

For loop

This lesson discusses the concepts of for loop and nested for loop using examples and illustrations

WE'LL COVER THE FOLLOWING ^

- Syntax
- Example
 - What does the for loop do?
- Nested For Loops
 - Example of Nested For Loop

A **for** loop is great for doing things a certain amount of time. It's like a **while** loop but the *increment* is included with the *condition*.

Syntax

A **for** loop is set up like this:

```
for (Initialization; Condition; Increment)
{
    // Code
}
```



for loop Syntax

- **Initialization** - Makes a **new** *local variable* that can only be used in the *loop*.
- **Condition** - The *loop* only runs when the *condition* is **true**.
- **Increment** - How the *variable* changes every time the *loop* runs.

Example

Here's an example of how the **for** loop works:

```
using System;
```

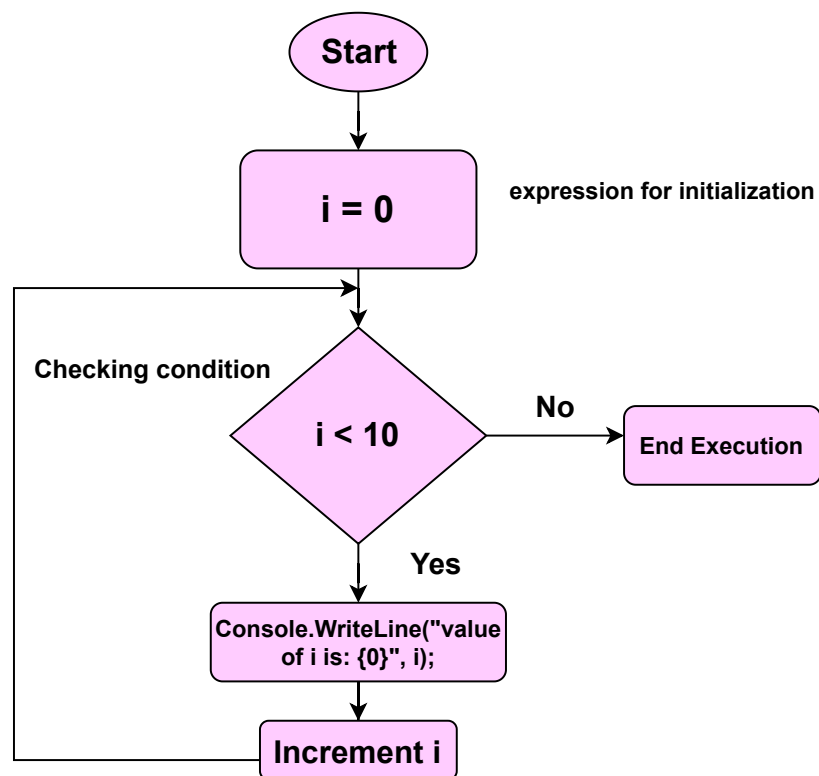


```
class ForloopExample  
{  
    static void Main()  
    {  
        for (int i = 0; i < 10; i++){  
            Console.WriteLine("value of i is: {0}", i);  
        }  
    }  
}
```



For loop example

Take a look at the illustration below to understand the code above more clearly.



Flow Chart for For Loop

What does the for loop do?

- Prior to the *first* iteration, it sets the value of **i** to **0**.
- Next, it tests (like a normal **while** loop) if **i** is *less* than **10**.
- If the statement returns **true**, the body of the loop is run and the

program will *print* the value returned by the simple arithmetic statement `i`.

- Next, the terminal cursor moves down to the next line.
- After the loop is finished, `i` is incremented (by `1`), as specified in the update statement, and the conditional is tested again.

So, this loop will run a total of **10** times, printing the “**i**” value each time. You’ve just taught your program to count! **Wow!**

The *variable* used in `for` loops is generally an *integer* variable named `i`, `j`, or `k`, and is often initialized prior to the *beginning* of the `for` loop.

Nested For Loops

It is possible to *nest* `for` loops. *Nesting* means including one `for` loop in another `for` loop.

The syntax for a **nested** `for` loop is as follows:

```
for (expression for initialization ; expression for testing ; expression for updating ) {  
    for (expression for initialization ; expression for testing ; expression for updating) {  
        //body  
    }  
    //body  
}
```

Nested for loop Syntax

Example of Nested For Loop

Let’s take a look at an example code to understand *nesting* of `for` loops better.

```
class NestedLoopExample  
{  
    static void Main()  
    {  
        int input = 5;  
        System.Console.WriteLine("How many missiles will you fire?");  
        System.Console.WriteLine("I will fire: {0}", input, "missiles");  
  
        for (int i = 0; i < input; i++) { // outer for loop  
            for (int j = 3; j > 0; j--) { // inner for loop  
                System.Console.WriteLine(j);  
            }  
            System.Console.WriteLine("Missile {0}", i+1, " has launched.");  
        }  
    }  
}
```

```
        System.Console.WriteLine("All missiles have been launched.");  
    }  
}
```



Nested For loop example

In a nested **for** loop, for a single value of the **outer** loop, in this case, **i**, the inner (*nested*) **for** loop will iterate over all its values, that is, for example for **i=0** the inner (*nested*) loop will run from **j = 3** to **j=1**. After this is done, **i** will be incremented to **1** and the inner loop will again iterate over all its values against this value of **i**. The process continues till all values of **i** are iterated over.

Look at the illustration below which will help you visualize this and help you understand this concept more clearly.

```
1 class NestedLoopExample  
2 {  
3     → static void Main()  
4     {  
5         int input = 5;  
6         System.Console.WriteLine("How many missiles will you fire?");  
7         System.Console.WriteLine("I will fire: {0}", input, "missiles");  
8  
9  
10        for (int i = 0; i < input; i++) { // outer for loop  
11            for (int j = 3; j > 0; j--) { // inner for loop  
12                System.Console.WriteLine(j);  
13            }  
14            System.Console.WriteLine("Missile {0}", i+1, " has launched.");  
15        }  
16  
17        System.Console.WriteLine("All missiles have been launched.");  
18    }  
19 }
```

Main

```

class NestedLoopExample
{
    static void Main()
    {
        → int input = 5;
        System.Console.WriteLine("How many missiles will you fire?");
        System.Console.WriteLine("I will fire: {0}", input, "missiles");

        for (int i = 0; i < input; i++) { // outer for loop
            for (int j = 3; j > 0; j--) { // inner for loop
                System.Console.WriteLine(j);
            }
            System.Console.WriteLine("Missile {0}", i+1, " has launched.");
        }

        System.Console.WriteLine("All missiles have been launched.");
    }
}

```

Main

input = 5

2 of 24

```

class NestedLoopExample
{
    static void Main()
    {
        int input = 5;
        → System.Console.WriteLine("How many missiles will you fire?");
        System.Console.WriteLine("I will fire: {0}", input, "missiles");

        for (int i = 0; i < input; i++) { // outer for loop
            for (int j = 3; j > 0; j--) { // inner for loop
                System.Console.WriteLine(j);
            }
            System.Console.WriteLine("Missile {0}", i+1, " has launched.");
        }

        System.Console.WriteLine("All missiles have been launched.");
    }
}

```

Main

input = 5

How many missiles will you fire?

3 of 24

```

1 class NestedLoopExample
2 {
3     static void Main()
4     {
5         int input = 5;
6         System.Console.WriteLine("How many missiles will you fire?");
7         System.Console.WriteLine("I will fire: {0}", input, "missiles");
8
9
10        for (int i = 0; i < input; i++) { // outer for loop
11            for (int j = 3; j > 0; j--) { // inner for loop
12                System.Console.WriteLine(j);
13            }
14            System.Console.WriteLine("Missile {0}", i+1, " has launched.");
15        }
16
17        System.Console.WriteLine("All missiles have been launched.");
18    }
19 }

```

Main

input = 5

How many missiles will you fire?
I will fire: 5 missiles

4 of 24

```

1 class NestedLoopExample
2 {
3     static void Main()
4     {
5         int input = 5;
6         System.Console.WriteLine("How many missiles will you fire?");
7         System.Console.WriteLine("I will fire: {0}", input, "missiles");
8
9
10        for (int i = 0; i < input; i++) { // outer for loop
11            for (int j = 3; j > 0; j--) { // inner for loop
12                System.Console.WriteLine(j);
13            }
14            System.Console.WriteLine("Missile {0}", i+1, " has launched.");
15        }
16
17        System.Console.WriteLine("All missiles have been launched.");
18    }
19 }

```

Main

input = 5

i = ?

How many missiles will you fire?
I will fire: 5 missiles

5 of 24

```

class NestedLoopExample
{
    static void Main()
    {
        int input = 5;
        System.Console.WriteLine("How many missiles will you fire?");
        System.Console.WriteLine("I will fire: {0}", input, "missiles");

        for (int i = 0; i < input; i++) { // outer for loop
            → for (int j = 3; j > 0; j--) { // inner for loop
                System.Console.WriteLine(j);
            }
            System.Console.WriteLine("Missile {0}", i+1, " has launched.");
        }

        System.Console.WriteLine("All missiles have been launched.");
    }
}

```

Main

input = 5

i = 0

j = ?

How many missiles will you fire?

I will fire: 5 missiles

6 of 24

```

1 class NestedLoopExample
2 {
3     static void Main()
4     {
5         int input = 5;
6         System.Console.WriteLine("How many missiles will you fire?");
7         System.Console.WriteLine("I will fire: {0}", input, "missiles");
8
9
10        for (int i = 0; i < input; i++) { // outer for loop
11            for (int j = 3; j > 0; j--) { // inner for loop
12                → System.Console.WriteLine(j);
13            }
14            System.Console.WriteLine("Missile {0}", i+1, " has launched.");
15        }
16
17        System.Console.WriteLine("All missiles have been launched.");
18    }
19 }

```

Main

input = 5

i = 0

j = 3

How many missiles will you fire?

will fire: 5 missiles

3

7 of 24

```

class NestedLoopExample
{
    static void Main()
    {
        int input = 5;
        System.Console.WriteLine("How many missiles will you fire?");
        System.Console.WriteLine("I will fire: {0}", input, "missiles");

        for (int i = 0; i < input; i++) { // outer for loop
            for (int j = 3; j > 0; j--) { // inner for loop
                System.Console.WriteLine(j);
            }
            System.Console.WriteLine("Missile {0}", i+1, " has launched.");
        }

        System.Console.WriteLine("All missiles have been launched.");
    }
}

```

Main

input = 5

i = 0

j = 2

How many missiles will you fire?

I will fire: 5 missiles

3

8 of 24

```

class NestedLoopExample
{
    static void Main()
    {
        int input = 5;
        System.Console.WriteLine("How many missiles will you fire?");
        System.Console.WriteLine("I will fire: {0}", input, "missiles");

        for (int i = 0; i < input; i++) { // outer for loop
            for (int j = 3; j > 0; j--) { // inner for loop
                System.Console.WriteLine(j);
            }
            System.Console.WriteLine("Missile {0}", i+1, " has launched.");
        }

        System.Console.WriteLine("All missiles have been launched.");
    }
}

```

Main

input = 5

i = 0

j = 2

How many missiles will you fire?

I will fire: 5 missiles

3 2

9 of 24


```

class NestedLoopExample
{
    static void Main()
    {
        int input = 5;
        System.Console.WriteLine("How many missiles will you fire?");
        System.Console.WriteLine("I will fire: {0}", input, "missiles");

        for (int i = 0; i < input; i++) { // outer for loop
            for (int j = 3; j > 0; j--) { // inner for loop
                System.Console.WriteLine(j);
            }
            System.Console.WriteLine("Missile {0}", i+1, " has launched.");
        }

        System.Console.WriteLine("All missiles have been launched.");
    }
}

```

Main

input = 5

i = 0

j = 1

How many missiles will you fire?

I will fire: 5 missiles

3 2

10 of 24

```

class NestedLoopExample
{
    static void Main()
    {
        int input = 5;
        System.Console.WriteLine("How many missiles will you fire?");
        System.Console.WriteLine("I will fire: {0}", input, "missiles");

        for (int i = 0; i < input; i++) { // outer for loop
            for (int j = 3; j > 0; j--) { // inner for loop
                System.Console.WriteLine(j);
            }
            System.Console.WriteLine("Missile {0}", i+1, " has launched.");
        }

        System.Console.WriteLine("All missiles have been launched.");
    }
}

```

Main

input = 5

i = 0

j = 1

How many missiles will you fire?

I will fire: 5 missiles

3 2 1

11 of 24

```

class NestedLoopExample
{
    static void Main()
    {
        int input = 5;
        System.Console.WriteLine("How many missiles will you fire?");
        System.Console.WriteLine("I will fire: {0}", input, "missiles");

        for (int i = 0; i < input; i++) { // outer for loop
            → for (int j = 3; j > 0; j--) { // inner for loop
                System.Console.WriteLine(j);
            }
            System.Console.WriteLine("Missile {0}", i+1, " has launched.");
        }

        System.Console.WriteLine("All missiles have been launched.");
    }
}

```

Main

input = 5

i = 0

How many missiles will you fire?

I will fire: 5 missiles

3 2 1

12 of 24

```

class NestedLoopExample
{
    static void Main()
    {
        int input = 5;
        System.Console.WriteLine("How many missiles will you fire?");
        System.Console.WriteLine("I will fire: {0}", input, "missiles");

        for (int i = 0; i < input; i++) { // outer for loop
            for (int j = 3; j > 0; j--) { // inner for loop
                System.Console.WriteLine(j);
            }
            → System.Console.WriteLine("Missile {0}", i+1, " has launched.");
        }

        System.Console.WriteLine("All missiles have been launched.");
    }
}

```

Main

input = 5

i = 0

How many missiles will you fire?

I will fire: 5 missiles

3 2 1 Missile 1 has launched

13 of 24

```

class NestedLoopExample
{
    static void Main()
    {
        int input = 5;
        System.Console.WriteLine("How many missiles will you fire?");
        System.Console.WriteLine("I will fire: {0}", input, "missiles");

        → for (int i = 0; i < input; i++) { // outer for loop
            for (int j = 3; j > 0; j--) { // inner for loop
                System.Console.WriteLine(j);
            }
            System.Console.WriteLine("Missile {0}", i+1, " has launched.");
        }

        System.Console.WriteLine("All missiles have been launched.");
    }
}

```

Main

input = 5

i = 1

How many missiles will you fire?

I will fire: 5 missiles

3 2 1 Missile 1 has launched

14 of 24

```

class NestedLoopExample
{
    static void Main()
    {
        int input = 5;
        System.Console.WriteLine("How many missiles will you fire?");
        System.Console.WriteLine("I will fire: {0}", input, "missiles");

        for (int i = 0; i < input; i++) { // outer for loop
            → for (int j = 3; j > 0; j--) { // inner for loop
                System.Console.WriteLine(j);
            }
            System.Console.WriteLine("Missile {0}", i+1, " has launched.");
        }

        System.Console.WriteLine("All missiles have been launched.");
    }
}

```

Main

input = 5

i = 1

j = 3

How many missiles will you fire?


I will fire: 5 missiles

3 2 1 Missile 1 has launched

15 of 24

```

class NestedLoopExample
{
    static void Main()
    {
        int input = 5;
        System.Console.WriteLine("How many missiles will you fire?");
        System.Console.WriteLine("I will fire: {0}", input, "missiles");

        for (int i = 0; i < input; i++) { // outer for loop
            for (int j = 3; j > 0; j--) { // inner for loop
                 System.Console.WriteLine(j);
            }
            System.Console.WriteLine("Missile {0}", i+1, " has launched.");
        }

        System.Console.WriteLine("All missiles have been launched.");
    }
}

```

Main

input = 5

i = 1

j = 3

How many missiles will you fire?

I will fire: 5 missiles


3 2 1 Missile 1 has launched

3

16 of 24

```

class NestedLoopExample
{
    static void Main()
    {
        int input = 5;
        System.Console.WriteLine("How many missiles will you fire?");
        System.Console.WriteLine("I will fire: {0}", input, "missiles");

        for (int i = 0; i < input; i++) { // outer for loop
             for (int j = 3; j > 0; j--) { // inner for loop
                System.Console.WriteLine(j);
            }
            System.Console.WriteLine("Missile {0}", i+1, " has launched.");
        }

        System.Console.WriteLine("All missiles have been launched.");
    }
}

```

Main

input = 5

i = 1

j = 2

How many missiles will you fire?

I will fire: 5 missiles


3 2 1 Missile 1 has launched

3

17 of 24

```

class NestedLoopExample
{
    static void Main()
    {
        int input = 5;
        System.Console.WriteLine("How many missiles will you fire?");
        System.Console.WriteLine("I will fire: {0}", input, "missiles");

        for (int i = 0; i < input; i++) { // outer for loop
            for (int j = 3; j > 0; j--) { // inner for loop
                 System.Console.WriteLine(j);
            }
            System.Console.WriteLine("Missile {0}", i+1, " has launched.");
        }

        System.Console.WriteLine("All missiles have been launched.");
    }
}

```

Main

input = 5

i = 1

j = 2

How many missiles will you fire?

I will fire: 5 missiles


3 2 1 Missile 1 has launched

3 2

18 of 24

```

class NestedLoopExample
{
    static void Main()
    {
        int input = 5;
        System.Console.WriteLine("How many missiles will you fire?");
        System.Console.WriteLine("I will fire: {0}", input, "missiles");

        for (int i = 0; i < input; i++) { // outer for loop
             for (int j = 3; j > 0; j--) { // inner for loop
                System.Console.WriteLine(j);
            }
            System.Console.WriteLine("Missile {0}", i+1, " has launched.");
        }

        System.Console.WriteLine("All missiles have been launched.");
    }
}

```

Main

input = 5

i = 1

j = 1

How many missiles will you fire?

I will fire: 5 missiles

3 2 1 Missile 1 has launched

3 2

19 of 24

```

class NestedLoopExample
{
    static void Main()
    {
        int input = 5;
        System.Console.WriteLine("How many missiles will you fire?");
        System.Console.WriteLine("I will fire: {0}", input, "missiles");

        for (int i = 0; i < input; i++) { // outer for loop
            for (int j = 3; j > 0; j--) { // inner for loop
                System.Console.WriteLine(j);
            }
            System.Console.WriteLine("Missile {0}", i+1, " has launched.");
        }

        System.Console.WriteLine("All missiles have been launched.");
    }
}

```

Main

input = 5

i = 1

j = 1

How many missiles will you fire?

I will fire: 5 missiles

3 2 1 Missile 1 has launched

3 2 1

20 of 24

```

class NestedLoopExample
{
    static void Main()
    {
        int input = 5;
        System.Console.WriteLine("How many missiles will you fire?");
        System.Console.WriteLine("I will fire: {0}", input, "missiles");

        for (int i = 0; i < input; i++) { // outer for loop
            for (int j = 3; j > 0; j--) { // inner for loop
                System.Console.WriteLine(j);
            }
            System.Console.WriteLine("Missile {0}", i+1, " has launched.");
        }

        System.Console.WriteLine("All missiles have been launched.");
    }
}

```

Main

input = 5

i = 1

How many missiles will you fire?

I will fire: 5 missiles


3 2 1 Missile 1 has launched

3 2 1

21 of 24

```

class NestedLoopExample
{
    static void Main()
    {
        int input = 5;
        System.Console.WriteLine("How many missiles will you fire?");
        System.Console.WriteLine("I will fire: {0}", input, "missiles");

        for (int i = 0; i < input; i++) { // outer for loop
            for (int j = 3; j > 0; j--) { // inner for loop
                System.Console.WriteLine(j);
            }
             System.Console.WriteLine("Missile {0}", i+1, " has launched.");
        }

        System.Console.WriteLine("All missiles have been launched.");
    }
}

```

Main

input = 5

i = 1

How many missiles will you fire?

I will fire: 5 missiles


3 2 1 Missile 1 has launched

3 2 1 Missile 2 has launched

22 of 24

```

class NestedLoopExample
{
    static void Main()
    {
        int input = 5;
        System.Console.WriteLine("How many missiles will you fire?");
        System.Console.WriteLine("I will fire: {0}", input, "missiles");

        for (int i = 0; i < input; i++) { // outer for loop
            for (int j = 3; j > 0; j--) { // inner for loop
                System.Console.WriteLine(j);
            }
             System.Console.WriteLine("Missile {0}", i+1, " has launched.");
        }

        System.Console.WriteLine("All missiles have been launched.");
    }
}

```

Main

input = 5

i = 1

How many missiles will you fire?

I will fire: 5 missiles

3 2 1 Missile 1 has launched

3 2 1 Missile 2 has launched

These iterations will continue for all values of i up till 4

23 of 24

```

class NestedLoopExample
{
    static void Main()
    {
        int input = 5;
        System.Console.WriteLine("How many missiles will you fire?");
        System.Console.WriteLine("I will fire: {0}", input, "missiles");

        for (int i = 0; i < input; i++) { // outer for loop
            for (int j = 3; j > 0; j--) { // inner for loop
                System.Console.WriteLine(j);
            }
            System.Console.WriteLine("Missile {0}", i+1, " has launched.");
        }

        → System.Console.WriteLine("All missiles have been launched.");
    }
}

```

Main

input = 5

How many missiles will you fire?

I will fire: 5 missiles

3 2 1 Missile 1 has launched

3 2 1 Missile 2 has launched

3 2 1 Missile 3 has launched

3 2 1 Missile 4 has launched

3 2 1 Missile 5 has launched

All missiles have been launched

The final result after the program has run for all values

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—

[]

Very interesting right? Now that the concept of **for** loops and *nested for* loops is clear let's look at some other interesting stuff related to loops in the next lesson.