Nested Loop

Get introduced to nested loops in C++.

We'll cover the following

Introduction#

Suppose you want to print the times tables of 6, 7, and 8 in a program. First, we need to choose the number whose table we want to print. Then, we print the table for that number. How can we do this task?

In C++, we can use nested loops to accomplish such tasks.

> A loop inside the body of another loop is called a **nested loop**.

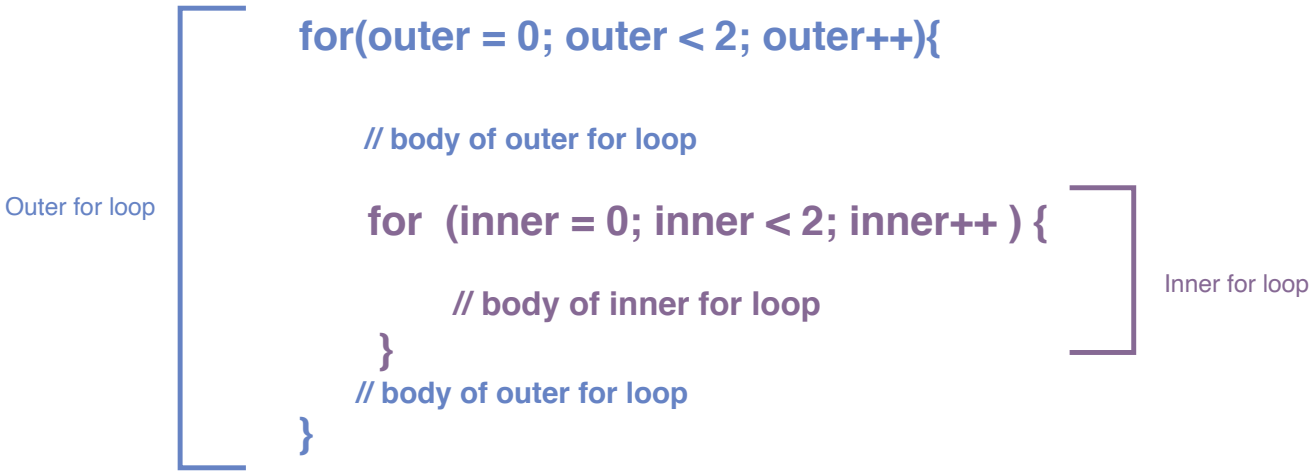
Types#

In C++, we have the following types of nested loops:

- Nested while loop
- Nested do-while loop
- Nested for loop

Syntax#

Let's go over the syntax of the nested `for` loop.



In the figure above, we have the following two `for` loops:

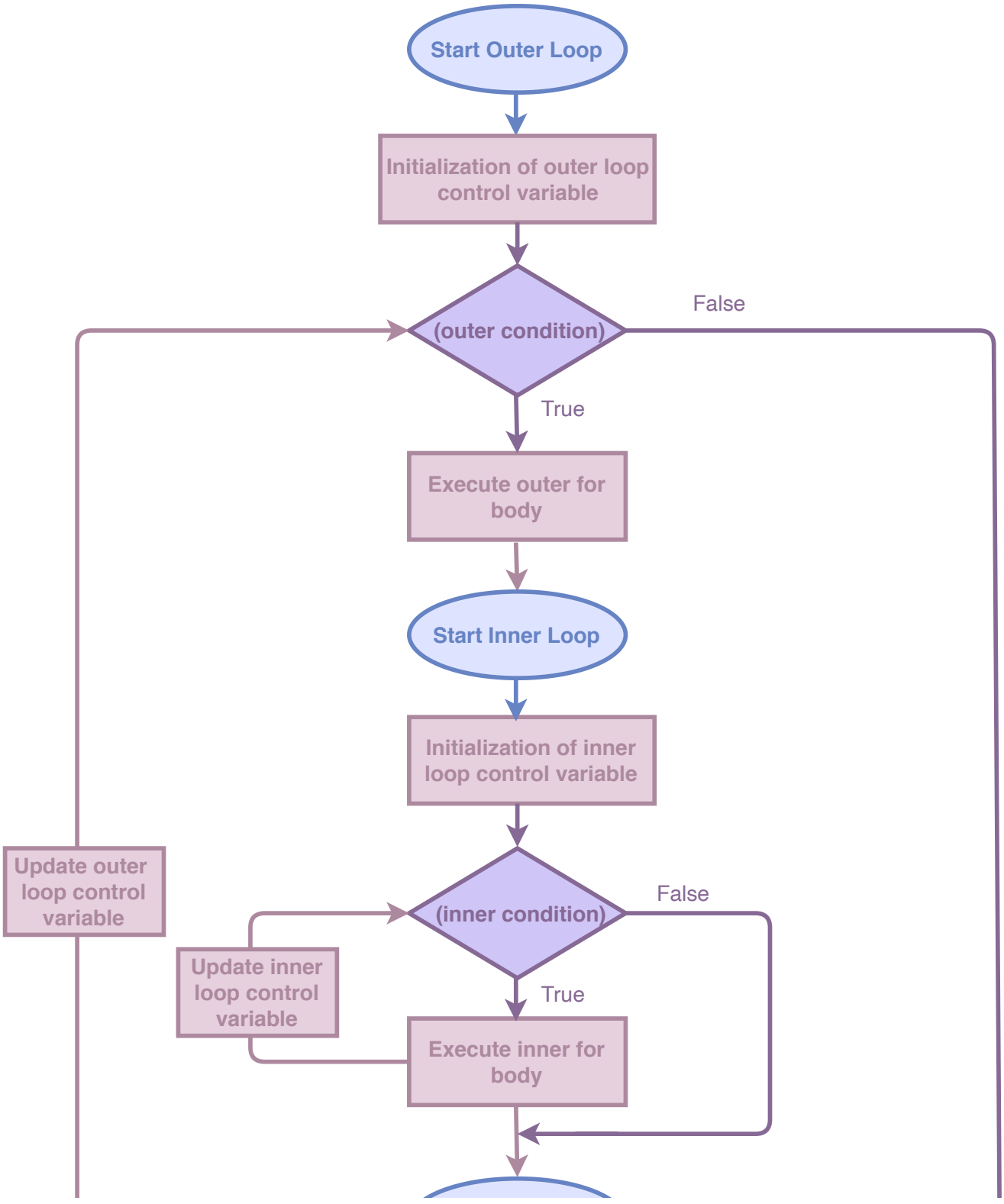
- Outer `for` loop
- Inner `for` loop

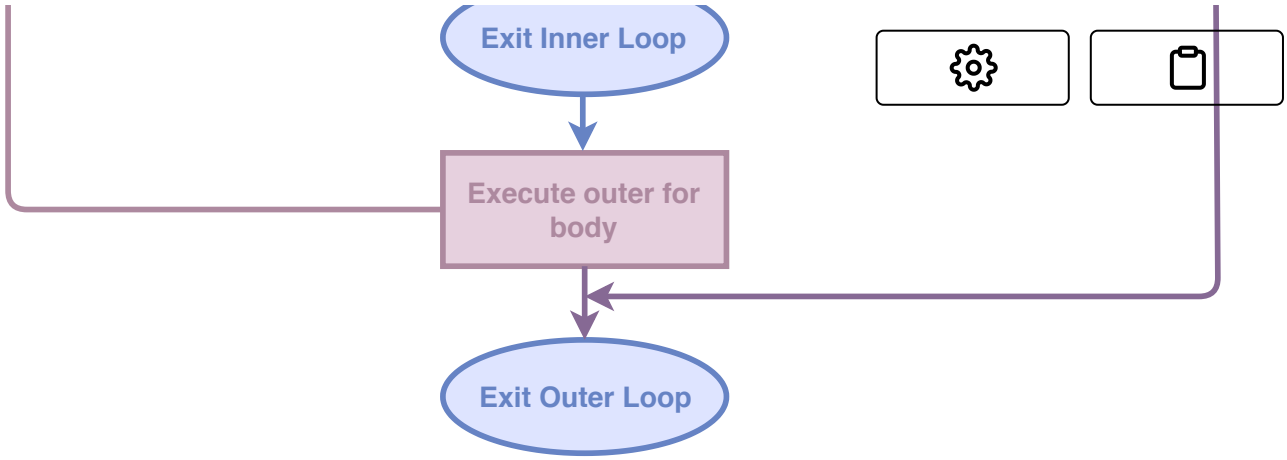
The outer `for` loop contains an inner `for` loop inside its body. We can do the same for the `while` and `do-while` loops.

> 📝 We can have multiple loops inside the body of a loop.

Flowchart#

Let's look at the flowchart of the `for` loop.





Example program#

Let's translate the example given above into a C++ program.

Press the **RUN** button and see the output!

```
#include <iostream>

using namespace std;

int main() {
  // Declares variable inner and outer
  int inner, outer;
  // Outer for loop
  for (outer = 6; outer <= 8; outer++) {
    // Outer for loop body
    cout << "Table of " << outer << " is:" << endl;
    // Inner for loop
    for (inner = 1; inner <= 5; inner++) {
      // Inner for loop body
      cout << outer << " * " << inner << " = " << (outer * inner) << endl;
    }
    // Exit inner for loop
  }
  // Exit outer for loop
  return 0;
}
```

```
Output                                                    1.3s
 7 * 3 = 21
 7 * 4 = 28
 7 * 5 = 35
 Table of 8 is:
 8 * 1 = 8
 8 * 2 = 16
 8 * 3 = 24
 8 * 4 = 32
 8 * 5 = 40
```

Explanation#

In the nested `for` loop, for the single value of the `outer` variable, the inner loop iterates over all its values. For example, for `outer = 6`, the inner loop runs from `inner = 1` to `inner = 5`. After this is done, `outer` is incremented to `7`, and the inner loop iterates over all its values again. This process continues until the value of the `outer` is less than or equal to `8`.

Line No. 7: Declares `inner` and `outer` variables.

Line No. 9: Defines an outer `for` loop that takes the values from `6 to 8`.

- **`outer = 6:`** The initial value of the `outer` is set to `6`.
- **`outer <= 8:`** If the loop condition evaluates to true, it executes the statements from **Lines No. 10 to 18**.
- **`outer++:`** After executing the loop block, it will jump back to **line No. 9**. At this point, it will increment the value of the `outer` by `1` and again evaluate the condition.

Line No. 11: Prints the value of `outer` to the console.

Line No. 13: Defines an inner `for` loop that takes the values from `1` to `5`

- **`inner = 1:`** The initial value of the `inner` is set to `1`.
- **`inner <= 5:`** If the loop condition evaluates to true, it executes the statements from **lines No. 14 to 16**.
- **`inner++:`** After executing the loop block, it jumps back to **Line No. 13**. At this point, it increments the value of the `inner` by `1` and evaluates the condition again.

Line No 15: Multiplies the value of `outer` by `inner` and display it on the screen.

That's all you needed to know about nested loops in C++. Let's discuss the `break` statement in the upcoming lesson.

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break Statement

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