CS 245 - Practice Assignment 7   Spring, 2020

Practice Assignment 7 - Palindromes

The goal of this assignment is to practice the implementation of two of the data structures we've seen: Stacks and Queues. For this assignment, the correctness of the data structures is primarily measured by how well the structures can be used to detect palindromes.

Background

Two of the data structures we discussed are Stacks and Queues. A Stack is a LIFO data structure which has four required functions (`push`, `pop`, `peek` and `empty`). On the other hand, a Queue is a FIFO data structure which has three functions (`enqueue`, `dequeue` and `empty`). Because of the order in which data is placed in these data structures, they can be used to detect palindromes.

A palindrome is a word which can be written the same way backwards or forwards. For example, the reverse of the word "level" is the same word. (In addition, phrases such as "Al lets Della call Ed Stella" are palindromes, if spaces omitted and uppercase letters changed to lowercase. But we don't test for those.)

If an input string is copied, letter-by-letter, into a Stack instance (with a push operation) and to a Queue instance (with an enqueue operation), the output order should match for palindromes. However, the same should cause a mismatch for non-palindromes. For example, a non-palindrome word such as "rat" placed into a Queue instance is retrieved in order (`r - a - t`) but for a Stack instance, the order is reversed (`t - a - r`).

Requirements (Process)

Requirement 1: Get the files you need. You will copy them to your own GitHub repository using the following procedure:
1. Log into GitHub. If you do not have a GitHub account, create one via github.com > Sign Up.
2. Point your browser to the URL https://classroom.github.com/a/36qim0gf.
3. If necessary, authorize GitHub Classroom by selecting the "Authorize github" button.
4. If available, select your name from the list of names available. This will link your GitHub ID.
5. Accept the assignment by selecting the appropriate button.

If successful, your repository should contain three (3) Java files:
- PracticeTest.java — the main file
- Queue.java — the interface for the Queue implementation
- Stack.java — the interface for the Stack implementation

Requirement 2: Add to the code in order to make it run. Specifically, you must add two classes: `ArrayQueue.java` and `ArrayStack.java`. ArrayQueue must implement the interface defined in the file Queue.java, specifically the functions: `enqueue`, `dequeue` and `empty`. ArrayStack must implement the interface defined in the file Stack.java, specifically the functions `push`, `pop`, `peek` and `empty`. Each of the implemented data structures is required to use an array implementation for storing data, as discussed in class, with a default array size of 10 instances of some template type, T, passed at time of declaration. The implementations are additionally required to grow to double the current size when an attempt is made to exceed the size of the arrays.

When the implementation is correct for single words, the output will be as follows:

```
[+10%] Queue and Stack declared correctly.
[+10%] Queue functions appear correct.
[+10%] Stack functions appear correct.
[+20%] Stack and Queue appear to resize correctly.
====================
[+10%] "level" is a palindrome (correct).
[+10%] "anna" determined to be a non-palindrome (incorrect).
====================
[+10%] "first" is a non-palindrome (correct)
[+10%] "Matter fact" is a non-palindrome (correct)
[+10%] "Landed on his hip and busted his lip" is a non-palindrome (correct)
====================
Grade for this assignment: 100%
```

Submission

You are required to submit two classes for this assignment: ArrayQueue.java and ArrayStack.java. Use GitHub to check in the two classes required to complete the implementation. On Canvas, submit the URL for your GitHub repository.

Grading

The assignment generates a grade ("`Grade for this assignment`") based on correctness of the data structure implementations and detection of palindromes and non-palindromes. This will be the starting point for the grade for the assignment.