CC-301 Programming Fundamentals

Lecture 8

Engr. Waseem Ullah Khan

While Loop

While loop is a repetition control structure which is used in situations where we do not know the exact number of iterations of loop beforehand

The loop execution is terminated on the basic of the test condition

Syntax

```
while (condition)
{
    // body of the loop
    // statements we want to execute
}
```
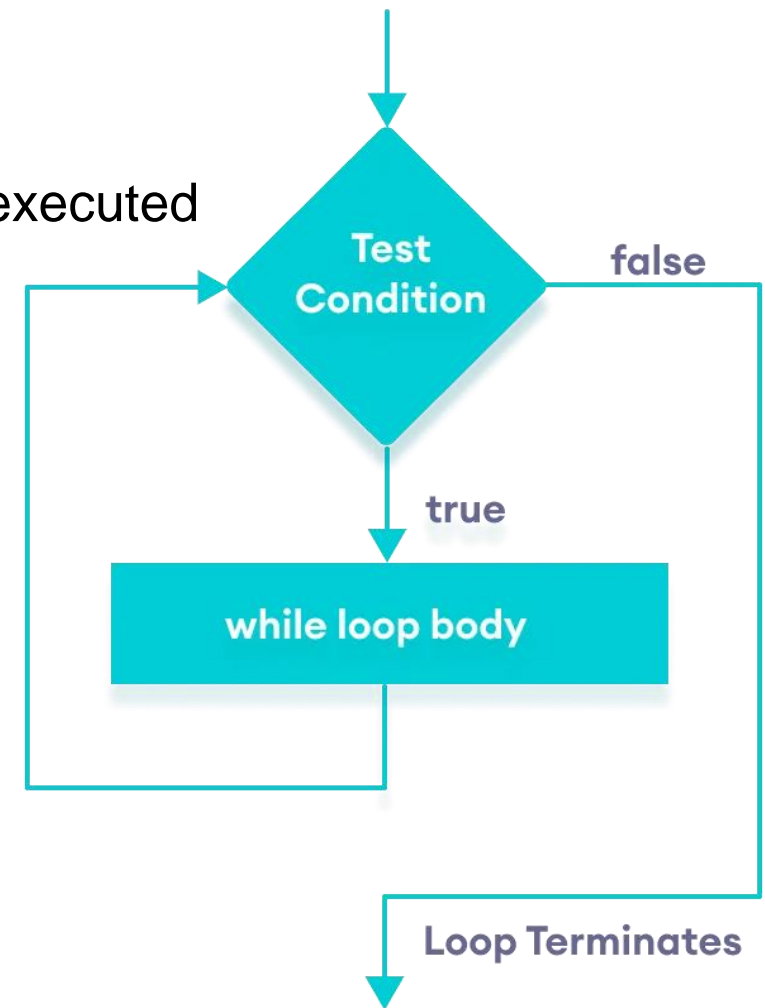
Working of While Loop

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

Example 1

```cpp
// Printing Numbers From 1 to 5

#include <iostream>
using namespace std;

int main()
{
    int i = 1;

    while (i <= 5)
    {
        cout << i << " ";
        ++i;
    }

    return 0;
}
```

E:\ICSIT_AUP\1st Semester\Code\Lecture 09\example_1.exe

```
1 2 3 4 5
```

How this program works

Iteration	Variable	i <= 5	Action
1st	i = 1	true	1 is printed. i is increased to 2
2nd	i = 2	true	2 is printed. i is increased to 3
3rd	i = 3	true	3 is printed. i is increased to 4
4th	i = 4	true	4 is printed. i is increased to 5
5th	i = 5	true	5 is printed. i is increased to 6
6th	i = 6	false	The loop is terminated

Example 2

Write a C++ program to find the sum of positive numbers using While Loop

```cpp
example_2.cpp
1   #include <iostream>
2   using namespace std;
3
4   int main() {
5
6       int number;
7       int sum = 0;
8       cout << "Enter a number: ";
9       cin >> number;
10
11      while (number >= 0)
12      {
13          sum += number;
14          cout << "Enter a number: ";
15          cin >> number;
16      }
17      cout << "\nThe sum is " << sum << endl;
18      return 0;
19  }
```

```
E:\ICSIT_AUP\1st Semester\Code\Lecture 09\example_2.exe
Enter a number: 4
Enter a number: 2
Enter a number: 6
Enter a number: 10
Enter a number: -1

The sum is 22
```

Nested While Loop

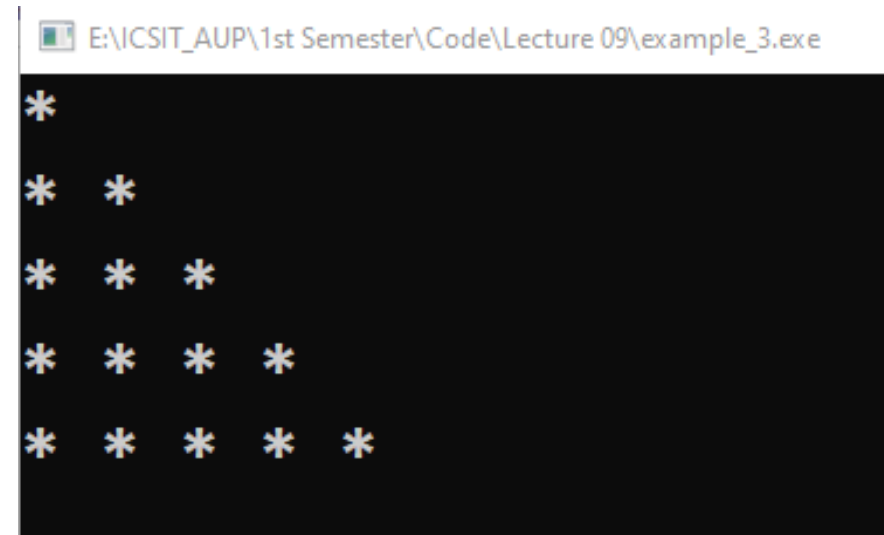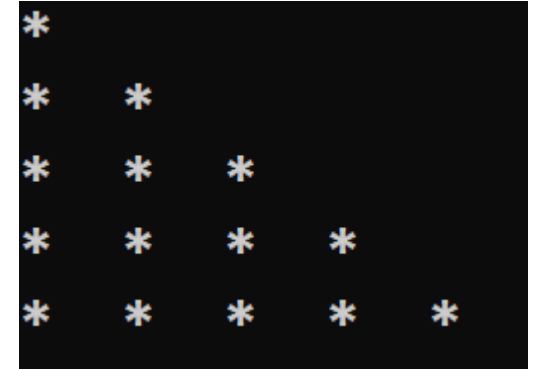A while loop within another while loop is called Nested while loop

Syntax

```
// outer loop
while (condition)
{
    // inner loop
    while (condition)
    {
        // body of inner while-loop
    }

    // body of outer while-loop
}
```

Example

Write a C++ program to display the output as shown below by using nested while loop

```cpp
example_3.cpp

1  #include <iostream>
2  using namespace std;
3
4  int main()
5  {
6      int rows = 5, i = 1;
7
8      while (i <= rows)
9      {
10         int j = 1;
11         while(j <= i)
12         {
13             cout << "* ";
14             j++;
15         }
16         cout << "\n";
17         i++;
18     }
19     return 0;
20 }
```

```
*
*   *
*   *   *
*   *   *   *
*   *   *   *   *
```

E:\ICSIT_AUP\1st Semester\Code\Lecture 09\example_3.exe

```
*
*   *
*   *   *
*   *   *   *
*   *   *   *   *
```

Do While Loop

The do...while loop is a variant of the while loop with one important difference:

> ➢ body of do while loop is executed once before the condition is checked

The loop execution is terminated on the basic of the test condition

Syntax

```
do
{
    // body of loop;
    // statements we want to execute
}
while (condition);
```
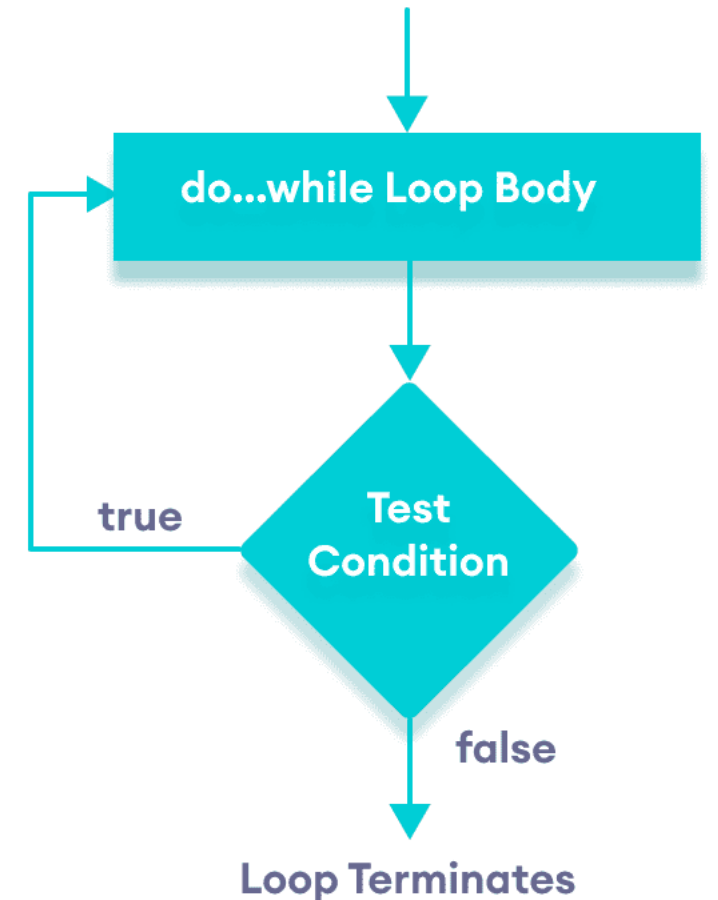
Working of Do While Loop

The body of the loop is executed at first. Then the condition is evaluated

If the condition evaluates to true, the body of the loop inside the do statement is executed again

The condition is evaluated once again

If the condition evaluates to true, the body of the loop inside the do statement is executed again

This process continues until the condition evaluates to false. Then the loop terminates
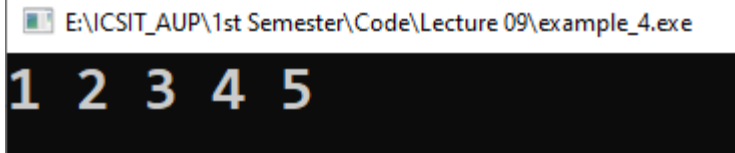
Example

```cpp
// C++ program to print numbers from 1 to 5
#include <iostream>
using namespace std;

int main()
{
    int i = 1;

    do
    {
        cout <<i <<" ";
        i++;
    }
    while (i <= 5);

    return 0;
}
```

example_4.cpp

E:\ICSIT_AUP\1st Semester\Code\Lecture 09\example_4.exe

```
1 2 3 4 5
```

How this program works

Iteration	Variable	i <= 5	Action
	i = 1	Not checked	1 is printed. i is increased to 2
1st	i = 2	true	2 is printed. i is increased to 3
2nd	i = 3	true	3 is printed. i is increased to 4
3rd	i = 4	true	4 is printed. i is increased to 5
4th	i = 5	true	5 is printed. i is increased to 6
5th	i = 6	false	The loop is terminated

Nested Do While Loop

A do while loop within another do while loop is called Nested do while loop

Syntax

```
//outer loop
do
{
    //inner loop
    do
    {
        // body of inner do-while-loop
    }
    while (condition);

    // body of outer do-while-loop
}
while (condition);
```

Home Tasks

Write a C++ program to find the sum of positive numbers using Do While Loop

Write a C++ program to display the output as shown below by using nested do while loop