

Tutorial 10 - For, While, and Do-While Loops in C++

Loops in C++

Loops allow repeated execution of code until a specific condition is met.

Types of loops in C++:

1. **For Loop**
 2. **While Loop**
 3. **Do-While Loop**
-

1. For Loop

- Executes code repeatedly for a defined number of iterations.
- **Syntax:**

```
1 for (initialization; condition; updation) {  
2     // loop body  
3 }  
4
```

- **Execution Steps:**
 - a. Initialize variable(s).
 - b. Check the condition (if true, execute loop body).
 - c. Execute the loop body.
 - d. Update variable(s).
 - e. Repeat until the condition becomes false.
- **Example:**

```
1 for (int i = 1; i <= 4; i++) {  
2     cout << i << endl; // Prints: 1, 2, 3, 4  
3 }  
4
```

- **Infinite Loop:**

```
1 for (int i = 1; true; i++) {  
2     cout << i << endl;  
3 }  
4
```

2. While Loop

- Executes code repeatedly as long as a condition is true.
- **Syntax:**

```
1 while (condition) {  
2     // loop body  
3 }  
4
```

- **Execution Steps:**

- a. Check the condition.
- b. If true, execute loop body.
- c. Update variable(s) inside the loop.
- d. Repeat until the condition becomes false.

- **Example:**

```
1 int i = 1;
2 while (i <= 4) {
3     cout << i << endl; // Prints: 1, 2, 3, 4
4     i++;
5 }
6
```

- **Infinite Loop:**

```
1 while (true) {
2     cout << "Infinite loop" << endl;
3 }
4
```

3. Do-While Loop

- Executes code **at least once** before checking the condition.

- **Syntax:**

```
1 do {
2     // loop body
3 } while (condition);
4
```

- **Execution Steps:**

- a. Execute the loop body.
- b. Check the condition.
- c. If true, repeat the loop.

- **Example:**

```
1 int i = 1;
2 do {
3     cout << i << endl; // Prints: 1, 2, 3, 4
4     i++;
5 } while (i <= 4);
6
```

- **Key Difference:** The **do-while loop** executes the code **once**, even if the condition is false.

Code Example

```
1 #include <iostream>
2 using namespace std;
3
4 int main() {
5     // 1. For Loop
```

```

6   for (int i = 1; i <= 4; i++) {
7       cout << i << " "; // Output: 1 2 3 4
8   }
9   cout << endl;
10
11  // 2. While Loop
12  int i = 1;
13  while (i <= 4) {
14      cout << i << " "; // Output: 1 2 3 4
15      i++;
16  }
17  cout << endl;
18
19  // 3. Do-While Loop
20  i = 1;
21  do {
22      cout << i << " "; // Output: 1 2 3 4
23      i++;
24  } while (i <= 4);
25
26  return 0;
27 }
28

```

Short Notes

1. For Loop

- Executes for a specific number of times.
- Syntax:

```

1  for (initialization; condition; updation) {
2      // loop body
3  }
4

```

- Example:

```

1  for (int i = 1; i <= 4; i++) {
2      cout << i;
3  }
4

```

2. While Loop

- Executes as long as the condition is true.
- Syntax:

```

1  while (condition) {
2      // loop body
3  }
4

```

- Example:

```

1  int i = 1;
2  while (i <= 4) {

```

```
3     cout << i;
4     i++;
5 }
6
```

3. Do-While Loop

- Executes at least once before checking the condition.
- Syntax:

```
1 do {
2     // loop body
3 } while (condition);
4
```

- Example:

```
1 int i = 1;
2 do {
3     cout << i;
4     i++;
5 } while (i <= 4);
6
```