Lesson 02

Iteration/Looping in C Programming

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What is Looping ?

- The looping can be defined as repeating the same process multiple times until a specific condition satisfies. It is known as iteration also. 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 looping?

- The looping simplifies the complex problems into the easy ones.
- It enables to alter the flow of the program so that instead of writing the same code again and again, we can execute the same code for a finite number of times.

For example, if we need to print 'UNIVERSITY OF CALCUTTA' 10-times then, instead of using the *printf* statement 10 times, we can use *printf* once inside a loop which runs up to 10 iterations.

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What are the advantages of Looping?

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

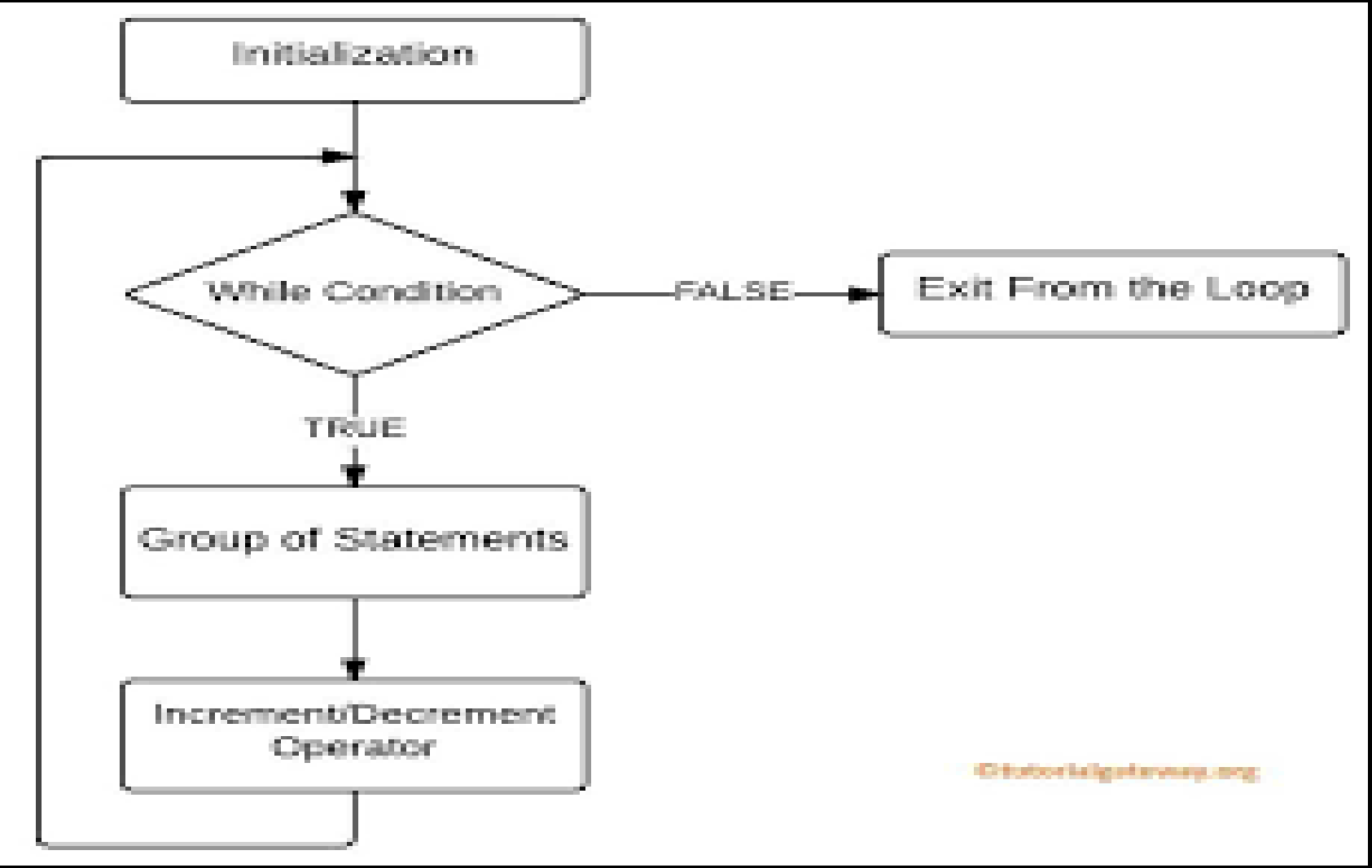
There are three types of loops in C language those are given below:

- while
- do while
- for

Essential components of a loop

- Counter
- Initialisation of the counter with initial value
- Condition to check with the optimum value of the counter
- Statement(s) to be executed by iteration
- Increment/decrement

Flowchart for a loop



while loop in C

- The *while* loop in c is to be used in the scenario where 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:

```
initialisation;
while(condition)
{
   block of statements to be executed ;
    increment;
 }
```

Write a C-program to print 10 natural numbers

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

Output

1
2
3
4
5
6
7
8
9
10

Program to print table for the given number using while loop in C

```
#include<stdio.h>
main()
{
int i=1,number,b;
printf("Enter a number: ");
scanf("%d",&number);
    while(i<=10)
        {
            b=number*i;
            printf("%d \n", b);
             i=i+1;
          }
 }
```

Output

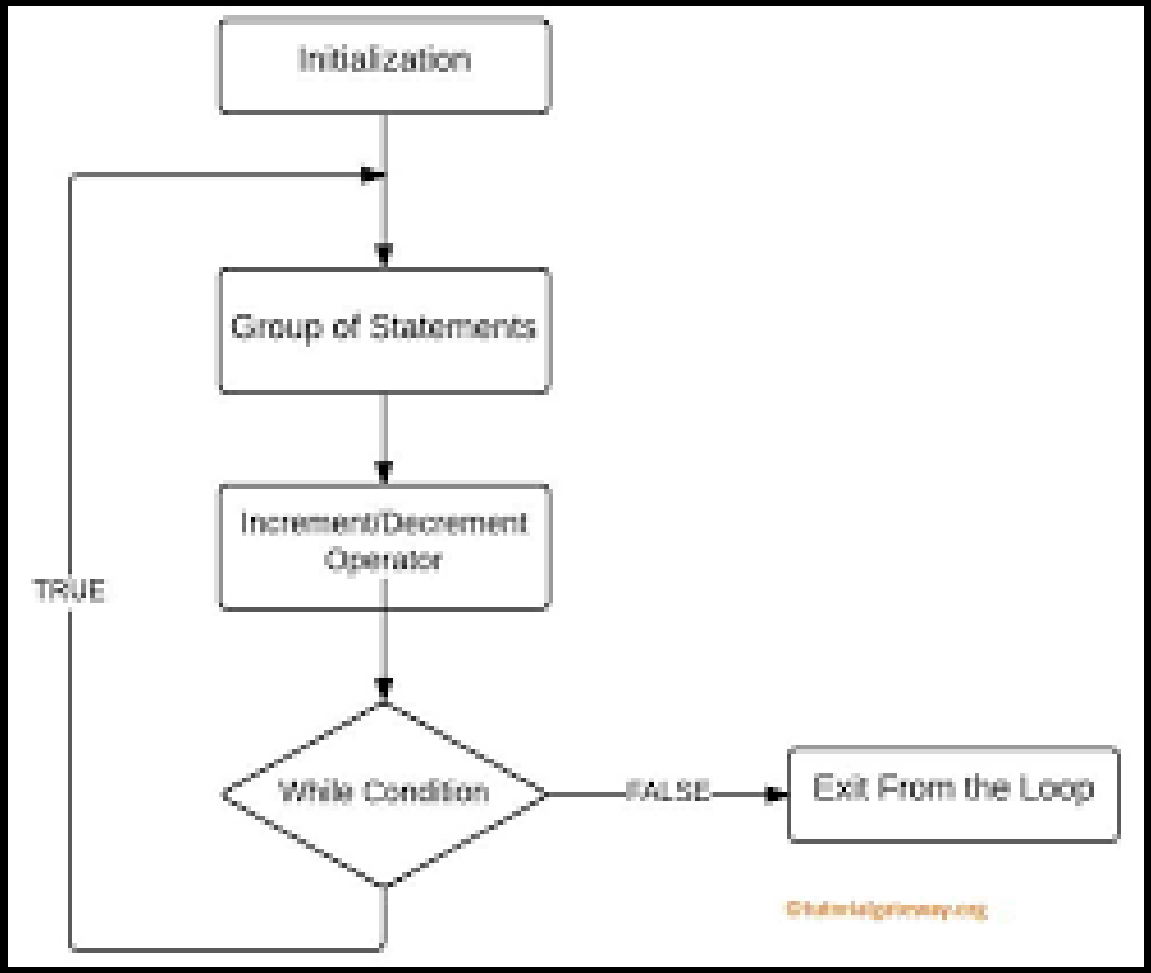
```
Enter a number: 5
5
10
15
20
25
30
35
40
45
50
```

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);
```

Flowchart for do-while loop



Output

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

Output

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

Example: Program to add two integers

```
1  /*   - - -- - - -*/
2    /* Program to prnt multipliction table of a number*/
3  #include <stdio.h>
4
5  main()
6  {
7     int number, i,m;        /* declaration */
8     printf( "Enter the number\n" ); /* prompt */
9     scanf( "%d", &number);          /* read a number */
10    i=1;                           /* read a number */
11    do{                           /* Starting of loop */
12    m=number*i;                   /* calculation of m*/
13    printf("%d, ", m);          /*printing m */
14    }while(i<=10);        /* condition testing*/
15
16
17 }
```

```
Enter first integer
5
5, 10, 15, 20, 25,30,35,40, 45,50,
```

Program Output

Outline

1. Variables declaration
2. Input

   2.1 loop starts

   2.2 print values

3. Condition testing
4. end

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

```
for(Expression1; Expression2; Expression3)
    {
      codes to be executed;
     }
```

Expression 1 (Optional)

- Represents the initialization of the loop variable.
- More than one variable can be initialised.

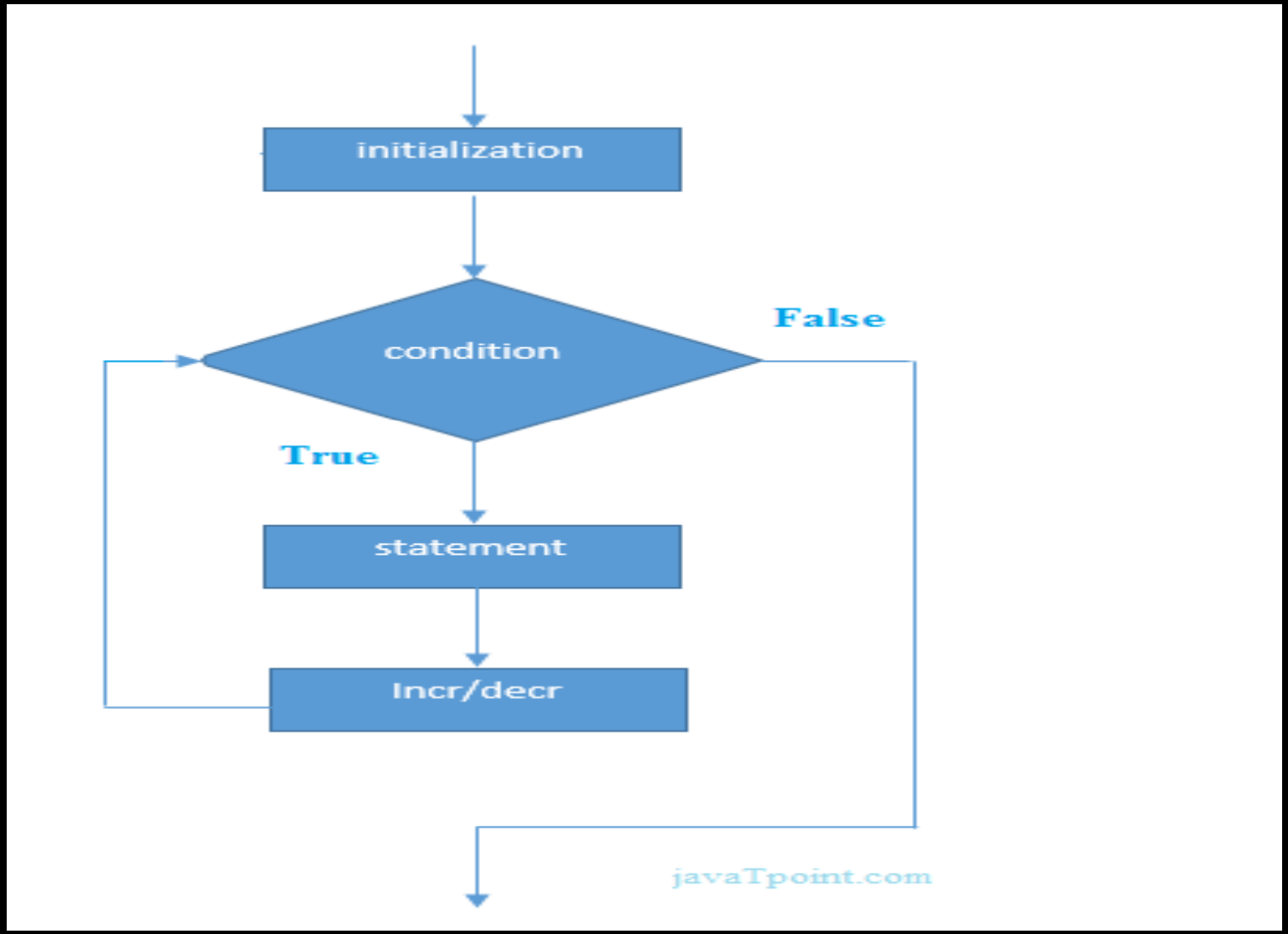
Expression 2

- 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 3

- Expression 3 is increment or decrement to update the valu of the loop variable

Flowchart : *for* loop



Program to print natural numbers 1to15

```
#include <stdio.h>
 main()
{
   int i;
   for(i=1;i<=15;i=i+1)
      {
        printf("%d, ", i);
      }
 }
```

output

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15,

Example: Program to add two integers

```
1  /*   - - -- - - -*/
2    /* Addition program */
3  #include <stdio.h>
4
5  main()
6  {
7     int integer1, integer2, sum;         /* declaration */
8
9     printf( "Enter first integer\n" );   /* prompt */
10    scanf( "%d", &integer1 );            /* read an integer */
11    printf( "Enter second integer\n" );  /* prompt */
12    scanf( "%d", &integer2 );            /* read an integer */
13    sum = integer1 + integer2;           /* assignment of sum */
14    printf( "Sum is %d\n", sum );        /* print sum */
15
16
17 }
```

```
Enter first integer
23
Enter second integer
24
Sum is 47
```

Program Output

Outline

1. Variables declaration
2. Input

   2.1 Sum
3. Print

Practice such simple programs

- Write a C program to calculate the perimeter and area of a land
- Write a C program to swap the value of to variables with the help of a third variable and without the help of a third variable.
- Write a C program to find the large number among two
- Write a C program to find the large number among three
- Write a C program to print even and odd numbers from 1-50 using while, for and do-while
- Write a C program to find the largest number among ten
- Write a C program to print the series 1 1 2 3 5 8 13 21 upto 150
- Write a C program to reverse a 3-digit integer
- Write a C program to find the prime number
- Write a C program to compile the mark-sheet of BLIS course
- Write a C program to prepare a bill for 10 books after 20% discount for your library