# Loops

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# Why Loops?

- Loops cause a section of your program to be repeated a certain number of times.

- Repeats until the condition remains true.

- Terminates when the condition becomes false.

# Loops in C++

- For loop
- While loop
- Do-While loop

# Syntax of for loop

```
for (int j=0; j<10; j++)
        cout << j * j <<endl;
```

# Example

```cpp
#include <iostream>
using namespace std;
int main()
{
    int j;

    for (j=0; j<10; j++)
        cout << j * j <<endl;

    return 0;
}
```

# For loop-multiple expressions

```
for (int j=0, k=9;  j<10;  j++,k--)
{
        cout << j * j <<endl;
         cout<< k*k <<endl;


}
```
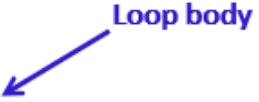
# Variable visibility

```cpp
void main()
{
    int j;
    for(j=0; j<10; j++) {
        int k=0;
        k = j*j;
        cout<<"\nValue of k: "<<k;
    }
    // k = 23; Cannot do this!
}
```

# Variable visibility

```
void main()
{
        for(int j=0; j<5; j++)
                cout<<"\nValue of j: "<<j;          Loop body

        cout<<"\nValue of j: "<<j; // ERROR
}
```

# Programs

- Get a number form user and calculate its factorial
- Write a program that ask the user to enter a
  number.  The program should print the Cube of all
  integers starting from 1 to the Number.

E.g.,

    Enter a Number: 4

| | |
|---|---|
| 1 | 1 |
| 2 | 6 |
| 3 | 27 |
| 4 | 64 |

# While Loop

■The while loop continues to loop while some condition is true.

■When the condition becomes false, the looping is discontinued.

■The general from of while loop is,initialize loop counter ;

while(test loop counter using a condition)

{

do this;

and this;

increment loop counter ;

}

# Important Points

- In place of the condition there can be any other valid expression.

■So long as the expression evaluates to a non-zero value the statements within the loop would get executed.

■The condition being tested may use relational or logical operators as shown in the following examples.

While(i<=10)

While(i>=10 && j<=15)

While (j>10 && (b<15 || c<20))

# Indefinite loop

- As a rule the while must test a condition that will eventually become false, otherwise the loop would be executed forever, indefinitely.

- Instead of incrementing, we can decrement the counter as well.

- It is not necessary that a loop counter must only be an int. it can be even float.

# Problem

■ Write a program that find the sum of all the digits from 1 to given number???
■ Write a program that find the even upto a given number and add all the those even numbers?

# Break Statement

- The break statement can be used to jump out of a **loop**.

- This example jumps out of the loop when i is equal to 4:

- Example:

```
for (int i = 0; i < 10; i++) {
 if (i == 4) {
   break;
 }
 cout << i << "\n";
}
```

Output:

0

1

2

3

# Continue Statement

- The continue statement breaks one iteration (in the loop), if a specified condition occurs, and continues with the next iteration in the loop.

- This example skips the value of 4:

- <span style="color:red">Example:</span>

```
for (int i = 0; i < 10; i++) {
  if (i == 4) {
    continue;
  }
  cout << i << "\n";
}
```

<span style="color:red">Output:</span>

0

1

2…..9

# The Do/While loop

- The do/while loop is a variant of the while loop. This loop will execute the code block once, before checking if the condition is true, then it will repeat the loop as long as the condition is true.

- Syntax:

do {
  // *code block to be executed*
}
while (*condition*);

# The Do/While loop

- The example below uses a do/while loop. The loop will always be executed at least once, even if the condition is false, because the code block is executed before the condition is tested:

- For Example:

```
int i = 0;
do {
  cout << i << "\n";
  i++;
}
while (i < 5);
```

# Problem of Do-While loop

- Write a program that find the even upto a given number and add all the those even numbers?