Chapter 4 - Loop Control Instruction

Why Loops

Sometimes we want our programs to execute few set of instructions over and over again. for ex: printing 1 to 100, first 100 even numbers etc.

Hence Loops make it easy for a programmer to tell computer that a given set of instructions must be executed repeatedly.

Types of Loops

Primarily, there are three types of loops in C language:

1) While loop
2) do - while loop
3) for loop

We will look into these one by one

While loop

```
while (condition is true) {

    // Code
    // Code

}
```

⟹ The block keeps executing as long as the condition is true.

An example:

```
int i = 0
While (i < 10) {
    printf (" The value of i is %d", i); i++;
}
```

Note: If the condition never becomes false, the while loop keeps getting executed. Such a loop is known as an infinite loop.

Quick Quiz: Write a program to print natural numbers from 10 to 20 when initial loop counter i is initialized to 0.

The loop counter need not be int, it can be float as well!

Increment and decrement operators

i ++ → i is increased by 1
i -- → i is decreased by 1

```
print f (" --i = %d", --i);
```

This first decrements i and then prints it

```
print f (" i-- = %d", i--);
```

This first prints i and then decrements it

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* +++ operator does not exist ⇒ Important
* += is compound assignment operator
just like -=, *=, /= & %= ⇒ Also Important

do-While Loop.
The syntax of do-While loop looks like this:

```
do {
   // Code ;
   // Code ;
} while ( Condition) ;
```

do-while loop works very similar to while loop.
while → checks the condition & then executes the code
do-while → Executes the code & then checks the condition

do-while loop = While loop which executes at least once.

→ Quick Quiz: Write a program to print first n natural numbers using do-while loop.

Input : 4

```
Output :  1
          2
          3
          4
```

for Loop

The syntax of for loop looks like this :

```
for( initialize ; test ; increment)
                         or decrement
  {
    //Code;
    // Code;
    // Code;
  }
```

Initialize → Setting a loop Counter to an initial value
Test → Checking a condition
Increment → Updating the loop Counter

An example :

```
for( i=0 ; i<3 ;i++) {
    printf( "%d", i);
    printf( "\n");
  }
```

Output :

```
0
1
2
```

Quick Quiz : Write a program to print first n natural numbers using for loop

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A Case of Decrementing for loop

```
for (i=5; i; i--)
    printf("%d\n", i);
```

This for loop will keep on running until i becomes 0.

The loop runs in following steps:

1> i is initialized to 5
2> The condition "i" (0 or nono) is tested
3> The code is executed
4> i is decremented
5> Condition i is checked & code is executed if its not 0.
6> & so on until i is non 0

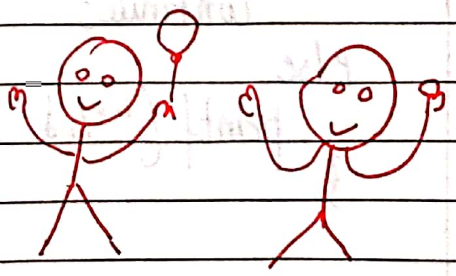
Quick Quiz: Write a program to print n natural numbers in reverse order.

The break Statement in C

The break statement is used to exit the loop irrespective of whether the condition is true or false.

Whenever a "break" is encountered inside the loop, the control is sent outside the loop

Let us see this with the help of an Example



```
for(i=0; i<1000; i++){
  printf("%d\n", i);
  if(i==5){
     break;
     }
  }
```

output ⇒

```
0
1
2
3
4
5
```

and not 0 to 100 ☺

The continue statement in C

The continue statement is used to immideately move to the next iteration of the loop.

The control is taken to the next iteration thus skipping everything below "continue" inside the loop for that iteration

Let us look at an example

```
int skip = 5;
int i=0;

while (i<10) {
  if(i != skip)   i++
      continue;
  else
      printf("%d", i);
  }
```

Output ⇒ 5

and not 0 9

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Notes :

1. Sometimes, the name of the variable might not indicate the behaviour of the program.
2. break statement completely exits the loop.
3. Continue statement skips the particular iteration of the loop.