PIC 10B Lectures 1 and 2 Spring 2015
Homework Assignment #6

Due Sunday, May 17, 2015 by 6:00pm.

Objectives:

1. To gain experience templatizing classes and functions.
2. To define and implement your own Queue and Stack class templates.
3. To solve problems using Linked Lists, Queues, and Stacks.

Directions:

1. Create the project called “Hw6” in a solution called “Homework” using Microsoft Visual Studio 2012. All header (.h) and source (.cpp) files inside the project should contain the following header:

```
/*
   <Your Name>                    PIC 10B Intermediate Programming
   ID: <Your Student ID>          Spring 2015
   Email: <Your Email Address>    Assignment #6
   Section: <Your Section # eg 2A>
   Honesty Pledge:

      I, <Your Name Here>, pledge that this is my own independent work,
   which conforms to the guidelines of academic honesty as described in
   the course syllabus.

   List of known bugs:  <Known bugs, if any>
*/
```

2. Convert the classes Iterator and LinearList into class templates. Use the example Iterator and LinearList classes in example LinearList posted on the CCLE Examples page. You will store your solutions in header files Iterator.h and LinearList.h respectively. The templatized Node class was already provided to you in the example Node.h on the Examples page. Be sure to include it into your project unmodified.

3. Define a templatized LinearList member function `reverse()` that reverses the order of the Nodes in the LinearList. You may not use any Stacks or Queues to solve this problem. Instead, manipulate Node pointers and avoid creating wild pointers and memory leak.

4. Define and implement class templates for Queue and Stack, using a object of your newly templatized LinearList<T> class as your underlying data structure

for each case. Implement the behaviors mentioned in the Queue and Stack lecture slides and provide a `private` size attribute as well. Be sure to define a default constructor, copy constructor, destructor, and overload the assignment operator for each class template. Also, overload the output << operator as a `friend` of each class. Put your Queue class template in header file Queue.h and your Stack class template in header file Stack.h and add them to your project.

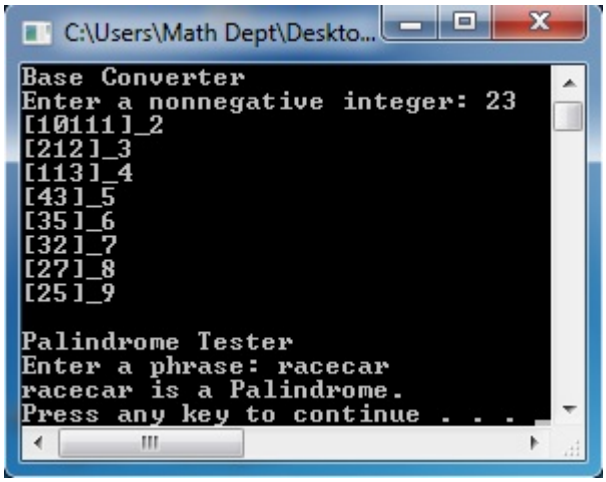
5. Define an application file called LIstQueueStackApp.cpp which contains a function `unsigned int changeBase(unsigned int n, unsigned int b)` that uses a Stack of `int` values to convert a nonnegative integer n into its representation with respect to another base b where we assume 2 <= b <= 9 as a precondition. For example, the integer 23 has base 2 representation [10111]_2 since $1(2^4) + 0(2^3) + 1(2^2) + 1(2^1) + 1(2^0) = 16 + 4 + 2 + 1 = 23$. Thus `changeBase(23, 2)` should return the integer `10111`. Have your `main()` function prompt the user for a value for n and show its representations in every base b from 2 to 9. Define another function
   `bool isPalindrome(string phrase)`
   that uses a Stack and a Queue of `char` values to determine whether or not the given phrase is a palindrome (reads the same way backwards as it does forwards). For example, "racecar" is a palindrome. Have your `main()` function prompt the user for a phrase and report to the screen whether or not it is a palindrome.

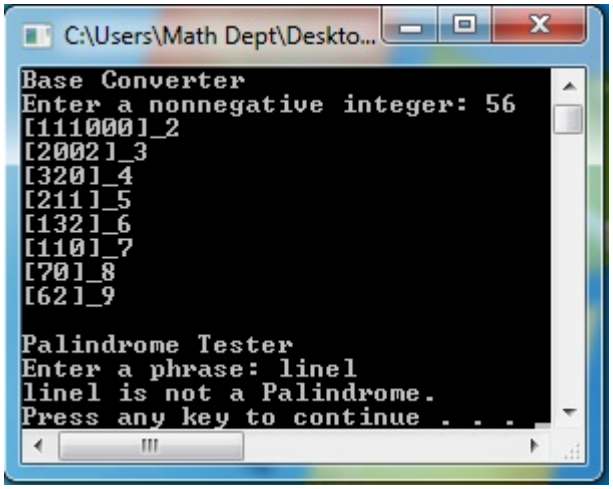
6. When you have completed your project, be sure to
   - make sure your program compiles in Visual Studio 2012.
   - run your program to make sure it works correctly
   - upload your source code files
     - Iterator.h
     - LinearList.h
     - Stack.h
     - Queue.h
     - ListQueueStackApp.cpp

     using the CCLE website. No hardcopies will be collected.
   - visually verify that your source code was submitted correctly by clicking on the links to those files on the CCLE page after submission.

You are not allowed to use STL list, STL queue and STL stack classes for this assignment.

Here are some sample screenshots:





Grade Breakdown:

Criteria	Description	Points
Header	Starts every .h and .cpp file	1
Comments	Program well-commented.	1
Iterator.h	Templatized correctly.	3
LinearList.h	Templatized correctly, reverse defined correctly	5 4
Stack.h, Queue.h	Implemented and templatized correctly.	3 3
LIstQueueStackApp.cpp	`changeBase` defined correctly `isPalindrome` defined correctly `main` defined correctly	4 4 2
Total		30

A penalty of 5 points will be assessed if your code does not compile using Microsoft Visual Studio 2012.