

برنامه نویسی با زبان C

مجتبی اجمی

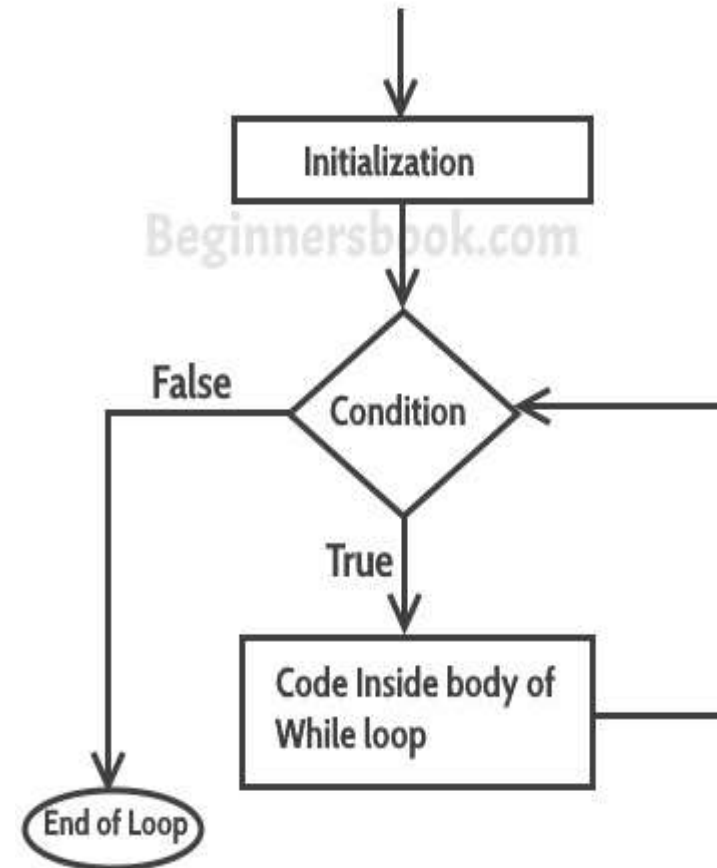
استادیار دانشگاه آزاد اسلامی واحد زنجان

حلقه تکرار

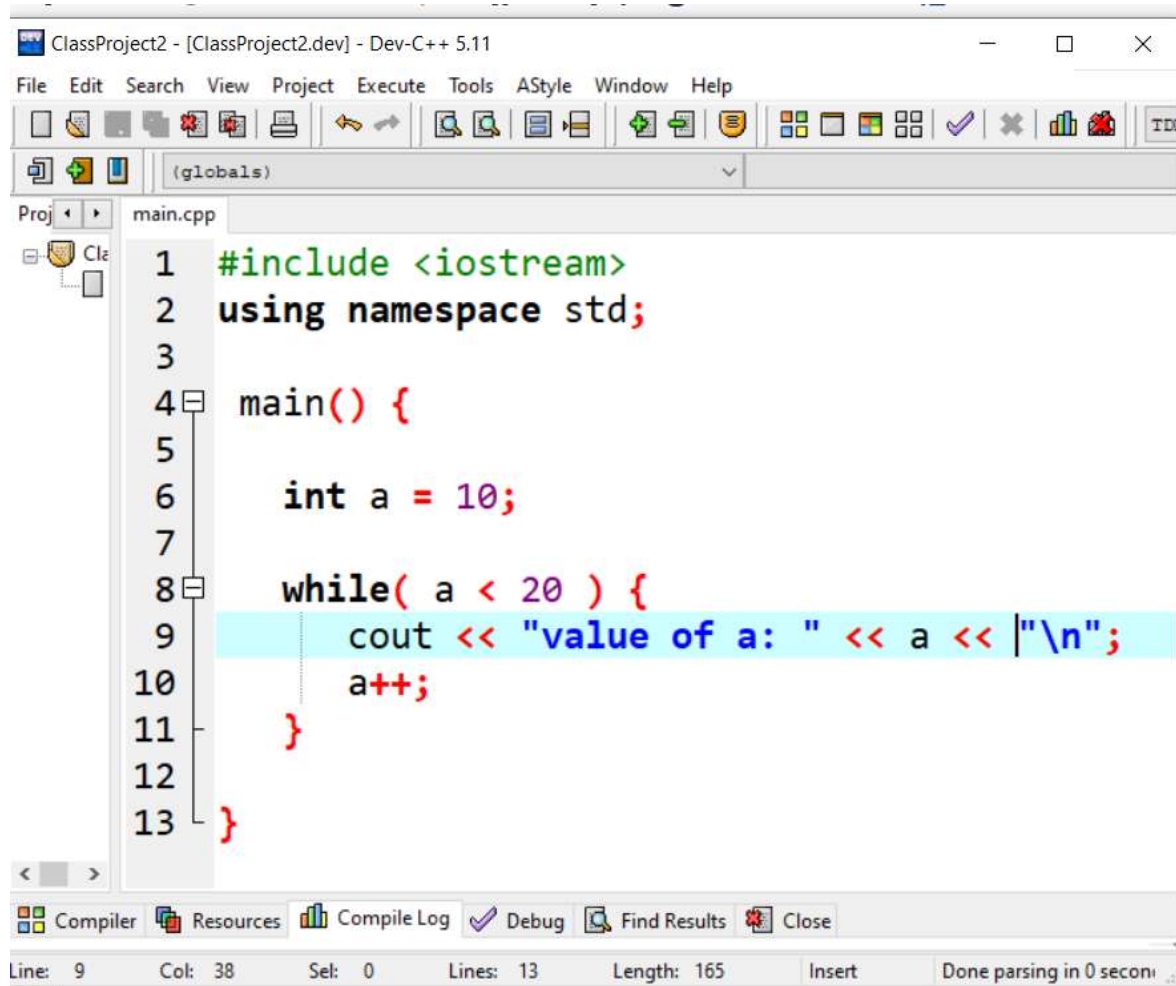
- برای حل بسیاری از مسائل لازم است که دستوراتی تکرار انجام شوند.
- محاسبه فاکتوریل
- محاسبه مجموع ارقام یک عدد صحیح
- در زبان برنامه سازی C چندین ساختار برای پیاده سازی حلقه تکرار وجود دارد.
 - `for(; ;){...}`
 - `while(){...}`
 - `do ... while (){...}`

حلقه while

```
while (condition test) {  
    دستوراتی که باید تکرار شوند  
}
```



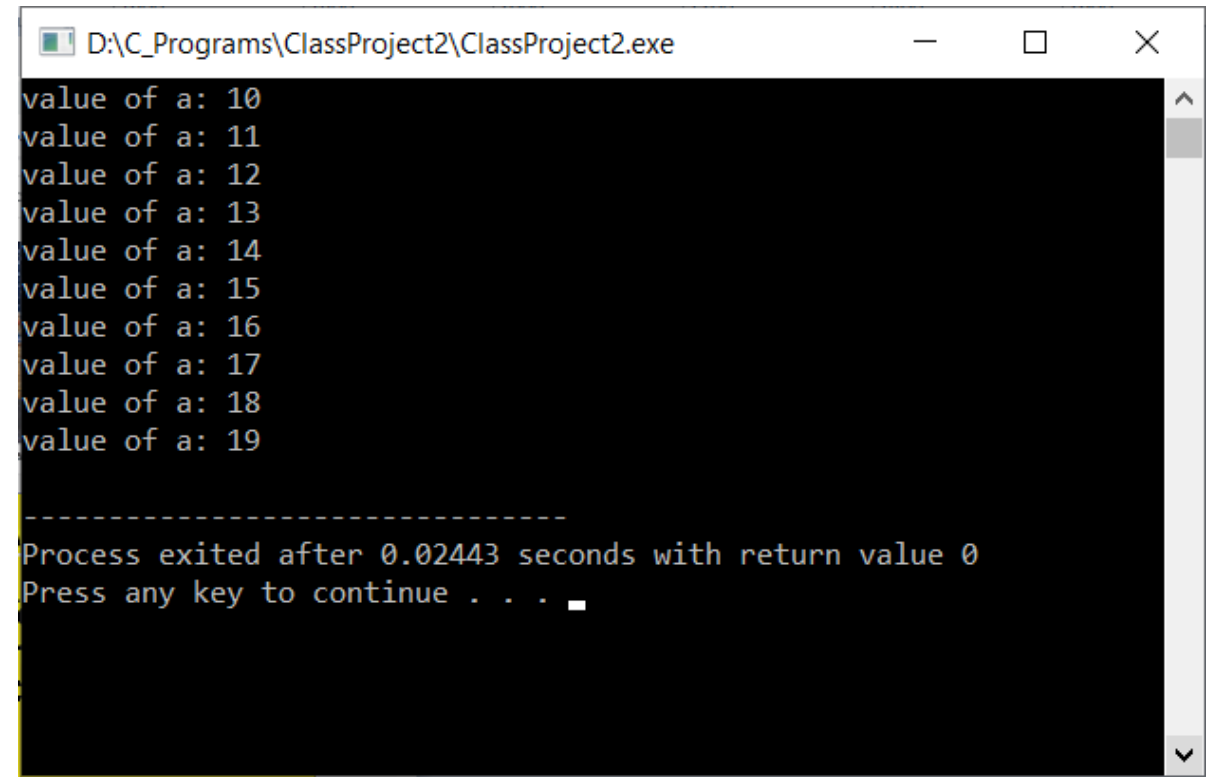
یک برنامه ساده با استفاده از while



The screenshot shows the Dev-C++ 5.11 IDE with a project named 'ClassProject2'. The main.cpp file contains the following code:

```
1 #include <iostream>
2 using namespace std;
3
4 main() {
5
6     int a = 10;
7
8     while( a < 20 ) {
9         cout << "value of a: " << a << "\n";
10        a++;
11    }
12
13 }
```

The status bar at the bottom indicates 'Line: 9 Col: 38 Sel: 0 Lines: 13 Length: 165 Insert Done parsing in 0 seconds'.

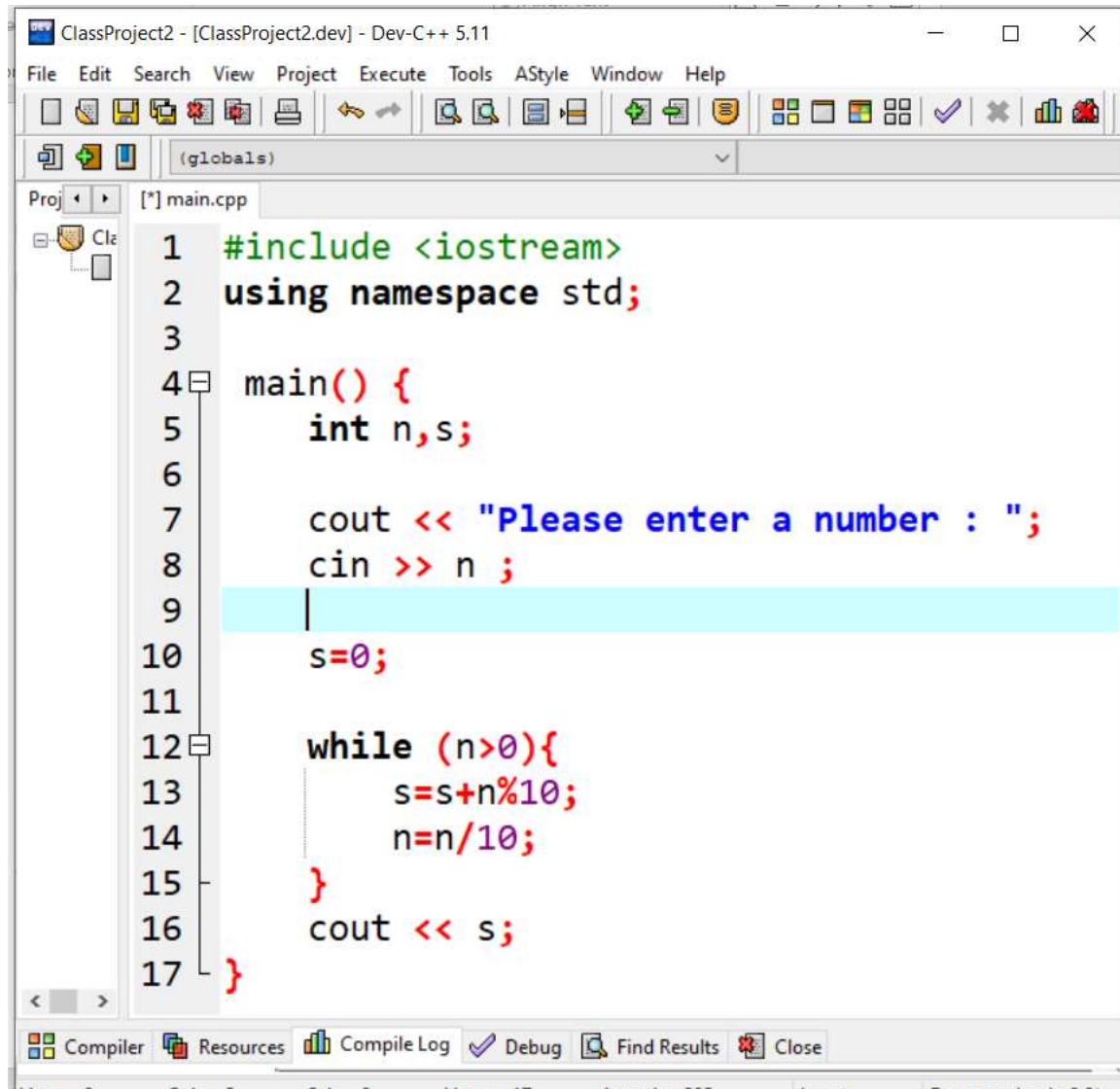


The screenshot shows the output window of the program, titled 'D:\C_Programs\ClassProject2\ClassProject2.exe'. The output displays the value of 'a' from 10 to 19, followed by a separator line and the program's exit message.

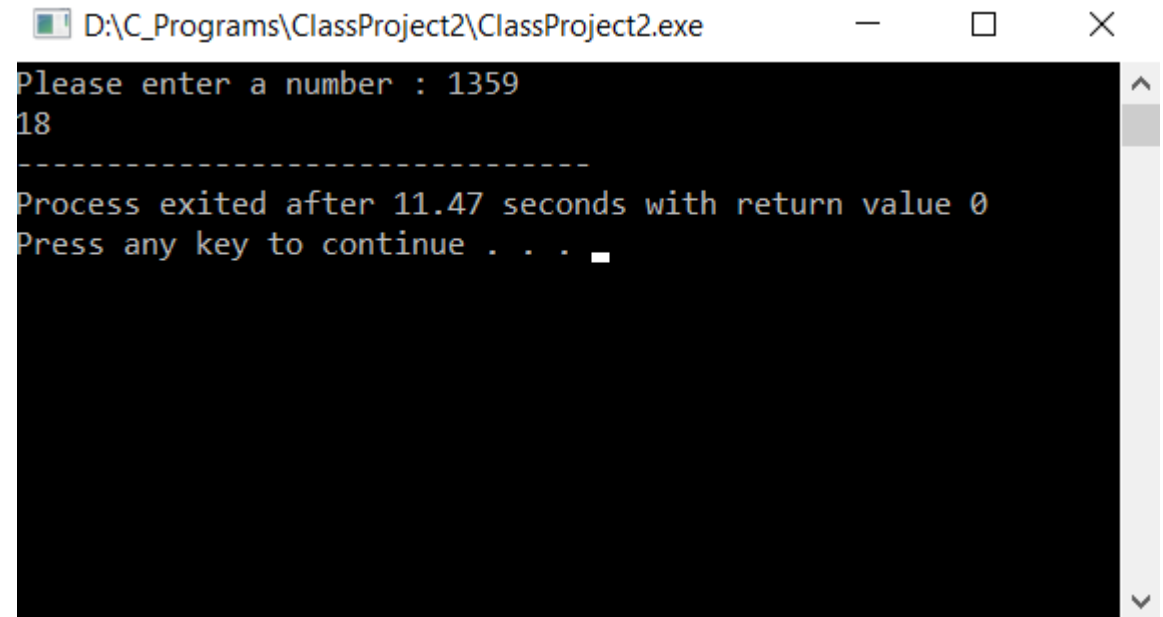
```
value of a: 10
value of a: 11
value of a: 12
value of a: 13
value of a: 14
value of a: 15
value of a: 16
value of a: 17
value of a: 18
value of a: 19

-----
Process exited after 0.02443 seconds with return value 0
Press any key to continue . . .
```

برنامه ای برای محاسبه مجموع ارقام یک عدد صحیح



```
1 #include <iostream>
2 using namespace std;
3
4 main() {
5     int n,s;
6
7     cout << "Please enter a number : ";
8     cin >> n ;
9
10    s=0;
11
12    while (n>0){
13        s=s+n%10;
14        n=n/10;
15    }
16    cout << s;
17 }
```



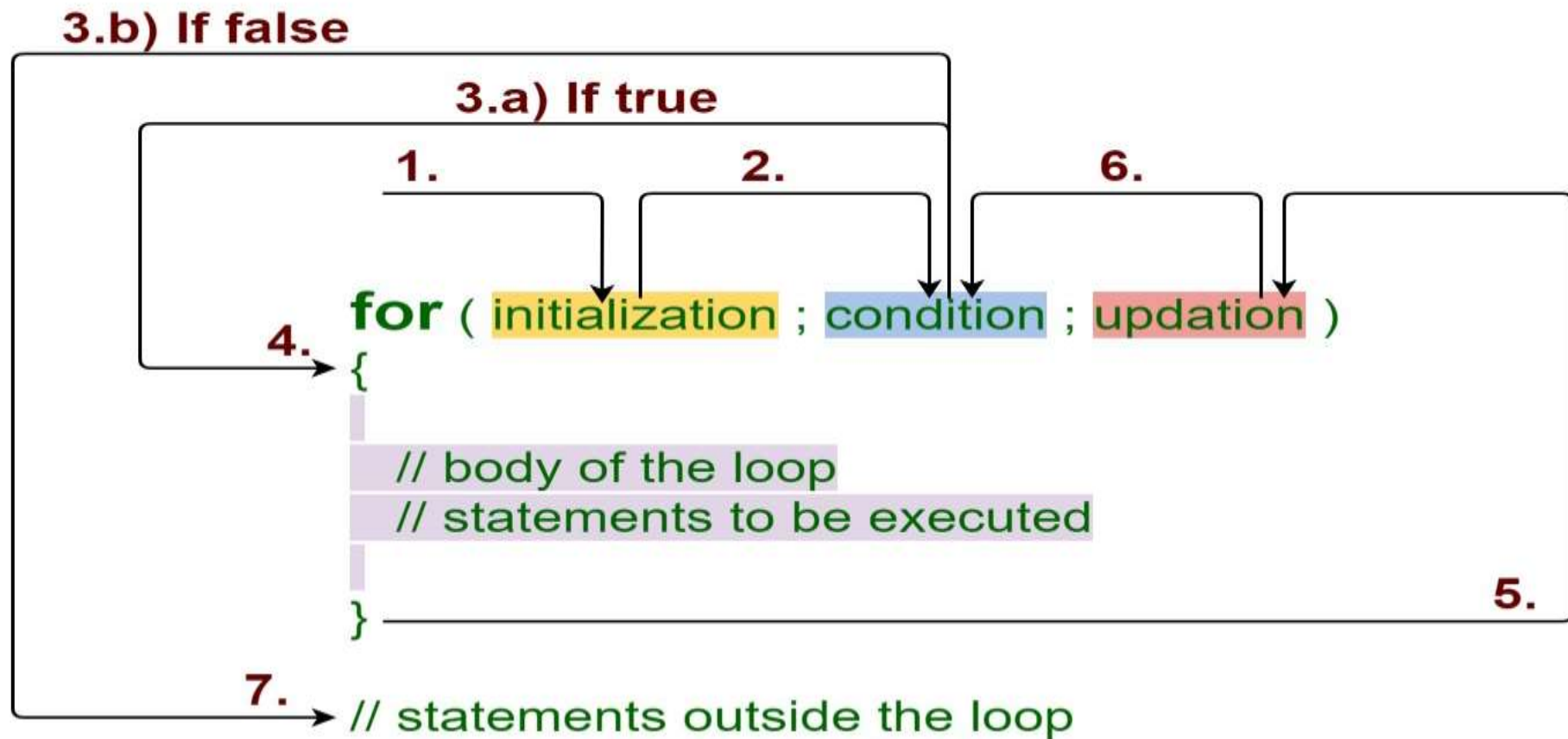
```
D:\C_Programs\ClassProject2\ClassProject2.exe
Please enter a number : 1359
18
-----
Process exited after 11.47 seconds with return value 0
Press any key to continue . . .
```

حلقه for

- زمانی از این ساختار استفاده می کنیم که می خواهیم به تعداد دفعات مشخصی دستورات داخل حلقه تکرار شوند.
- برای شمارش دفعات تکرار از یک متغیر صحیح استفاده می کنیم که به این متغیر اصطلاحاً شمارنده (iterator) گویند.

```
for ( بهنگام سازی شمارنده ; شرط تکرار ; مقداردهی اولیه شمارنده ) {  
    دستوراتی که باید تکرار شوند  
}
```

for حلقة



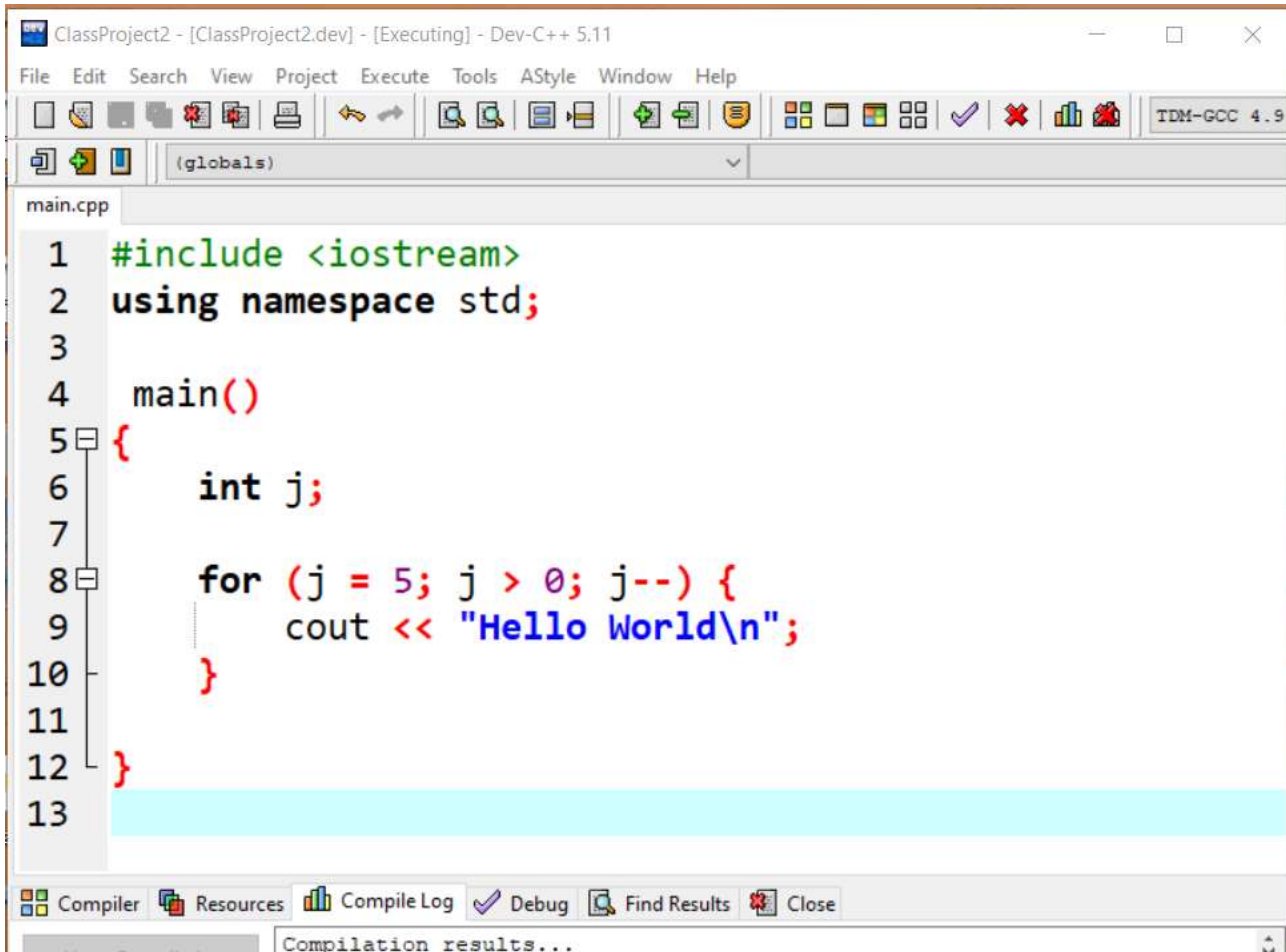
حلقه for : مثال ۱ - ۵ بار چاپ یک رشته

```
ClassProject2 - [ClassProject2.dev] - [Executing] - Dev-C++ 5.11
File Edit Search View Project Execute Tools AStyle Window Help
(globals)
[*] main.cpp
1 #include <iostream>
2 using namespace std;
3
4 main()
5 {
6     int i;
7
8     for (i = 1; i <= 5; i++) {
9         cout << "Hello World\n";
10    }
11
12 }
13
14
```

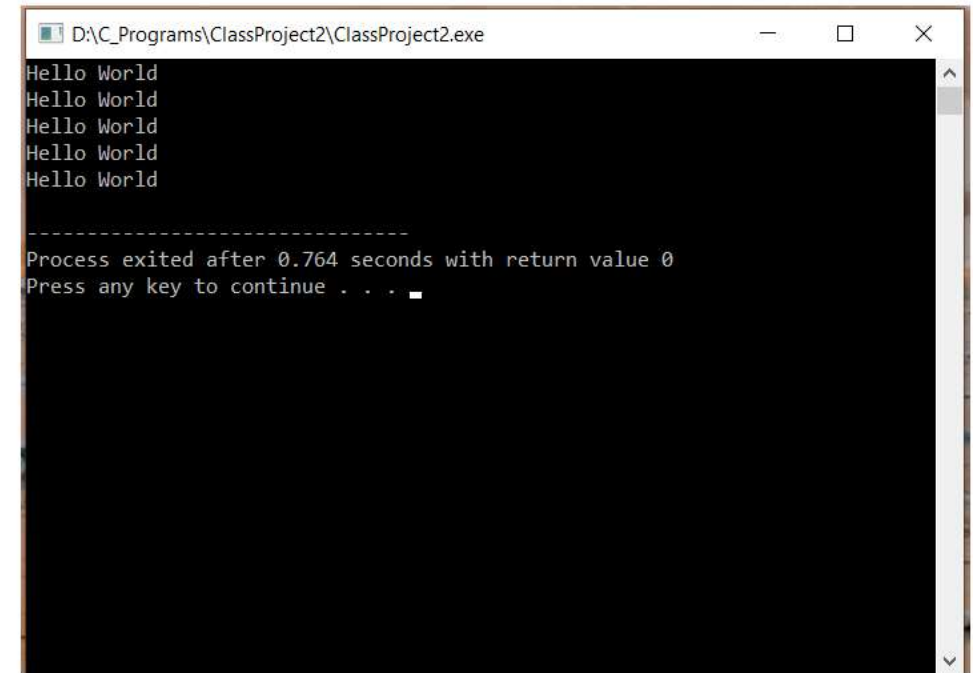
```
D:\C_Programs\ClassProject2\ClassProject2.exe
Hello World
Hello World
Hello World
Hello World
Hello World

-----
Process exited after 0.9941 seconds with return value 0
Press any key to continue . . .
```


حلقه for : مثال ۲ - ۵ بار چاپ یک رشته



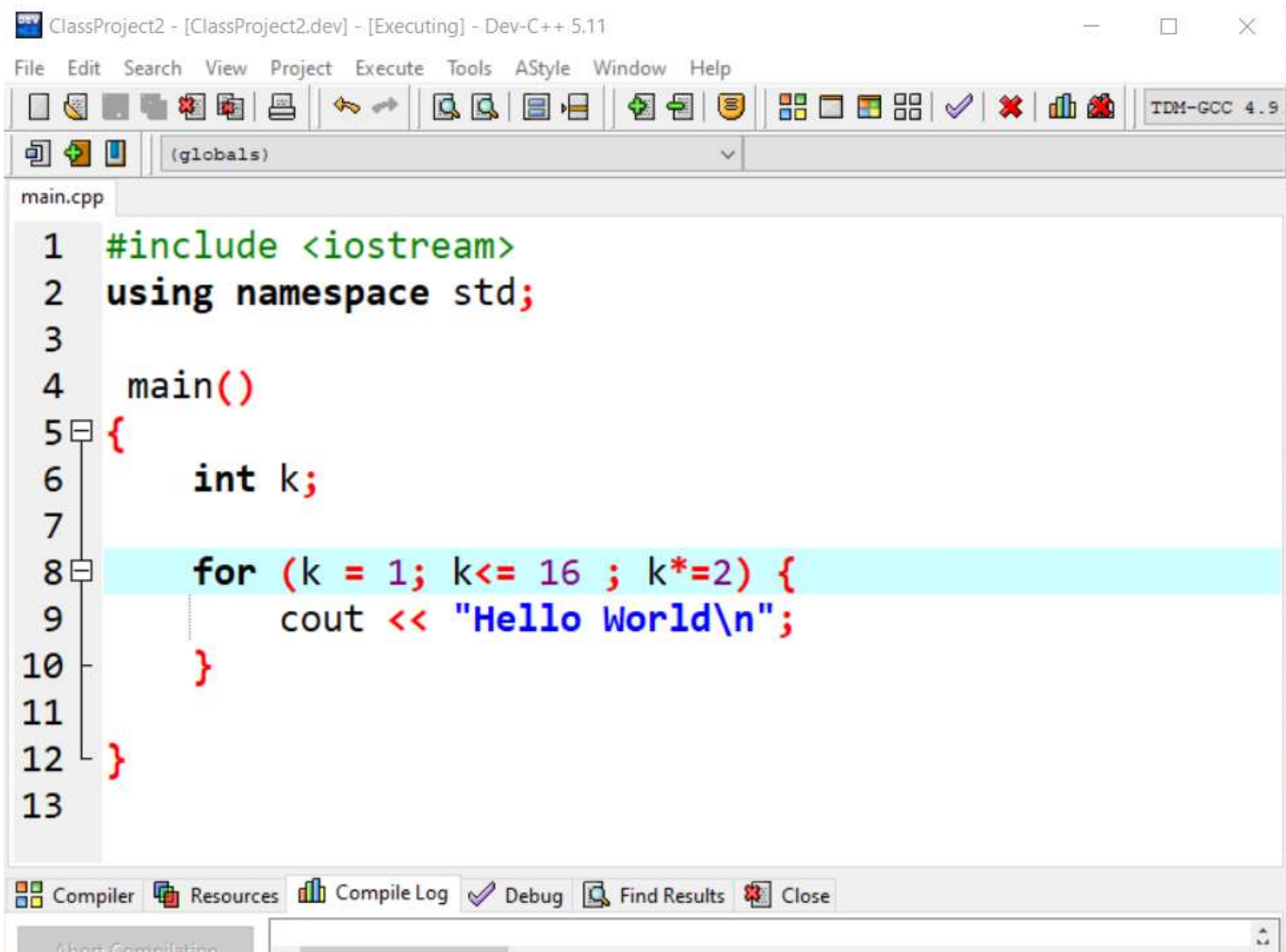
```
1 #include <iostream>
2 using namespace std;
3
4 main()
5 {
6     int j;
7
8     for (j = 5; j > 0; j--) {
9         cout << "Hello World\n";
10    }
11
12 }
13
```



```
D:\C_Programs\ClassProject2\ClassProject2.exe
Hello World
Hello World
Hello World
Hello World
Hello World

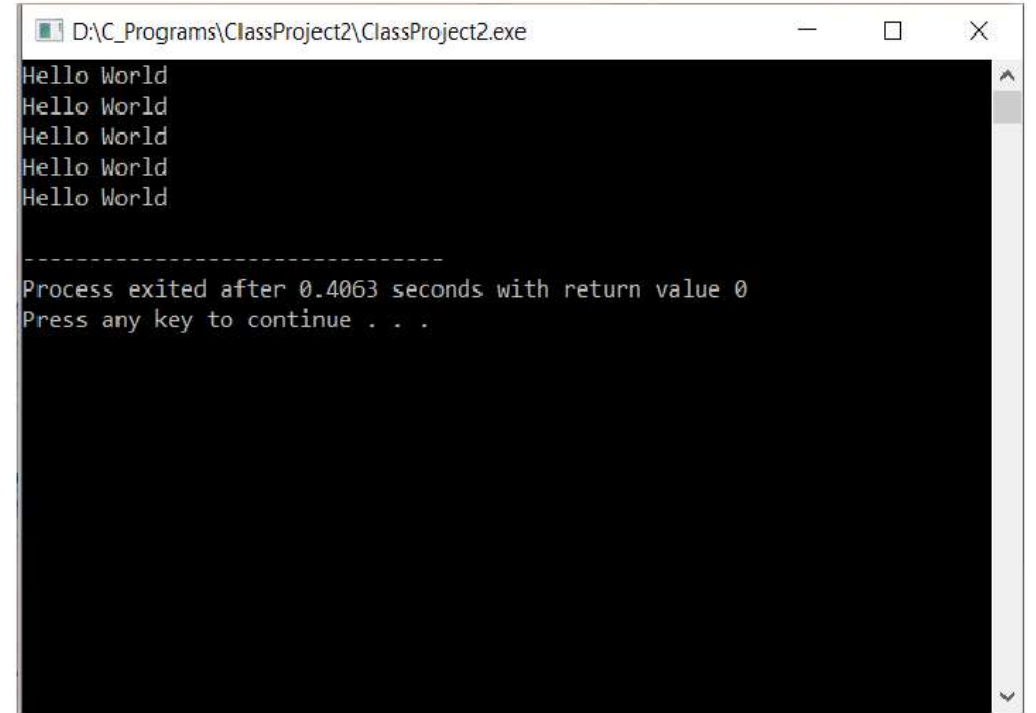
-----
Process exited after 0.764 seconds with return value 0
Press any key to continue . . .
```

حلقه for : مثال ۳ - ۵ بار چاپ یک رشته



```
1 #include <iostream>
2 using namespace std;
3
4 main()
5 {
6     int k;
7
8     for (k = 1; k <= 16 ; k*=2) {
9         cout << "Hello World\n";
10     }
11
12 }
13
```

The screenshot shows the Dev-C++ IDE with a C++ file named main.cpp. The code defines a main function that contains a for loop. The loop variable k starts at 1 and is multiplied by 2 in each iteration. The loop condition is k <= 16, which means the loop will execute 5 times (k = 1, 2, 4, 8, 16). In each iteration, the string "Hello World" is printed followed by a newline character. The IDE interface includes a menu bar, a toolbar, and a status bar at the bottom.

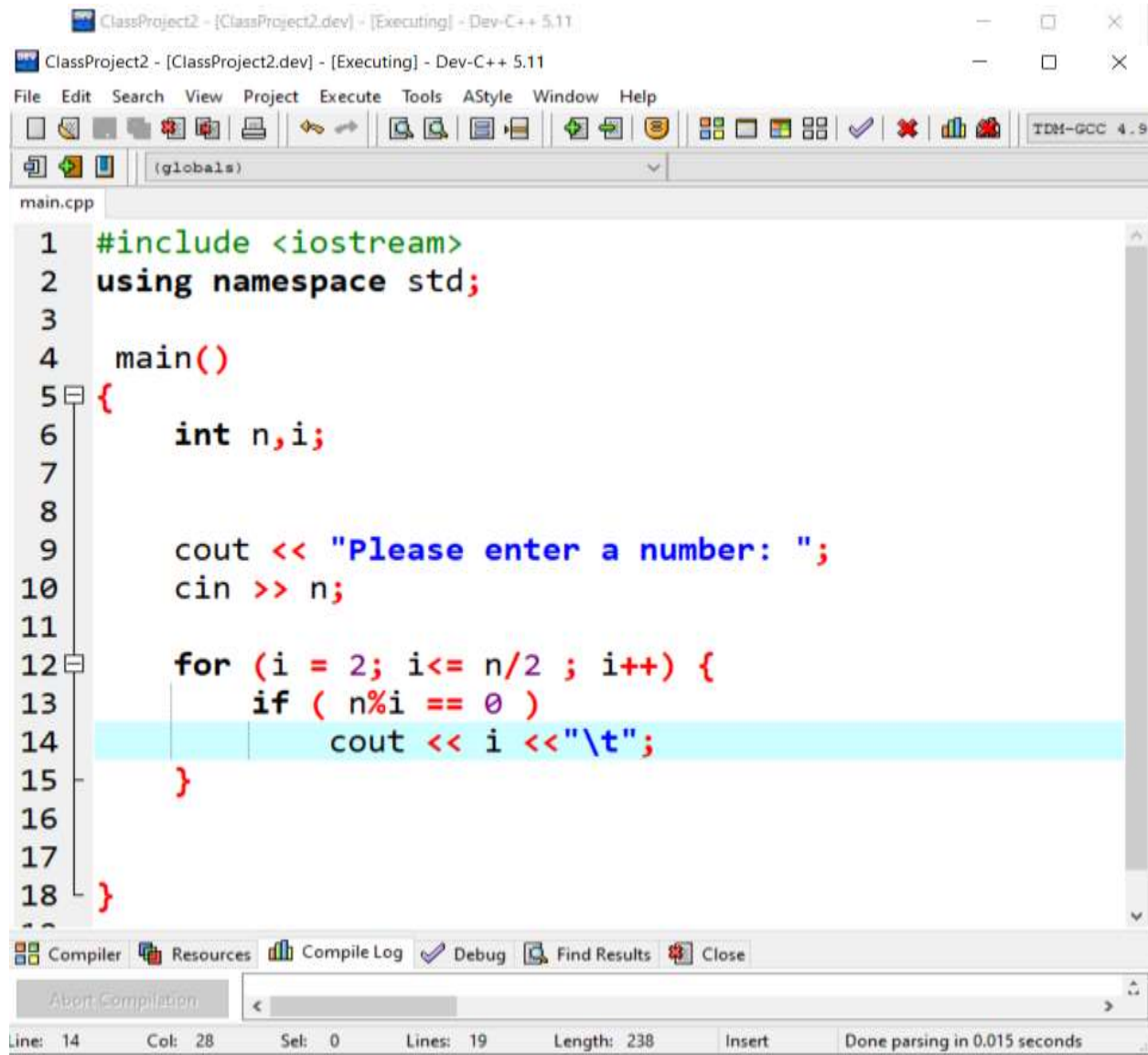


```
D:\C_Programs\ClassProject2\ClassProject2.exe
Hello World
Hello World
Hello World
Hello World
Hello World

-----
Process exited after 0.4063 seconds with return value 0
Press any key to continue . . .
```

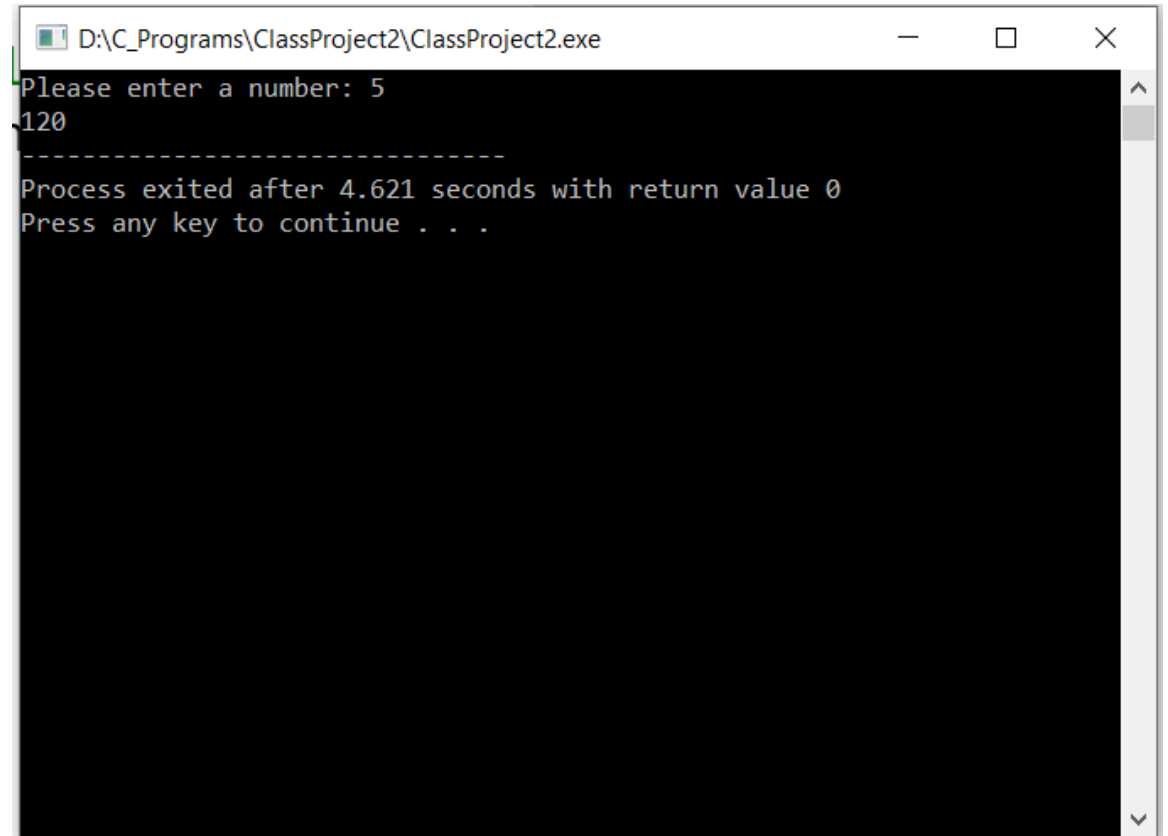
The screenshot shows a command prompt window titled "D:\C_Programs\ClassProject2\ClassProject2.exe". It displays the output of the program, which is five lines of "Hello World". Below the output, there is a separator line followed by the message "Process exited after 0.4063 seconds with return value 0" and "Press any key to continue . . .".

حلقه for : مثال ۴ – چاپ مقسوم علیه های یک عدد



The screenshot shows the Dev-C++ IDE with a C++ program in main.cpp. The code uses a for loop to iterate from 2 to n/2, checking if each number divides n. Line 14, which contains the output statement, is highlighted in light blue.

```
1 #include <iostream>
2 using namespace std;
3
4 main()
5 {
6     int n,i;
7
8
9     cout << "Please enter a number: ";
10    cin >> n;
11
12    for (i = 2; i <= n/2 ; i++) {
13        if ( n%i == 0 )
14            cout << i << "\t";
15    }
16
17
18 }
```



The screenshot shows the output window of the program. It displays the prompt 'Please enter a number: 5', the user input '120', and the output '-----'. Below this, it shows the message 'Process exited after 4.621 seconds with return value 0' and 'Press any key to continue . . .'. The output window has a black background with white text.

```
Please enter a number: 5
120
-----
Process exited after 4.621 seconds with return value 0
Press any key to continue . . .
```

حلقه for : مثال ۵ – محاسبه و چاپ ب.م.م دو عدد

```
ClassProject2 - [ClassProject2.dev] - [Executing] - Dev-C++ 5.11
File Edit Search View Project Execute Tools AStyle Window Help
(globals)
main.cpp
1 #include <iostream>
2 using namespace std;
3
4 main()
5 {
6     int Num1, Num2, i, GCD;
7
8     cout << "Please Enter two integer Values :";
9     cin >> Num1 >> Num2;
10
11     for(i = 1; i <= Num1 && i <= Num2; i++)
12     {
13         if(Num1 % i == 0 && Num2 % i == 0)
14             GCD = i;
15     }
16
17     cout << "GCD of " << Num1 << " and " << Num2 << " is " << GCD;
18 }
19
20
Compiler Resources Compile Log Debug Find Results Close
```

```
D:\C_Programs\ClassProject2\ClassProject2.exe
Please Enter two integer Values :32
40
GCD of 32 and 40 is 8
-----
Process exited after 15.06 seconds with return value 0
Press any key to continue . . .
```

حلقه for : مثال ۵ – محاسبه و چاپ فاکتوریل یک عدد

```
ClassProject2 - [ClassProject2.dev] - [Executing] - Dev-C++ 5.11
File Edit Search View Project Execute Tools AStyle Window Help
TDM-GCC 4.9.2 64-bit
(globals)
main.cpp
2 using namespace std;
3
4 main()
5 {
6
7     int N, j, F;
8
9     cout << "Please Enter an integer number : ";
10    cin >> N;
11
12    F=1;
13    for(j = 2; j <= N; j++){
14        F*=j;
15
16    }
17
18    cout << N << "! is " << F ;
19 }
20
```

```
D:\C_Programs\ClassProject2\ClassProject2.exe
Please Enter an integer number : 5
5! is 120
-----
Process exited after 6.611 seconds with return value 0
Press any key to continue . . .
```


حلقه های for تودر تو: مثال

```
ClassProject2 - [ClassProject2.dev] - [Executing] - Dev-C++ 5.11
File Edit Search View Project Execute Tools AStyle Window Help
(globals)
main.cpp
1 #include <iostream>
2 using namespace std;
3
4 int main()
5 {
6     int i,j;
7
8     for ( i = 1; i <= 10; i++) {
9         for (j=1; j<=10; j++){
10             cout << " " <<i*j;
11         }
12         cout << "\n";
13     }
14
15 }
16
Compiler Resources Compile Log Debug Find Results Close
Abort Compilation
```

```
D:\C_Programs\ClassProject2\ClassProject2.exe
1 2 3 4 5 6 7 8 9 10
2 4 6 8 10 12 14 16 18 20
3 6 9 12 15 18 21 24 27 30
4 8 12 16 20 24 28 32 36 40
5 10 15 20 25 30 35 40 45 50
6 12 18 24 30 36 42 48 54 60
7 14 21 28 35 42 49 56 63 70
8 16 24 32 40 48 56 64 72 80
9 18 27 36 45 54 63 72 81 90
10 20 30 40 50 60 70 80 90 100

-----
Process exited after 0.766 seconds with return value 0
Press any key to continue . . .
```

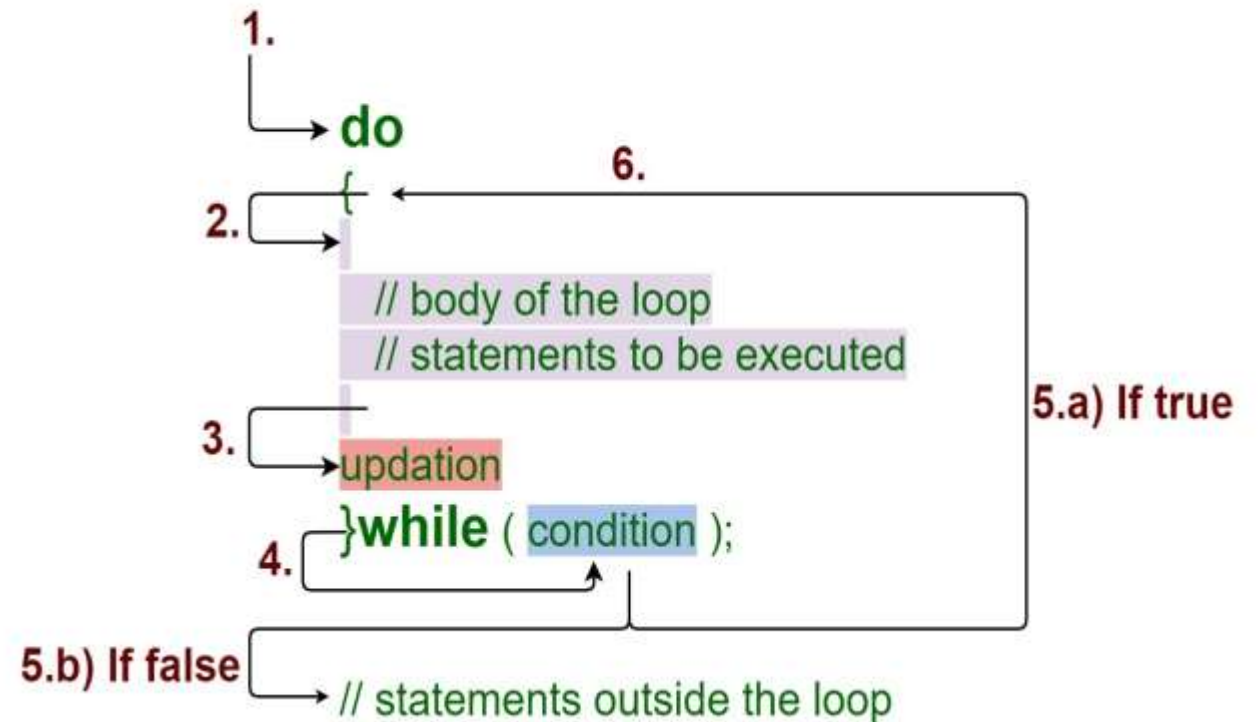
حلقه do ... while

- ساختاری که دستورات داخل آن حداقل یکبار اجرا می شوند.
- شرط در انتها بررسی می شود.

```
do {
```

دستوراتی که باید تکرار شوند

```
} while (condition test)
```

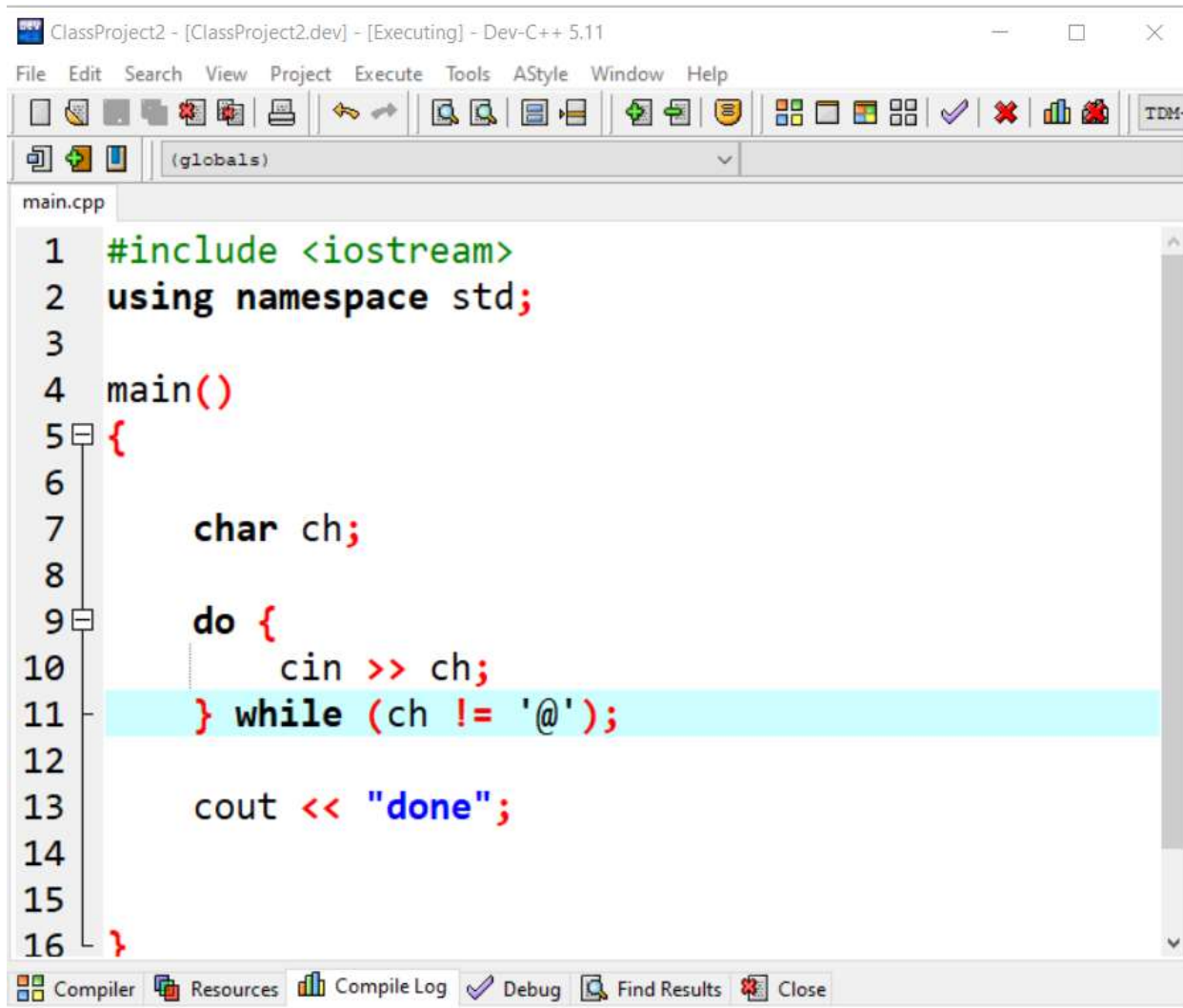


```
while (not edge) {  
    run();  
}
```

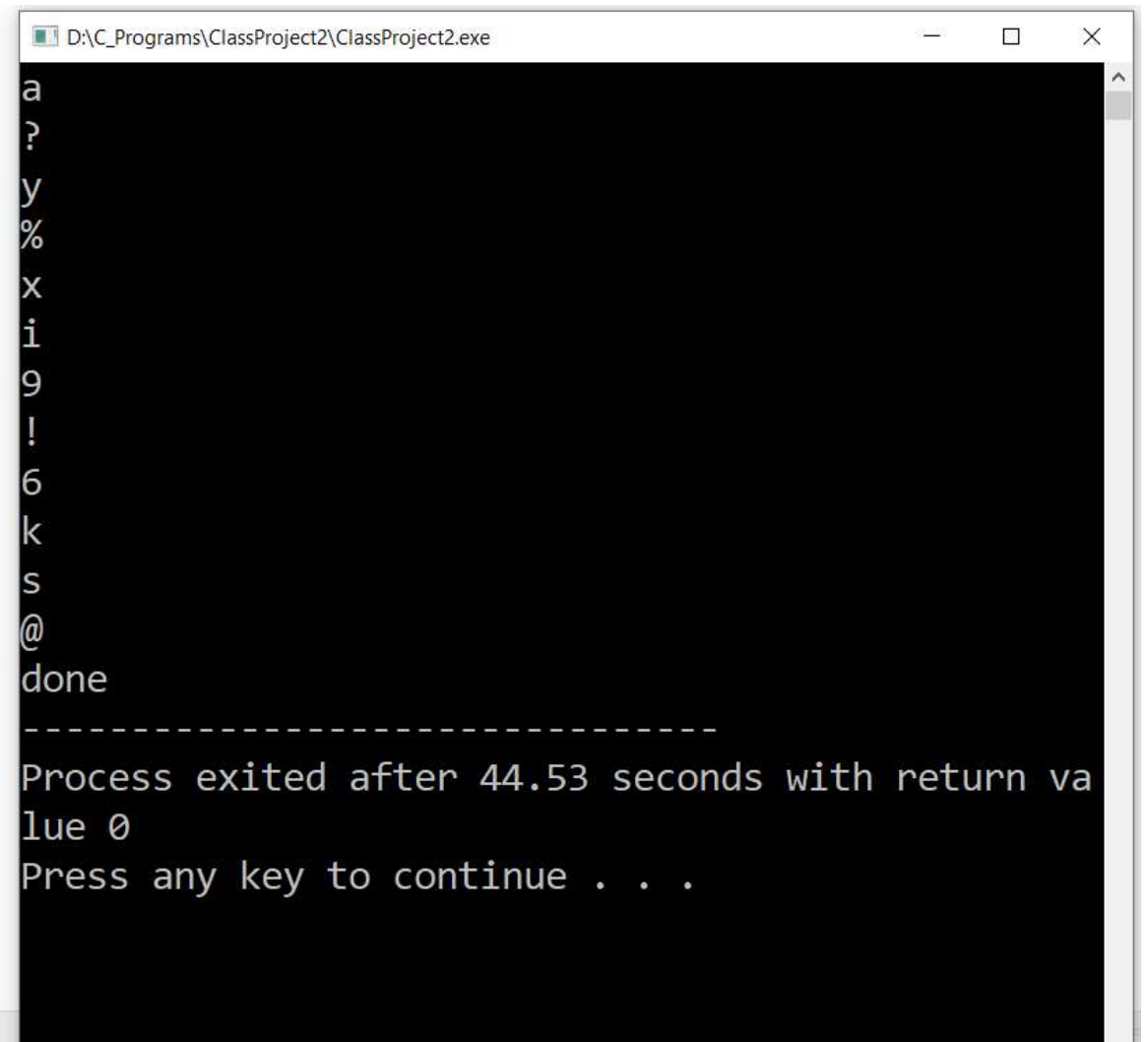
```
do {  
    run();  
} while (not edge);
```



حلقه **do ... while** : مثال: برنامه ای که تا زمانی که کاربر کاراکتر @ را وارد کند از او ورودی می گیرد



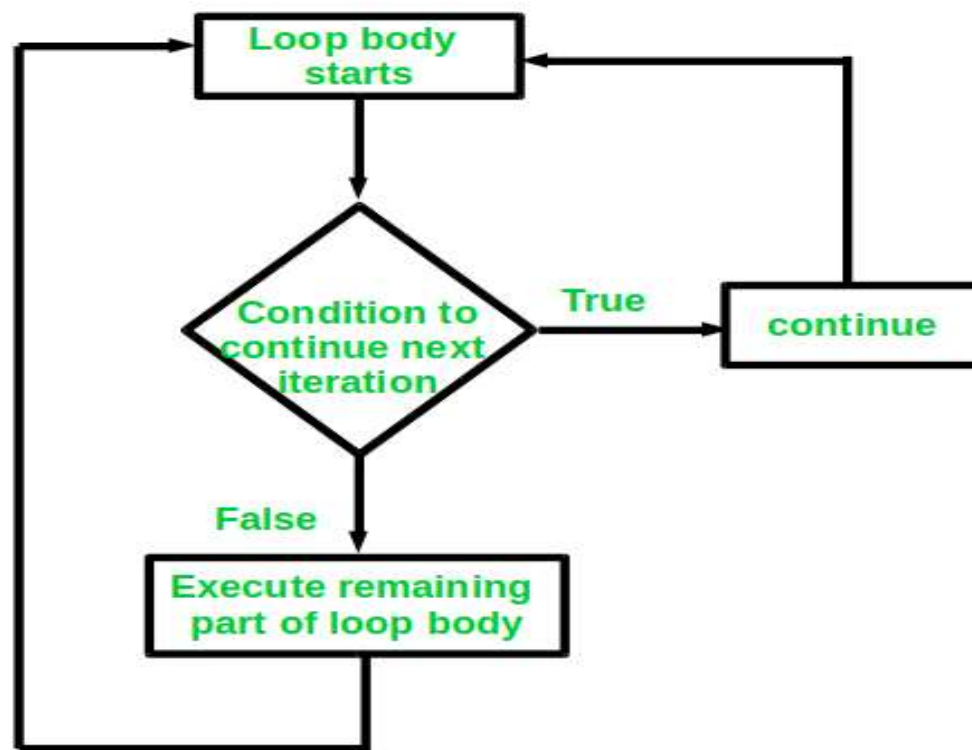
```
1 #include <iostream>
2 using namespace std;
3
4 main()
5 {
6
7     char ch;
8
9     do {
10         cin >> ch;
11     } while (ch != '@');
12
13     cout << "done";
14
15
16 }
```



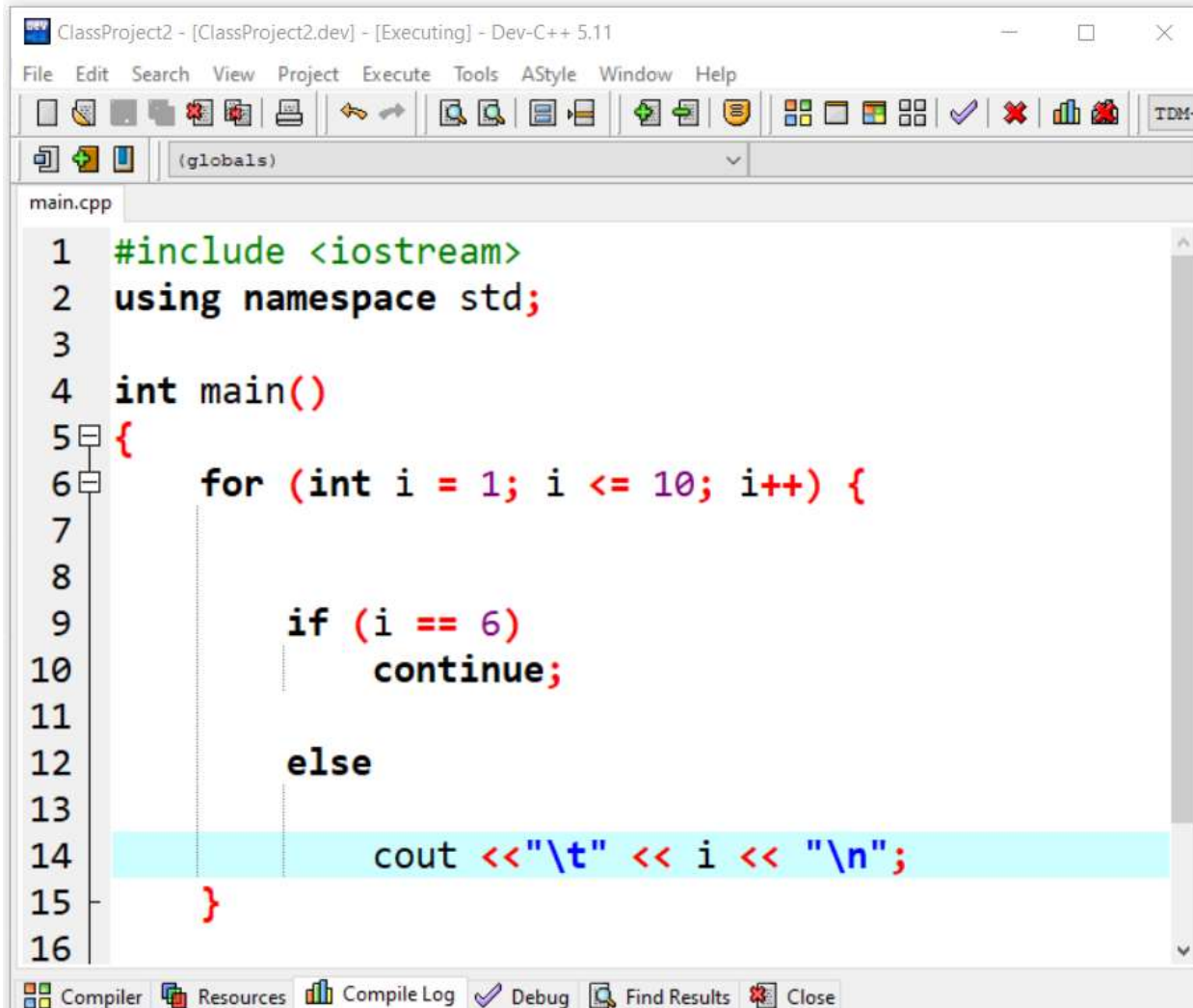
```
a
?
y
%
x
i
9
!
6
k
s
@
done
-----
Process exited after 44.53 seconds with return va
lue 0
Press any key to continue . . .
```

دستور continue

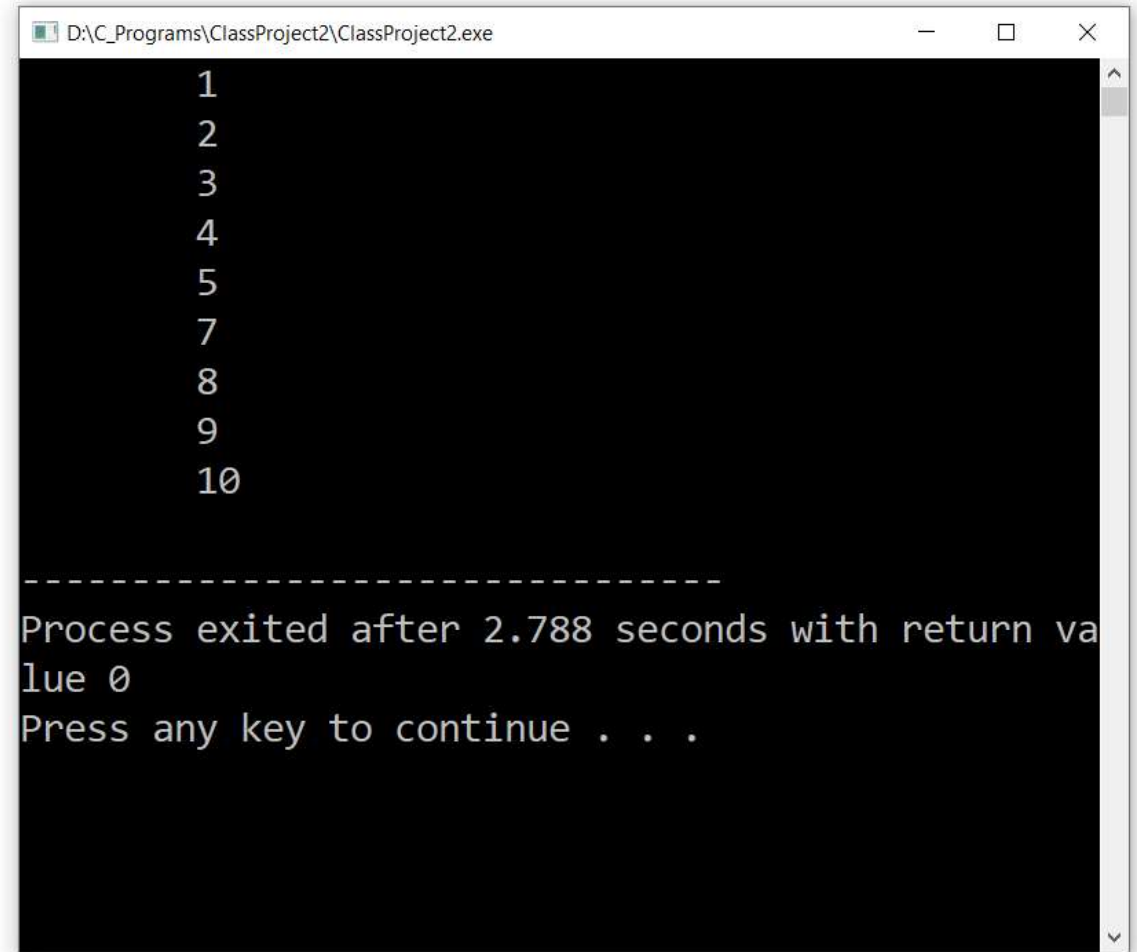
- هر گاه که این دستور اجرا شود **دور بعدی** حلقه شروع می شود.
- دستورات داخل حلقه بعد continue اجرا نمی شوند.



دستور continue: مثال



```
1 #include <iostream>
2 using namespace std;
3
4 int main()
5 {
6     for (int i = 1; i <= 10; i++) {
7
8
9         if (i == 6)
10            continue;
11
12        else
13
14            cout << "\t" << i << "\n";
15    }
16 }
```



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

-----
Process exited after 2.788 seconds with return value 0
Press any key to continue . . .
```