DEPARTMENT OF COMPUTER ENGINEERING
CMPE110: Fundamentals of Computing and Programming
EXPERIMENT 4

Introduction to C++ Programming: repetitive structure

Objectives:

1) Understand how to edit, compile and execute C++ computer codes.

2) Understand C++ programming: repetitive structure.

Note: Before writing a computer code, you should do the following steps: 1) **understand** and **analyze** the problem, 2) develop an **algorithm** or **flowchart** and 3) convert the **algorithm** or the **flowchart** into a C **code**.

Task I: Trace the following code segments and show the output:

a)
```
int i = 1;
while (i++ < 5){
    cout << i << ' ';}
```

b)
```
int i = 1;
while (++i < 5){
   cout << i << ' ';}
```

Note the difference between a and b.

c)
```
int i = 1;
while (i <= 4)
 {  cout << "  *  \n";
    cout << " *** \n";
    cout << "*****\n";
    cout << "  *  \n";
    cout << "  *  \n";
    cout << endl;
    i++;   }
```

d)
```
int i = 1;
do {
    cout << "  *  \n";
    cout << " *** \n";
    cout << "*****\n";
    cout << "  *  \n";
    cout << "  *  \n";
    cout << endl;
    i++;
} while(i <= 4);
```

Note the difference between c and d.

e)
```
int i;
for (i=0; i<5; i++)
   {cout << i;}
```

Re-write this loop using while-loop and do-while loop.

f)
```
int i;
  i=0;
  while (i<5) {
     cout << i;
     t++;}
```
if you delete i++; what will happen? What kind of loop you will have?

g) How can you make the for-loop to be infinite? Refer to part f

h)
```
for(int i=1; i<8; i++)
 { if (i==4) break;
    cout << i << " ";}
```
Can you re-write this code-segment without break statement?

i)
```
for(int i=1; i<8; i++)
  {    if (i==4) continue;
    cout << i << " ";  }
```
Can you re-write this code-segment without continue statement?

Task II: Programming tasks

1) Consider the following code that finds the sum of all integers between 1 and the number N:

```
#include<iostream>
#include<cmath>
using namespace std;
int main(){
int N,i, sum=0;
cout << "Enter an integer number: ";
cin>> N;
for(i=1;i<=N;++i)
     sum=sum+i;
cout<< "The sum="<< sum << endl;
system("pause");
return 0;}
```

a) Edit, compile and execute this code. Use the following input values for N: **10**.

b) Modify the given code to read the value of N and find and prints the sum of the even numbers only. **Note:** a number i said to be even if it can be divided by 2 without a remainder, i.e., i%2=0

A sample run of the program must be as follows:

*** Program to claculate find the sum of even numbers between 1 and a numbers N ***
Enter an integer number N: **10**
The sum of even numbers is 30.

c) How can you modify part b to find the average of the even numbers only?

2) Write a program to calculate the sum of: $1^2 + 2^2 + 3^2 + \ldots + N^2$.

A sample run of the program must be as follows:

```
Enter an integer number N: 5
The sum is 55.
```

3) Write a C program that will read the birth year of 4 students and finds 1) the average age; 2)the maximum age and 3) the minimum age.

Note: Age=Current Year – Birth Year

Exercise:

4) The GPA of a student taking 5 courses is calculated as

$$GPA=\frac{\sum_{i=1}^{5} p_i * cr_i}{\sum_{i=1}^{5} cr_i}$$

where cr_i and p_i are, respectively, the credit and the points of the i^{th} course. The points indicate how well a student has done in a particular course and vary depending on the letter grade received from that course. More formally, the points are calculated according to the following table:

Letter grade	Points
A	4
B	3
C	2
D	1
F	0

You are asked to write one C code to calculate the GPA of 30 students in the class. Assume that all students are taking 5 courses and the letter grade is calculated according the student's course average as

```
80≤average≤100 letter grade=A
70≤average<80       letter grade=B
60≤average<70       letter grade=C
50≤average<60       letter grade=D
Otherwise           letter grade=F
```

where the average is computed as:
average=0.5*final+0.4*midterm+0.1*lab.
You are asked to write one C code to do the following:

1) For each student calculate the GPA.
2) Find the highest GPA, and the lowest GPA.

Note: The lab, the midterm and the final grades for each student course can be entered as inputs from the keyboard.