select sort: 39 milliseconds

p = 152
Merge sort: 47 milliseconds
Select sort: 44 milliseconds

p = 153
Merge sort: 44 milliseconds
Select sort: 40 milliseconds

p = 154
Merge sort: 44 milliseconds
Select sort: 40 milliseconds

p = 155
Merge sort: 46 milliseconds
Select sort: 42 milliseconds

p = 156
Merge sort: 43 milliseconds
Select sort: 42 milliseconds

p = 157
Merge sort: 43 milliseconds
Select sort: 44 milliseconds

Point where merge sort wins = 157

RUN SUCCESSFUL (total time: 6s)
```

Problem #5

Tree:

How does this compare to Hashing?

The hashing vs the tree show that the hashing does a faster search since it just does the the hashed index and then just searches the links in that index, on the other hand the tree has to go through a lot of nodes to be able to find a element at least double the amount the hash would go through



Problem #6

Weighted Graphs:

Does the hand analysis agree with the program?

Yes, the hand analysis does mach the results from the simulations

```
a) Find the shortest distance between ORD(3) and LAX(6): 2037
b) Find the shortest distance between JFK(4) and SFO(0): 2590
c) Find the minimum spanning tree:Edge  Weight
6 - 1   1234
4 - 2   189
1 - 3   803
3 - 4   743
4 - 5   1093
0 - 6   338
4400

RUN SUCCESSFUL (total time: 199ms)
```