**Programming Project Report**

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Date: 3/16/2023

**Academic Integrity Statement:** I pledge that I have neither given nor received unauthorized help on this programming assignment.

**Problem Statement:**

The goal of this programming assignment is to compare the run times of a Queue vs a Stack implementation, then document the findings into a excel spread sheet. For this program the only input was a static input number set at the beginning of running. The outputs of this program consist of 2 outputs. The first is a output of the Stack implementation followed by a display of its run time. Next is the output of the Queue implementation followed by a display of its run time.

**Design:**

The design of this program consisted of creating 2 classes called Queue and Stack to house the methods of each respective storage implementation. After successfully implementing these methods a main function was created which is responsible for calling the methods created in each class. The main function would handle the running of each implementation and documenting the run times of each.

**Implementation:**

The implementation process began with using the provided skeleton code for the queue.h and stack.h files. Then implementing the methods given into their respective .cpp files. After this the main.cpp and main function would be implemented. Here 2 for loops are created that will iterate through 0 – number of iterations. The first loop generates a random number between 1-100 and stores it in the variable random. Then 2 if statements compare whether the random number is > 50 or < 50. If it is greater than 50 then it pushes the random number onto the top of the stack, if the random number is less than 50 then it pops the top number of the stack out. The same implementation is used for the Queue only a new object of type Queue is created and the for loop uses the Queue methods instead of the Stack methods. For run time to be calculated a timer is started once main begins, then once the first for loop finishes then it logs the time, then once the second for loop finishes it subtracts the run time of the 1st for loop from the total time to get the time for the second loop.

**Testing:**

As documented in the Excel file, the numbers that were tested started at 1000 iterations and the final test was 10000000 iterations. Since these numbers pushed the algorithms to their limit it was sufficient for these tests to call this a success. Let it be noted that the Stack implementation was significantly faster than the queue implementation.

**Conclusions:**

The overall result of this project was a success. This was due to the implementation of the Queue and Stack were successful in their runs, and gave expected run times. If this project were to be continued the ability to add multiple queues then spread the numbers between each would be implemented. This project took 4hrs to complete including the report and Excel file.