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C++ Jump Start

Data Structures
C++ for C Coders

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C++ as a better C
namespace
scope resolution operator
GCC compiler options
input/output
inline function

C++ as a better C

- Comment Lines

```
/* This is a comment */  
// This is a comment
```

- Declarations and definitions can be placed anywhere.
- A variable lives only in the block, in which it was defined. This block is called the **scope** of this variable.

```
int a = 0;  
for (int i = 0; i < 100; i++){ // i is declared in for loop  
    a++;  
    int p = 12;                // declaration of p ...  
    ...                        // scope of p  
} // end of scope for i and p
```

namespaces

- Identifiers in a header file used in a program become global.
 - Syntax error occurs if an identifier in a program has the same name as a global identifier in the header file.
- Same problem can occur with third-party libraries.
 - Common solution: third-party vendors begin their global identifiers with `_` (underscore)
 - Do not begin identifiers in your program with `_`
- ANSI/ISO Standard C++ attempts to solve this problem with the **namespace**.
- Syntax:

```
namespace namespace_name {  
    members  
}
```

- A member is usually a variable declaration, a named constant, a function, or another namespace.

namespaces

Briefly, it's a fence!

```
namespace namespace_name {  
    members  
}
```



namespaces

Example

```
#include <iostream>
using namespace std;

namespace one { int var = 5; }
namespace two { int var = 3; }

int main(int argc, char **argv) {
    cout << one::var << endl;
    cout << two::var << endl;
    return 0;
}
```

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namespaces

Example

```
#include <iostream>
using namespace std;

namespace one { int var = 5; }
namespace two { int var = 3; }

int main(int argc, char **argv) {
    cout << one::var << endl;
    cout << two::var << endl;
    return 0;
}
```

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Scope resolution operator ::

The scope resolution operator :: is used for following purposes.

1. To access a global variable when there is a local variable with same name.
2. To define a function outside a class.
3. To access a class's static variables.
4. In case of multiple Inheritance.

Scope resolution operator 🍷

- A definition in a block can hide a definition in an enclosing block or a global name. It is possible to use a hidden global name by using the **scope resolution operator ::**

```
int y = 0;           // Global y
int x = 1;           // Global x
void f(){            // Function is a new block
    int x = 5;       // Local x=5, it hides global x
    ::x++;           // Global x=2
    x++;             // Local x=6
    y++;             // Global y=1
}
```


More GCC Compiler Options

- There are some flags available for compiler options:

```
$ g++ -std=c++11 -Wall -g file1.cpp file2.cpp -o prog
```

- **-o** : specifies the output executable filename.
- **-std=c++11** : to specify the C++ standard version
c++11, c++14, c++17, c++2a
- **-Wall** : enables most warning messages
- **-g** : for use with gdb debugger.
- **-DDEBUG** : define "DEBUG" as a macro
- **-I** : specifies the include file folder
- **-L** : specifies the library file folder
- **-l** : specifies the lib (lib~.a) filename

Input/Output

- When a C++ program includes the `iostream` header, four objects are created and initialized:
 - **cin** handles input from the standard input, **the keyboard**.
 - **cout** handles output to the standard output, **the screen**.
 - **cerr** handles unbuffered output to the standard error device, the screen.
 - **clog** handles buffered error messages to the standard error device.

Input/Output – Using **cin** object

- cin is used with >> to gather input

cin >> variable;

- The stream extraction operator is >>
- For example, if miles is a **double** variable

cin >> miles;

- Causes computer to get a value of type **double**
- Places it in the variable miles

Input/Output – Using **cin** object

- The predefined **cin** stream object is used to read data from the standard input device, usually the keyboard.
- The **cin** stream uses the >> operator, usually called the "get from" operator.

```
#include<iostream>
using namespace std;                // we don't need std:: anymore

int main() {
    int i, j;                       // Two integers are defined
    cout << "Give two numbers \n";  // cursor to the new line

    cin >> i >> j;                  // Read i and j from the keyboard
    cout << "Sum= " << i + j << "\n";
    return 0;
}
```

Input/Output – Avoid using `cin >>` if you can

- Using `cin` to get user input is convenient sometimes since we can specify a primitive data type. However, it is notorious at causing input issues because it doesn't remove the newline character from the stream or do type-checking. So anyone using `cin >> var;` and following it up with another `cin >> stringtype;` or `std::getline();` will receive empty inputs. It's the best practice not to mix the different types of input methods from `cin`.
- Another disadvantage of using `cin >> stringvar;` is that `cin` has no checks for length, and it will break on a space. So you enter something that is more than one word, only the first word is going to be loaded. Leaving the space, and following word still in the input stream. **This may cause an error.**
- JoyNote: A more elegant solution, much easier to use, is the `std::getline()`.
- Reference <https://github.com/idebtor/nowic/blob/master/02GettingInput.md>

Input/Output – Using **cout** object

- The syntax of **cout** and **<<** is:

cout << expression or manipulator << ... ;

- Called an output statement
- The stream insertion operator is **<<**
- Expression evaluated and its value is printed at the current cursor position on the screen

Input/Output

TABLE 2-4 Commonly Used Escape Sequences

	Escape Sequence	Description
<code>\n</code>	Newline	Cursor moves to the beginning of the next line
<code>\t</code>	Tab	Cursor moves to the next tab stop
<code>\b</code>	Backspace	Cursor moves one space to the left
<code>\r</code>	Return	Cursor moves to the beginning of the current line (not the next line)
<code>\\</code>	Backslash	Backslash is printed
<code>\'</code>	Single quotation	Single quotation mark is printed
<code>\"</code>	Double quotation	Double quotation mark is printed

inline functions

- In C, macros are defined by using the `#define` directive of the preprocessor.

```
#define sq(x) ((x) * (x))  
#define max(x, y) (y < x ? x : y)
```

- In C++, macros are defined as normal functions.
Here the keyword **inline** is inserted before the declaration of the function.

```
inline int sq(int x) { return x * x; }  
inline int max(int x, int y) { return y < x ? x : y; }
```

inline functions

- An inline function is defined using almost the same syntax as an ordinary function. However, instead of placing the function's machine-language code in a separate location, the compiler simply inserts it into the location of the function call.
- It's appropriate to inline a function when it is short, but not otherwise. If a long or complex function is inlined, too much memory will be used and not much time will be saved.
- Advantages
 - Debugging
 - Type checking
 - Readable

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Scope resolution operator 🟡

- Lab

```
int i = 1;
int main(){
    int i = 2; {
        int n = i;
        int i = 3;
        cout << i << " " << ::i << endl;
        cout << n << "\n" ;
    }
    cout << i << " " << ::i << endl;
    return 0;
}
```