Assignment 4
CIS 2168 (Section 001)
Fall 2023
Instructor: Shuvra Chakraborty
Total points: 100

Objectives

Practice recursion problem set.

Iterative solutions are not accepted for this one.

Problem description

1. Given a String, find out whether it is a palindrome or not. Note that the string is not case sensitive and may contain any kind of characters. For example, ?KayAK? is a palindrome.

   Hint: We have already done palindrome checking in class, however, we did not use recursion. Do it using recursion this time. **15 pts**

2. Given a sorted array of numbers "nums", and a target, write a method performing binary search which always returns the first location of given "target" in the array. If the traditional binary search complexity $O(\log_2 n)$, compare the complexity of your method with the traditional binary search.

   For example, for an array {1,2,4,4,4,4,4,4,4,4} and target 4, traditional binary search and Arrays.binarySearch() may return any index of target 4 in the array. However, your method must return 2 as an index.

   15 pts

3. Given a sorted array of numbers "nums", and a target, write a method performing traditional binary search. Explain the following scenarios with an example (Assume you are using the method you have written):

   a. Give an example how your binary search method fails even if the target belongs to the array when the array is not sorted prior to searching.

   b. Give an example where your binary search method returns failure because target is smaller than any element of the array.

   c. Give an example where your binary search method returns failure because target is greater than any element of the array. **30 pts**

4. Given an integer n, return true if it is a power of 3. Otherwise, return false. **15 pts**
5. Given two non-negative integers x and n, compute x^n. **15 pts**

Submission Instruction

The assignment should be submitted through the available link on course Canvas shell. The assignment rubric is as follows:

1. Source code and demonstration [90 points]:

Write it like a report and provide the source code (if necessary) in zip file. Each file should have proper comments (e.g., explanations for methods, class and so on). It will be graded based on accuracy (e.g., program execution), clarity of the necessary comments, and short demonstration as instructed by TA or instructor.

2. Status.txt [10 points]:

In this text file, you need to report:

- The status of your program/report (completed or not; partial credit will be given even if the program is not completed).
- The design of your program (what and how the objectives have been accomplished.
- Support and advice (if any) you get from TA and/or your classmates.
- Comments and suggestions to improve this assignment.
- If you are doing late submission, you should mention the number of days you are late since the due date. According to our policy, for N days of late submission, you get a deduction of Nx3 points per day even if your submission completes all the requirements. That said, if you are late for 5 days, your maximum point can be up to 85 out of 100.

Please have the report, source codes(if necessary) and status files zipped into a single file DSAssign4- LastnameFirstname.zip and upload the file on Canvas.