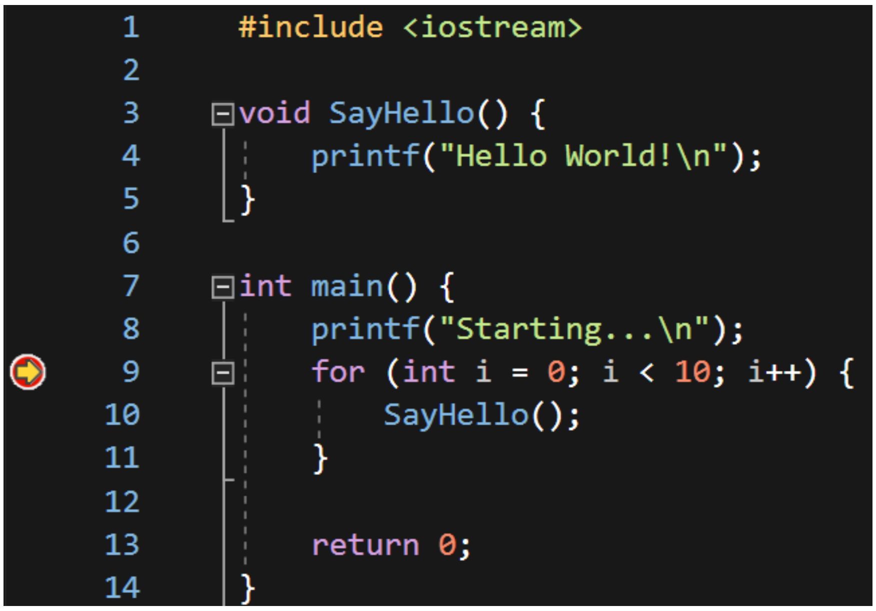
Debugging Crash Course

If you've never used a debugger before you should go try it out. It's important that you know how to use them. Here is a crash course in debugging.

- **Breakpoint** - Pauses execution at the line of code the breakpoint is set on. When execution reaches a breakpoint that is known as "hitting a breakpoint". When a breakpoint is hit execution stops before the line of code the breakpoint is on is executed. In the following example, line 9 is *not* executed when the breakpoint is hit. Line 9 is executed when execution continues past the breakpoint.



```
1    #include <iostream>
2
3    void SayHello() {
4        printf("Hello World!\n");
5    }
6
7    int main() {
8        printf("Starting...\n");
9        for (int i = 0; i < 10; i++) {
10           SayHello();
11       }
12
13       return 0;
14   }
```

- **Stepping** - Stepping is the act of running the line of code you are currently on. This allows you to slowly execute the program line-by-line and examine everything that the program is doing.
- **Step Into** or **Over** - When stepping you can choose whether to step into or over a function call. If you step into a function call you will follow the call and you can then step through that function. If you step over a function call you will not go into that function. In the code example above if I were to *step into* the function call on line 10 I would be able to debug and step through `SayHello`. If I *step over* the function call on line 10 I will *not* be brought into the `SayHello` function and I will instead step directly to line 11.
- **Step Out** - If you are in the middle of a function and you want to get out of it, you can step out. This will execute the rest of the function and return to where it was called.

Those are the basics of debugging. It's quite a simple process but it's extremely important and helpful to developers and us reverse engineers.