Lab Exercise - Week 4

Experiment 1.
Program name: multiplication_table.c

Write a program to read an integer, and display its multiplication table (Up to 16) in a nicely formatted way. For example, if the user inputs 5, the output should look like this:

```
Multiplication table of 5
==========================
  5 x  1 =     5
  5 x  2 =    10
  5 x  3 =    15
  5 x  4 =    20
  5 x  5 =    25
  5 x  6 =    30
  5 x  7 =    35
  5 x  8 =    40
  5 x  9 =    45
  5 x 10 =    50
  5 x 11 =    55
  5 x 12 =    60
  5 x 13 =    65
  5 x 14 =    70
  5 x 15 =    75
  5 x 16 =    80
==========================
```

Hint: Try "%2d" instead of "%d" to right align a column of two digit numbers.

Experiment 2.
Program name: statistics.c

Write a C program that takes a number n (the number of students), followed by a set of n scores (integers) from the user and displays the highest score.

Modify this program to output the following statistics also

- the lowest score
- the average score
- the standard deviation
- the number of failures (scores below 40).

You can use the following formula to calculate the standard deviation σ^2 of n n numbers x1,x2,…,xn.

$$\sigma^2 = \left(\frac{\sum_{i=1}^{n} {x_i}^2}{n}\right) - \left(\frac{\sum_{i=1}^{n} x_i}{n}\right)^2$$

To the find the square root of a number, you can use the sqrt() function available in math.h. See the example below.

```
#include <stdio.h>
#include <math.h>
int main()
{
float a = 16, b;
b = sqrt(a);
printf("%f", b);
return 0;
}
```

To compile this, you will need the "-lm" option to ask gcc to use the math library.

```
gcc statistics.c -o statistics.out -lm
```

Experiment 3.
Program name: multiplication_matrix.c

Write a C program to read two positive numbers and display the multiplication matrix upto a x b in a nicely formatted way. For example, if the inputs are 5 and 6, the output should look like this:

```
=========================
  1   2   3   4   5   6
  2   4   6   8  10  12
  3   6   9  12  15  18
  4   8  12  16  20  24
  5  10  15  20  25  30
=========================
```

Hint: Try a nested while loop with a "\t" in the inner printf and a "\n" in the outer printf.

```
while (condition1)
{
  while (condition 2)
  {


  }
}
```

Experiment 4.
Program name: calculator.c

Guess what the following program does.

```
#include <stdio.h>
int main()
{

  float x,y,ans;
  char op;
  while(1)
  {
   scanf("%f %c %f", &x, &op, &y);
   if(op == '+')
     {
       ans = x + y;
       printf("%g\n\n", ans);
     }
   else
   {
      printf("Syntax error.\n\n");
   }
  }
  return 0;
}
```

Modify the calculator to include the subtraction, multiplication and division operators. In the division operator check if the divisor is 0 and warn the user accordingly.

Home Work

Write a C program that takes a list of n numbers from user and gives the maximum of this set of n numbers.

Also find out the:

a) Min of the set
b) Sum of this set
c) Average of this set
d) Standard deviation

Happy learning