CSCI 1380 Homework 5
Due Date: see the course webpage
Instructor: Xiang Lian

Assignment:
  (1) Design a modular program to solve the following problem.
  (2) Enter and successfully run the program in the Visual C++ environment

Problem (100 points):
Write a C++ program that will read in a list of numbers, find the average of all numbers, the average of only positive, the average of only negative numbers, and the largest element. Your program should contain at least four functions – one to read in the list, one to write it out, one to get the averages, and one to find the largest element.

  void ReadList(int Array[ ], int N)
      This will read in a list of N values, where N is already known

  void Avgs (int Array[], int N, int &Ave, int &aveP, int &AveN)
      Array is a one-dimensional array of integers and N is the number of elements in that array. Both of these are input parameters to the function. The function must calculate 1) the average of the N integers in Array and return the result in Ave, 2) the average of the positive numbers (> 0) and return the result in AveP, and 3) the average of the negative numbers (< 0) and return the result in AveN.

  int Large (int Array[], int N)
      Array is a one-dimensional array of signed integers and N is the number of elements in that array. The function returns the value of the largest element in the array.

  void Display(int Array[ ], int N)
      This will display the list of values (nicely formatted) together with the averages and the largest value.

Use the following test data (there are two sets):
  A) 4 -30   0   7   42 -20 18 400 -123 -6

  B) 2 17 -5   0 20 15 -16 -3 -2 14 -1 12   1 -5 -100 15 22 -5 68 -13

Store this information in a file and have your program read this data from that file.

You need to add appropriate comments to your program.

Extra Bonus Part A (10 points). This part is optional. If you can get it done, you will receive 10 extra points.

Add a function to find the largest subsequence from the input list of integers. A largest subsequence for a list of integers is a sub-list of integers with the largest possible sum among all the possible sub-lists. For examples, for the list

   4 -30   0   7   42 -20   18 400 -123   -6

The largest subsequence is
            0   7   42   -20   18 400

Here is a very simple algorithm to find the largest sub-sequence for a list of size n:
      for (int i = 0; i< n; i++)
      {
            for (int j = 0; j < n ; j++)
            {
                  use a loop to add all number from i to j and save the result to sum.
                  keep the largest sum and record the i and j values.
            }
      }
      Output the largest sum and all the numbers from i to j.

Extra Bonus Part B (20 points). This part is optional. If you can get it done, you will receive 20 extra points.

As you may be able to see, to find the largest subsequence for a list of n numbers, the algorithm given in Extra Bonus Part B is of $O(n^3)$ time complexity. If possible, find a new algorithm which is substantially faster than the previous algorithm and implement the new algorithm in your program.

Submission guidelines

-   Submit printed copies of all the programs and their execution results for given test data <u>under the door of the instructor's office (ENGR 3.275)</u>.
-   Submit electronic copies of all the programs that you wrote for this assignment via Blackboard.
-   <u>Both</u> paper and electronic copies must be submitted before or in class by the due date posted on the course webpage.
-   Note that this assignment must be completed by each student individually (no teamwork please!).