**Nested Loops in C#: for, while, do-while**

In this article, we will learn about nested loops in C#. We'll learn to use nested for, while and do-while loops in a program.

A loop within another loop is called nested loop. This is how a nested loop looks like:

Outer-Loop

{

// body of outer-loop

Inner-Loop

{

// body of inner-loop

}

... ... ...

}

As you can see, the **outer loop** encloses the **inner loop**. The inner loop is a part of the outer loop and must start and finish within the body of outer loop.

On each iteration of outer loop, the inner loop is executed completely.

**Nested for loop**

A for loop inside another for loop is called nested for loop.

For example:

for (int i=0; i<5; i++)

{

// body of outer for loop

for (int j=0; j<5; j++)

{

// body of inner for loop

}

// body of outer for loop

}

**Example 1: Nested for Loop**

using System;

namespace Loop

{

class NestedForLoop

{

public static void Main(string[] args)

{

int outerLoop = 0, innerLoop = 0;

for (int i=1; i<=5; i++)

{

outerLoop ++;

for (int j=1; j<=5; j++)

{

innerLoop++;

}

}

Console.WriteLine("Outer Loop runs {0} times", outerLoop);

Console.WriteLine("Inner Loop runs {0} times", innerLoop);

}

}

}

When we run the program, the output will be:

Outer Loop runs 5 times

Inner Loop runs 25 times

In this program, the outer loop runs for 5 times. Each time the outer loop runs, the inner loop runs for 5 times making it run 25 times altogether.

**Example 2: Nested for Loop to Print Pattern**

using System;

namespace Loop

{

class NestedForLoop

{

public static void Main(string[] args)

{

for (int i=1; i<=5; i++)

{

for (int j=1; j<=i; j++)

{

Console.Write(j + " ");

}

Console.WriteLine();

}

}

}

}

When we run the program, the output will be:

1

1 2

1 2 3

1 2 3 4

1 2 3 4 5

**Nested while loop**

A while loop inside another while loop is called nested while loop.

For example:

while (condition-1)

{

// body of outer while loop

while (condition-2)

{

// body of inner while loop

}

// body of outer while loop

}

**Example 3: Nested while Loop**

using System;

namespace Loop

{

class NestedWhileLoop

{

public static void Main(string[] args)

{

int i=0;

while (i<2)

{

int j=0;

while (j<2)

{

Console.Write("({0},{1}) ", i,j);

j++;

}

i++;

Console.WriteLine();

}

}

}

}

When we run the program, the output will be:

(0,0) (0,1)

(1,0) (1,1)

**Nested do-while loop**

A do-while loop inside another do-while loop is called nested do-while loop.

For example:

do

{

// body of outer while loop

do

{

// body of inner while loop

} while (condition-2);

// body of outer while loop

} while (condition-1);

**Example 4: Nested do-while Loop**

using System;

namespace Loop

{

class NestedWhileLoop

{

public static void Main(string[] args)

{

int i=0;

do

{

int j=0;

do

{

Console.Write("({0},{1}) ", i,j);

j++;

} while (j<2);

i++;

Console.WriteLine();

} while (i<2);

}

}

}

When we run the program, the output will be:

(0,0) (0,1)

(1,0) (1,1)

**Different inner and outer nested loops**

It is not mandatory to nest same type of loop. We can put a for loop inside a while loop or a do-while loop inside a for loop.

**Example 5: C# Nested Loop: Different inner and outer loops**

using System;

namespace Loop

{

class NestedLoop

{

public static void Main(string[] args)

{

int i=1;

while (i<=5)

{

for (int j=1; j<=i; j++)

{

Console.Write(i + " ");

}

Console.WriteLine();

i++;

}

}

}

}

When we run the program, the output will be:

1

2 2

3 3 3

4 4 4 4

5 5 5 5 5

In the above program, a for loop is placed within a while loop. We can use different types of loop inside a loop.