Loops in C++
Counter Loops
&
Conditional Loops

Revision: Say Welcome to UET

Let's say we want to write Welcome to UET on the Console.

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

main(){

 cout<<"Welcome to UET!!";

}
```

Say Welcome to UET 5 times

Let's say we want to write Welcome to UET on the Console 5 times.

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

main(){

 cout<<"Welcome to UET!!";

}
```

Code Repetition

What if we want to write Welcome to UET on the Console 100 times or 1000 times ???

```
#include<iostream>
using namespace std;
main(){
 cout<<"Welcome to UET!!" << endl;
 cout<<"Welcome to UET!!" << endl;
 cout<<"Welcome to UET!!" << endl;
 cout<<"Welcome to UET!!" << endl;
 cout<<"Welcome to UET!!" << endl;
}
```

Code Repetition: Problem

Is there a way, we don't have to repeat the same instructions again and again?

Code Repetition: Solution

In High level languages, Loops are used to repeat the same command without writing it multiple times.

Loops

There are 2 types of Loops.

1. Counter Loops
2. Conditional Loops

Counter Loop

In Counter Loop, the program knows beforehand about how many times a specific instruction or set of instructions will be executed.

Keyword | Initial Statement | Loop Condition | Update statement

```
for (int x = 0; x < 5; x = x + 1)
{
        //body
}
```

Body of Loop

Counter Loop: Working Example

Let's see how to write Welcome to UET on the Console 5 times using for loop.

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

main(){

 for(int x = 0; x < 5; x = x + 1)
 {
    cout << "Welcome to UET!!" << endl;
 }
}
```

Counter Loop: Working Example

Output on the Console is as follows.

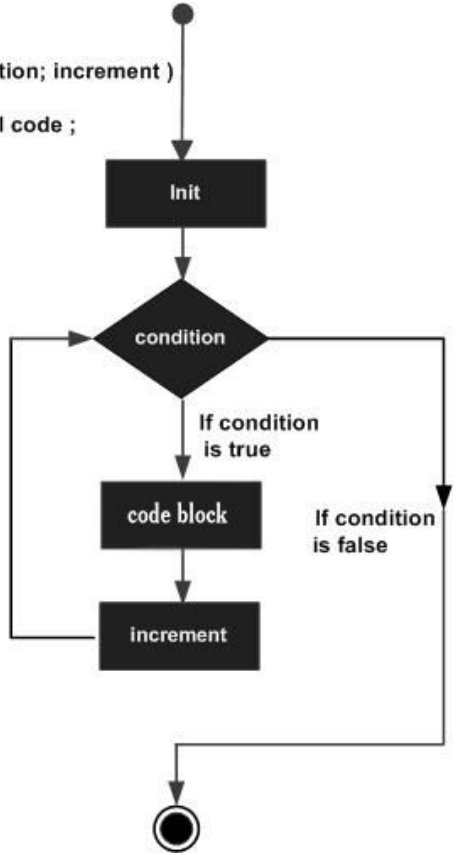
```
C:\C++>c++ example.cpp -o example.exe

C:\C++>example.exe
Welcome to UET!!
Welcome to UET!!
Welcome to UET!!
Welcome to UET!!
Welcome to UET!!

C:\C++>
```

Counter Loop: Flow of for Loop

```
for( init; condition; increment )
{
    conditional code ;
}
```



Counter Loop: Working Example

Now, Let's say we have to write Welcome to UET on the Console 20 times using for loop.

In this Code Snippet, how many places the changes will have to be done?

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

main(){

 for(int x = 0; x < 5; x = x + 1)
 {
    cout << "Welcome to UET!!" << endl;
 }
}
```

Counter Loop: Working Example

In this Code Snippet, how many places the changes will have to be done?

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

main(){

 for(int x = 0; x < 5; x = x + 1)
 {
    cout << "Welcome to UET!!" << endl;
 }
}
```

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

main(){

 for(int x = 0; x < 20; x = x + 1)
 {
    cout << "Welcome to UET!!" << endl;
 }
}
```

Counter Loop: Working Example

This code Snippet, will print Welcome to UET!! on the console 20 times.

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

main(){

 for(int x = 0; x < 20; x = x + 1)
 {
    cout << "Welcome to UET!!" << endl;
 }
}
```

```
C:\C++>c++ example.cpp -o example.exe

C:\C++>example.exe
Welcome to UET!!
Welcome to UET!!
Welcome to UET!!
Welcome to UET!!
Welcome to UET!!
Welcome to UET!!
Welcome to UET!!
Welcome to UET!!
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Welcome to UET!!
Welcome to UET!!
Welcome to UET!!
Welcome to UET!!
Welcome to UET!!
Welcome to UET!!
Welcome to UET!!

C:\C++>
```

Conditional Loops

Now, What if we don't know beforehand how many times a set of instructions will be executed?

Loops

There are 2 types of Loops.

1. Counter Loops
2. Conditional Loops

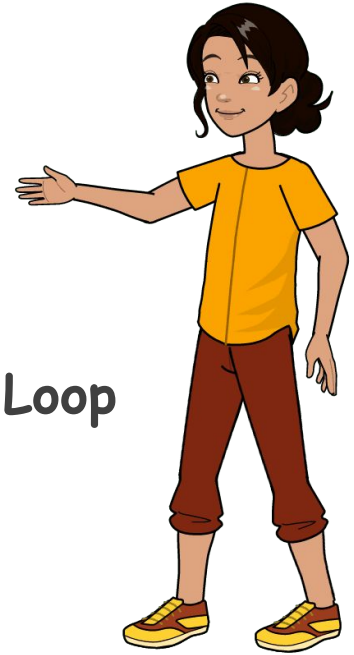
Conditional Loops

Then we will use Conditional Loops. I.e., we will execute the loop until a certain condition is met.

Keyword Loop Condition

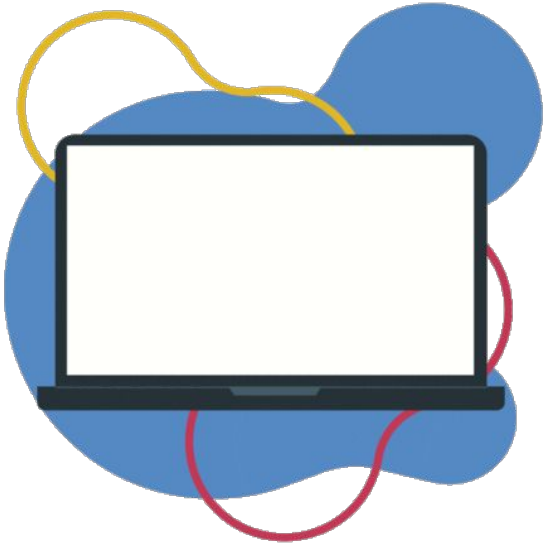
```
while (condition)
{
    //body
}
```

Body of Loop



Conditional Loop: Working Example

Suppose, the requirement is to keep taking numbers as input from the user until the user enters -1.



Conditional Loop: Working Example

Suppose, the requirement is to keep taking numbers as input from the user until the user enters -1.

```
#include<iostream>
using namespace std;
main(){
 int number = 0;
 while (number != -1)
 {
     cout << "Please Enter any Number or -1 to Exit: ";
     cin >> number;
 }
    cout << "Program Ends";
}
```

Conditional Loop: Working Example

Output on the Console is as follows.

```
C:\C++ Programming\Level 1>c++ program.cpp -o program.exe

C:\C++ Programming\Level 1>program.exe
Please Enter any Number or -1 to Exit: 4
Please Enter any Number or -1 to Exit: 3
Please Enter any Number or -1 to Exit: 8
Please Enter any Number or -1 to Exit: -1
Program Ends

C:\C++ Programming\Level 1>
```

Learning Objective

In this lecture, we learnt how to write a C++ Program that repeats a Set of Instructions for a specific number of times to solve the given problem using Counter Loop.

Learning Objective

In this lecture, we learnt how to write a C++ Program that repeats a Set of Instructions for an unknown number of times to solve the given problem using Conditional Loop.

Conclusion

- Loops are of 2 types
  1. Counter Loops.
  2. Conditional Loops
- In Counter Loop, the program knows beforehand about how many times a specific instruction or set of instructions will be executed.
- In C++ programming language, for loop is used as a counter loop.

Conclusion

- Conditional loops help to repeat a set of instructions until some condition is true.
- There are two common places for it use.
  1. Reading an unknown amount of input from the user
  2. Validating input.
- C++ provides a while loop that is used as a conditional loop.

Self Assessment

1. What is the output?

```
for( int i = 1; i < 10; i = i + 3 )
{
    cout << i << " ";
}
```

2. What is the output of the following code fragment?

```
for ( int j = 10;  j >  5; j-- )
{
cout << j << " ";
}
```

Self Assessment

3. Write a C++ Program that asks the user to enter 5 numbers, one at a time, and add them together. This is called a Running Total. Once the user is done, display the total sum on the Console.

Self Assessment

4. What is the output?

```
int number = 6;
while (number > 0)
{
    cout << number << " ";
    number -= 3;
}
```

5. What is the output of the following code fragment?

```
int number = 4;
while (number >= 0){
    number = number -1;
    cout << number << endl;
    }
```

Self Assessment

6. Write a program to keep asking for a number until the user enters a negative number. At the end, print the sum of all entered numbers.

7. Write a program to ask for a name until the user enters “END”. Print the hello with the name each time when the user enters. At the end of the program, print "END" when the user enters END.