Scope of Variables

CS111 Lab Instructor: Chi Tse
What is Scope?

- The “scope” of a variable means the places in your code you can use it.
- All of our variables so far have been declared in blocks of code delineated by `{ }` (such as the int main() function or other function, as well as loops and conditionals.)
- If a variable is declared in a block, it can only be used in that block (and sub-blocks).
  - i.e. the scope of variables declared within a function or any inner block cannot be used outside that block.
Exercise 1:

#include <iostream>
using namespace std;

int main () {
    int i = 15;
    for (int i=1; i<=10; i++)
        cout << i << " ";
    cout << i << endl;
    return 0;
}

• What’s the output?
Exercise 2:
#include <iostream>
using namespace std;

int main () {
    //int i = 15;  //get commented out
    for (int i=1; i<=10; i++)
        cout << i << ' ';
    cout << endl;
    return 0;
}

- What happens now? What is the error message that you get?
Exercise 2 (con’t):

```cpp
for(int i=0;i<=10;i++){
    cout<<i; //outputs “i"
}
cout<<i; //error!
```

This is true even without `{ }`

```cpp
for(int i=0;i<=10;i++)
    cout<<i; //outputs “i"
cout<<i; //error!
```
Another example:

```cpp
#include <iostream>
using namespace std;
int main() {
    int n = 8;
    for (int r = 1; r <= n; r++) {
        for (int c = 1; c <= n; c++) {
            cout << "*");
        }
        cout << "\n";
    }
    return 0;
}
```

Local variable `c` only accessible within the inner loop.
Do you see an error below?

```cpp
#include <iostream>
using namespace std;
int main() {
    int a = 5;
    if(a > 3) {
        string b = "hello";
        cout << b;
    } else {
        b = "hi";
        cout << b;
    }
    return 0;
}
```
Answers to exercises:

- For exercise 1, the output is:
  1 2 3 4 5 6 7 8 9 10 15

- For exercise 2, the error message that you get for out of scope is:
  
g++ scope.cpp -o scope
  scope.cpp: In function "int main()":
  scope.cpp:8: error: name lookup of "i" changed for ISO "for" scoping
  scope.cpp:8: note: (if you use "-fpermissive" G++ will accept your code)