C Loops

The looping can be defined as repeating the same process multiple times until a specific condition satisfies. There are three types of loops used in the C language. In this part of the tutorial, we are going to learn all the aspects of C loops.

Why use loops in C language?

The looping simplifies the complex problems into the easy ones. It enables us to alter the flow of the program so that instead of writing the same code again and again, we can repeat the same code for a finite number of times. For example, if we need to print the first 10 natural numbers then, instead of using the printf statement 10 times, we can print inside a loop which runs up to 10 iterations.

Advantage of loops in C

1) It provides code reusability.

2) Using loops, we do not need to write the same code again and again.

3) Using loops, we can traverse over the elements of data structures (array or linked lists).

Types of C Loops

There are three types of loops in C language that is given below:

1. do while
2. while
3. for

do-while loop in C

The do-while loop continues until a given condition satisfies. It is also called post tested loop. It is used when it is necessary to execute the loop at least once (mostly menu driven programs).

The syntax of do-while loop in c language is given below:

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

while loop in C

The while loop in c is to be used in the scenario where we don't know the number of iterations in advance. The block of statements is executed in the while loop until the condition specified in the while loop is satisfied. It is also called a pre-tested loop.

The syntax of while loop in c language is given below:

```
while(condition){
//code to be executed
}
```

for loop in C

The for loop is used in the case where we need to execute some part of the code until the given condition is satisfied. The for loop is also called as a per-tested loop. It is better to use for loop if the number of iteration is known in advance.

The syntax of for loop in c language is given below:

```
for(initialization;condition;incr/decr){
//code to be executed
}
```

for loop in C

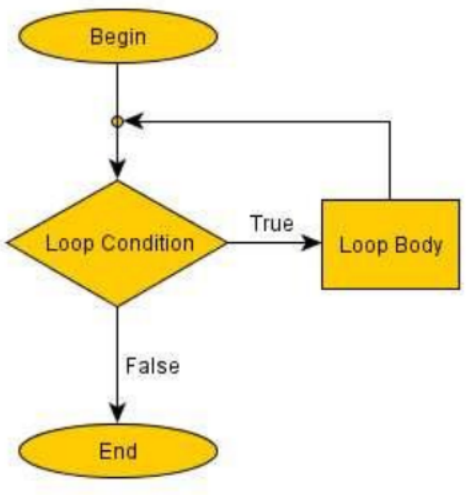
The **for loop in C language** is used to iterate the statements or a part of the program several times. It is frequently used to traverse the data structures like the array and linked list.

Syntax of for loop in C

The syntax of for loop in c language is given below:

```
for(Expression 1; Expression 2; Expression 3){
//code to be executed
}
```

Flowchart of for loop in C



C for loop Examples

Let's see the simple program of for loop that prints table of 1.

```
#include<stdio.h>
int main(){
int i=0;
for(i=1;i<=10;i++){
printf("%d \n",i);
}
return 0;
}
```

Output

```
1
2
3
4
5
6
7
8
9
10
```

C Program: Print table for the given number using C for loop

```
#include<stdio.h>
int main(){
int i=1,number=0;
```

```c
printf("Enter a number: ");
scanf("%d",&number);
for(i=1;i<=10;i++){
printf("%d \n",(number*i));
}
return 0;
}
```

Output

```
Enter a number: 2
2
4
6
8
10
12
14
16
18
20
Enter a number: 1000
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
```

Properties of Expression 1

- The expression represents the initialization of the loop variable.
- We can initialize more than one variable in Expression 1.
- Expression 1 is optional.
- In C, we can not declare the variables in Expression 1. However, It can be an exception in some compilers.

Example 1

```c
#include <stdio.h>
int main()
{
    int a,b,c;
    for(a=0,b=12,c=23;a<2;a++)
    {
        printf("%d ",a+b+c);
    }
}
```

Output

```
35 36
```

Example 2

```
#include <stdio.h>
int main()
{
    int i=1;
    for(;i<5;i++)
    {
        printf("%d ",i);
    }
}
```

Output

```
1 2 3 4
```

Properties of Expression 2

- Expression 2 is a conditional expression. It checks for a specific condition to be satisfied. If it is not, the loop is terminated.
- Expression 2 can have more than one condition. However, the loop will iterate until the last condition becomes false. Other conditions will be treated as statements.
- Expression 2 is optional.
- Expression 2 can perform the task of expression 1 and expression 3. That is, we can initialize the variable as well as update the loop variable in expression 2 itself.
- We can pass zero or non-zero value in expression 2. However, in C, any non-zero value is true, and zero is false by default.

Example 1

```c
#include <stdio.h>
int main()
{
    int i;
    for(i=0;i<=4;i++)
    {
        printf("%d ",i);
    }
}
```

output

```
0 1 2 3 4
```

Example 2

```c
#include <stdio.h>
int main()
{
    int i,j,k;
    for(i=0,j=0,k=0;i<4,k<8,j<10;i++)
    {
        printf("%d %d %d\n",i,j,k);
        j+=2;
        k+=3;
    }
}
```

Output

```
0 0 0
1 2 3
2 4 6
3 6 9
4 8 12
```

Example 3

```c
#include <stdio.h>
int main()
```

```
{
    int i;
    for(i=0;;i++)
    {
        printf("%d",i);
    }
}
```

Output

```
infinite loop
```

Properties of Expression 3

- Expression 3 is used to update the loop variable.
- We can update more than one variable at the same time.
- Expression 3 is optional.

Example 1

```
#include<stdio.h>
void main ()
{
    int i=0,j=2;
    for(i = 0;i<5;i++,j=j+2)
    {
        printf("%d %d\n",i,j);
    }
}
```

Output

```
0 2
1 4
2 6
3 8
4 10
```

Loop body

The braces {} are used to define the scope of the loop. However, if the loop contains only one statement, then we don't need to use braces. A loop without a body is possible. The braces work as a block separator, i.e., the value variable declared inside for loop is valid only for that block and not outside. Consider the following example.

```c
#include<stdio.h>
void main ()
{
    int i;
    for(i=0;i<10;i++)
    {
        int i = 20;
        printf("%d ",i);
    }
}
```

Output

```
20 20 20 20 20 20 20 20 20 20
```

Infinitive for loop in C

To make a for loop infinite, we need not give any expression in the syntax. Instead of that, we need to provide two semicolons to validate the syntax of the for loop. This will work as an infinite for loop.

```c
#include<stdio.h>
void main ()
{
    for(;;)
    {
        printf("welcome to javatpoint");
    }
}
```