Assignment #2
CS 163 Data Structures

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****Assignments in CS163 consists of written homework and programming****
****All parts are required to get a grade on this homework ****

HOMEWORK QUESTIONS:

1. **Create an Algorithm** to determine if two linear linked lists contain the same contents independent of their order using recursion.

   Algorithms should be written using complete sentences in a way that is easy to follow – consider using outline form. Make sure to desk check the algorithm

2. **Definition of Terms.** In your own words, define the following terms and provide examples of their use:

   - **Loop Invariant**
   - **Unit Testing**
   - **Default Arguments**
   - **Function Overloading**
   - **Pass by Pointer vs. Pass by Reference**
   - **Pointer Arithmetic**
   - **Data Abstraction**

3. **Ethics.** Part of computer ethics is providing software that is useable and understandable. In our case, we are building ADTs this term for other programmers to use as the foundation for their application development. For example, is it ethical for a data type to display a "list is empty" error or a "divide by zero" error. Is it meaningful to the user?

   Brainstorm: As a developer of an ADT, what are our responsibilities in regards to making sure we meet the needs of application developers? Write in 5 complete sentences, *your thoughts about any ethical concerns.*

Programming Project

Programming – Problem Statement: Part of a game program is keeping track of the avatars, and weapons (tools or capabilities if you prefer). You have decided to queue up weapons that you intend to use for a particular game. And, you have decided use a stack to keep old avatars that are no longer active. This way you can access them again if you need (instead of deleting them), but they aren't essential.

***Each avatar has information in regards to their (a) name, (b) ranking, and (c) weapons **queue**. You may add other things (but this list of items is required). The weapons (or tools) must have at least three fields, one of which must be dynamically allocated. Your job is to implement a stack ADT and a queue ADT. These should be implemented as separate ADTs in their own .h and corresponding .cpp files.

Programming – Data Structures: Your queue must be implemented using a circular linked list. Your queue must implement a dequeue, enqueue, displayall, and peek. Your stack must be implemented using a linear linked list. Your stack must have a push, pop, displayall and peek. In addition, the **user** of the program must not be aware that a stack or queue is being used – this is the job of the application program!

Things you should know...as part of your program:

1) Do not use statically allocated arrays in your classes or structures. All memory must be dynamically allocated and kept to a minimum!

2) All data members in a class must be private

3) Never perform input operations from your class in CS163

4) Global variables are not allowed in CS163

5) Do not use the String class! (use arrays of characters instead!) You may use the cstring class.

6) Use modular design, separating the .h files from the .cpp files. Remember, .h files should contain the class header and any necessary prototypes. The .cpp files should contain function definitions. You must have at least 2 .h file and 3 .cpp files. **Never "#include" .cpp files!**

7) Use the iostream library for all I/O; do not use stdio.h.

8) Make sure to define a constructor and destructor for your class. Your destructor must deallocate all dynamically allocated memory.

9) Remember that 20% of each program's grade is based on a written discussion of the design. *Take a look at the style sheet which gives instruction on the topics that your write-up needs to cover.*