

DEPARTMENT OF COMPUTER ENGINEERING
CMPE112: Programming Fundamentals
EXPERIMENT 3

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** and/or **flowchart** and 3) convert the **algorithm** and/or the **flowchart** into a C **code**.

Part I: Trace Section

Trace the following code segments and show the output:

a) `int i = 1;`
`while (i++ < 5){`
`printf("%d ", i);}`
b) `int i = 1;`
`while (++i < 5){`
`printf("%d ", i);}`

Note the difference between a) and b).

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

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

Note the difference between c) and d).

e) `int i;`
`for (i=0; i<5; i++)`
`{ printf("%d ", i);}`

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

f) `int i;`
`i=0;`
`while (i<5) {`

```
printf("%d ", 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;
  printf("%d ", i);}
```

Can you re-write this code-segment without break statement?

```
i) for(int i=1; i<8; i++)
{   if (i==4) continue;
    printf("%d ", i); }
```

Can you re-write this code-segment without continue statement?

Task II: Programming

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

```
#include<stdio.h>
#include<math.h>
int main(){
int N,i, sum=0;
printf("Enter an integer number: ");
scanf("%d",&N);
for(i=1;i<=N;++i)
    sum=sum+i;
printf("The sum=%d\n", sum);
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 calculate 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: $1^2 + 2^2 + 3^2 + \dots + N^2$.

3) Write a C program that will read the birth year of 10 students and finds 1) the average age; 2) the maximum age and 3) the minimum age.

Note: Age=Current Year - Birth Year

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

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

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.