

Chapter # 3

Loops & Decisions



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Objectives



- Relational operators.
- *For*, *While* and *Do while* Loops.
- Input/output with *cin* and *cout*.
- *If* and *If...else* statements.
- The *Switch* statement.
- The conditional operator.
- Logical operators.

Relational Operators



Operator	Meaning
>	Greater than
<	Less than
==	Equal to
!=	Not equal to
>=	Greater than or equal to
<=	Less than or equal to

Relational Operators (Contd...)



```
int a=12;    //assignment statement
int b=34;    //assignment statement
(b>34)      //false or 0
(b<=34)     //true or 1
(a==12)     //true or 1
(b!=35)     //true or 1
(a<14)      //true or 1
(a<=10)     //false or 0
```

Loops



- Three kinds of loops
 - For
 - While
 - Do-while

For Loop



Syntax

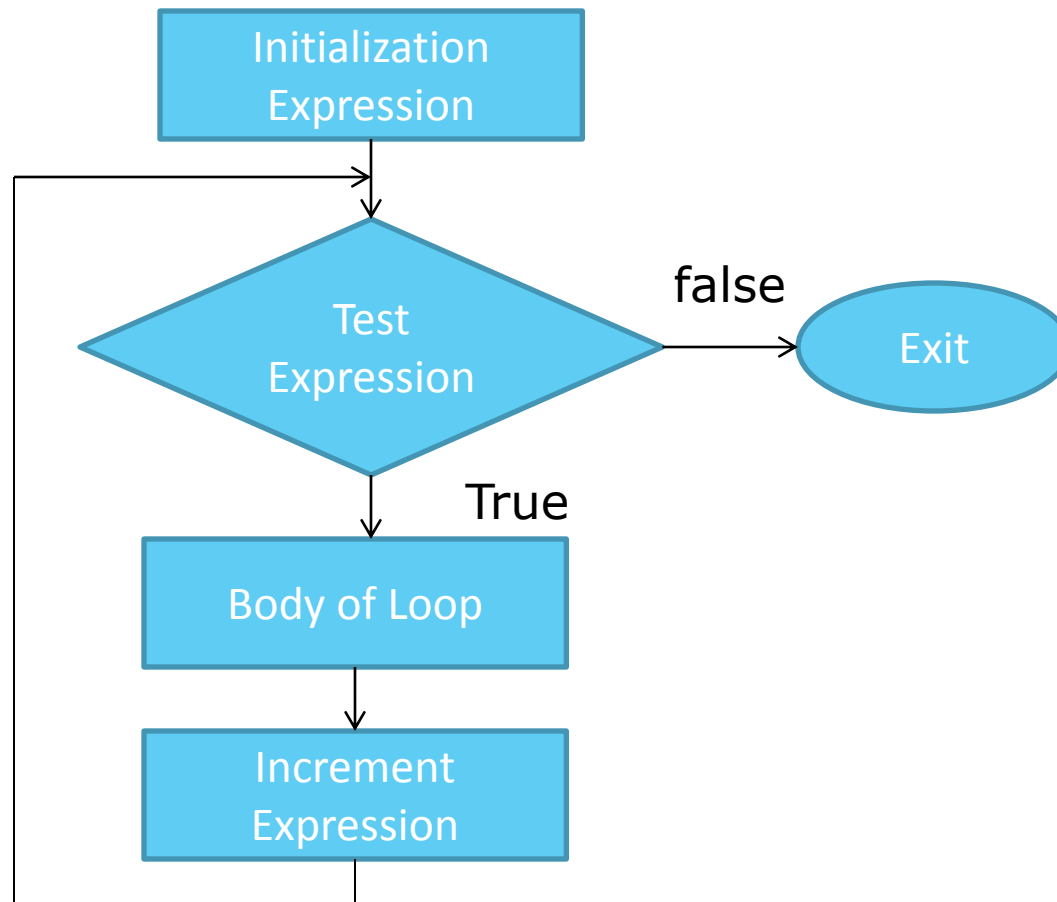
- **Single Statement Loop**

```
for(variable initialization, condition, variable update)  
statement; //executed if condition true
```

- **Multi Statement Loop**

```
for(variable initialization, condition, variable update)  
{  
    //executed if condition true  
statement1;  
statement2;  
}
```

For Loop Flow Chart



For Loop Example



```
//single statement loop
#include<iostream>
using namespace std;
int main()
{
int i;
for(i=0;i<10;i++)
cout<<i<<endl;
return 0;
}
```


For Loop Example



```
//multi statement loop
#include<iostream>
using namespace std;
int main()
{
int i;
for(i=0;i<10;i++)
{
//loop body starts
cout<<setw(4)<<I;
int j=i*i*i;
cout<<setw(6)<<j<<endl;
}
//loop body ends
return 0;
}
```

Block & Variable Visibility



```
//multi statement loop
#include<iostream>
using namespace std;
int main()
{
int i;
for(i=0;i<10;i++)
{
//loop body starts
cout<<setw(4)<<l;
int j=i*i*i;
cout<<setw(6)<<j<<endl;
}
//loop body ends
cout<<j; //ERROR
return 0;
}
```

For Loop Variations



```
//increment expression variations
#include<iostream>
using namespace std;
int main()
{
int i;
for(i=10;i>0;i--)
{
//loop body starts
cout<<setw(6)<<i;
cout<<endl;
}
//loop body ends
return 0;
}
```

For Loop Variations



```
//variables defined in for statement
#include<iostream>
using namespace std;
int main()
{
for(int i=0;i<10;i++)
{           //loop body starts
cout<<setw(6)<<i;
cout<<endl;
}           //loop body ends
return 0;
}
```

For Loop Variations



```
//multiple initialization and increment expressions
#include<iostream>
using namespace std;
int main()
{
int i;
for(i=0,alpha=100;i<10;i++,beta--)
{
           //loop body starts
.....
cout<<setw(6)<<i;
cout<<endl;
}
           //loop body ends
return 0;
}
```

TASK



What happens if you use for loop in the following manner

- `for(;;)`
- `for(;;);`

(Submit your answers in the next class)

While Loop



Syntax

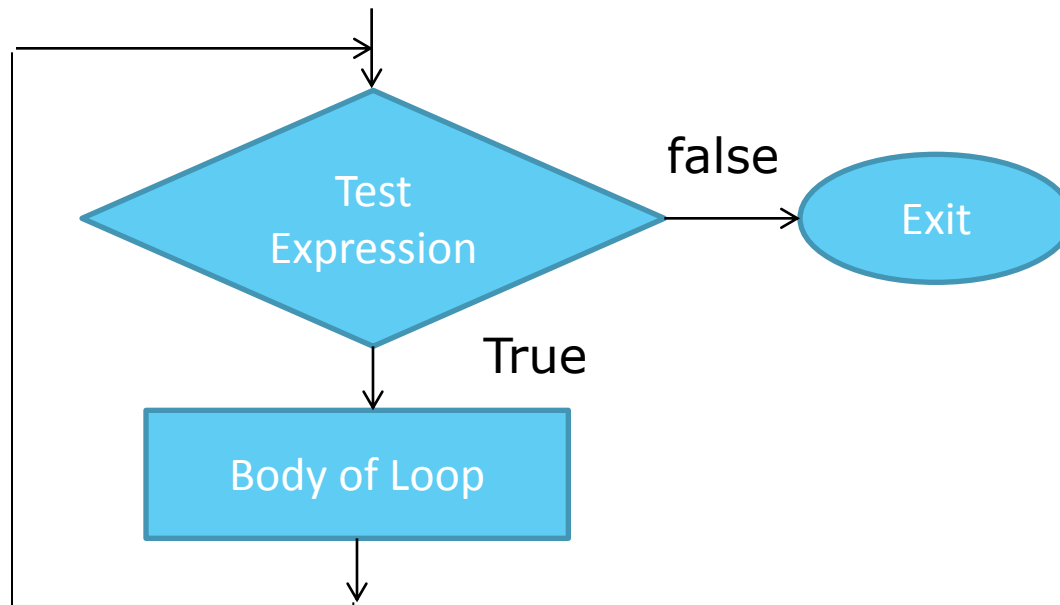
- **Single Statement while Loop**

```
while(test expression)  
statement;
```

- **Multi Statement while Loop**

```
while(test expression)  
{  
Body of loop  
}
```

While Loop Flow Chart



While Loop Example



```
#include<iostream>
using namespace std;
int main()
{
int i=0;
While(i<10)
{
cout<<i<<endl;
i++;
}
return 0;
}
```

Do While Loop



Syntax

do

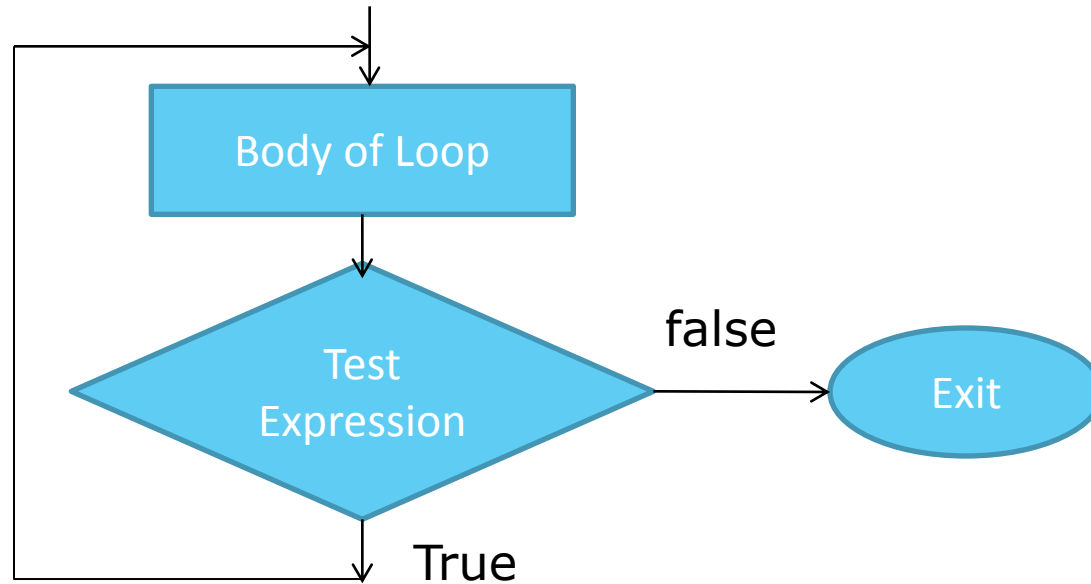
{

Body of loop

}

while(test expression);

Do While Loop Flow Chart



Do While Loop Example



```
#include<iostream>
using namespace std;
int main()
{
int i=0;
do
{
cout<<i<<endl;
i++;
} While(i<10);
return 0;
}
```

Nested Loops



- Loops inside another loop
- Example

```
for(int i=0;i<3;i++)  
{  
  for(int j=0;j<3;j++)  
  {  
    cout<<"Loop2";  
  }  
  cout<<"\nLoop1 ";  
}
```

Diagram illustrating the execution flow of the nested loops:

- The **Outer** loop (for `i`) is represented by a large rectangle.
- The **Inner** loop (for `j`) is represented by a smaller rectangle nested inside the outer loop.
- Arrows indicate the flow of execution: the inner loop completes its iterations for each iteration of the outer loop before moving to the next iteration of the outer loop.

Nested Loops Example



- Program to print the following pattern

*

* *

* * *

* * * *

Contd...



```
#include<iostream>
using namespace std;
int main()
{
int num=1;
for(int i=0;i<4;i++)
{
for(int j=0;j<num;j++)
{
cout<<"*";
}
num++;
cout<<endl;
}
return 0;
}
```

??????

