Loyola University Chicago

Department of Computer Science

COMP 272: Data Structures II (Spring 2024)

Assignment # 1

This is an individual assignment.

Deadline: **Monday, February 5th, 2024, 11:55PM**.

You need to submit your solutions in Repl.it. See the information shared in Sakai regarding joining our Replit classroom.

Document your source code, such that someone not familiar with the source code will easily understand it. E.g.,

- Document each object (class) and its external methods as if you were placing them in a public library to be used by other developers.
- Place appropriate comments / error handling within your source code. These comments should guide the reader on what the code is conceptually doing as they read your source code (and to make sure when we look at your code, we know you understand the code).

1. Lists (20 points)

a. Complete the *removeElementsLT* method to remove all elements from the list less than the element passed into the method as an argument. Example: running *removeElementsLT(8)* would remove elements less than 8 from the list.

2. Stacks (40 points) Complete these questions using Stacks (java.util.Stack).

a. Complete the *isPalindrome* method to check if the input string by a user is a palindrome (a word or sentence that is spelled the same in reverse as it is spelled straightforward). This method should work irrespective of **spaces and casing**. Example: the method should return true for "Race Car" and "racecar". *Hint: the String method .replaceAll() will be helpful.*

b. Complete the *findLargestK* method which takes a stack and an integer *K* as inputs and then returns the largest index of *K* in the stack. Example: Given the stack [5,3,1,4,1] and *K*=1, the method will return 4.

3. Algorithm Analysis 1 (20 points)

Modify the provided *System.out.println()* statements to print the following for the *algorithmAnalysis1* method:

- Mathematical equation for the method: Example: *System.out.println("Math equation is : 5 n log n + 2);*
- The time complexity for the *algorithmAnalysis2* method, one each for Big-Oh, Big-Omega, and Big-Theta. Example: *System.out.println("O(n log n");*

Note: This question doesn't have any automated tests in Replit

4. Algorithm Analysis 2 (20 points)

Modify the provided *tystem.out.println()* statements to print the following for the *algorithmAnalysis2* method; **assume** that both input arrays are of size N:

- Mathematical equation for the method: Example: *System.out.println("Math equations is: 5n log n + 10n + 2");*
- The time complexity for the *algorithmAnalysis2* method, one each for Big-Oh, Big-Omega, and Big-Theta. Example: *System.out.println("O(n log n);*

Note: This question doesn't have any automated tests in Replit

Submission:

1. Before submission, make sure your code passes all the JUnit tests. Keep in mind, however, that passing the test cases does not guarantee that your code is correct or efficient. Your assignment will be graded considering test results, correctness, and efficiency.
2. The submission should be completed in Replit.
3. **Include your name and course's section number as comments at the top of each submitted Java file.**