CS215: Introduction to Program Design, Abstraction and Problem Solving
(Spring, 2025)
Lab Assignment 12
(20 points)
Today's Date: Tuesday, April 22
Submission Due Date: Sunday, April 27
Demonstration is optional for this last Lab assignment!

The purpose of this lab assignment is

- to continue practicing how to define your own class
- to practice how to use stack and its basic operations to solve problems
- to practice how to use recursion to solve problems

Problem Statement

The following class **SuperString** implements some basic operations on strings. The following shows the declaration of the class **SuperString**. In this lab assignment, you need to complete the class definition and write the main function.

```
class SuperString  {
  public:
    // constructor: initialize str with ini_str passing as a parameter
    SuperString(string ini_str);

    // return the current value of the private data member: str
    string getString() const;

    // set the value of str to be the passed in parameter input_str
    void setString(string input_str);

    // return a reverse string
    // using a loop to implement
    // Note that the private data member named str, has not been changed
    string rev_loop() const;

    // return a reverse string
    // using recursion to implement
    // Note that the private data member named str, has not been changed
    string rev_recursion() const;

    // return a reverse string
    // using a stack to implement
    // Note that the private data member named str, has not been changed
    string rev_stack() const;

    // return true if str is a palindrome
    // otherwise return false
```

```
      // A palindrome is defined as a sequence of characters which
      //                reads the same backward as forward
      // Calling member function to implement
      // Note that the private data member named str, has not been changed
      bool isPalindrome() const;

      // return true if str is a palindrome
      // otherwise return false
      // A palindrome is defined as a sequence of characters which
      //                reads the same backward as forward
      // Using recursion to implement
      // Note that the private data member named str, has not been changed
      bool isPalindrome_recursion() const;

      // displays str, followed by a new line marker,
      // to the standard output
      void print() const;

  private:
    string str;
};
```

You can either download (you need to save the file under the same folder as your solution file, and add it into the solution) or copy the content of the header file, which contains the declaration of the class **`SuperString`**, from the following link:
https://www.cs.uky.edu/~yipike/CS215/SuperString.h

Note that for this Lab assignment, you need to provide the implementation of the member functions for the class **`SuperString`**, in a .cpp file, which completes the definition of class **`SuperString`**. After you create a new project from Visual Studio IDE, right click on **Header Files** and select **Add → New Item...,** and choose "Header File (.h)" for the declaration of the class **`SuperString`** (You can copy the content from the link above). Then right click on **Source Files** and select **Add → New Item...,** and choose "C++ File (.cpp)" for the implementation file of the class **`SuperString`**.

Then use the following link to download the main source file to test your complete definition of the class **`SuperString`**:
https://www.cs.uky.edu/~yipike/CS215/Lab12.cpp

From Visual Studio IDE, right click on **Source Files** and select **Add → New Item...,** and choose "C++ File (.cpp)" for the main source file (You can copy the content from the file named **`Lab12.cpp`** of the above link.

After passing the compilation, you can test run your program, it should exactly match the following sample output: (Note that the blue part represents the user input, and "↵" represents the return key from the user input.)

```
Welcome to CS215 Super String operations!
Please input a string to watch its magic:
A↲
The original string you type is: A
Reverse of the string (using a loop): A
Reverse of the string (using recursion): A
Reverse of the string (using a stack): A

Is " A " a palindrome?
Calling member function to decide, the answer is: true
Using recursion to decide, the answer is: true


Please input a string to watch its magic:
CS215↲
The original string you type is: CS215
Reverse of the string (using a loop): 512SC
Reverse of the string (using recursion): 512SC
Reverse of the string (using a stack): 512SC

Is " CS215 " a palindrome?
Calling member function to decide, the answer is: false
Using recursion to decide, the answer is: false


Please input a string to watch its magic:
02/25/2025↲
The original string you type is: 02/25/2025
Reverse of the string (using a loop): 5202/52/20
Reverse of the string (using recursion): 5202/52/20
Reverse of the string (using a stack): 5202/52/20

Is " 02/25/2025 " a palindrome?
Calling member function to decide, the answer is: false
Using recursion to decide, the answer is: false


Please input a string to watch its magic:
5202025↲
The original string you type is: 5202025
Reverse of the string (using a loop): 5202025
Reverse of the string (using recursion): 5202025
Reverse of the string (using a stack): 5202025

Is " 5202025 " a palindrome?
Calling member function to decide, the answer is: true
```

```
Using recursion to decide, the answer is: true


Please input a string to watch its magic:
taco cat↵
The original string you type is: taco cat
Reverse of the string (using a loop): tac ocat
Reverse of the string (using recursion): tac ocat
Reverse of the string (using a stack): tac ocat

Is " taco cat " a palindrome?
Calling member function to decide, the answer is: false
Using recursion to decide, the answer is: false


Please input a string to watch its magic:
tarcocat↵
The original string you type is: tarcocat
Reverse of the string (using a loop): tacocrat
Reverse of the string (using recursion): tacocrat
Reverse of the string (using a stack): tacocrat

Is " tarcocat " a palindrome?
Calling member function to decide, the answer is: false
Using recursion to decide, the answer is: false


Please input a string to watch its magic:
star rats↵
The original string you type is: star rats
Reverse of the string (using a loop): star rats
Reverse of the string (using recursion): star rats
Reverse of the string (using a stack): star rats

Is " star rats " a palindrome?
Calling member function to decide, the answer is: true
Using recursion to decide, the answer is: true


Please input a string to watch its magic:
↵
Quitting CS215 Super String operations. Thank you!
```

Submission

Note for this Lab assignment, the demonstration is not required unless for the purpose of Bonus 3 points only. You need to demonstrate your Lab12 by the end of Lab12 class to gain the possible Bonus 3 points. Any demonstration after the Lab12 class is not qualified for

Bonus 3 points.
Open the link to Course Canvas page (https://www.uky.edu/canvas), and log in to your account using your LinkBlue ID and password. **Please submit ONE source file, named SuperString.cpp through link "Lab 12".**

Grading (20 points + Bonus 3 points)

1. Attend the lab session or have a documented excused absence. (5 points)
2. Your program correctly solves the problem. (15 points)
   (you get zero if your program cannot pass compilation)
   - Include comments as specified in the lecture notes. (2 points)
   - implement the constructor of SuperString class correctly (1 point)
   - implement the getString( ) member function of SuperString class correctly (1 point)
   - implement the setString( ) member function of SuperString class correctly (1 point)
   - implement the rev_loop( ) member function of SuperString class correctly (2 points)
   - implement the rev_recursion( ) member function of SuperString class correctly (2 points)
     (if your function is correct, however you did not use recursion, you lose 2 points)
   - implement the rev_stack( ) member function correctly (2 points)
     (if your function is correct, however you did not use stack, you lose 2 points)
   - implement the isPalindrome( ) member function of SuperString class correctly (2 points)
     (if your function is correct, however you did not call member function, you lose 2 points)
   - implement the isPalindrome_recursion( ) member function of SuperString class correctly (The definition of this member function is done during the Lecture, for your reference)
   - implement the print( ) member function of SuperString class correctly (2 points)

Demonstrate your program to your TA and answer TA's questions by the end of Lab12 class (Bonus 3 points)

(Note the due date is technically Sunday, April 27, 2025 (by 11:59pm), but submissions will be accepted without late penalty until 11:59pm on Wednesday, ~~May~~ April 30, 2025)