

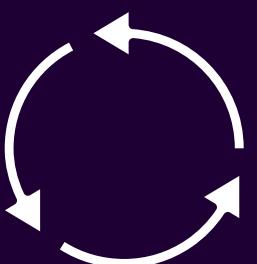
C++

Loops Nested Loop Pattern

Content

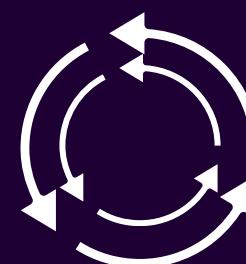
01

LOOPS



02

NESTED LOOP



03

PATTERN

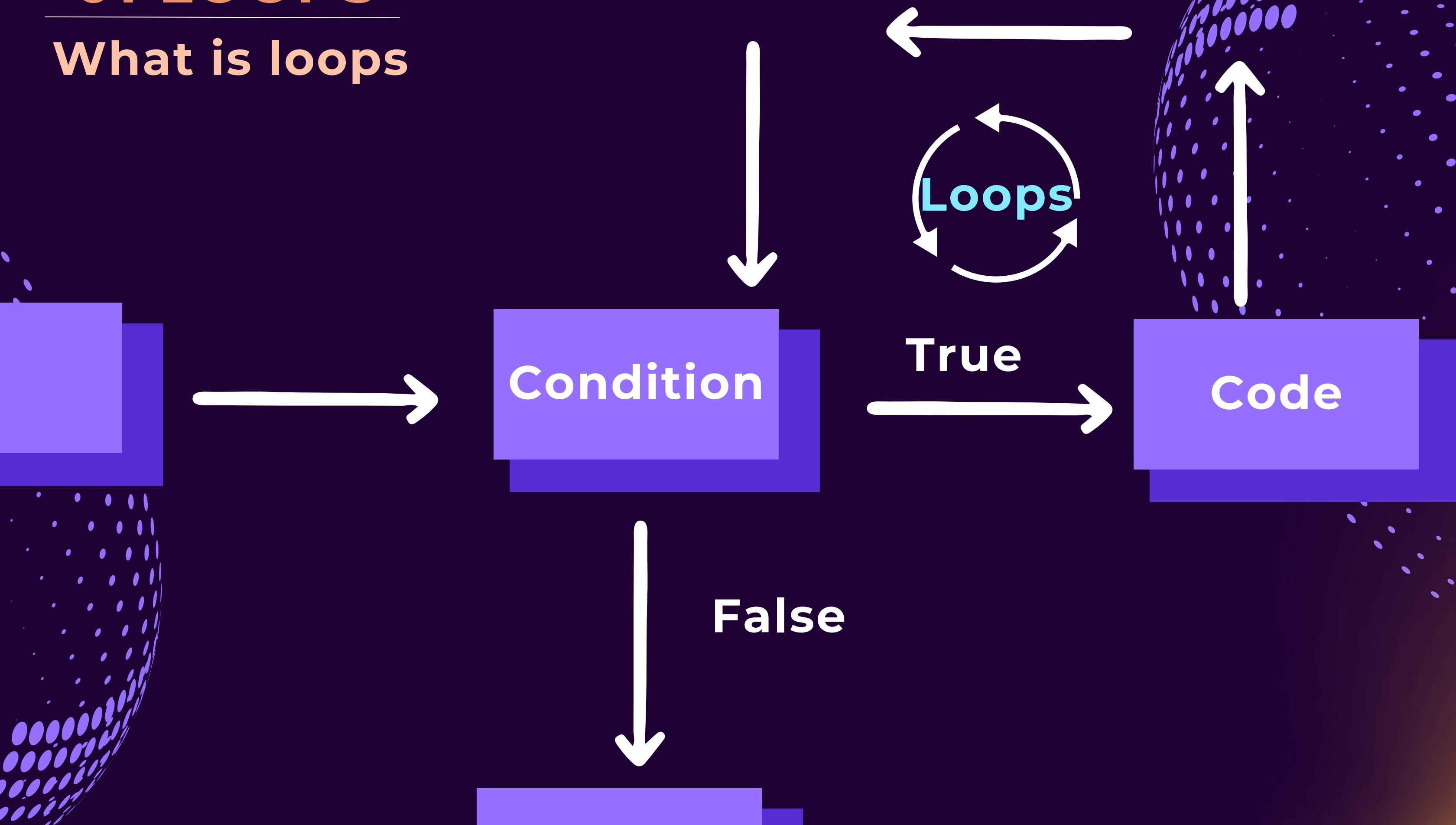


01

LOOPS

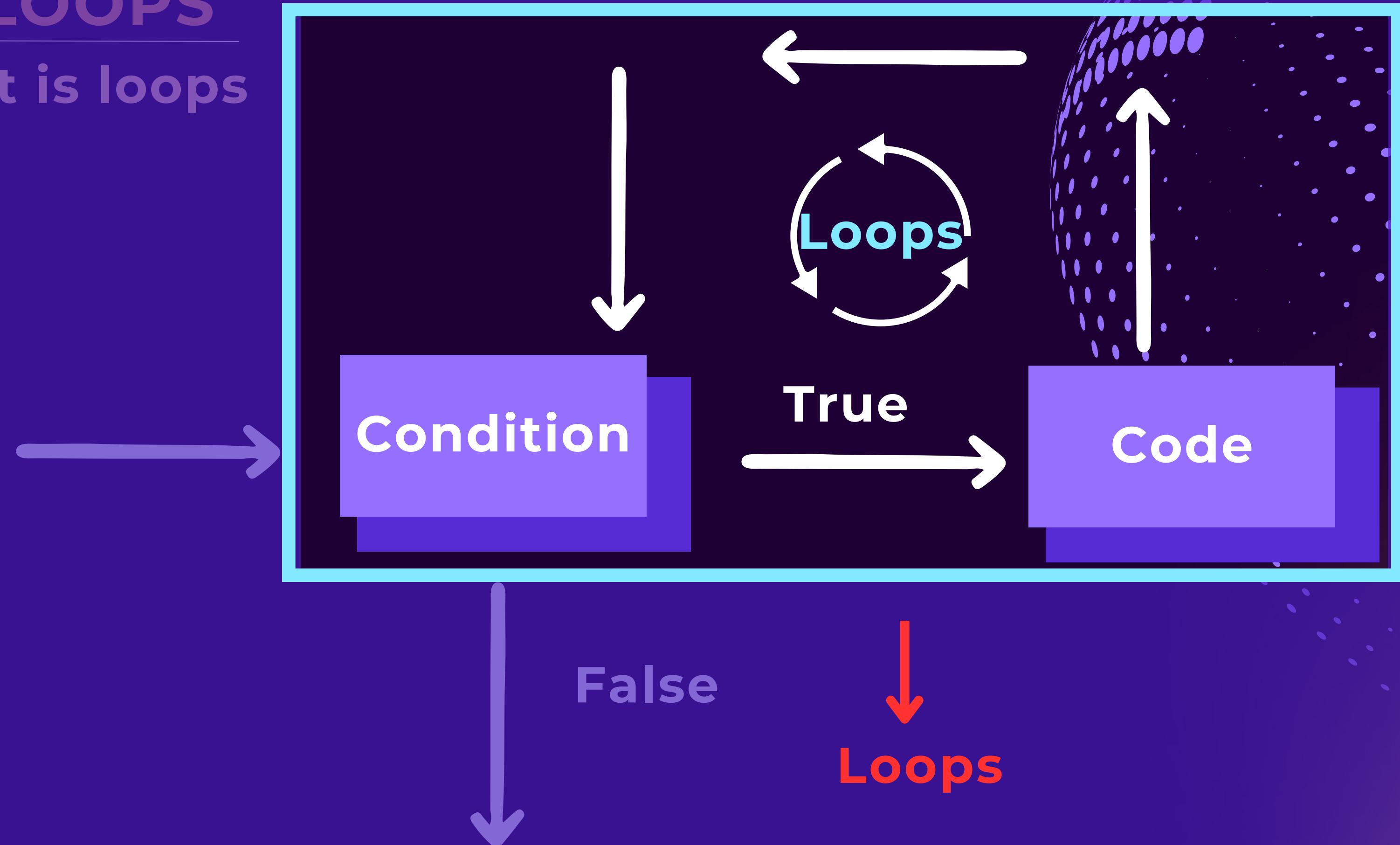
01 LOOPS

What is loops



01 LOOPS

What is loops



01 LOOPS

Type

While

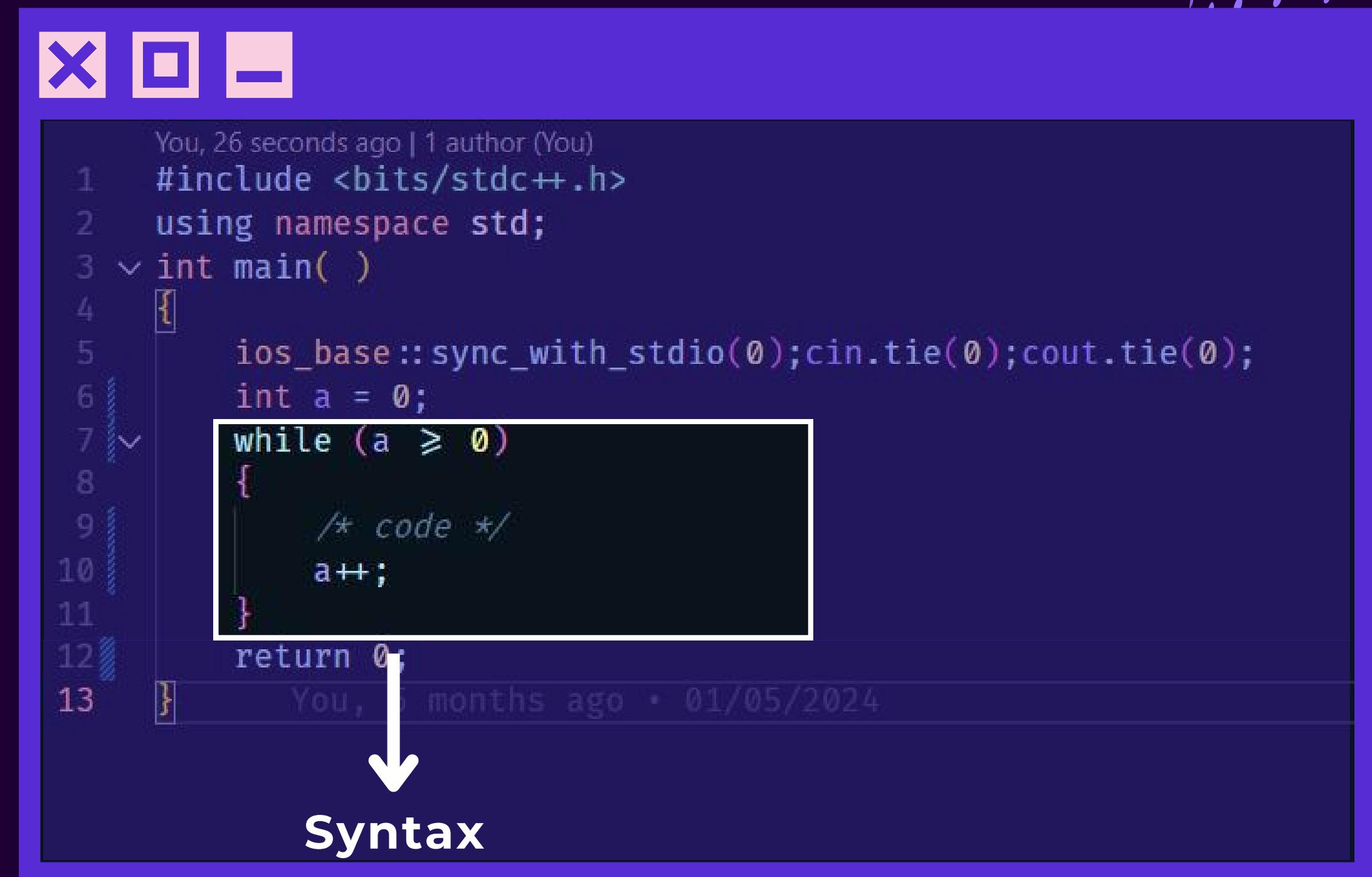
Loop ไม่รู้จุดจบ

For

Loop รู้จุดจบ

01 LOOPS

While Syntax



The image shows a screenshot of a code editor with a dark theme. At the top left are three icons: a red X, a blue square, and a green minus sign. Below them is a status bar with the text "You, 26 seconds ago | 1 author (You)". The main area contains the following C++ code:

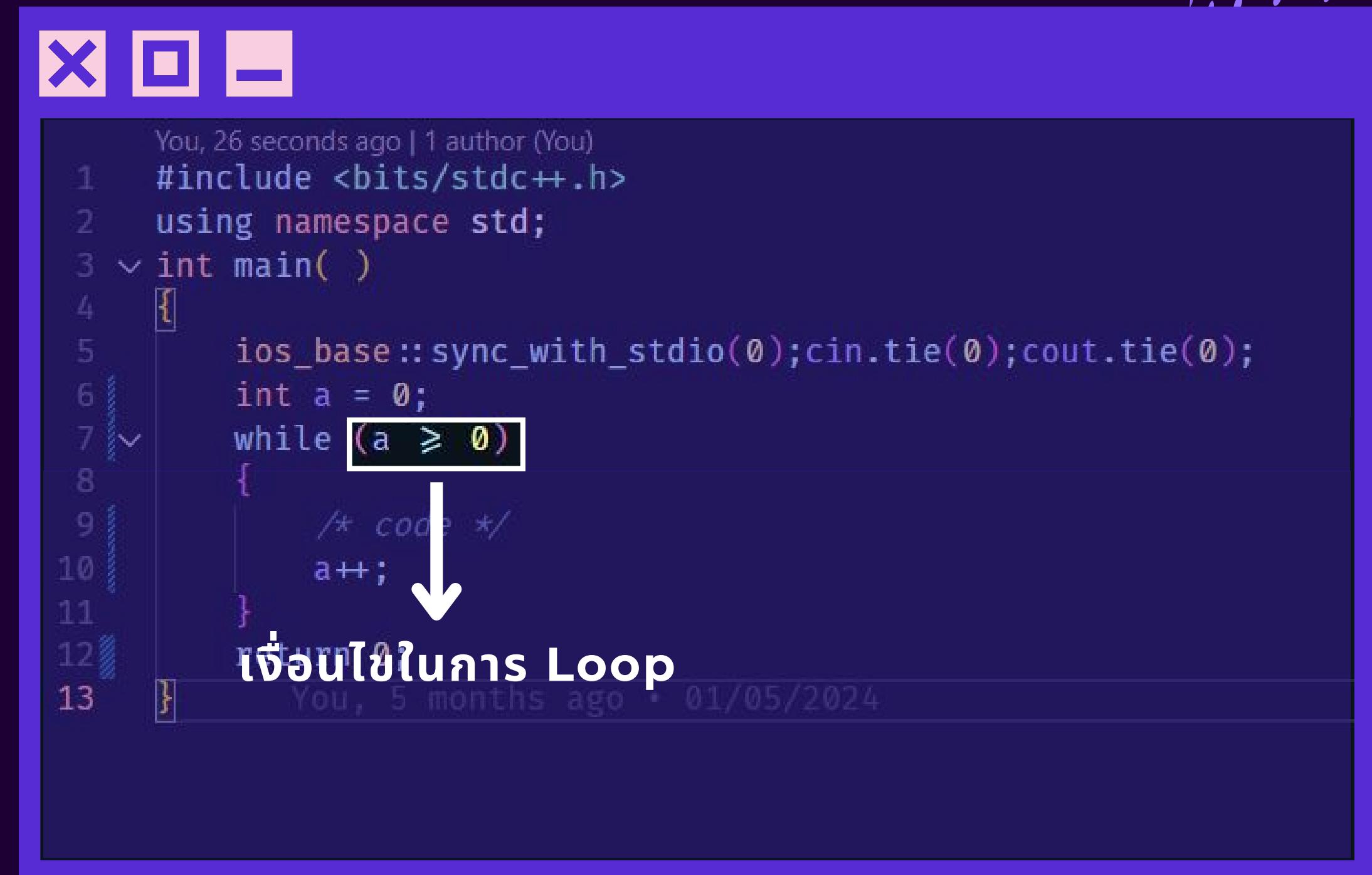
```
You, 26 seconds ago | 1 author (You)
1 #include <bits/stdc++.h>
2 using namespace std;
3 ~ int main( )
4 {
5     ios_base::sync_with_stdio(0);cin.tie(0);cout.tie(0);
6     int a = 0;
7     ~ while (a ≥ 0)
8     {
9         /* code */
10        a++;
11    }
12    return 0;
13 }
```

At the bottom of the code editor, there is a timestamp "You, 6 months ago • 01/05/2024". A large white arrow points downwards from the word "Syntax" at the bottom center to the "while" keyword in the code.

Syntax

01 LOOPS

While Syntax



The image shows a screenshot of a code editor with a dark theme. A yellow callout box highlights the condition of a while loop. The code is as follows:

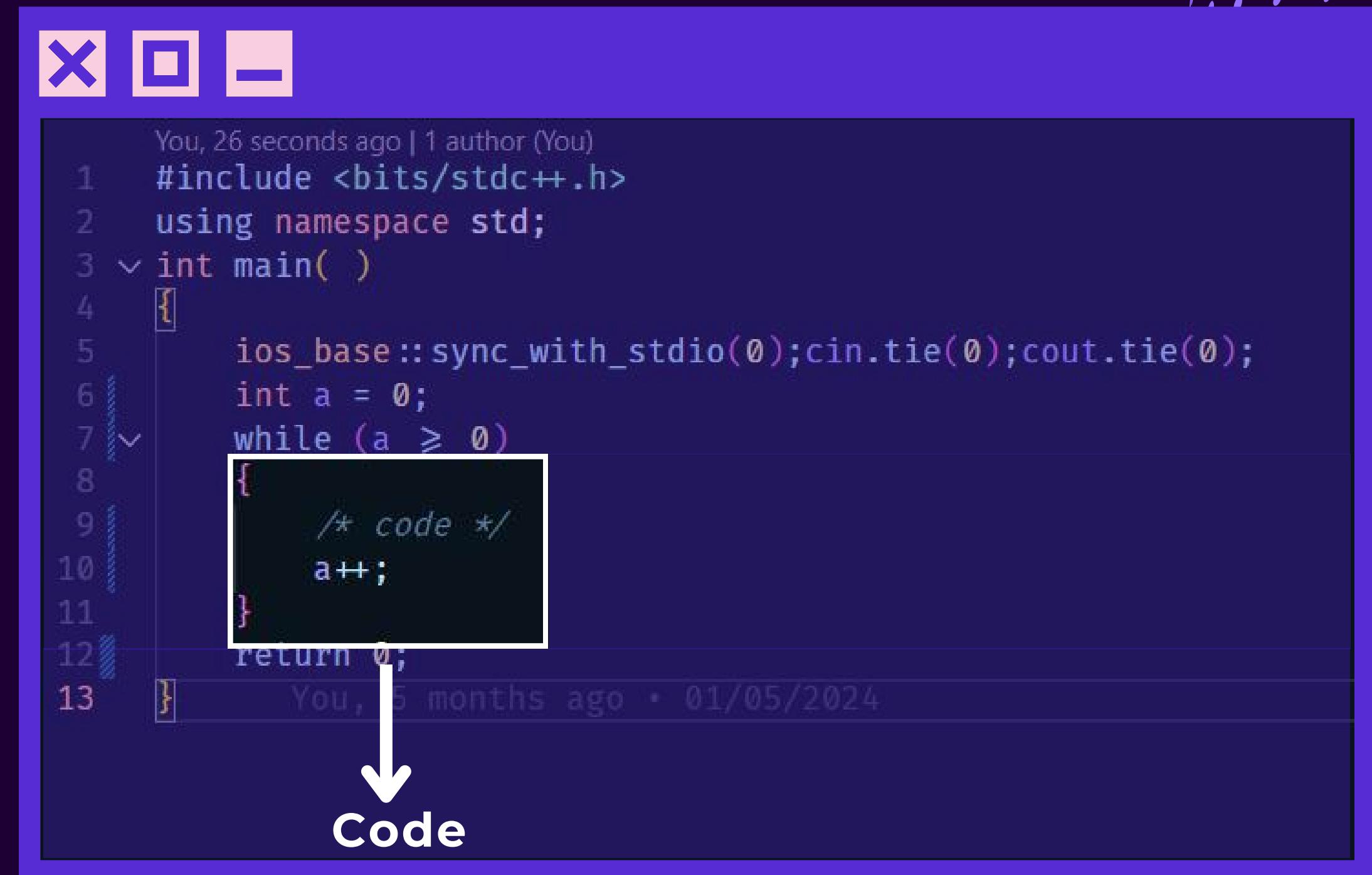
```
You, 26 seconds ago | 1 author (You)
1 #include <bits/stdc++.h>
2 using namespace std;
3 ~ int main( )
4 {
5     ios_base::sync_with_stdio(0);cin.tie(0);cout.tie(0);
6     int a = 0;
7     while (a ≥ 0)
8     {
9         /* code */
10        a++;
11    }
12 }
13 
```

A large white arrow points from the highlighted condition in line 7 down to the text "เงื่อนไขในการ Loop" (Loop Condition) in Thai.

เงื่อนไขในการ Loop

01 LOOPS

While Syntax



The screenshot shows a code editor window with a dark theme. At the top are three icons: a red X, a yellow square, and a blue minus sign. Below them is a status bar with the text "You, 26 seconds ago | 1 author (You)". The main area contains the following C++ code:

```
1 #include <bits/stdc++.h>
2 using namespace std;
3 ~ int main( )
4 {
5     ios_base::sync_with_stdio(0);cin.tie(0);cout.tie(0);
6     int a = 0;
7     while (a ≥ 0)
8     {
9         /* code */
10        a++;
11    }
12    return 0;
13 }
```

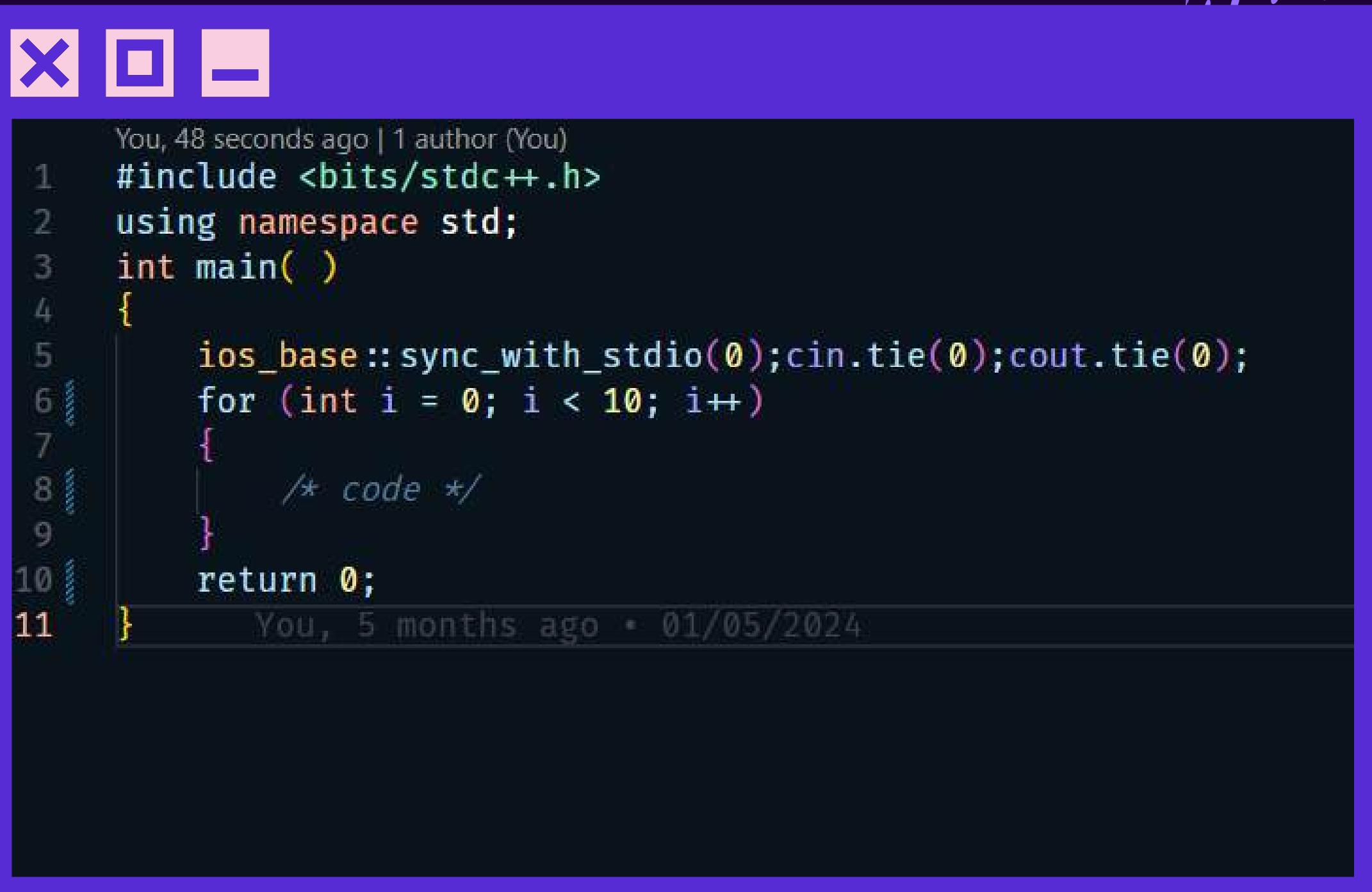
A white rectangular box highlights the code block from line 8 to line 11. A large white arrow points downwards from this highlighted area towards the word "Code" at the bottom.

You, 5 months ago • 01/05/2024

Code

01 LOOPS

For Syntax



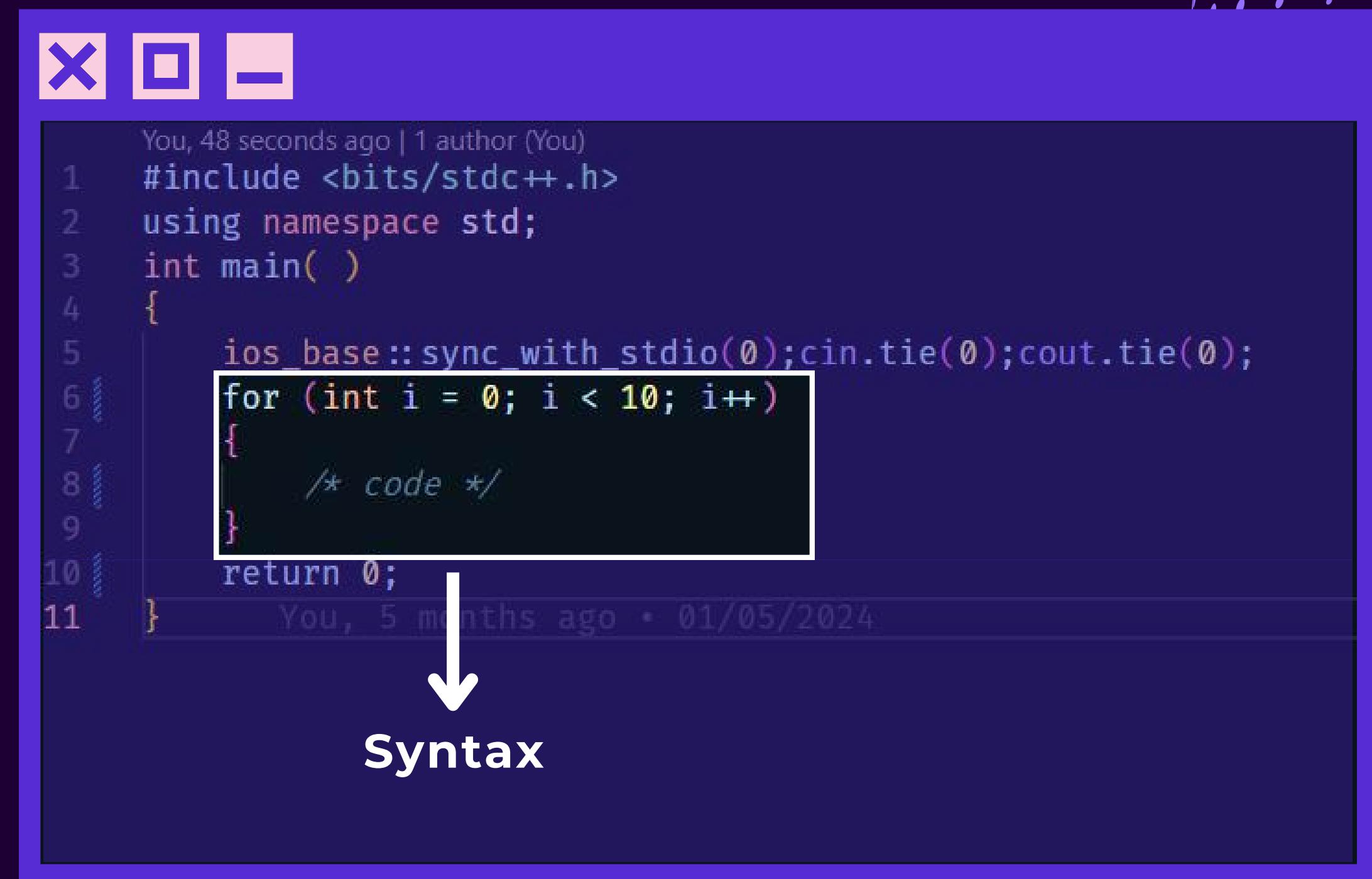
The image shows a screenshot of a code editor window. At the top left are three icons: a red X, a blue square, and a white square with a minus sign. The main area contains the following C++ code:

```
You, 48 seconds ago | 1 author (You)
1 #include <bits/stdc++.h>
2 using namespace std;
3 int main( )
4 {
5     ios_base::sync_with_stdio(0);cin.tie(0);cout.tie(0);
6     for (int i = 0; i < 10; i++)
7     {
8         /* code */
9     }
10    return 0;
11 }
```

At the bottom of the code editor, there is a status bar with the text "You, 5 months ago • 01/05/2024".

01 LOOPS

For Syntax



The image shows a screenshot of a code editor window. At the top left are three icons: a red X, a blue square, and a grey minus sign. Below them is a status bar with the text "You, 48 seconds ago | 1 author (You)". The main area contains the following C++ code:

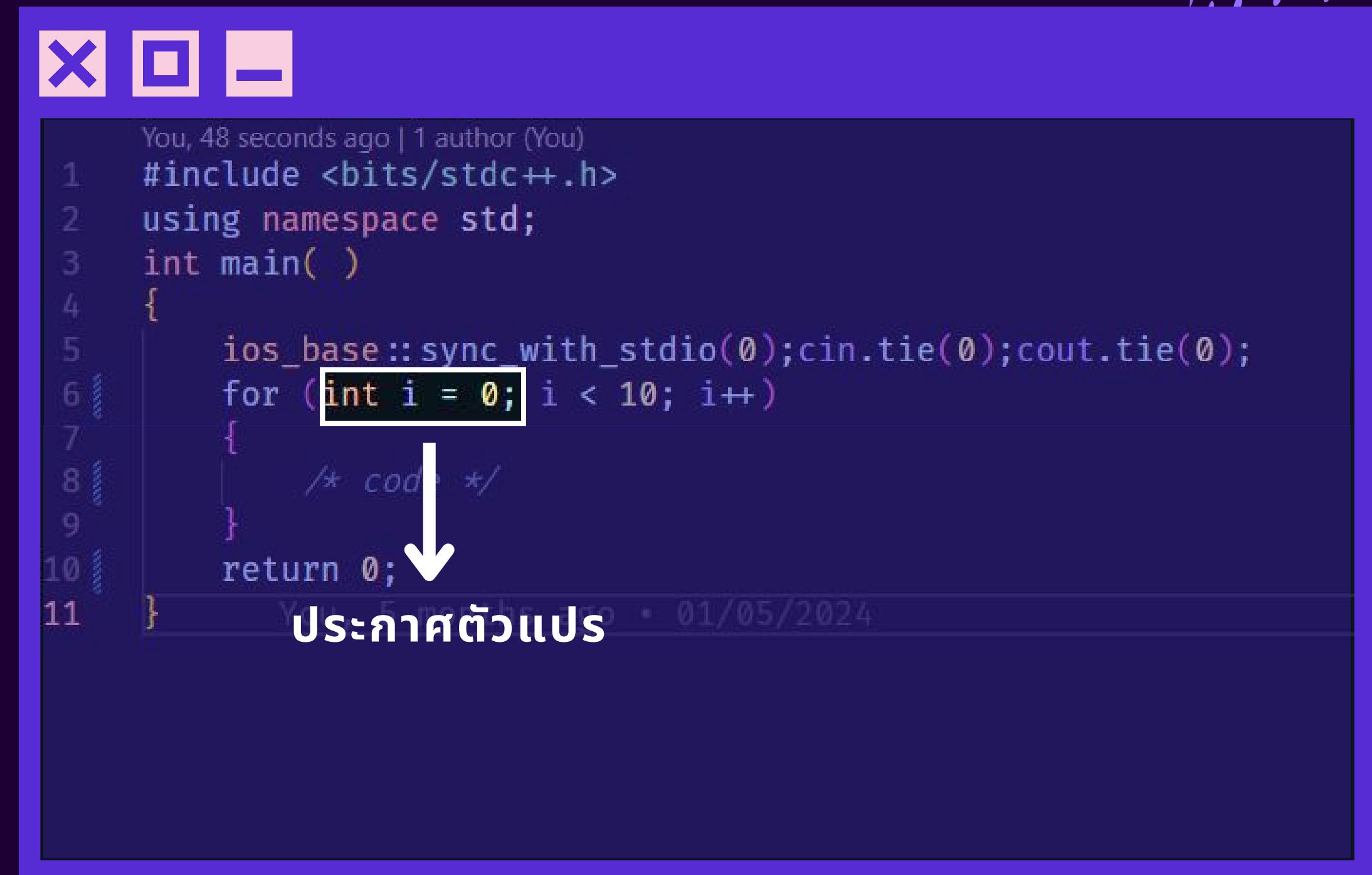
```
You, 48 seconds ago | 1 author (You)
1 #include <bits/stdc++.h>
2 using namespace std;
3 int main( )
4 {
5     ios_base::sync_with_stdio(0);cin.tie(0);cout.tie(0);
6     for (int i = 0; i < 10; i++)
7     {
8         /* code */
9     }
10    return 0;
11 }
```

At the bottom of the code editor, there is a timestamp "You, 5 months ago • 01/05/2024". A large white arrow points downwards from the code area towards the word "Syntax" at the bottom center.

Syntax

01 LOOPS

For Syntax



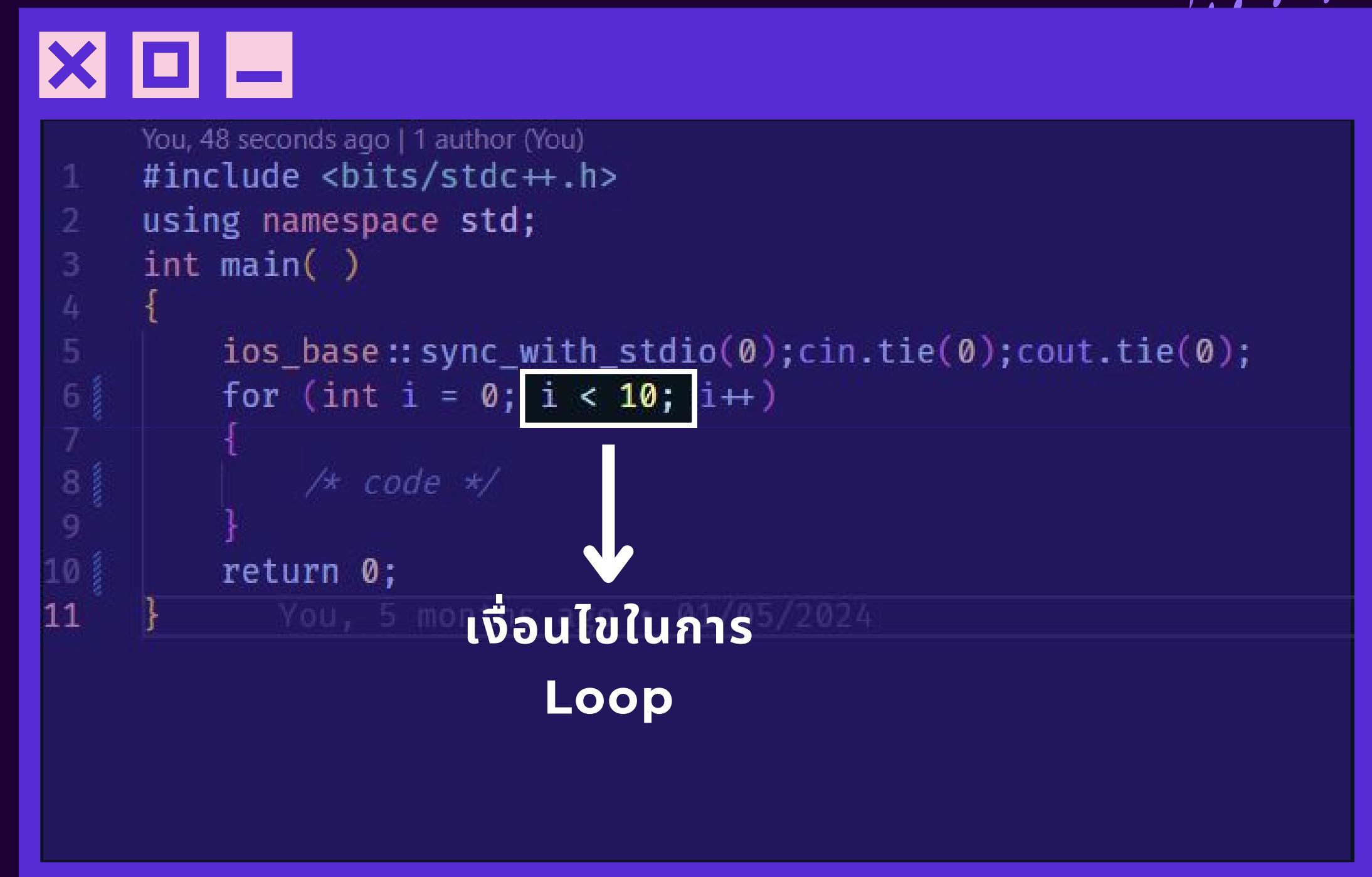
The image shows a screenshot of a code editor with a dark theme. The code is written in C++ and displays a for loop. A large white arrow points downwards from the line 'int i = 0;' to the word '_FOR' in the Thai text below.

```
You, 48 seconds ago | 1 author (You)
1 #include <bits/stdc++.h>
2 using namespace std;
3 int main( )
4 {
5     ios_base::sync_with_stdio(0);cin.tie(0);cout.tie(0);
6     for (int i = 0; i < 10; i++)
7     {
8         /* code */
9     }
10    return 0;
11 }
```

arasatwaps

01 LOOPS

For Syntax



The image shows a screenshot of a code editor with a dark theme. At the top left are three icons: a red X, a blue square, and a white square. Below them is a status bar with the text "You, 48 seconds ago | 1 author (You)". The main area contains the following C++ code:

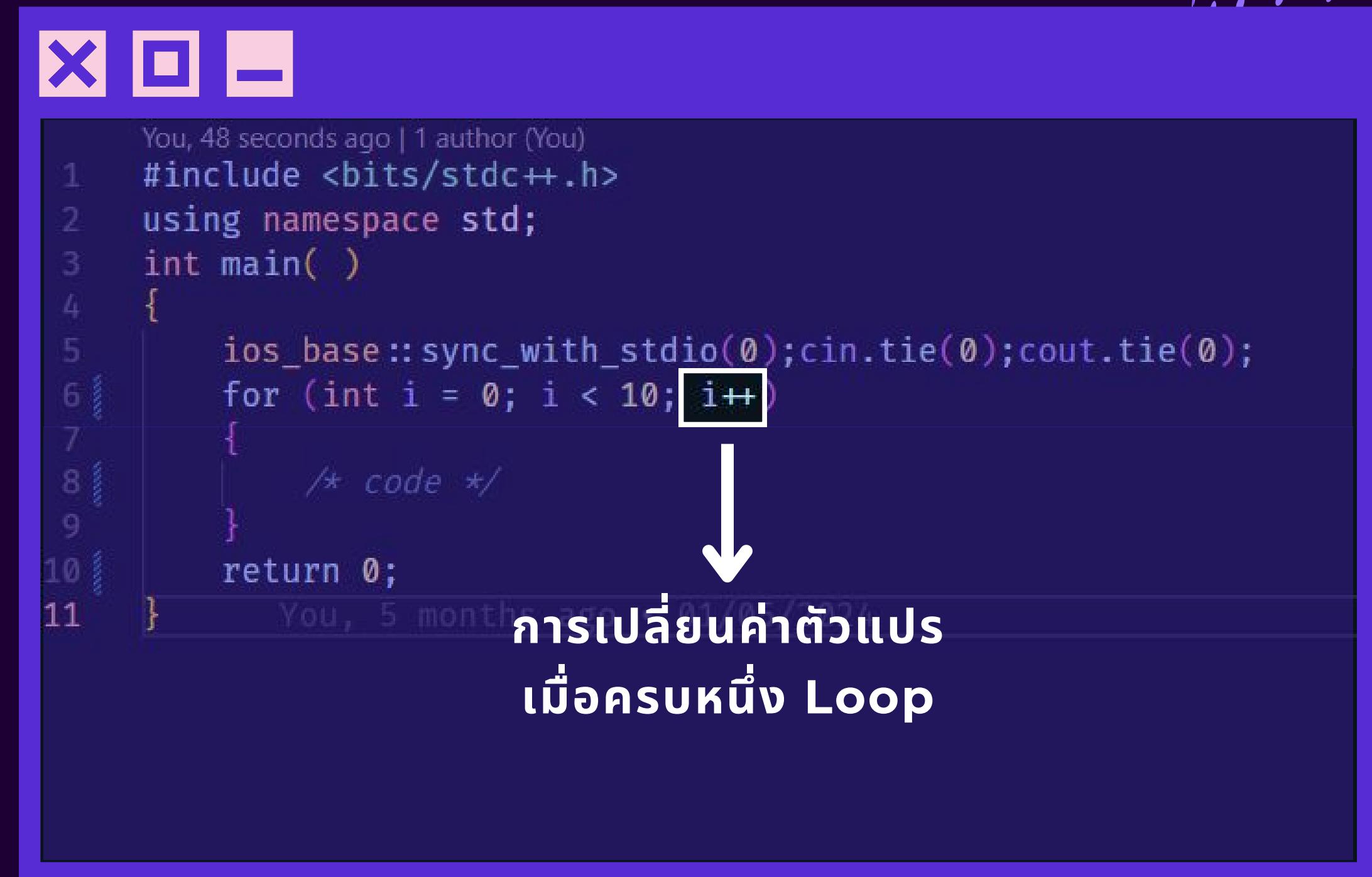
```
You, 48 seconds ago | 1 author (You)
1 #include <bits/stdc++.h>
2 using namespace std;
3 int main( )
4 {
5     ios_base::sync_with_stdio(0);cin.tie(0);cout.tie(0);
6     for (int i = 0; i < 10; i++)
7     {
8         /* code */
9     }
10    return 0;
11 }
```

A large white arrow points downwards from the line "i < 10" in the for loop to the text "เงื่อนไขในการ Loop" located below the code editor.

เงื่อนไขในการ
Loop

01 LOOPS

For Syntax



The screenshot shows a code editor window with a dark theme. At the top left are three icons: a red X, a blue square, and a green minus sign. Below them is a status bar with the text "You, 48 seconds ago | 1 author (You)". The main area contains the following C++ code:

```
You, 48 seconds ago | 1 author (You)
1 #include <bits/stdc++.h>
2 using namespace std;
3 int main( )
4 {
5     ios_base::sync_with_stdio(0);cin.tie(0);cout.tie(0);
6     for (int i = 0; i < 10; i++)
7     {
8         /* code */
9     }
10    return 0;
11 }
```

A large white arrow points downwards from the highlighted increment part of the for loop (`i++`) towards the explanatory text below.

การเปลี่ยนค่าตัวแปร
เมื่อครบหนึ่ง Loop

01 LOOPS

For Syntax



The screenshot shows a code editor window with a dark theme. At the top left are three icons: a red X, a yellow square, and a blue minus sign. The code area has a dark background with light-colored text. It displays a C++ program:

```
You, 48 seconds ago | 1 author (You)
1 #include <bits/stdc++.h>
2 using namespace std;
3 int main( )
4 {
5     ios_base::sync_with_stdio(0);cin.tie(0);cout.tie(0);
6     for (int i = 0; i < 10; i++)
7     {
8         /* code */
9     }
10    return 0;
11 }
```

A white rectangular box highlights the code block from line 7 to line 9. A large white arrow points downwards from this highlighted area towards the word "Code" at the bottom center of the image.

You, 5 months ago • 01/05/2024

Code

01 LOOPS

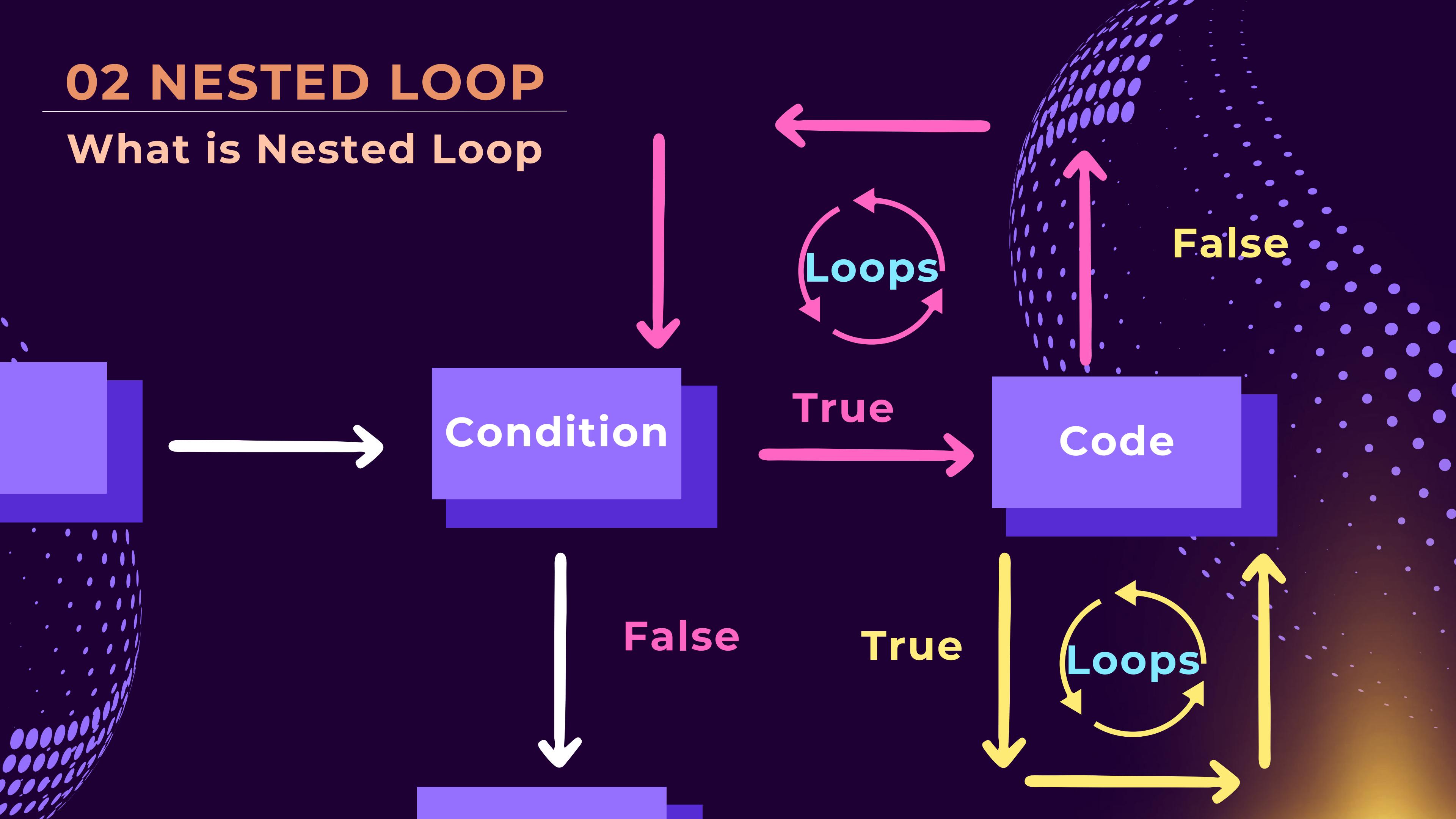
Example

02

NESTED LOOP

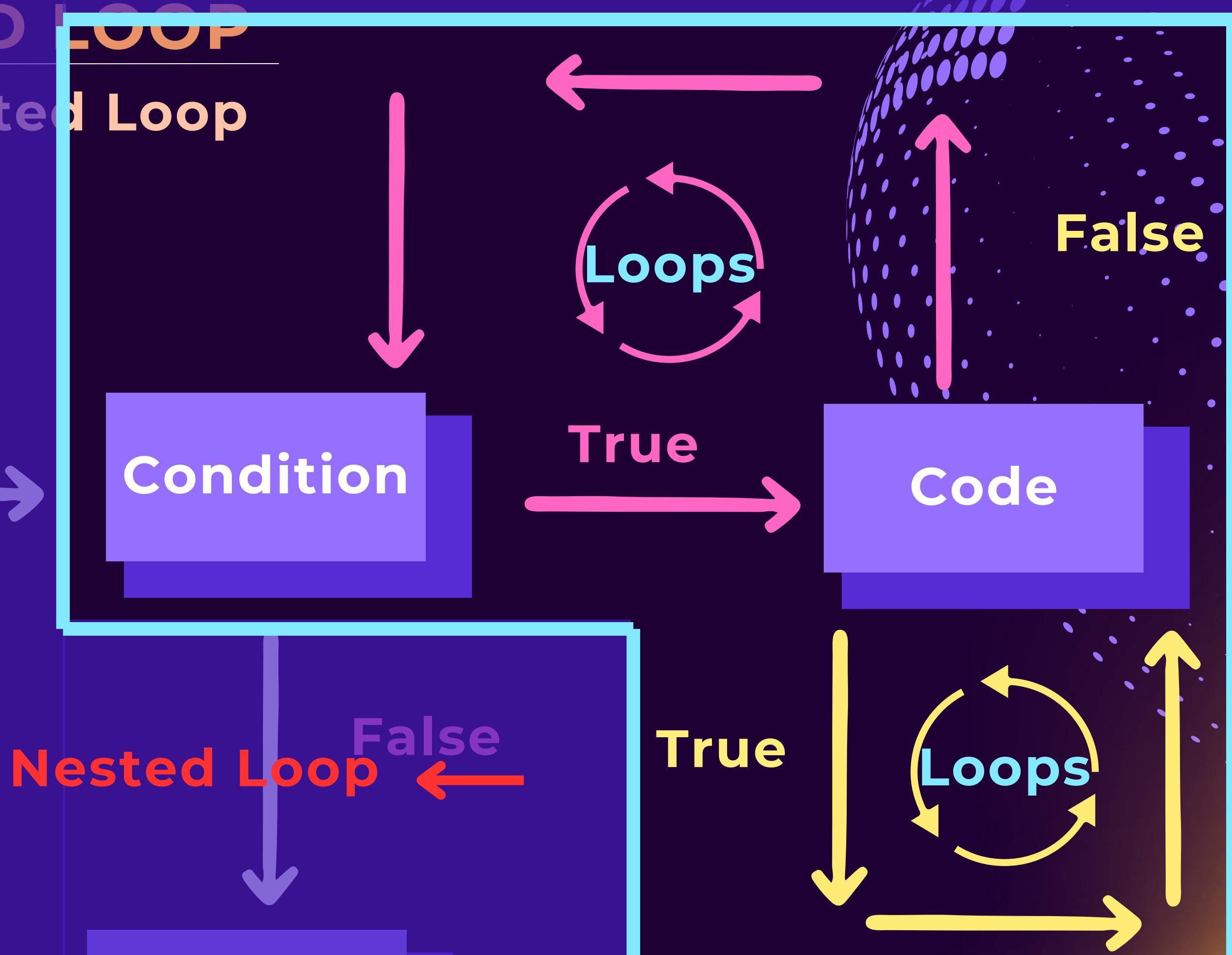
02 NESTED LOOP

What is Nested Loop



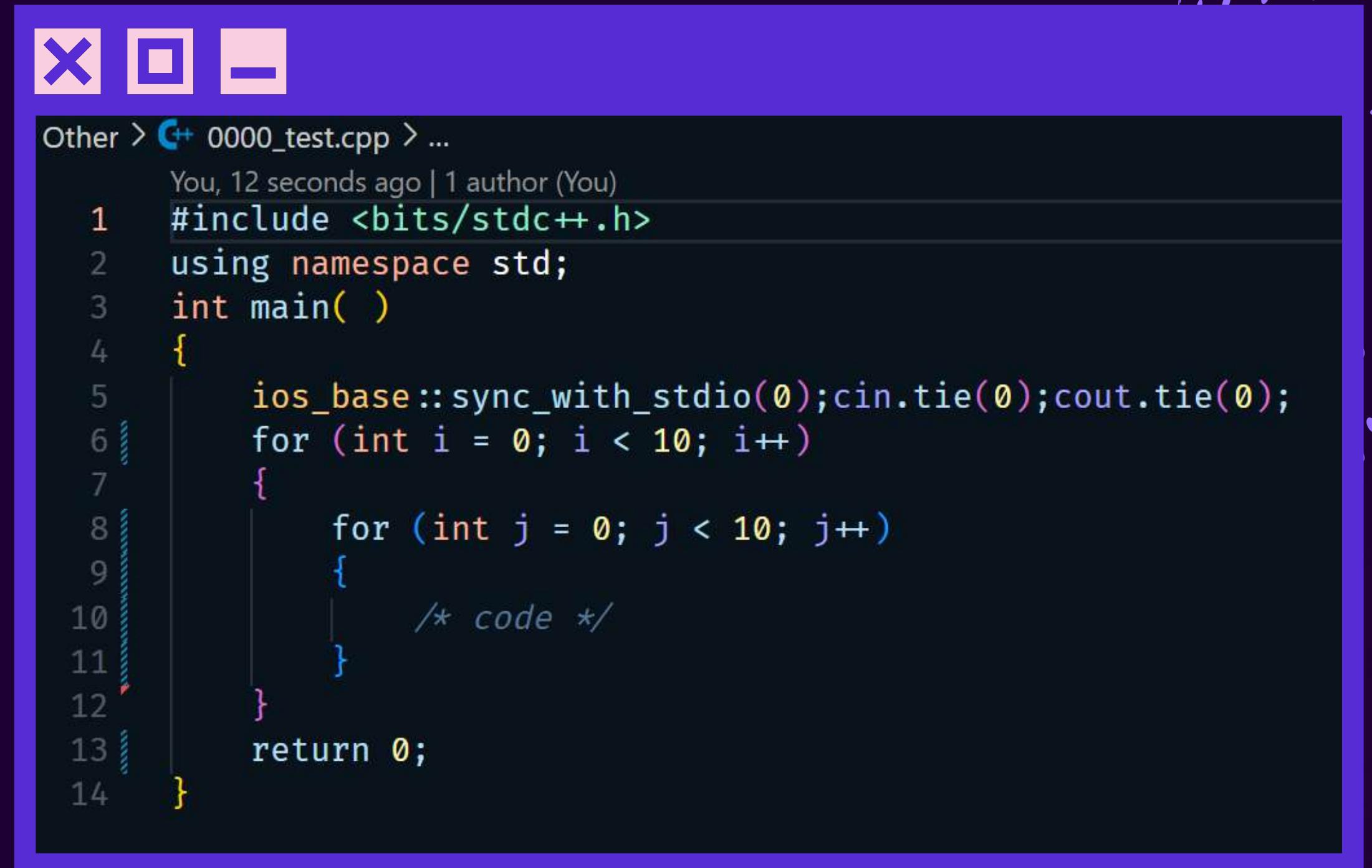
02 NESTED LOOP

What is Nested Loop



02 NESTED LOOP

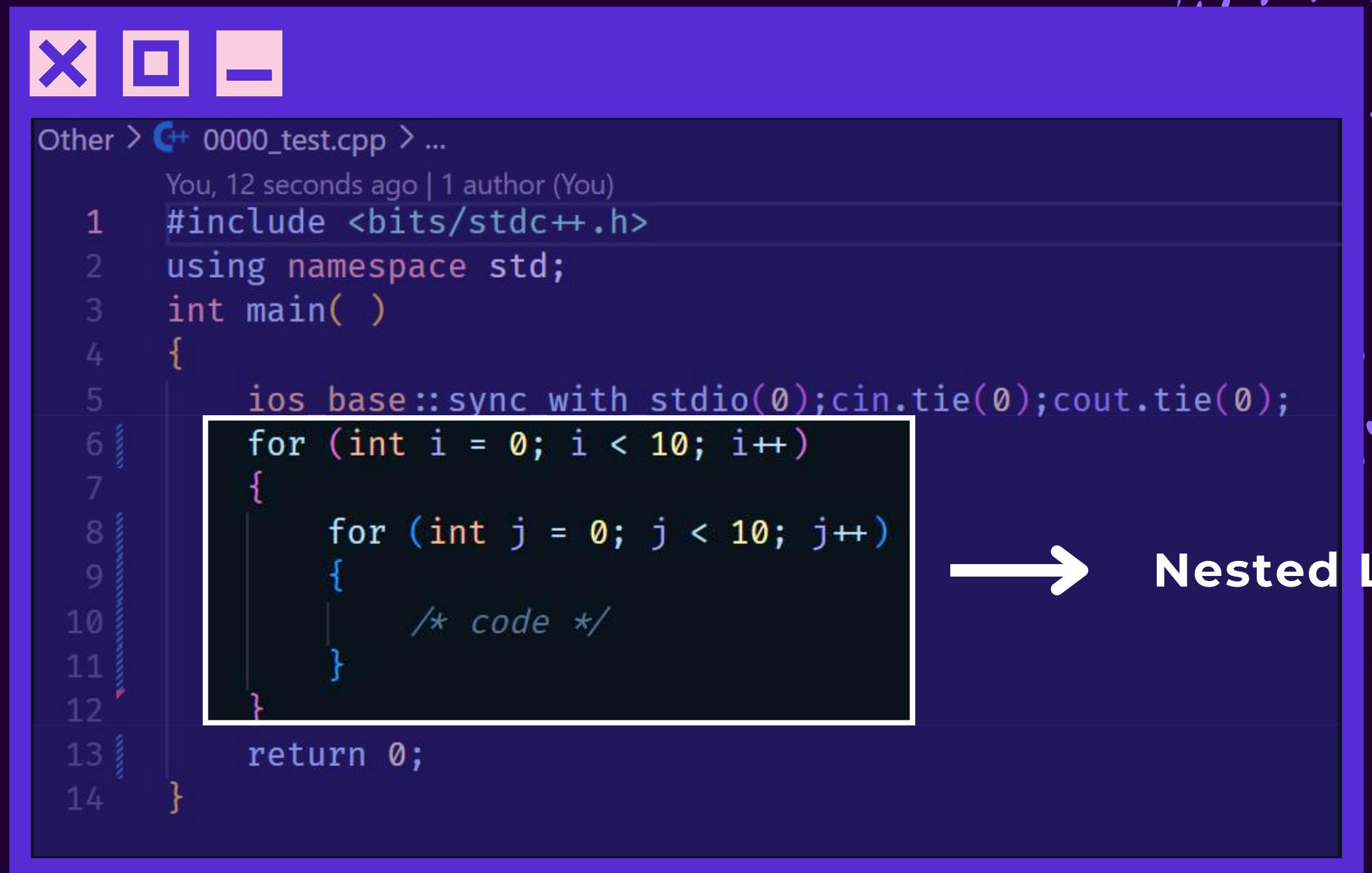
Nested Loop



```
X  □  -  
Other > C++ 0000_test.cpp > ...  
You, 12 seconds ago | 1 author (You)  
1 #include <bits/stdc++.h>  
2 using namespace std;  
3 int main( )  
4 {  
5     ios_base::sync_with_stdio(0);cin.tie(0);cout.tie(0);  
6     for (int i = 0; i < 10; i++)  
7     {  
8         for (int j = 0; j < 10; j++)  
9         {  
10            /* code */  
11        }  
12    }  
13    return 0;  
14 }
```

02 NESTED LOOP

Nested Loop



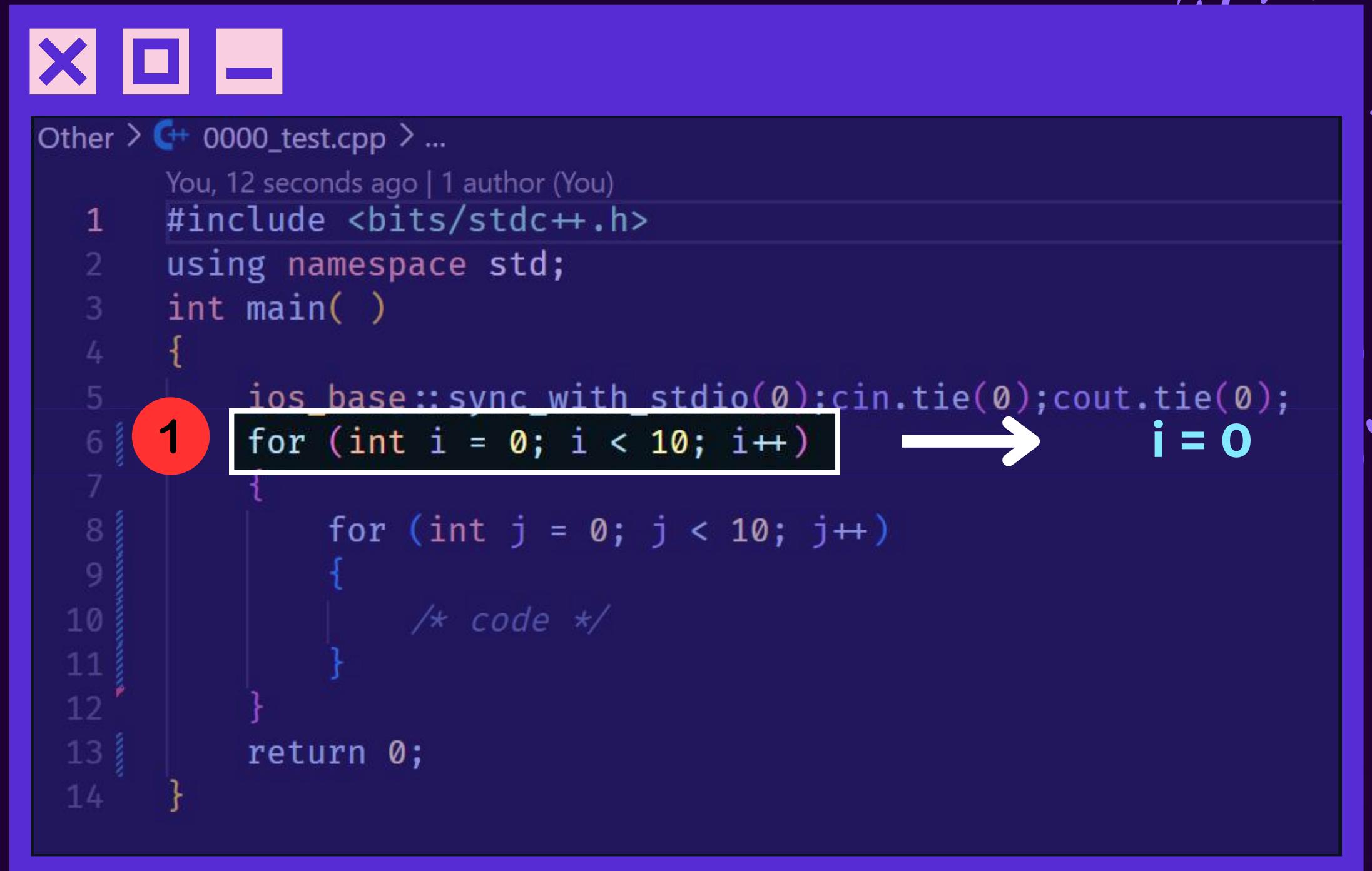
The image shows a screenshot of a code editor window. The title bar says "Other > C++ 0000_test.cpp > ...". The code is as follows:

```
You, 12 seconds ago | 1 author (You)
1 #include <bits/stdc++.h>
2 using namespace std;
3 int main( )
4 {
5     ios_base::sync_with_stdio(0);cin.tie(0);cout.tie(0);
6     for (int i = 0; i < 10; i++)
7     {
8         for (int j = 0; j < 10; j++)
9         {
10            /* code */
11        }
12    }
13    return 0;
14 }
```

A white callout box highlights the inner loop structure, starting from the opening brace of the first inner loop and ending at the closing brace of the second inner loop. To the right of the callout box is a large white arrow pointing to the right, followed by the text "Nested Loop" in white.

02 NESTED LOOP

Nested Loop



The image shows a code editor window with the following code:

```
Other > C++ 0000_test.cpp > ...
You, 12 seconds ago | 1 author (You)
1 #include <bits/stdc++.h>
2 using namespace std;
3 int main( )
4 {
5     ios_base::sync_with_stdio(0);cin.tie(0);cout.tie(0);
6     for (int i = 0; i < 10; i++)
7     {
8         for (int j = 0; j < 10; j++)
9         {
10            /* code */
11        }
12    }
13    return 0;
14 }
```

A red circle highlights the first iteration of the outer loop at line 6, where `i = 0`. An arrow points from this highlighted code to the value `i = 0`.

02 NESTED LOOP

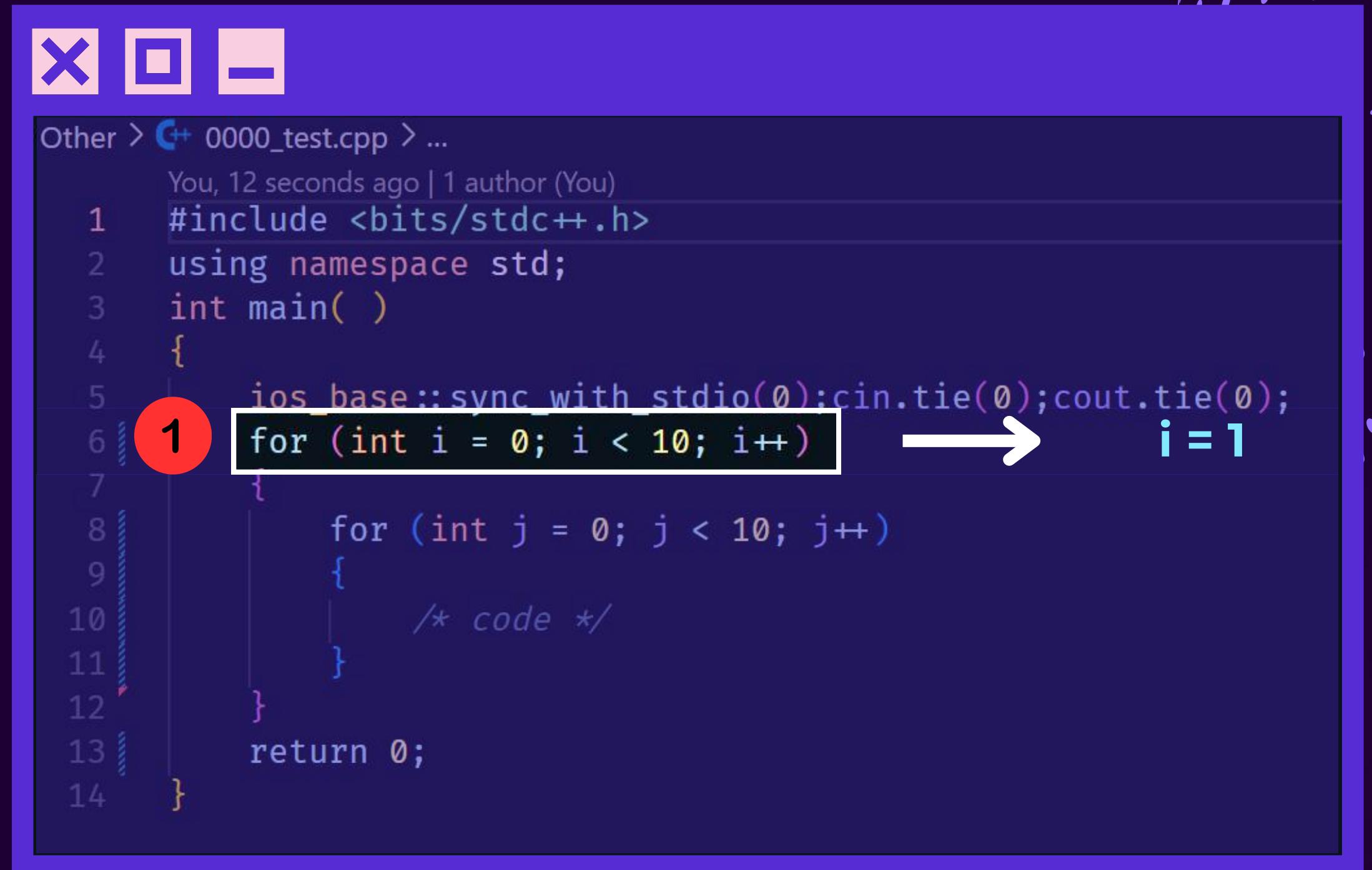
Nested Loop

```
X  □  -  
Other > C++ 0000_test.cpp > ...  
You, 12 seconds ago | 1 author (You)  
1 #include <bits/stdc++.h>  
2 using namespace std;  
3 int main( )  
4 {  
5     ios_base::sync_with_stdio(0);cin.tie(0);cout.tie(0);  
6     for (int i = 0; i < 10; i++)  
7     {  
8         for (int j = 0; j < 10; j++)  
9         {  
10            /* code */  
11        }  
12    }  
13    return 0;  
14 }
```

2 → i = 0
j = 0
j = 1
j = 2
j = 3
j = 4
j = 5
j = 6
j = 7
j = 8
j = 9

02 NESTED LOOP

Nested Loop



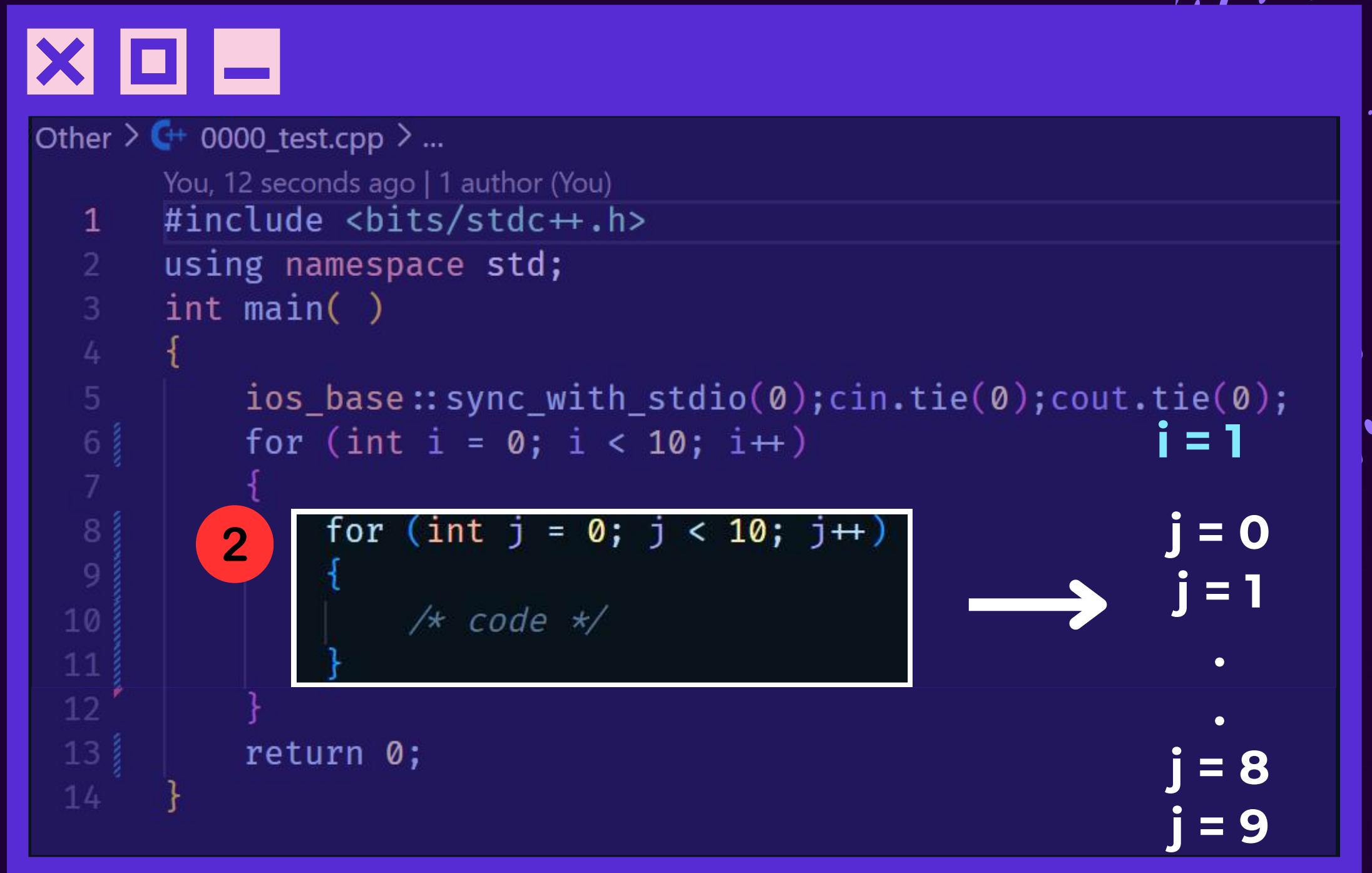
The image shows a code editor window with a dark theme. At the top left are three icons: a red X, a blue square, and a white square. Below them is the file path "Other > C++ 0000_test.cpp > ...". The date "You, 12 seconds ago | 1 author (You)" is shown above the code area. The code itself is:

```
1 #include <bits/stdc++.h>
2 using namespace std;
3 int main( )
4 {
5     ios_base::sync_with_stdio(0);cin.tie(0);cout.tie(0);
6     for (int i = 0; i < 10; i++) → i = 1
7     {
8         for (int j = 0; j < 10; j++)
9         {
10             /* code */
11         }
12     }
13     return 0;
14 }
```

A red circle highlights the number "1" on line 6. A large white arrow points from the highlighted line to the variable "i = 1".

02 NESTED LOOP

Nested Loop



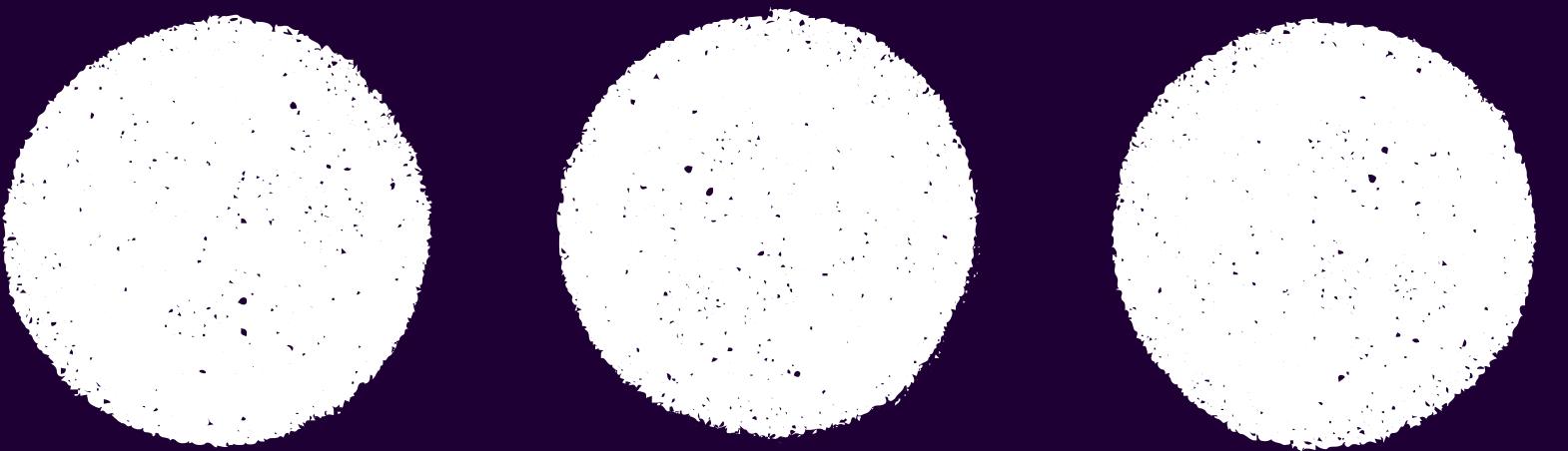
The image shows a screenshot of a code editor window. The title bar says "Other > C++ 0000_test.cpp > ...". The code is as follows:

```
You, 12 seconds ago | 1 author (You)
1 #include <bits/stdc++.h>
2 using namespace std;
3 int main( )
4 {
5     ios_base::sync_with_stdio(0);cin.tie(0);cout.tie(0);
6     for (int i = 0; i < 10; i++)           i = 1
7     {
8         for (int j = 0; j < 10; j++)       j = 0
9         {
10            /* code */
11        }
12    }
13    return 0;
14 }
```

A red circle with the number "2" is placed over the second line of the inner loop. To the right of the code, there is a large white arrow pointing to the right, followed by the values "j = 0", "j = 1", "j = 2", "j = 3", "j = 4", "j = 5", "j = 6", "j = 7", "j = 8", and "j = 9".

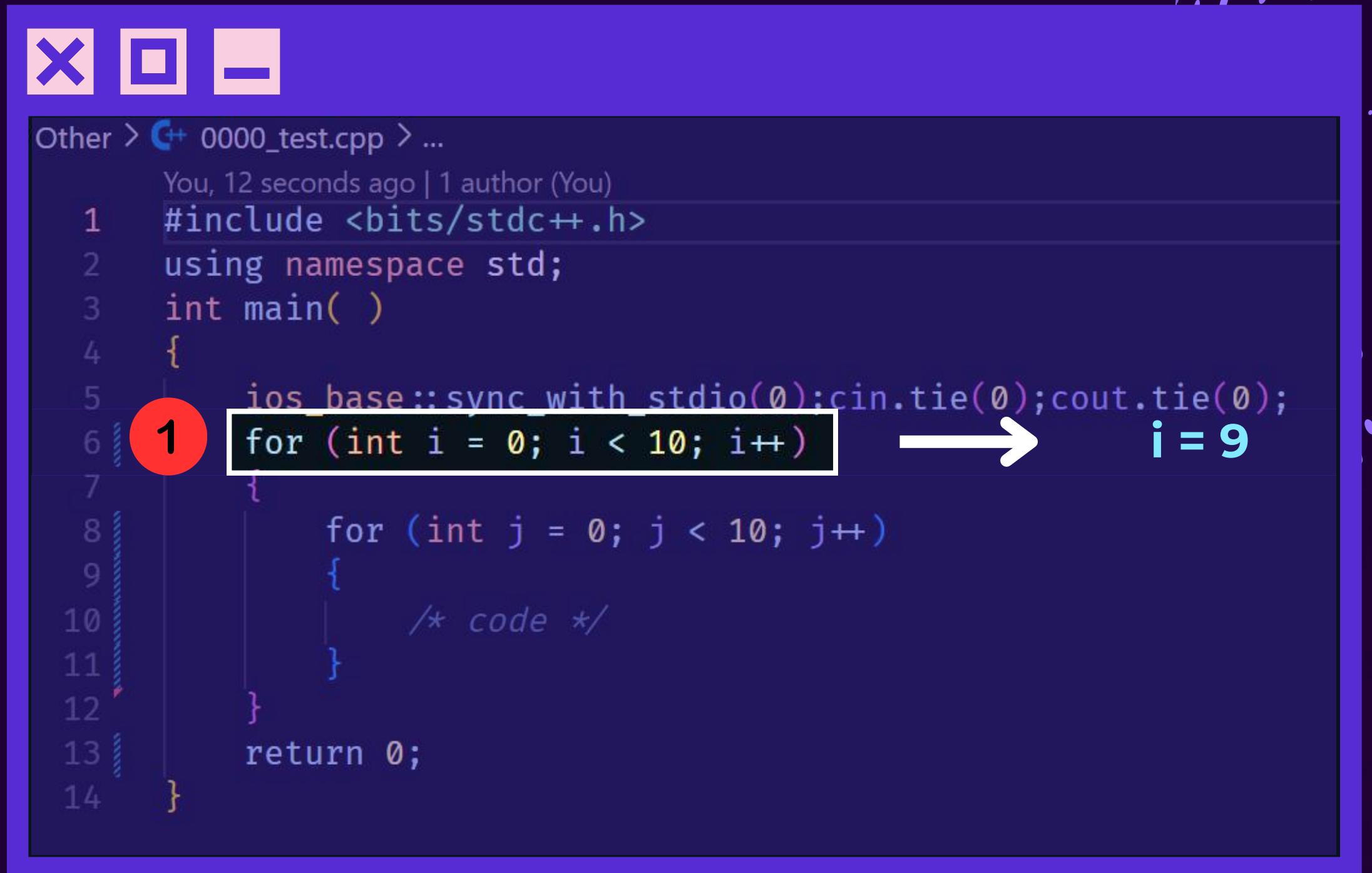
02 NESTED LOOP

Nested Loop



02 NESTED LOOP

Nested Loop



The image shows a screenshot of a code editor window. The title bar says "Other > C++ 0000_test.cpp > ...". The code is as follows:

```
You, 12 seconds ago | 1 author (You)
1 #include <bits/stdc++.h>
2 using namespace std;
3 int main( )
4 {
5     ios_base::sync_with_stdio(0);cin.tie(0);cout.tie(0);
6     for (int i = 0; i < 10; i++) → i = 9
7     {
8         for (int j = 0; j < 10; j++)
9         {
10            /* code */
11        }
12    }
13    return 0;
14 }
```

A red circle with the number "1" is placed over the first line of the outer loop. A black rectangular box highlights the line "for (int i = 0; i < 10; i++)". An arrow points from this box to the variable "i" in the line "i = 9".

02 NESTED LOOP

Nested Loop

```
Other > C++ 0000_test.cpp > ...
You, 12 seconds ago | 1 author (You)
1 #include <bits/stdc++.h>
2 using namespace std;
3 int main( )
4 {
5     ios_base::sync_with_stdio(0);cin.tie(0);cout.tie(0);
6     for (int i = 0; i < 10; i++)           i = 9
7     {
8         for (int j = 0; j < 10; j++)    j = 0
9         {
10            /* code */
11        }
12    }
13    return 0;
14 }
```

2 → j = 0
j = 1
...
j = 8
j = 9
End



The background features a dark purple gradient with a subtle halftone dot pattern. In the top right corner, there is a bright, glowing orange circular area with lens flare effects.

03

PATTERN

03 PATTERN

What is Pattern

INPUT	OUTPUT
3	* * * * * *
5	* * * * * * * * * * * * * * *
10	* *

03 PATTERN

What is Pattern

INPUT	OUTPUT
3	* 1 * * * * *
5	1 * * * * * * * * * * * * * * *
10	* *

03 PATTERN

What is Pattern

INPUT	OUTPUT
3	* * * 2 * * *
5	2 * * * * * * * * * * * * * * *
10	* *

03 PATTERN

What is Pattern

INPUT	OUTPUT
3	* * * * 3 * * *
5	3 * * * * * * * * * * * *
10	* *

03 PATTERN

What is Pattern

INPUT	OUTPUT
3	<p style="text-align: center;">* * * * * *</p> <p style="text-align: right; color: red;">1 2 3</p>
5	<p style="text-align: center;">* * * * * * * * * * * * * *</p> <p style="text-align: right; color: red;">1 2 3</p>
10	<p style="text-align: center;">* *</p>

03 PATTERN

What is Pattern

INPUT	OUTPUT
3	* * * * * *
5	* * * * * * * * * * * * * * *
10	1 2 3 4 5 *

03 PATTERN

What is Pattern

INPUT	OUTPUT	
3	* * * * * *	
5	* * * * * * * * * * * * * * *	
10	* *	1 2 3 4 5 6 7 8 9 10

03 PATTERN

Way to solve

Normal

ກຳທີລະບຸສົກຫຼັດ

Graph

ໃຊ້ if ມາຫົວຍ

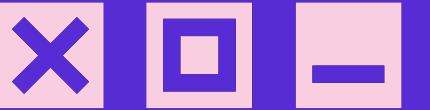
03 PATTERN

Example

INPUT	OUTPUT
3	* * * * * *
5	* * * * * * * * * * * * * * *
10	* *

03 PATTERN

Normal Way



```
2  using namespace std;
3  int main( )
4  {
5      ios_base::sync_with_stdio(0);cin.tie(0);cout.tie(0);
6      int n;
7      cin >> n;
8      for (int i = 0; i < n; i++)
9      {
10         for (int j = n; j > i+1; j--)
11         {
12             cout << " ";
13         }
14         for (int j = 0; j <= 2*i; j++)
15         {
16             if (j % 2 == 0)
17             {
18                 cout << "*";
19             }
20             else
21             {
22                 cout << " ";
23             }
24         }
25         cout << "\n";
26     }
27     return 0;
```

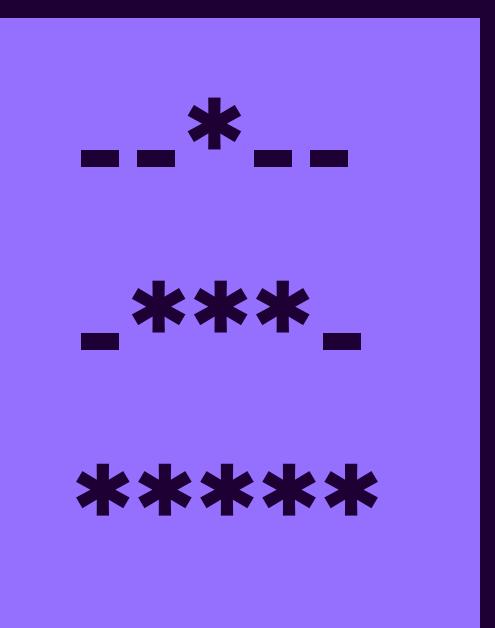
03 PATTERN

Graph Way

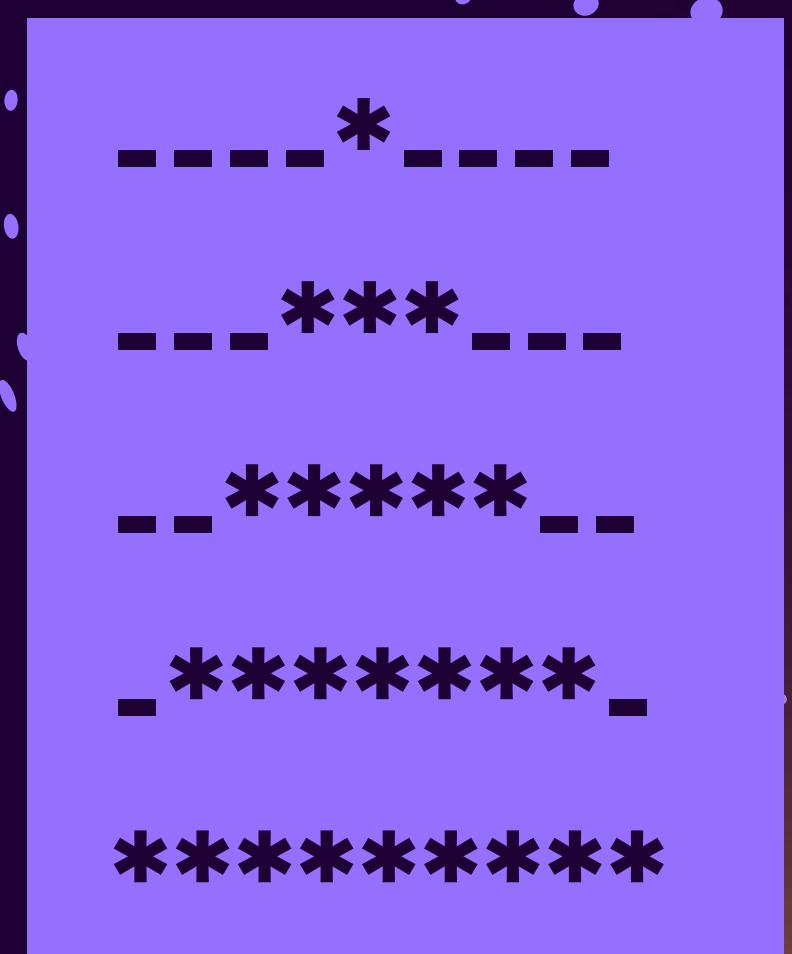
1



3

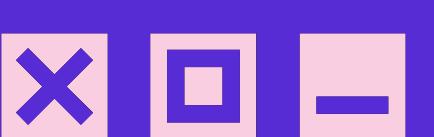


5



03 PATTERN

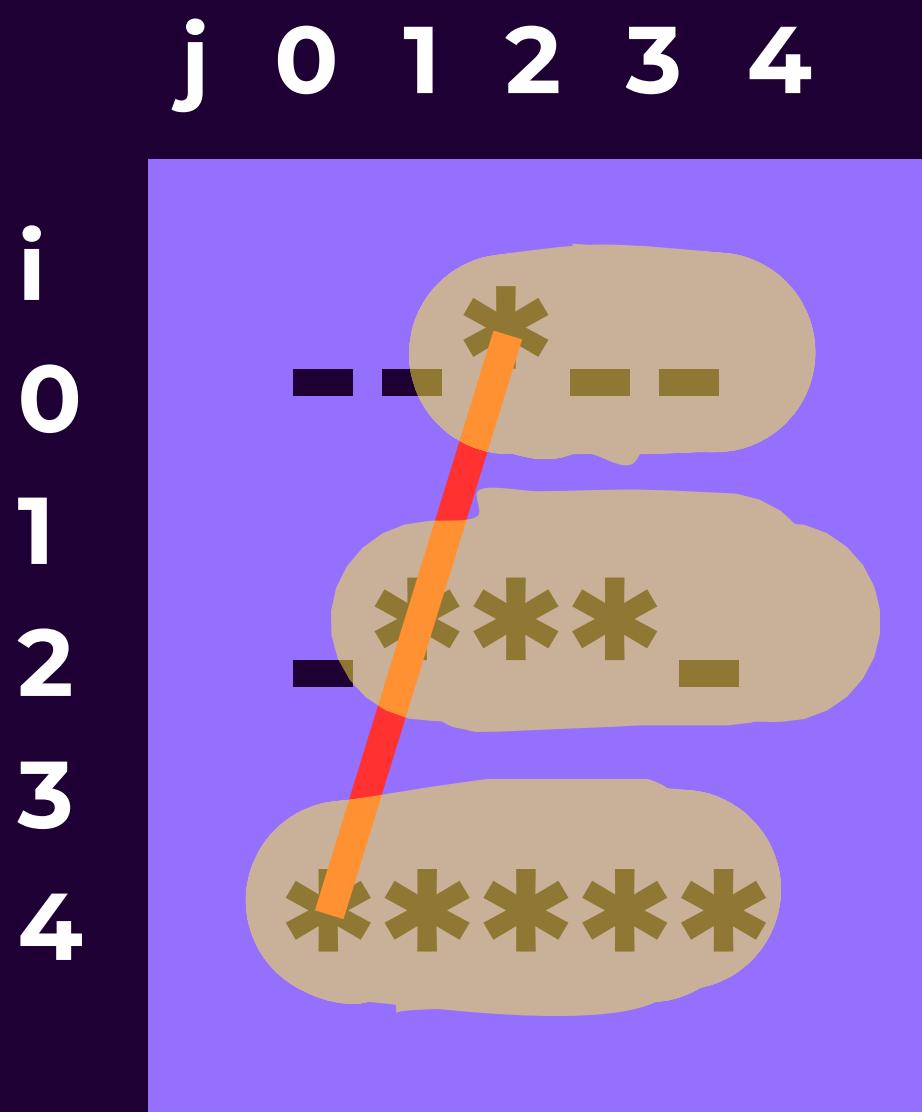
Graph Way



```
1 #include <bits/stdc++.h>
2 using namespace std;
3 int main( )
4 {
5     ios_base::sync_with_stdio(0);cin.tie(0);cout.tie(0);
6     int n;
7     cin >> n;
8     for (int i = 0; i < n; i++)
9     {
10         for (int j = 0; j < 2*n-1; j++)
11         {
12             if (i+j ≥ n-1 && abs(i-j) ≤ n-1)
13             {
14                 cout << "*";
15             }
16             else
17             {
18                 cout << "-";
19             }
20         }
21         cout << "\n";
22     }
23     return 0;
24 }
```

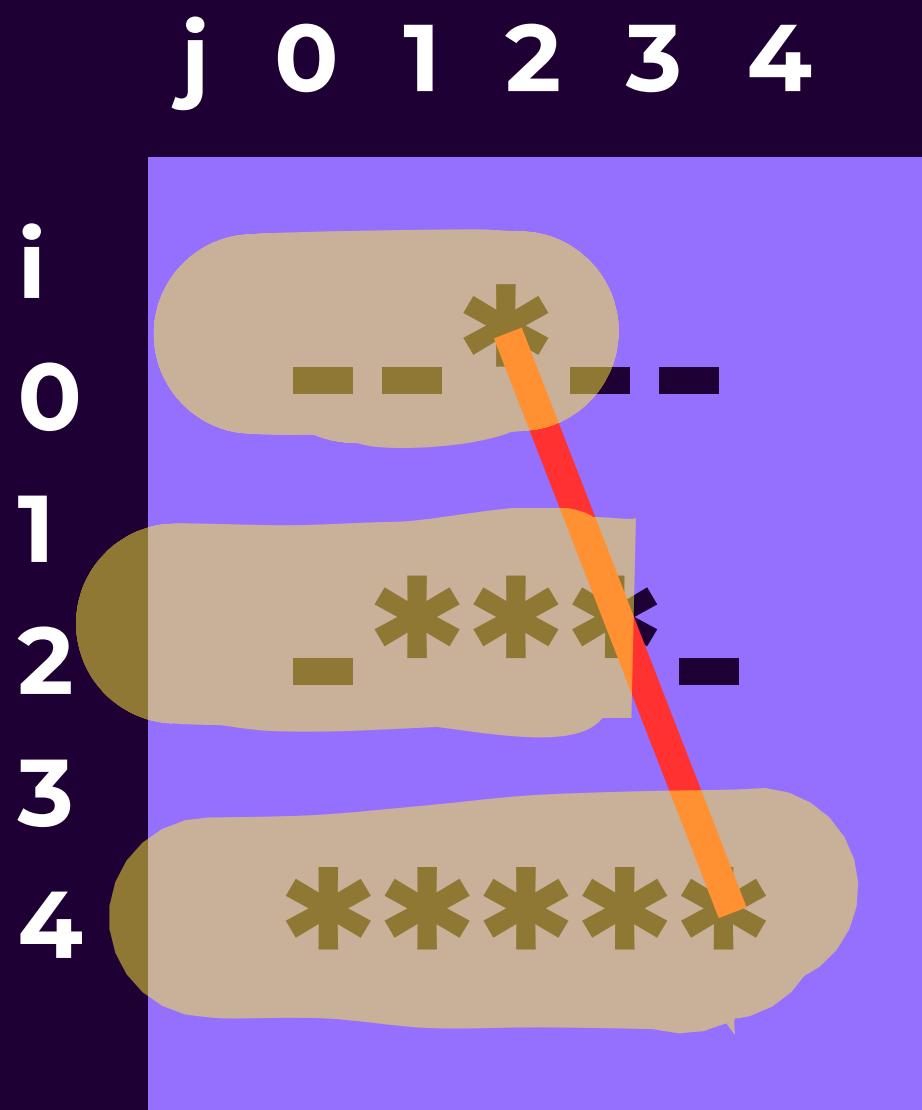
03 PATTERN

Graph Way



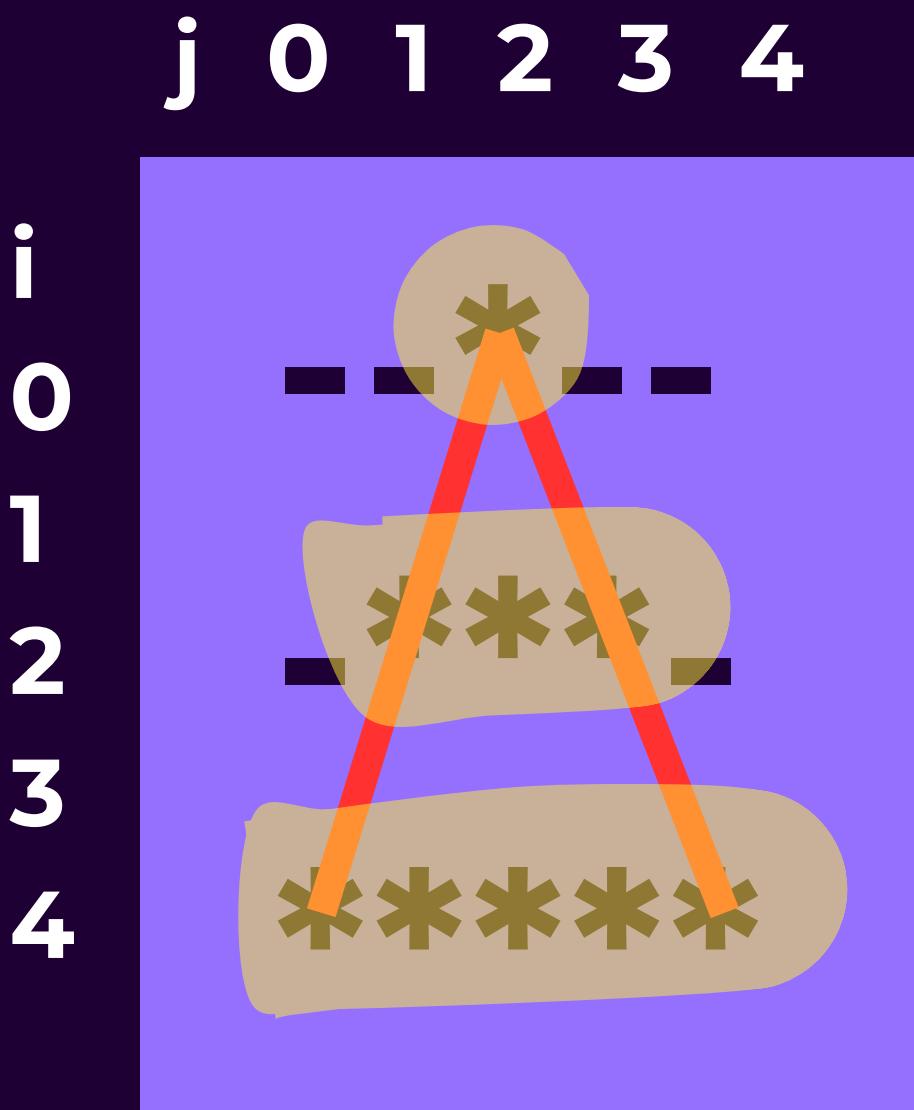
03 PATTERN

Graph Way



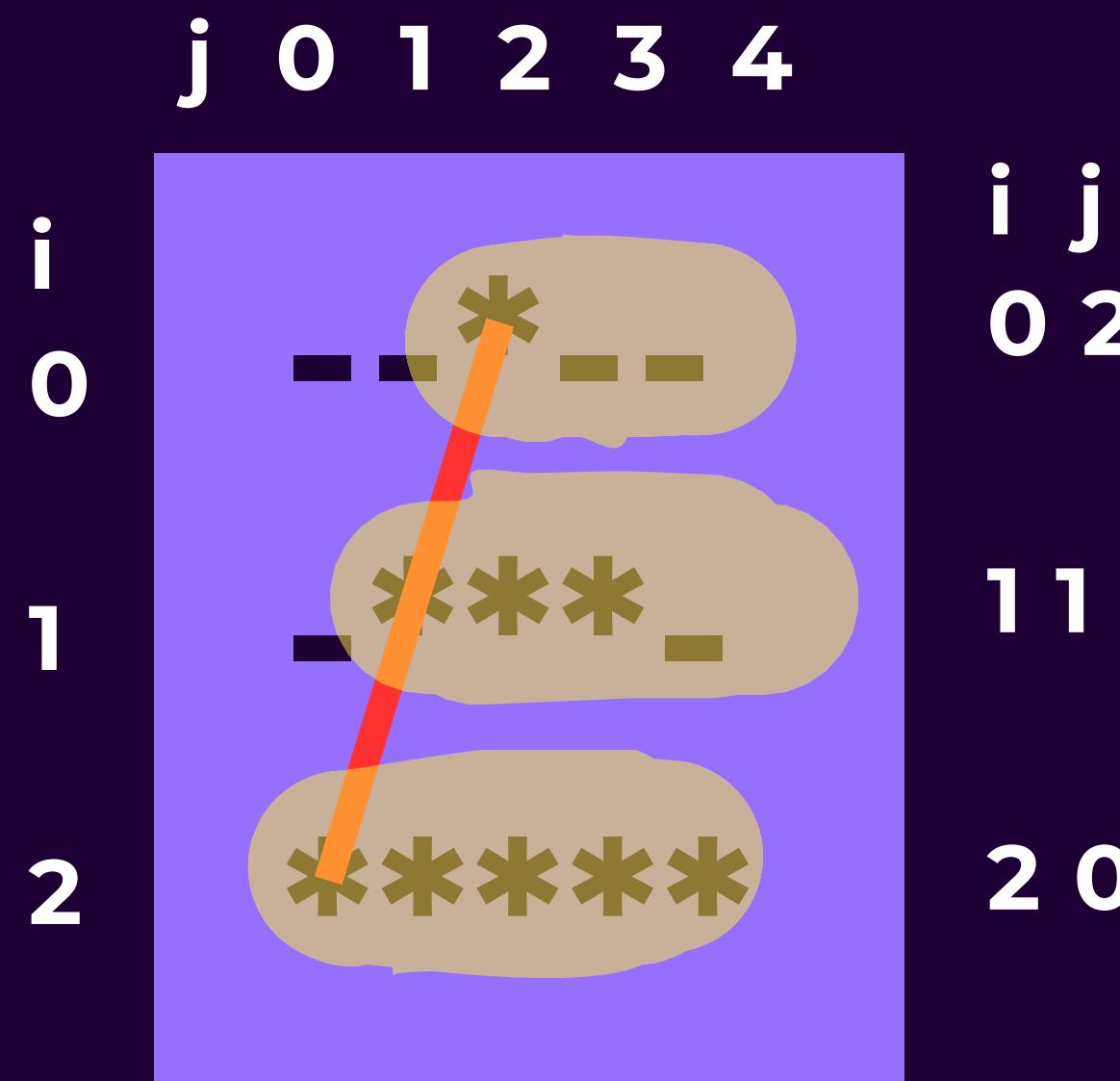
03 PATTERN

Graph Way



03 PATTERN

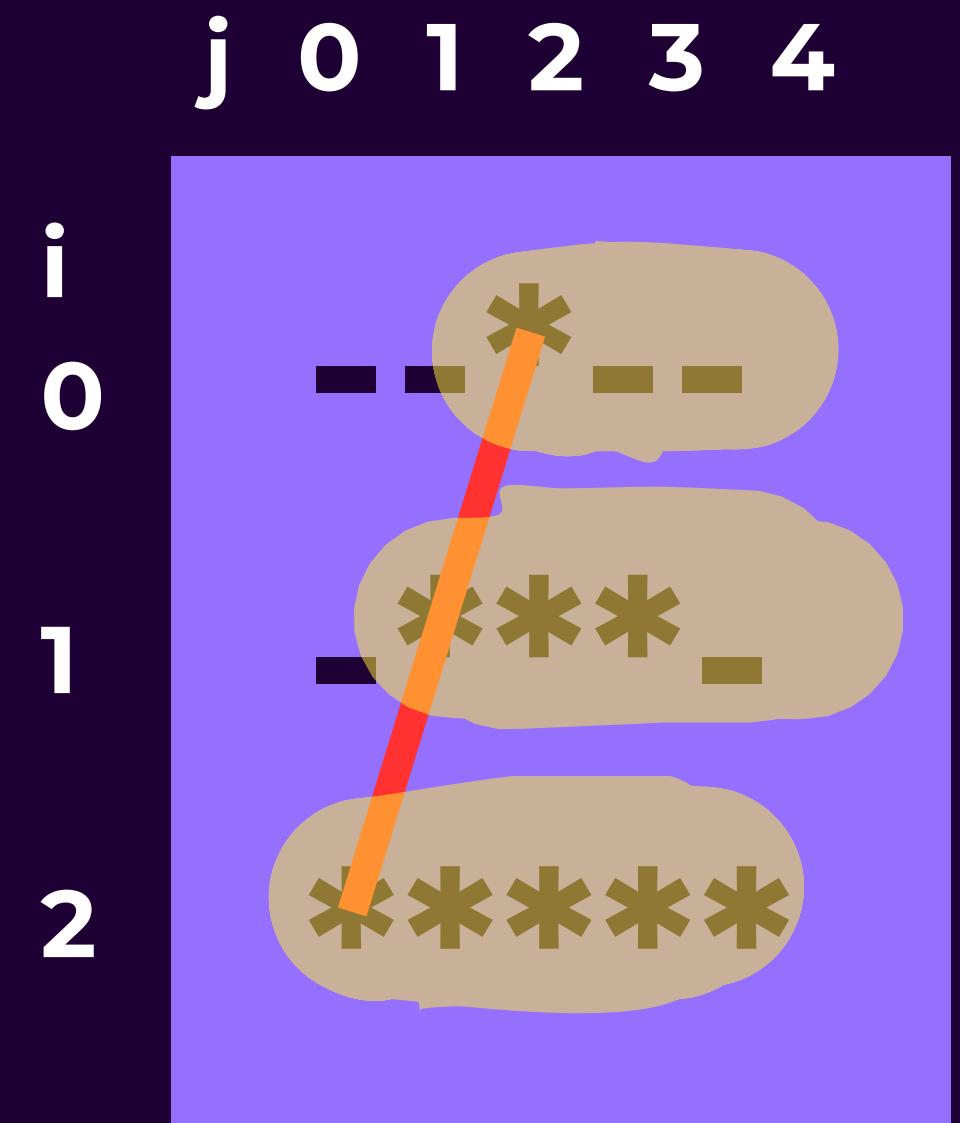
Graph Way



$i \ j$
0 2
1 1
2 0

03 PATTERN

Graph Way

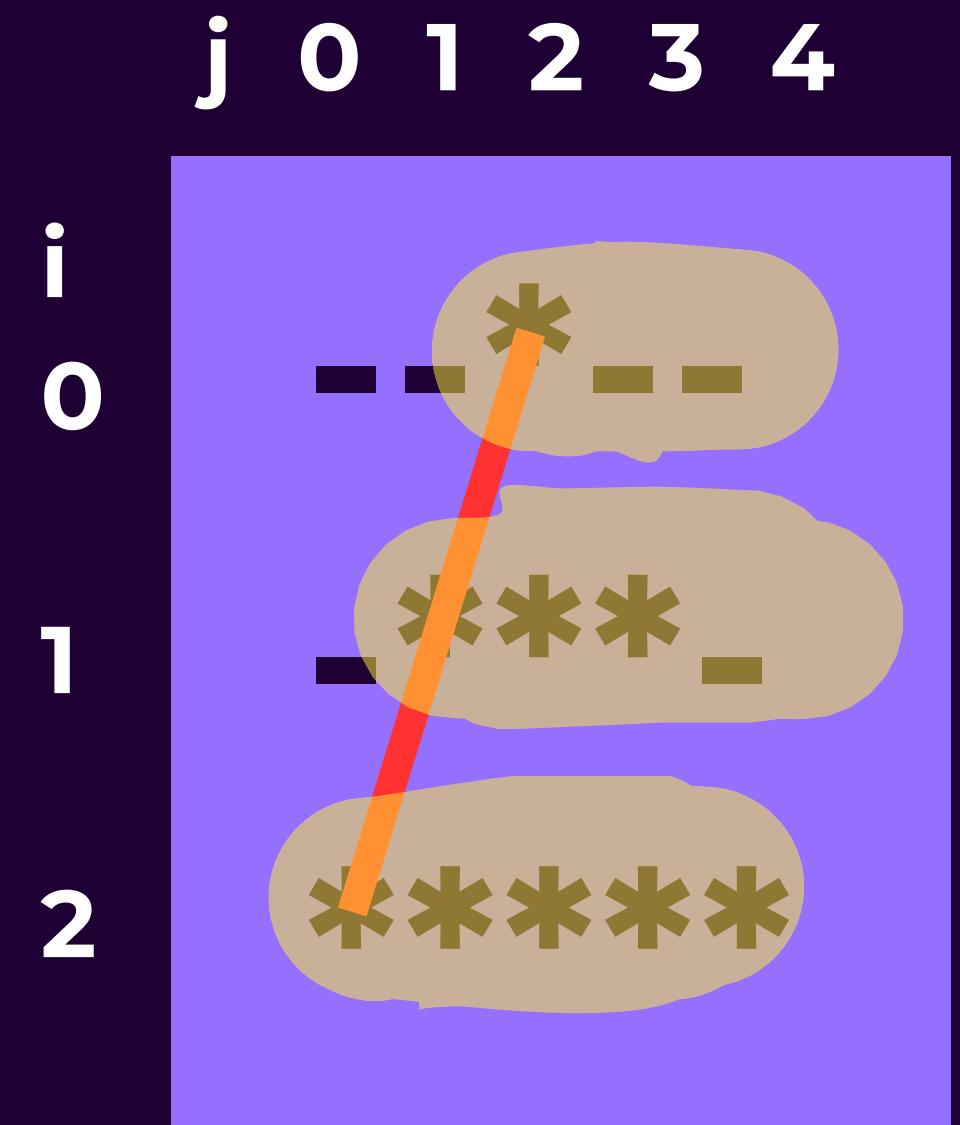


$i \ j$
0 2
1 1
2 0

$\rightarrow i+j = 2$

03 PATTERN

Graph Way

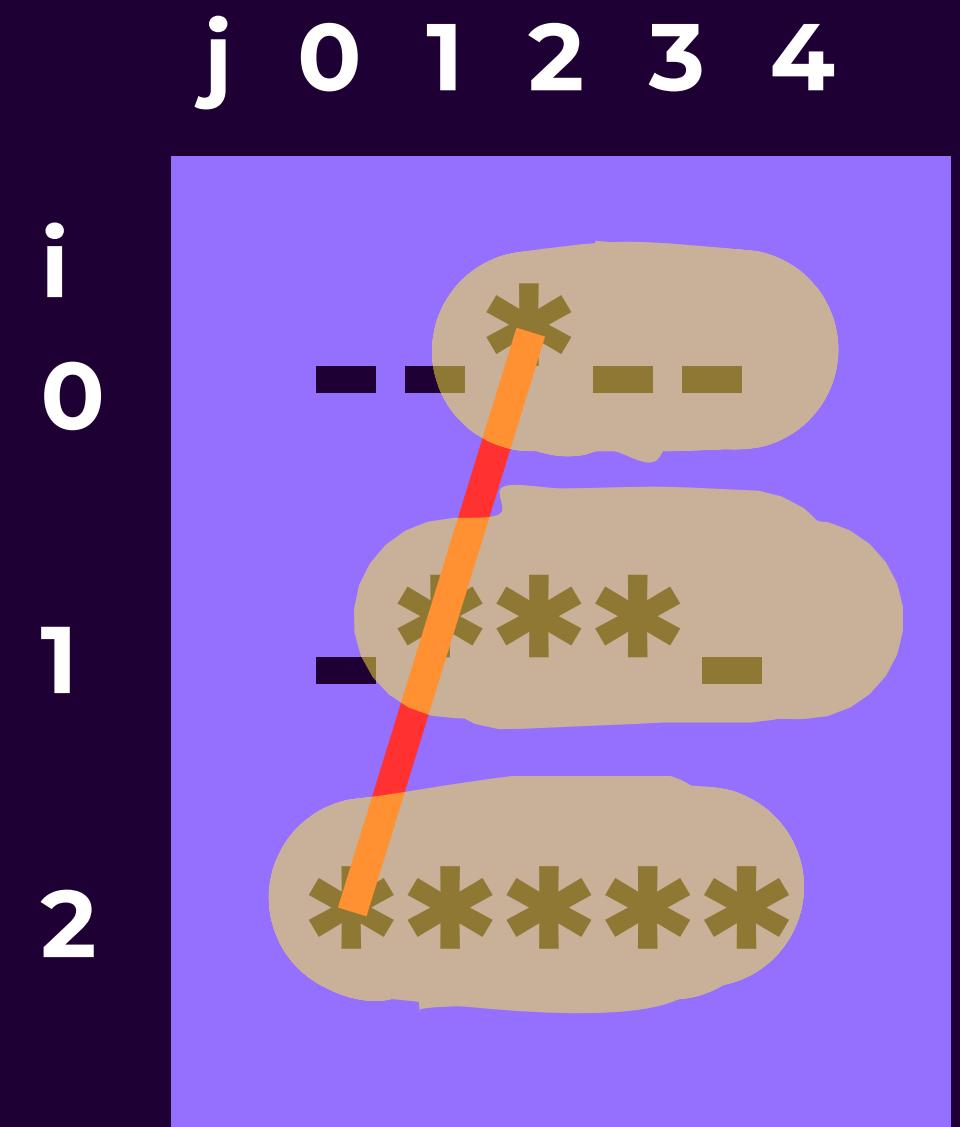


i j
0 2
1 1
2 0

→ $i+j = n-1$

03 PATTERN

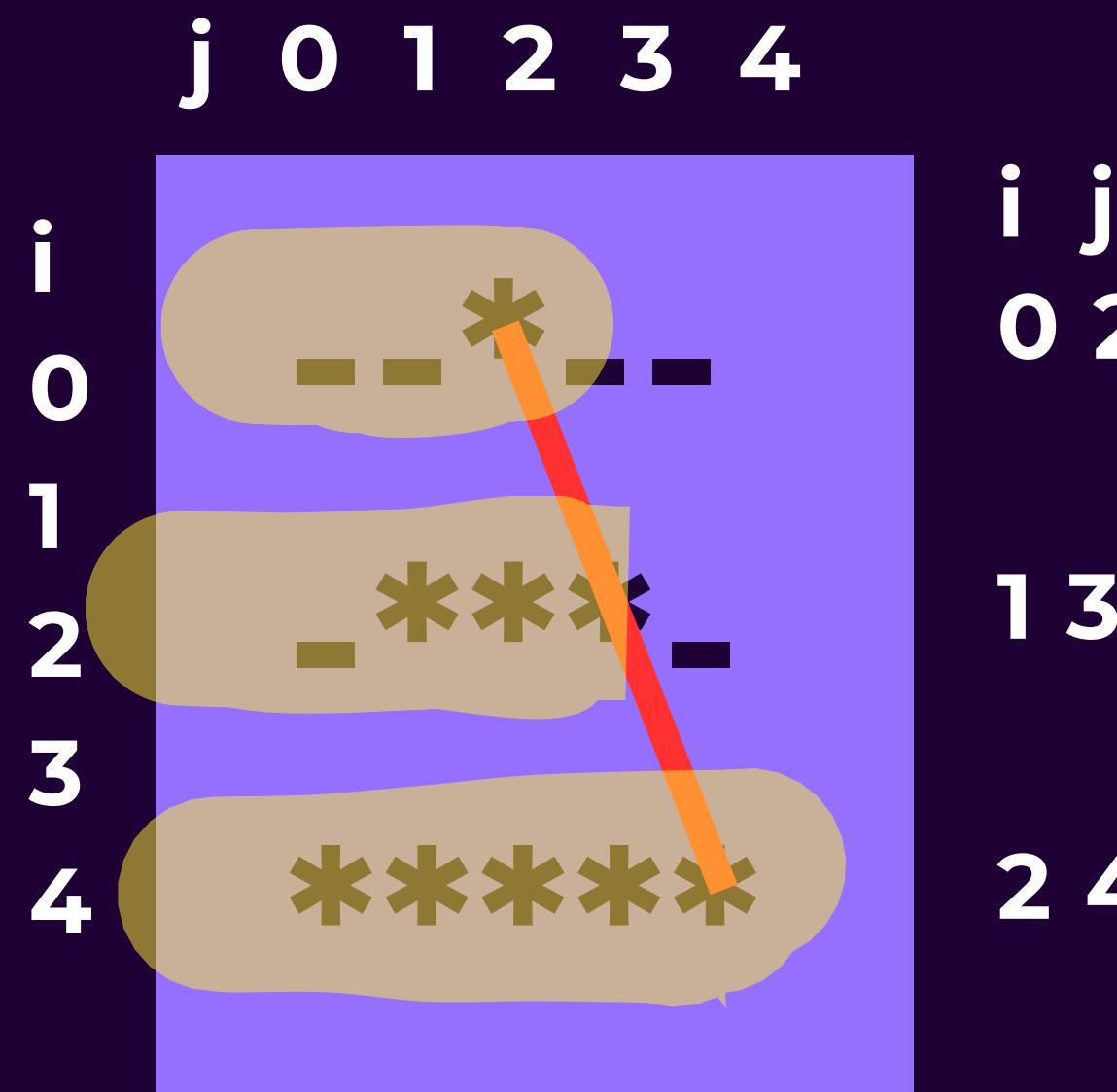
Graph Way



$i+j \geq n-1$

03 PATTERN

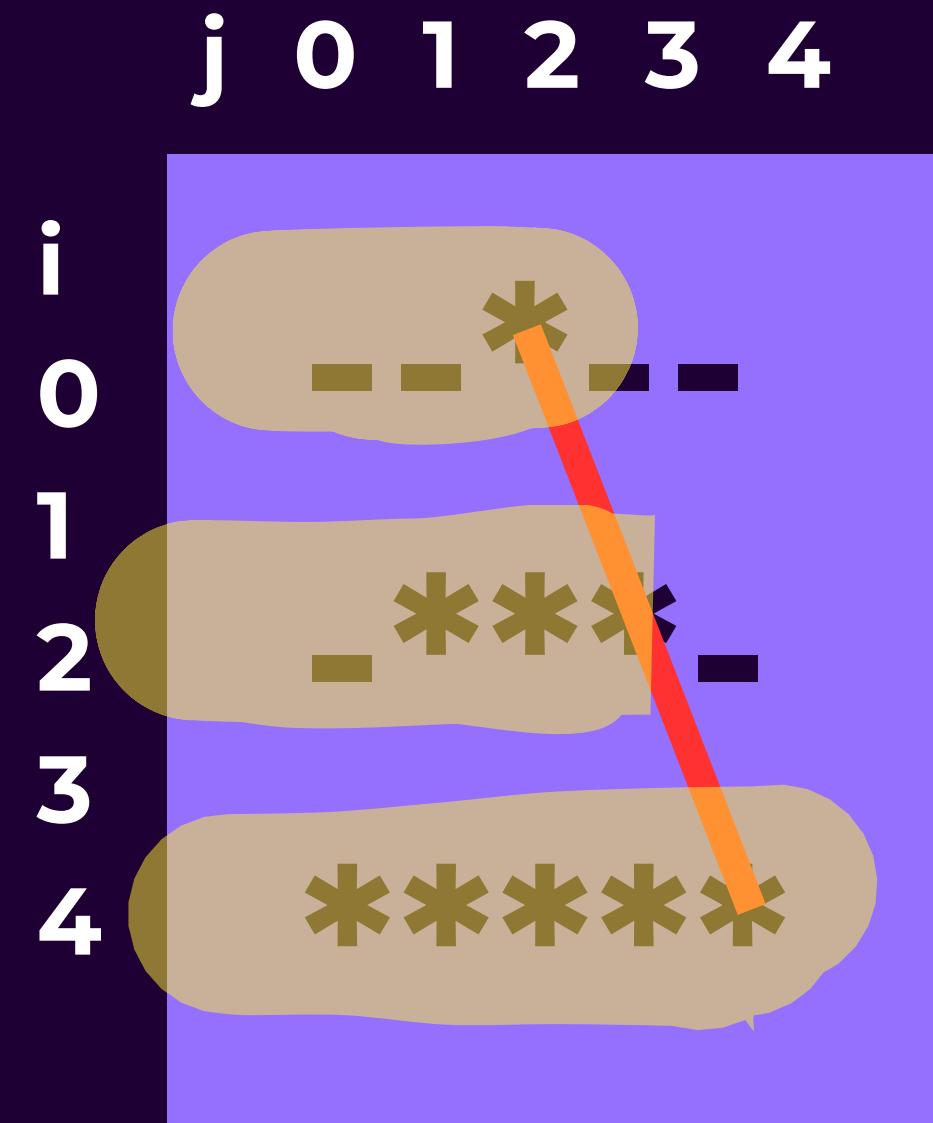
Graph Way



i j
0 2
1 3
2 4

03 PATTERN

Graph Way



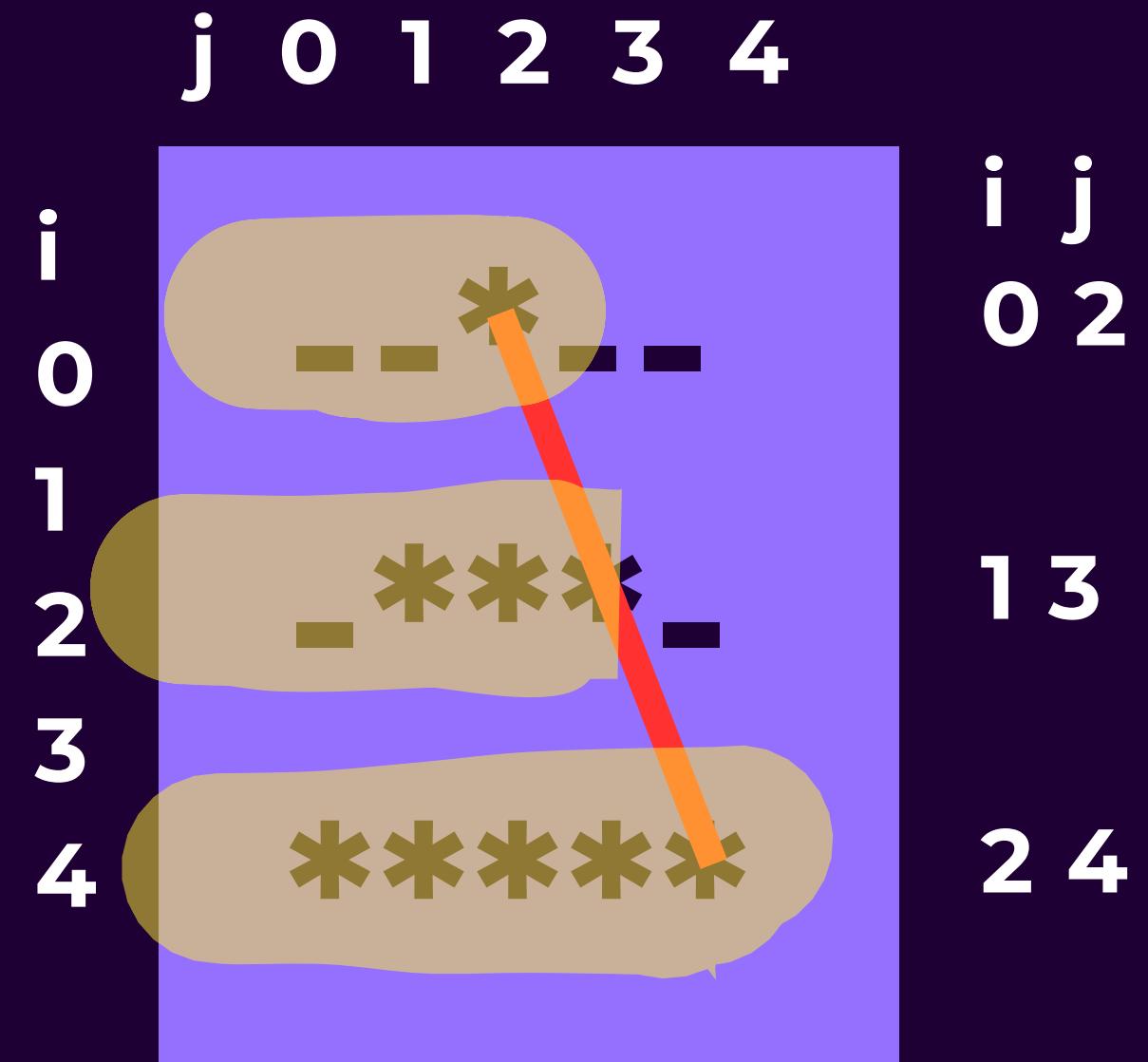
$i \ j$
0 2
1 3
2 4



$$\text{abs}(i-j) = 2$$

03 PATTERN

Graph Way



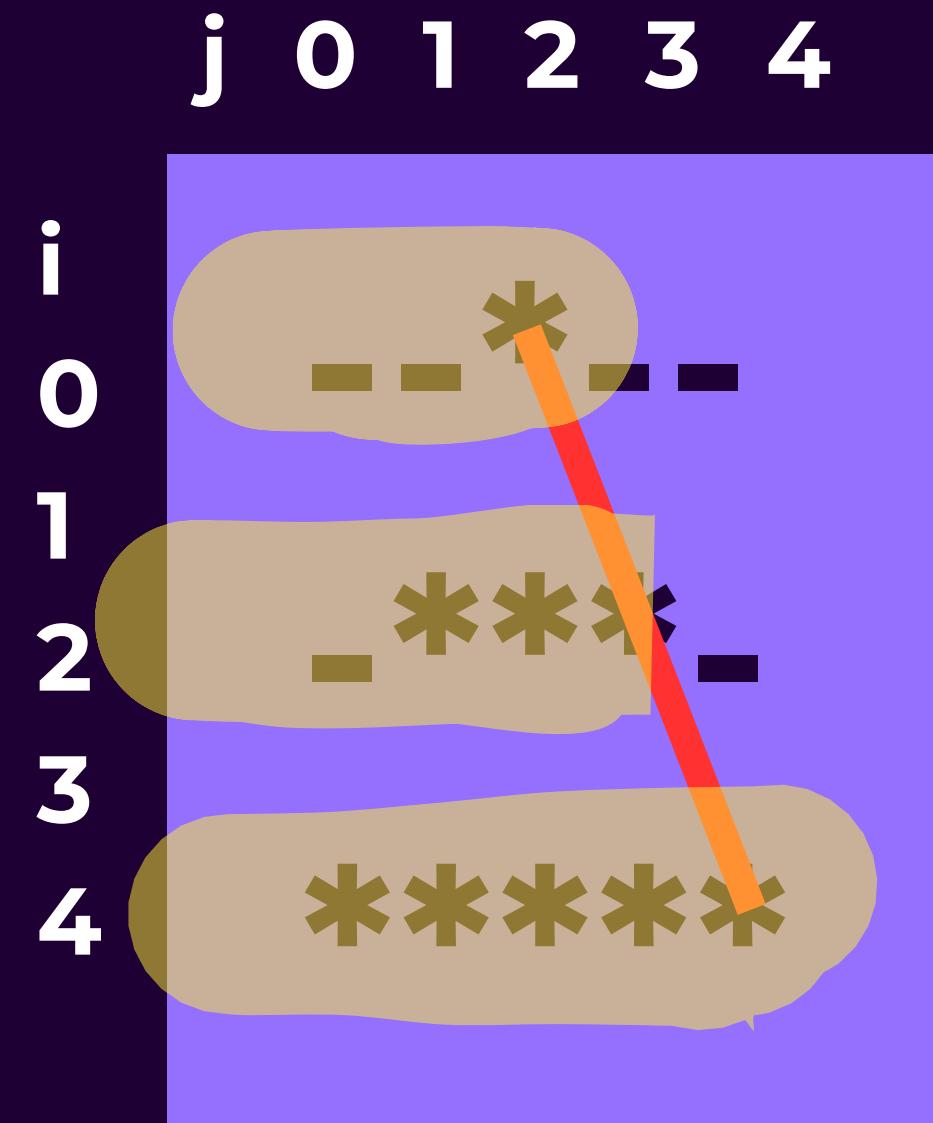
$i \ j$
0 2
1 3
2 4



$$\text{abs}(i-j) = n-1$$

03 PATTERN

Graph Way



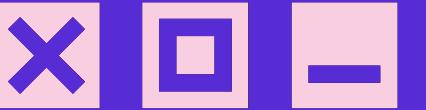
$i \ j$
0 2
1 3
2 4



$$abs(i-j) \leq n-1$$

03 PATTERN

Graph Way



```
1 #include <bits/stdc++.h>
2 using namespace std;
3 int main( )
4 {
5     ios_base::sync_with_stdio(0);cin.tie(0);cout.tie(0);
6     int n;
7     cin >> n;
8     for (int i = 0; i < n; i++)
9     {
10         for (int j = 0; j < 2*n-1; j++)
11         {
12             if (i+j ≥ n-1 && abs(i-j) ≤ n-1)
13             {
14                 cout << "*";
15             }
16             else
17             {
18                 cout << "-";
19             }
20         }
21         cout << "\n";
22     }
23     return 0;
24 }
```

03 PATTERN

Problem

<https://shorturl.at/quiQK>

THANK YOU
