



**University of Mosul**  
**College of Computer Sciences and Mathematics**  
**Department of Artificial Intelligence**

**Algorithms and Structured Programming (I)**  
**First stage**

# **Lecture 6**

أ.م. بيداء سليمان بهنام

**Assist.Prof. Baydaa Sulaiman Bahnham**

# Lecture 6 Outline



1. Loop Statements in C++
2. for statement
3. Examples
4. Programs

# Loop Statements in C++ :

# جمل التكرار (الدوران)

The loop statements are essential to construct systematic block styled programming. C++ provides three iteration structures: for, while and do/while .

## for statement

### General Form of For statement:

```
for ( initialization ; continuation condition ; update )  
    statement1 ;
```

```
for ( initialization ; continuation condition ; update )  
{  
    statement1 ;  
    statement2 ;  
    :  
}
```

Example 1:      for ( i = 0; i < 10; i++ )  
                      cout << i;

Output:  
0 1 2 3 4 5 6 7 8 9

Example 2:      for ( i = 0; i < 10; i += 2 )  
                      cout << i;

Output:      even numbers only  
0 2 4 6 8

Example 3:      for ( i = 1; i < 10; i += 2 )  
                      cout << i;

Output:      odd numbers only  
1 3 5 7 9

# Examples \_ for statement

// Write C++ program to print the numbers from 1 to 5:

```
#include <iostream>
```

```
using namespace std;
```

```
int main() {
```

```
    for (int i = 1; i <= 5; i++) }   for (int i = 1; i <= 5; ++i) عند التنفيذ نفس النتائج تظهر
```

```
{ // 1. Initialization (i = 1), 2. Condition (i <= 5), 3. Update (i++) or (++i)
```

```
    cout << i << endl; // Print the current value of i
```

```
}
```

```
    return 0;
```

```
}
```

1  
2  
3  
4  
5

ملاحظة عند نهاية تنفيذ كل دورة يتم زيادة او نقصان متغير التحكم مهما كان نوع الزيادة او النقصان ( سواء  $++i, i++, --i, i--$  او مثلا زياد بـ 2 او 3 او نقصان بـ 5 او غيرها ). يليها يتم التحقق من الشرط اذا صحيح **true** سيتم تنفيذ الكود داخل جسم الحلقة ثم يتم تحديث متغير الحلقة وهكذا. اما اذا غير صحيح **false** سيتم الخروج من الحلقة لتكملة تنفيذ الجمل (ان وجدت) التي تلي الحلقة باكملها.

| Step | Value of i  | Condition ( i <= 5 )                | Operation                       | Printed Value |
|------|-------------|-------------------------------------|---------------------------------|---------------|
| 1    | 1 (initial) | $1 \leq 5 \rightarrow \text{true}$  | Print $i = 1$ and increment $i$ | 1             |
| 2    | 2           | $2 \leq 5 \rightarrow \text{true}$  | Print $i = 2$ and increment $i$ | 2             |
| 3    | 3           | $3 \leq 5 \rightarrow \text{true}$  | Print $i = 3$ and increment $i$ | 3             |
| 4    | 4           | $4 \leq 5 \rightarrow \text{true}$  | Print $i = 4$ and increment $i$ | 4             |
| 5    | 5           | $5 \leq 5 \rightarrow \text{true}$  | Print $i = 5$ and increment $i$ | 5             |
| 6    | 6           | $6 \leq 5 \rightarrow \text{false}$ | Loop ends                       |               |

## Examples \_ for statement

// Write a C++ program to print numbers from 10 to 1, followed by "stop".

```
#include <iostream>
```

```
using namespace std;
```

```
int main()
```

```
{
```

```
    for (int i = 10; i >= 1; i--) }   for (int i = 10; i >= 1; --i) عند التنفيذ نفس النتائج تظهر
```

```
        cout << i << " ";
```

```
    cout << "stop" << endl;
```

```
    return 0;
```

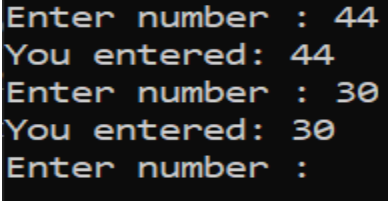
```
}
```

10 9 8 7 6 5 4 3 2 1 stop

| Step | Value of i | Condition ( i >= 1 ) | Operation                    | Printed Value |
|------|------------|----------------------|------------------------------|---------------|
| 1    | 10         | 10 >= 1 → true       | Print i = 10 and decrement i | 10            |
| 2    | 9          | 9 >= 1 → true        | Print i = 9 and decrement i  | 9             |
| 3    | 8          | 8 >= 1 → true        | Print i = 8 and decrement i  | 8             |
| 4    | 7          | 7 >= 1 → true        | Print i = 7 and decrement i  | 7             |
| 5    | 6          | 6 >= 1 → true        | Print i = 6 and decrement i  | 6             |
| 6    | 5          | 5 >= 1 → true        | Print i = 5 and decrement i  | 5             |
| 7    | 4          | 4 >= 1 → true        | Print i = 4 and decrement i  | 4             |
| 8    | 3          | 3 >= 1 → true        | Print i = 3 and decrement i  | 3             |
| 9    | 2          | 2 >= 1 → true        | Print i = 2 and decrement i  | 2             |
| 10   | 1          | 1 >= 1 → true        | Print i = 1 and decrement i  | 1             |
| 11   | 0          | 0 >= 1 → false       | Loop ends                    |               |
| 12   |            |                      | Print "stop"                 | stop          |

// Write a C++ program to read 10 integer numbers and display each number after it is entered.

```
#include <iostream>
using namespace std;
int main()
{
    int num, i;
    for (i = 1; i <= 10; i++)
    {
        cout << "\nEnter integer number = ";
        cin >> num;
        cout << "You entered: " << num << endl;
    }
    return 0;
```



```
Enter number : 44
You entered: 44
Enter number : 30
You entered: 30
Enter number :
```

-----

الحل بطريقة اخرى : العداد يبدأ بالصفر

```
#include <iostream>
using namespace std;
int main()
{
    int no;
    for (int i = 0; i < 10; ++i)
    {
        cout << "\nEnter integer number = ";
        cin >> num;
        cout << "You entered: " << num << endl;
    }
    return 0;
```

```
// Write a C++ program to read and print ten numbers.
```

```
#include <iostream>
```

```
using namespace std;
```

```
void main()
```

```
{
```

```
    int no;
```

```
    for (int i = 10; i > 0; --i)
```

```
    {
```

```
        cout << "Enter number : " ;
```

```
        cin >> no;
```

```
        cout << "You entered: " << no << endl;
```

```
    }
```

```
}
```

```
Enter integer number = 4
You entered: 4
```

```
Enter integer number = 7
You entered: 7
```

```
Enter integer number = 100
You entered: 100
```

```
Enter integer number =
```

```
//Write C++ program to print the odd numbers from 1 to 20:
```

```
#include <iostream>
```

```
using namespace std;
```

```
int main()
```

```
{
```

```
    cout << "Odd numbers from 1 to 20 are:" << endl;
```

```
    for (int i = 1; i <= 20; i += 2)
```

```
    {
```

```
        // Start from 1 and increment by 2 to get odd numbers
```

```
        cout << i << " ";
```

```
    }
```

```
return 0;
```

```
}
```

```
Odd numbers from 1 to 20 are:
1 3 5 7 9 11 13 15 17 19
```

// Write C++ program to add the numbers from 1 to 100:

```
#include <iostream>
```

```
using namespace std;
```

```
void main()
```

```
{
```

```
    int sum = 0;
```

```
    for (int i = 1; i <= 100; i++)
```

```
        sum = sum + i;
```

```
    cout << "Sum is: " << sum << endl;
```

```
}
```

Sum is: 5050

-----

// Write a C++ program to sum the even numbers from 1 to 100.

```
int main()
```

```
{
```

```
    int sum = 0; // Variable to store the sum of even numbers
```

```
    // Loop through numbers from 1 to 100
```

```
    for (int i = 1; i <= 100; i++)
```

```
    {
```

```
        // Check if the number is even
```

```
        if (i % 2 == 0)
```

```
            sum += i; // Add the even number to the sum
```

```
    }
```

```
    // Output the result
```

```
    cout << "The sum of even numbers from 1 to 100 is: " << sum << endl;
```

```
    return 0;
```

```
}
```

// Write a C++ program to find the square of even numbers from 2 to 8.

```
#include <iostream>
```

```
using namespace std;
```

```
void main()
```

```
{
```

```
    int i, j;
```

```
    for (i = 2; i <= 8; i += 2) {
```

هنا نحتاج زيادة العداد بمقدار 2 حتى نحصل على الرقم الزوجي فقط

```
    {
```

```
        j = i * i;
```

```
        cout << "The square of " << i << " is = " << j << endl;
```

```
    }
```

```
}
```

```
The square of 2 is = 4
The square of 4 is = 16
The square of 6 is = 36
The square of 8 is = 64
```

-----

// Write a C++ program to print a sequence as follows.

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

```
#include <iostream>
```

```
using namespace std;
```

```
void main()
```

```
{
```

```
    int x;
```

```
    for (x = 1; x < 7; ++x)
```

```
        cout << x << "\t" << 11 - x << endl;
```

```
}
```

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