

LAB 09

Summary

Items	Description
Course Title	Programming Fundamentals
Lab Title	Operators in C++
Duration	3 Hours
Operating System/Tool/Language	Ubuntu/ g++/ C++
Objective	To get familiar with use of while and for loop

Repetitions-I (while loop, for loop)

In computer programming, loops are used to repeat a block of code.

A loop is used for executing a block of statements repeatedly until a particular condition is satisfied. For example, when you are displaying number from 1 to 100 you may want set the value of a variable to 1 and display it 100 times, increasing its value by 1 on each loop iteration instead of writing the print statement 100 times.

There are 3 types of loops in C++.

1. for loop
2. while loop
3. do...while loop

While loop:

In while loop, condition is evaluated first and if it returns true then the statements inside while loop execute, this happens repeatedly until the condition returns false. When condition returns false, the control comes out of loop and jumps to the next statement in the program after while loop.



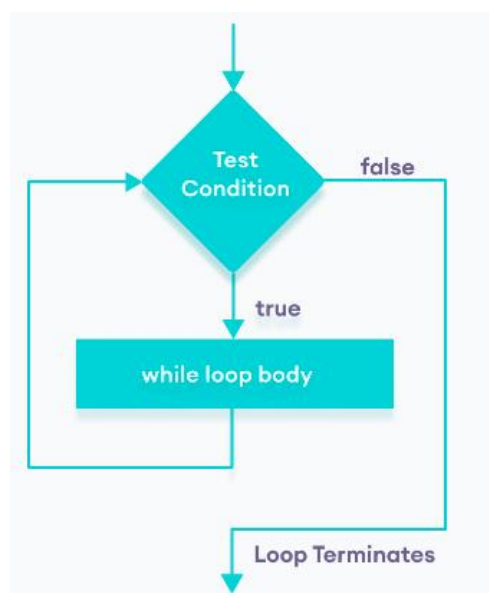
The syntax of the `while` loop is:

```
while (condition) {  
    // body of the loop  
}
```

Here,

- A `while` loop evaluates the `condition`
- If the `condition` evaluates to `true`, the code inside the `while` loop is executed.
- The `condition` is evaluated again.
- This process continues until the `condition` is `false`.
- When the `condition` evaluates to `false`, the loop terminates.

Flowchart of while loop:



Example 1.1:

Display numbers from 1 to 5.



```
// C++ Program to print numbers from 1 to 5

#include <iostream>

using namespace std;

int main() {
    int i = 1;

    // while loop from 1 to 5
    while (i <= 5) {
        cout << i << " ";
        ++i;
    }

    return 0;
}
```

Output:

1 2 3 4 5

Working of program:

Iteration	Variable	$i \leq 5$	Action
	<code>i = 1</code>	not checked	<code>1</code> is printed and <code>i</code> is increased to 2
1st	<code>i = 2</code>	true	<code>2</code> is printed and <code>i</code> is increased to 3
2nd	<code>i = 3</code>	true	<code>3</code> is printed and <code>i</code> is increased to 4
3rd	<code>i = 4</code>	true	<code>4</code> is printed and <code>i</code> is increased to 5
4th	<code>i = 5</code>	true	<code>5</code> is printed and <code>i</code> is increased to 6
5th	<code>i = 6</code>	false	The loop is terminated

Infinite while loop:



A while loop that never stops is said to be the infinite while loop, when we give the condition in such a way so that it never returns false, then the loops becomes infinite and repeats itself indefinitely.

```
// infinite while loop
while(true) {
    // body of the loop
}
```

Example 1.2:

```
#include <iostream>
using namespace std;

int main()
{
    int a=1;
    while (a<0)
    {
        cout << "The value of variable is " << a;
        a = a + 1;
    }
    return 0;
}
```

For Loop:

A for loop is a repetition control structure that allows you to efficiently write a loop that needs to execute a specific number of times.



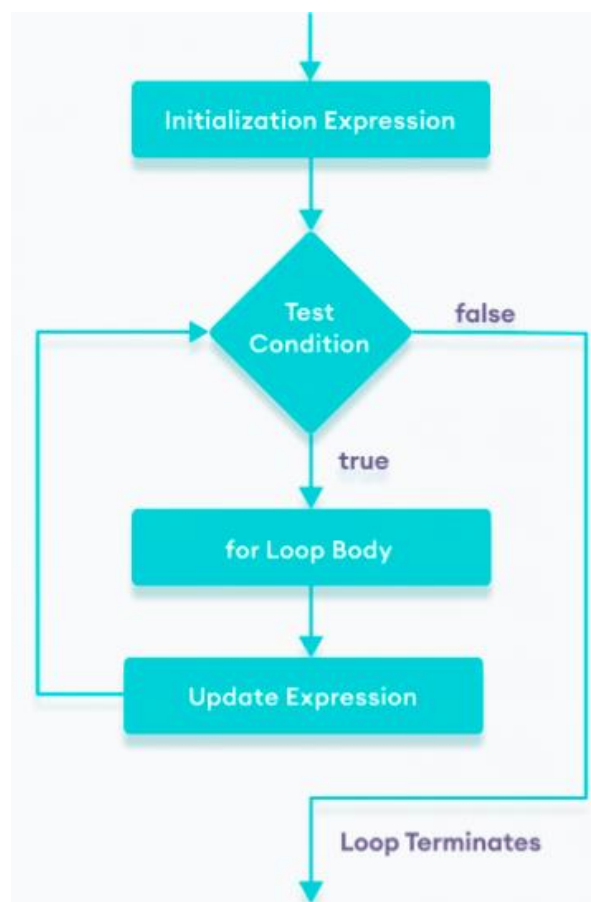
The syntax of for-loop is:

```
for (initialization; condition; update) {  
    // body of-loop  
}
```

Here,

- `initialization` - initializes variables and is executed only once
- `condition` - if `true`, the body of `for` loop is executed
if `false`, the for loop is terminated
- `update` - updates the value of initialized variables and again checks the condition

Flowchart of For loop:





Example 2.1:

Display numbers from 1 to 5

```
#include <iostream>

using namespace std;

int main() {
    for (int i = 1; i <= 5; ++i) {
        cout << i << " ";
    }
    return 0;
}
```

Output

```
1 2 3 4 5
```

Example 2.2:

Display "Hello world" 5 times.

```
// C++ Program to display a text 5 times

#include <iostream>

using namespace std;

int main() {
    for (int i = 1; i <= 5; ++i) {
        cout << "Hello World! " << endl;
    }
    return 0;
}
```

Output

```
Hello World!
Hello World!
Hello World!
Hello World!
Hello World!
```



Example 2.3:

Find the sum of first n Natural Numbers.

```
// C++ program to find the sum of first n natural numbers
// positive integers such as 1,2,3,...n are known as natural numbers

#include <iostream>

using namespace std;

int main() {
    int num, sum;
    sum = 0;

    cout << "Enter a positive integer: ";
    cin >> num;

    for (int i = 1; i <= num; ++i) {
        sum += i;
    }

    cout << "Sum = " << sum << endl;

    return 0;
}
```

Output

```
Enter a positive integer: 10
Sum = 55
```

Lab Tasks

Task#01

Write a C++ program to print the following:

The Prophet (Sallallahu Alayhi Wa Sallam) said:

"Lying is wrong, except in three things: the lie of a man to his wife to make her content with him; a lie in war, for war is deception; or a lie to settle trouble between people."

[Ahmad, 6.459. H].

Tsk#02

Use while loop:

Write a program to find the sum of positive numbers. Take positive numbers from user as an input.

If the user enters a negative number, the loop ends and that negative number entered should not be added to the sum. Finally the program should display the total sum.

For example user entered 12,5,3,-2 then the program should return 20.

Task#03

Use while Loop:

In this problem, you would ask the user to enter some integers. User can enter as many numbers as he wants to. When the user wants to stop entering the numbers, he would press 0. When the user presses 0, you would display the maximum number and minimum number entered by the User.

For example user entered 6,18,319,74,0 then the program should display:

Minimum number = 6

Maximum number = 319

Task#04

Use for loop:

Write a C++ program using the for loop to find the sum of the even integers 2,4,6,8,...,500.

Display the resulting sum and average.

Output:

```
Print sum of even numbers till : 500
Sum of even numbers from 1 to 500 is : 62750
Averag of even numbers from 1 to 500 is : 251
```




Task#05

In mathematics, the factorial of a positive integer n , denoted by $n!$, is the product of all positive integers less than or equal to n . For Example

$$5! = 5 * 4 * 3 * 2 * 1$$

Write a program using FOR loop that can compute factorial of an integer entered by user. If the number is less than zero display "invalid Input" else display the resulted factorial.

Note : $0! = 1$

Output:

```
hp@hp-HP-15-Notebook-PC:~/Desktop/FAST Job/PF/Lab7 G1$ ./p
Enter a positive integer: 5
Factorial of 5 = 120
hp@hp-HP-15-Notebook-PC:~/Desktop/FAST Job/PF/Lab7 G1$ ./p
Enter a positive integer: 0
Factorial of 0 = 1
hp@hp-HP-15-Notebook-PC:~/Desktop/FAST Job/PF/Lab7 G1$ ./p
Enter a positive integer: -9
Error! Factorial of a negative number doesn't exist.
```

Task#06

Use any loop of your own choice:

Problem 05

Create a C++ program which takes an integer number as input and pass it thorough parameter to the function named **checkPrimeNumber**. This function **checkPrimeNumber** should display whether the number is prime or not. This process should continue until the user enter negative number.

Ouput:

```
Enter the number: 5
The number you entered is prime.
Enter the number: 12
The number you entered is not prime.
Enter the number: -9
```

Practice Question:

Run all sample programs

Submission Instructions:

1. Save all .cpp files with your roll no and task number
e.g. i21XXXX_Task01.cpp
2. Save all screenshots of terminal with your roll no and task number
3. Now create a new folder with name ROLLNO_LAB03 e.g. i21XXXX_LAB03
4. Move all your .cpp files to this newly created directory and compress it into .zip file.
5. Now you must submit this zipped file on Google Classroom.

OR

You can make a single file where you will be pasting all your solutions with screenshots.