Algorithms and Data Structures 2

Laboratory Sheet 2

1. Exercises in using while or do/while loops

The following program isn't difficult but it does require some logical thinking and planning before you write the code.

The Fibonacci series of numbers 0 1 1 2 3 5 8 13 21 34.... is calculated using the formula

$F_{n+2} = F_{n+1} + F_n$, where F_0 is 0 and F_1 is 1.

Write a program which accepts a value x and prints out the first x Fibonacci numbers.

e.g. if x = 7 then the sequence would be 0 1 1 2 3 5 8

You will always display the first two numbers 0 and 1 and then the remaining numbers will be calculated by adding the previous two numbers

2. Exercises in using the Switch statement

Write a program that inputs a month as an integer (1 – 12) and the year. A *switch* statement should be used to display the numbers of days in that month (there are 30 days in April, June, Sept and Nov, 28 in Feb (except for leap years) and 31 in the rest.)

A year is a leap year if it is divisible by 4 (i.e. leaves no remainder) and not divisible by 100 OR is divisible by 400.

3. Exercises in using arrays

Download the zipped code file from Brightspace. Using the program called *arrReverse1.cpp* (copy and paste it into the online compiler), execute this code which inputs numbers into an array and displays them in reverse order. When you get the basic program working, add to this code by counting all of the even numbers in the array (numbers where are exactly divisible by 2) and get the average of these numbers.

4. Open the program called *arrReverse3.cpp*, make sure you understand the code and execute it.

   Once you are happy with the basic program and understand how it operates, change the program by ensuring that if the user inputs invalid input (i.e. not an integer) or a negative number that an error message is displayed, the value is not input into the array and the user is asked to input another value.

5. Write a program using an array of 20 characters. Ask the user to input characters into the array until a full stop is input or the maximum capacity of the array is reached. Then get the system to display the characters followed by the number of vowels in the characters (i.e. the total number of occurrences of the letters a, e, i, o and u).