Lab Practice Week 7
To be submitted as C Exercise 2 by Week 9

Internal Students: You need to show a working version of your solutions to program 15, 16, and 17. **Your tutor will expect to see your submission on or before your lab class in week 9 as part of your C Exercise 2 assessment.**

External Students: Please email your Program 15, 16 and 17 to your tutor. Your tutor will expect to receive them by the end of week 9.

**Program 15**

Write and test a C program that prompts the user to enter the details of a number of employees. This includes name, age (in years) and height (in centimetres). Stop the process when “HAL” is entered. Compute the **average height and average age**.

Print the name and details of the employee whose age and height are closest to both averages. Use only one array. State clearly how do you consider the employee who is “closest” to the two averages?

The program should have the following functions:

- A function for accepting user input.
- A function for calculating the average height.
- A function for calculating the average age.
- A function for returning the employee’s record with the closest age and height.

**Hint:** Break the tasks into appropriate functions. Develop individual functions and test them independently. Integrate the functions when all of them work correctly. How do you determine the “distance” between two points? What will you do if weights and annual income are also included?

**Application:** This is a common problem in how to find the “best match” between two “vectors”. What happens if the values of the “variables” differ a lot (e.g. annual income could be in terms of thousands while age is normally under 100).
Program 16

Write a program in C that reads in three integers from the keyboard and then arranges the integers in ascending order. The program will have a function named inOrder that takes two integers as its parameters and arranges the integers in ascending order. Use this function to arrange the three integers read from the keyboard and display them on the screen. Note that this program does not require the use of an array.

*Hint: Consider how the parameters are passed and how to alter their orders.*

*Application:* This forms the basis of a type of "sort" algorithm. An effective sort algorithm is a fundamental function to many practical applications.

Program 17

Write and test a C program that searches through memory for the first ten occurrences of the character W. Print out the address *(in hexadecimal format)* where that occurrence is found.

*Note:* While you may develop your program in any platform or compiler, all programs are expected to be able to run in the Cygwin environment. Even you may not be able to produce the complete program in the lab session, you MUST record and show your work to your tutor, otherwise no marks will be given. You should be able to give the following information:

1. An overall design of the program (How does the program work?)
2. Algorithm of the program (How do you process the data?)
3. Code and comments (What have you developed?)
4. Results (What are the outputs from the program?)
5. Testing (How did you test it?)
6. Discussion (Does it work? If no, what will you do next? If yes, how can it be improved?)