Lecture 7

Repetition Structures

Repetition structures, or loops, are used when a program needs to repeatedly process one or more instructions until some condition is met, at which time the loop ends. There are three looping structures in C++:

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

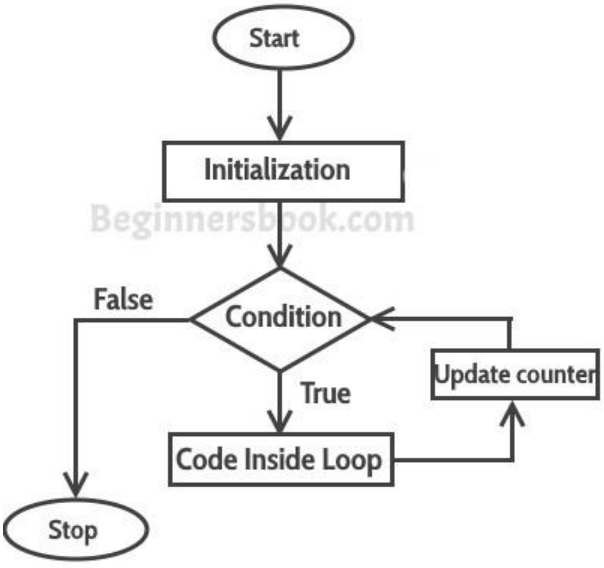
For loop

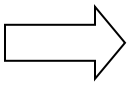
A loop is used for executing a block of statements repeatedly until a particular condition is satisfied. For example, when you are displaying number from 1 to 100 you may want set the value of a variable to 1 and display it 100 times, increasing its value by 1 on each loop iteration. In C++ we have three types of basic loops: for, while and do-while.

a) for loop

```
for(initialization; condition ; increment/decrement)
{
   C++ statement(s);
}
```

Flow of Execution of the for Loop





```
#include <iostream>
using namespace std;
int main(){
   for(int i=1; i<=6; i++){
      /* This statement would be executed
       * repeatedly until the condition
       * i<=6 returns false.
       */
      cout<<"Value of variable i is: "<<i<<endl;
   }
   return 0;
}
```

Output:

```
Value of variable i is: 1
Value of variable i is: 2
Value of variable i is: 3
Value of variable i is: 4
Value of variable i is: 5
Value of variable i is: 6
```

How to use counters:

A) Vary the control variable from 1 to 100 increment of 1.
   for(int i=1; i<=100; i++)

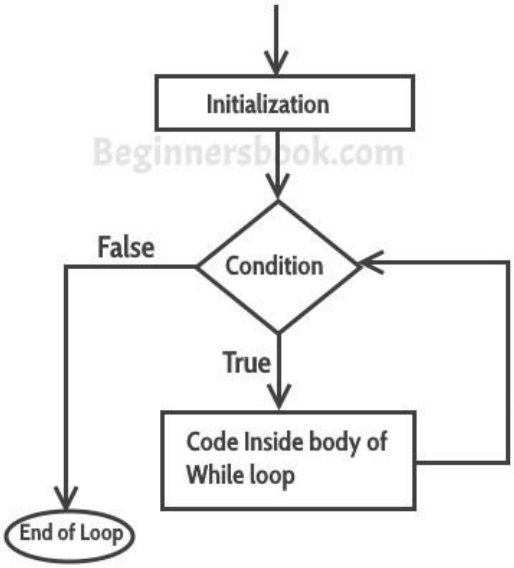
B) Vary the control variable from 100 to 1 decrement of 1.
   for(int i=100; i>=1; i--)

C) Vary the control variable over the following sequence of values:
   2,5,8,11,14,17,20
   for(int j=2; j<=20; j+=3)

b) while loop

```
while(condition)
{
   statement(s);
}
```

Flow of Execution of while loop




```
#include <iostream>
using namespace std;
int main(){
int i=1;
/* The loop would continue to print
 * the value of i until the given condition
 * i<=6 returns false.
 */
while(i<=6){
   cout<<"Value of variable i is: "<<i<<endl; i++;
}
}
```

Output:

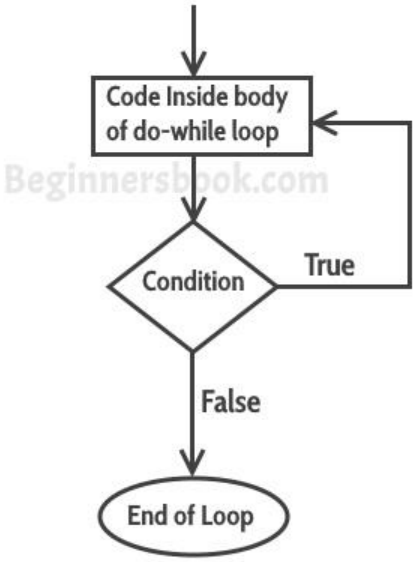
```
Value of variable i is: 1
Value of variable i is: 2
Value of variable i is: 3
Value of variable i is: 4
Value of variable i is: 5
Value of variable i is: 6
```

c) do-while loop

A loop is used for repeating a block of statements until the given loop condition returns false. Do-while loop is similar to while loop, however there is a difference between them: In while loop, condition is evaluated first and then the statements

inside loop body gets executed, on the other hand in do-while loop, statements inside do-while gets executed first and then the condition is evaluated.

```
do
{
   Statement/s;
} while(condition);
```




```
#include <iostream>
using namespace std;
int main(){
   int num=1;
   do{
      cout<<"Value of num: "<<num<<endl;
      num++;
   }while(num<=6);
   return 0;
}
```

Output:

```
Value of num: 1
Value of num: 2
Value of num: 3
Value of num: 4
Value of num: 5
Value of num: 6
```

Hint: Difference between X++ and ++X :