CS 124 Project 2

Due by Wednesday, September 29th

For this project, you will write a C++ program that uses Stack and Queue data structures to store objects of varying data types.

Requirements

It is recommended that you use the data and program from Project 1 as a starting point.

Stack Class

- Start with the Stack class from lecture. What is the Big-Oh complexity of the methods?

Queue Class

- Create a Queue class that uses the Node class from lecture to create a functioning queue data structure.
- Your Queue should keep track of where the front and back Nodes are.
- Your Queue should be able to push Objects onto its back, pop Objects off its front, and determine if an Object is in the Queue. What is the complexity of each method?
- Your Queue must be able to be used with any data type.
- Your Nodes must be stored in heap memory.
- Your program must not have any memory leaks.

Main function

- Create three Queue objects: one of integers, one of strings, and one of the type you created in Project 1.
- Demonstrate that the Queue methods work correctly by calling methods on the objects and printing out to the console when appropriate.
- Perform the following operations:
  - Create a Queue object and a Stack object, both of the type you created in Project 1.
  - Print and push the first 10 objects from your vector (from Project 1) onto the Queue.
  - Pop the 10 objects off the Queue and push them onto the Stack.
  - Pop and print the 10 objects off the Stack.
  - What is the order of the objects before and after adding them to the Queue and Stack? When and why did it change?

Design

Consider the following questions:

- Using the Node class, will the links point from the front to the back of the Queue or from the back to the front? Which way will make the push and pop methods more efficient?
- How will you make sure there are no memory leaks?
- How will you print the objects in the main function? Should you overload an operator?

Test

How can you demonstrate in your code that your Queue class works correctly? How can you use the integer and string Queue objects to show this?

Report and Submit

You must write a report about your project:

- Include information about your data set. You will be assigned a different grader for this project.
- Answers to all of the questions above.
- **Note: Any code that was not authored by yourself or the instructor must be cited in your report. This includes the use of concepts not taught in lecture.**

You must submit your source files, your data file(s), and your PDF report.

Grading

The project is out of 60 points.

5 pts	Program compiles and runs.
5 pts	Code style. Readable, naming style is consistent, comments where appropriate.
20 pts	Queue class satisfies requirements.
5 pts	You create at least three Queue objects of different types, as described above.
5 pts	You test your code to demonstrate that everything works correctly.
10 pts	You perform the operations with the Stack and the Queue as described above.
10 pts	Report satisfies requirements, is easily readable, and is professional.