**ECCS 1611 – Programming 1**

**Lab 8 – More Functions**

* For all programs you **MUST** write functions and you **MUST** use function prototypes.
* For all programs you **MUST** implement the functions **AS SHOWN** – you may not create new names and/or parameters.

**Part A. Small Group Problem Solving + Individual Coding**

**Program 1:** Write a program that receives as input a numerical date (e.g. 7 4 2008 for July 4, 2008) and outputs the day of the week that corresponds to that date. This is to be performed by writing the function dayOfWeek that has the following prototype and function header comments:

int dayOfWeek(int month, int day, int year);

/\*\*

dayOfWeek - Computes the weekday of a given date.

@param year the year

@param month the month (1 = January ... 12 = December)

@param day the day of the month

@return the weekday (0 = Sunday ... 6 = Saturday)

\*/

The day of the week for a given date is calculated using a formula known as Zeller’s congruence:



where

* *h* is the day of the week (0 = Saturday, 1 = Sunday, 2 = Monday, ...)
* *q* is the day of the month
* *m* is the *modified* month (3 = March, 4 = April, 5 = May, ..., 14 = February)
* *Y* is the *modified* year, which is the *current* year for March through December, and the *previous* year for January and February.

**Notes:**

* In this algorithm January and February are interpreted as months 13 and 14 of the *previous* year.
  + For example, if the date passed to your function is February 2, 2010, the algorithm must interpret the date as the second day of the fourteenth month of 2009.
  + The conversion, if needed, for the modified month and year values are conducted within the dayOfWeek function.
* The floor function is implemented via integer division.

Your function is allowed to call “helper” functions of your own design, if needed. You should also include any additional functions that will help to streamline the code within your main function.

Example run (with user input indicated with ***red bold italics***):

Enter a date or Q to quit: ***10 13 2011***

Thursday, October 13, 2011

Enter a date or Q to quit: ***4 14 1865***

Friday, April 14, 1865

Enter a date or Q to quit: ***2 29 2000***

Tuesday, February 29, 2000

Enter a date or Q to quit: ***Q***

**Program 2:** Write a program that, given a month and year as integer inputs, prints a calendar for that specific month:

Enter month and year: ***6 2016***

June 2016

Su Mo Tu We Th Fr Sa

1 2 3 4

5 6 7 8 9 10 11

12 13 14 15 16 17 18

19 20 21 22 23 24 25

26 27 28 29 30

**Notes:**

1. To determine the weekday of the first day of a particular month, use the dayOfWeek function written for program 1.
2. Write a helper function to print the header and another helper function to print each row of days.

**Part B. Individual Programming Practice with Functions.**

The functions that are to be written for this portion of the lab (except for main) are **NOT** to include any cin or cout statements.

**P8-1** Write the function int countVowel(string str) that returns a count of all vowels in the string str. Vowels are the letters a, e, i, o, and u and their uppercase variants. Strings should be requested from the user via a loop construct for acquiring test data. HINT: please refer to the following demonstration program for reading in a string from the user:

// getline.cpp - John K. Estell - 07 October 2011

// demo of reading in a string from the keyboard

#include <iostream>

#include <string>

using namespace std;

int main(void) {

string input;

while ( true ) {

cout << "Enter a string or Q to quit: ";

getline( cin, input );

if ( input == "Q" )

break;

cout << "\"" << input << "\"" << endl; // do something with input

}

return 0;

}

Example run (with user input indicated with ***bold italics***):

Enter a string or Q to quit: ***The quick brown fox jumped over the lazy dog.***

Vowel count: 12

Enter a string or Q to quit: ***aeiouAEIOU***

Vowel count: 10

Enter a string or Q to quit: ***zxcvbnm***

Vowel count: 0

Enter a string or Q to quit: ***Q***

**P8-2** Write the function int countWords(string str) that returns a count of all words in the string str. Words are separated by one or more spaces. Strings should be requested from the user via a loop construct for acquiring test data. Please refer to the previous demonstration program for reading in a string from the user.

Example run (with user input indicated with ***bold italics***):

Enter a string or Q to quit: ***The quick brown fox jumped over the lazy dog.***

Word count: 9

Enter a string or Q to quit: ***aeiou AEIOU***

Word count: 2

Enter a string or Q to quit: ***zxcvbnm***

Word count: 1

Enter a string or Q to quit: ***Q***

**P8-3** Write a program that converts a Roman number such as MCMLXXVIII to its decimal number representation that uses the following functions:

* int romanCharValue(char r): yields the numeric value of the passed Roman numeral character.
* int convertRomanToInt(string s): this function converts the Roman number string into its equivalent integer value by implementing the following algorithm.

total = 0

While the roman number string is not empty

If the first character has a larger or equal value than the second, or the string has length 1

Add value(first character) to total.

Remove the character.

Else

Add the quantity: value(second character) - value(first character) to total.

Remove both characters.

Provide a program that tests your functions via a loop construct for acquiring testing data.

Example run (with user input indicated with ***bold italics***):

Enter Roman number or Q to quit: ***I***

I = 1

Enter Roman number or Q to quit: ***V***

V = 5

Enter Roman number or Q to quit: ***X***

X = 10

Enter Roman number or Q to quit: ***L***

L = 50

Enter Roman number or Q to quit: ***C***

C = 100

Enter Roman number or Q to quit: ***D***

D = 500

Enter Roman number or Q to quit: ***M***

M = 1000

Enter Roman number or Q to quit: ***MCMLXII***

MCMLXII = 1962

Enter Roman number or Q to quit: ***MDCCCLXXXVIII***

MDCCCLXXXVIII = 1888

Enter Roman number or Q to quit: ***Q***

