Lab Practice Week 8
To be submitted as C Exercise 2 by Week 9

Internal Students: You need to show a working version of your solutions to program 18, 19, and Exercise. 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 18, 19 and Exercise to your tutor. Your tutor will expect to receive them by the end of week 9.

Program 18

Write a program in C that reads in two integers in the range 10 to 100 from the keyboard, performs bitwise AND, OR, and exclusive OR operations on the two integers and prints out the result. Enhance this program to perform left shift and right shift by 2 on each of the two numbers. If you perform the same logical operations (AND, OR, XOR and SHIFT) on the same numbers in floating point format, what are the results? Why are the results different when they are stored as Integers?

Program 19

Write a program in C that will store integer values in an array declared as int X[N] where N is defined as an integer constant. The program is to sort the values in the array in ascending order using the Bubble sort method. The program will consist of at least two functions – the main function and a Sort function. The values will be stored in the array in the main function and then the Sort function will be called to sort the array. The Sort function will have two parameters – the array and a count of the number of values to be sorted. The main function will output the values in the array before and after sorting.

The process can be summarised as follows:

Store N random numbers in the array. The random numbers can be generated using the C/C++ <stdlib.h> library function rand() as follows:
for (i = 0; i<N; i++)
    X[i] = rand();

The function Sort is to use a bubble sort to do sorting, with the following psuedocode as a basis:
for (i = 0; i < N-1; i++)
    for (j = i+1; j<N; j++)
    if (X[i] > X[j]) then swap X[i] and X[j]

Experiment with sorting arrays of different sizes by choosing different values for N.

**Exercise**

Determine the output of the following program segment BY HAND.

```c
int a, b, *intPtr1, *intPtr2;
a = 99;    b = -1;
intPtr1 = &a;    *intPtr1 = 25;
intPtr2 = &b;    *intPtr2 = *intPtr1 + 2;
printf("a = %d, b = %d, *intPtr1 = %d, *intPtr2 = %d\n", a, b, *intPtr1, *intPtr2);
a = a – 1;
b = b * 2;
intPtr2 = intPtr1;
printf("a = %d, b = %d, *intPtr1 = %d, *intPtr2 = %d\n", a, b, *intPtr1, *intPtr2);
```

**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?)