Introduction to C++

Chapter 1.3-1.4

Slidedeck #2
CMPT 130

Topics

1) What does a simple C++ program look like?
2) How can we output text to the screen?
3) What kind of errors will we see?

Hello World!

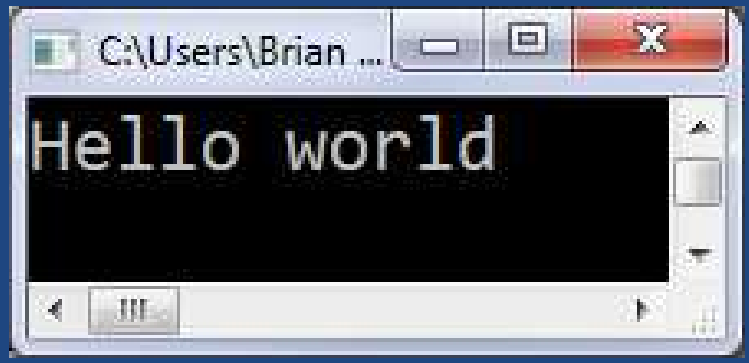
A simple C++ program.

Simple C++ Program

```
// A simple C++ program.
#include <iostream>
using namespace std;

int main () {
    cout << "Hello world";
    return 0;
}
```

Output



Simple C++ Program

```
// A simple C++ program.
#include <iostream>
using namespace std;

int main () {
    cout << "Hello world";
    return 0;
}
```

Comments:

All text on a line after a // is a comment.

These are notes to the programmer;..

Simple C++ Program

```
// A simple C++ program.
#include <iostream>
using namespace std;

int main () {
    cout << "Hello world";
    return 0;
}
```

#include:
Tells the compiler that we may use the keyboard or the screen in our program.

This is called a ..

The file *iostream* is included for our use.

Simple C++ Program

```
// A simple C++ program.
#include <iostream>
using namespace std;

int main () {
    cout << "Hello world";
    return 0;
}
```

using namespace:

All identifiers (such as variable and function names) are inside a namespace.

Basically, this states that we want to use identifiers in the std namespace.

..

Simple C++ Program

```
// A simple C++ program.
#include <iostream>
using namespace std;

int main () {
    cout << "Hello world";
    return 0;
}
```

int main() { ... }:
Creates the main() function.

The main() function is..

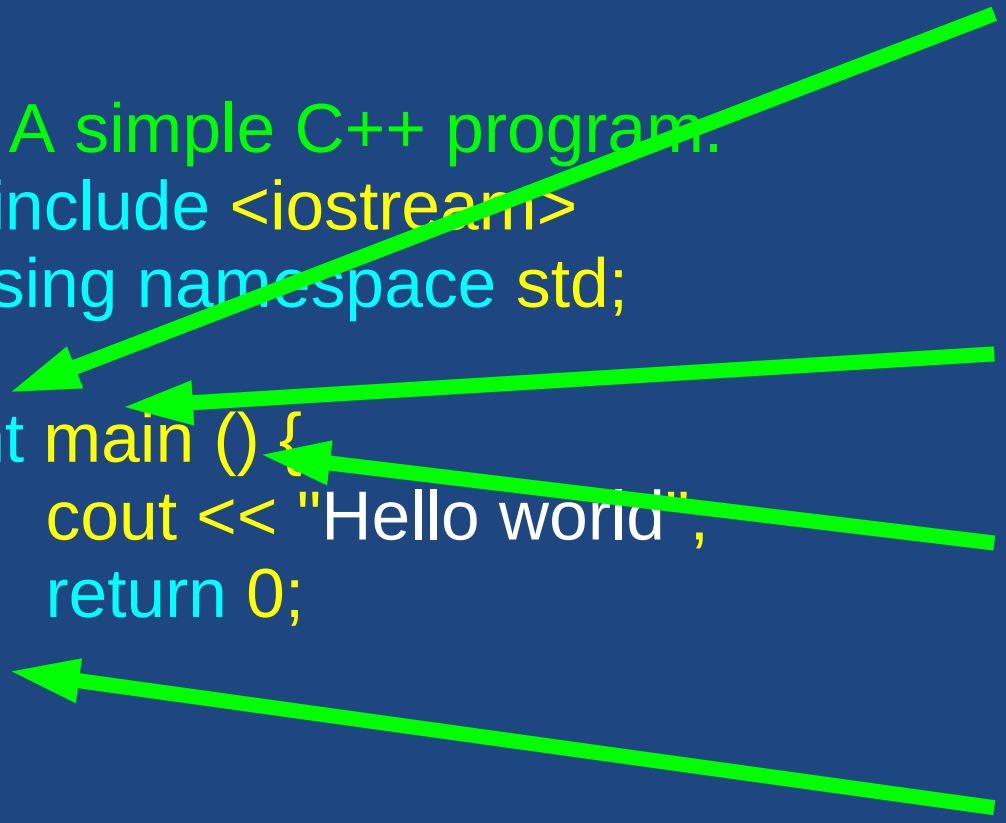
Functions are named collection of statements.

Note: C++ is case sensitive!
main() is different than Main() or MAIN()!

Simple C++ Program

```
// A simple C++ program.
#include <iostream>
using namespace std;

int main () {
    cout << "Hello world";
    return 0;
}
```



int is the return type.
In this case, an integer.
It is the type of information the program "returns" to the OS.

main is the name of our function.
Each program we create must..

The () indicates this is...

The { ... } indicates a block.
In this case, a block of statements associated with the main() function.

Simple C++ Program

```
// A simple C++ program.
#include <iostream>
using namespace std;

int main () {
    cout << "Hello world";
    return 0;
}
```

cout:..

Think of << as sending the string to cout.
(cout = character out).

Completed statements end with a semicolon.
We will later get a better feel for this.
For now, just concentrate on the parts of the program.

Simple C++ Program

```
// A simple C++ program.
#include <iostream>
using namespace std;

int main () {
    cout << "Hello world";
    return 0;
}
```

return:

The return statement in the main() function returns a value to the operating system.

Returning 0 to the OS indicates success (by convention).

..

Review

1) What C++ statement prints "I love programming" to the screen?

2) What part of a C++ program is first to be executed?

3) What is wrong with this C++ statement?

   cOut >> “Hello!”

Tools

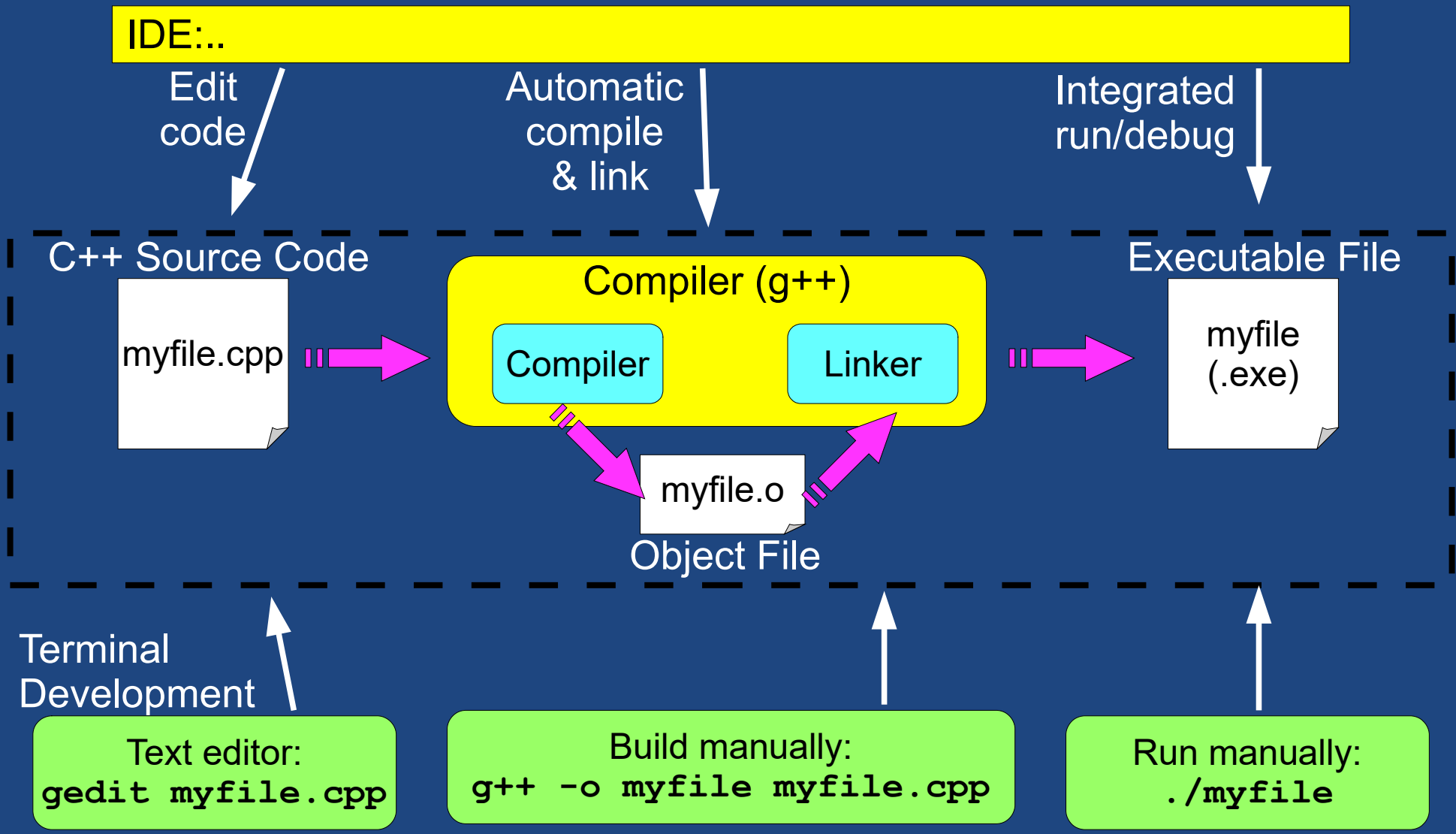
How to build an executable.

Build Process

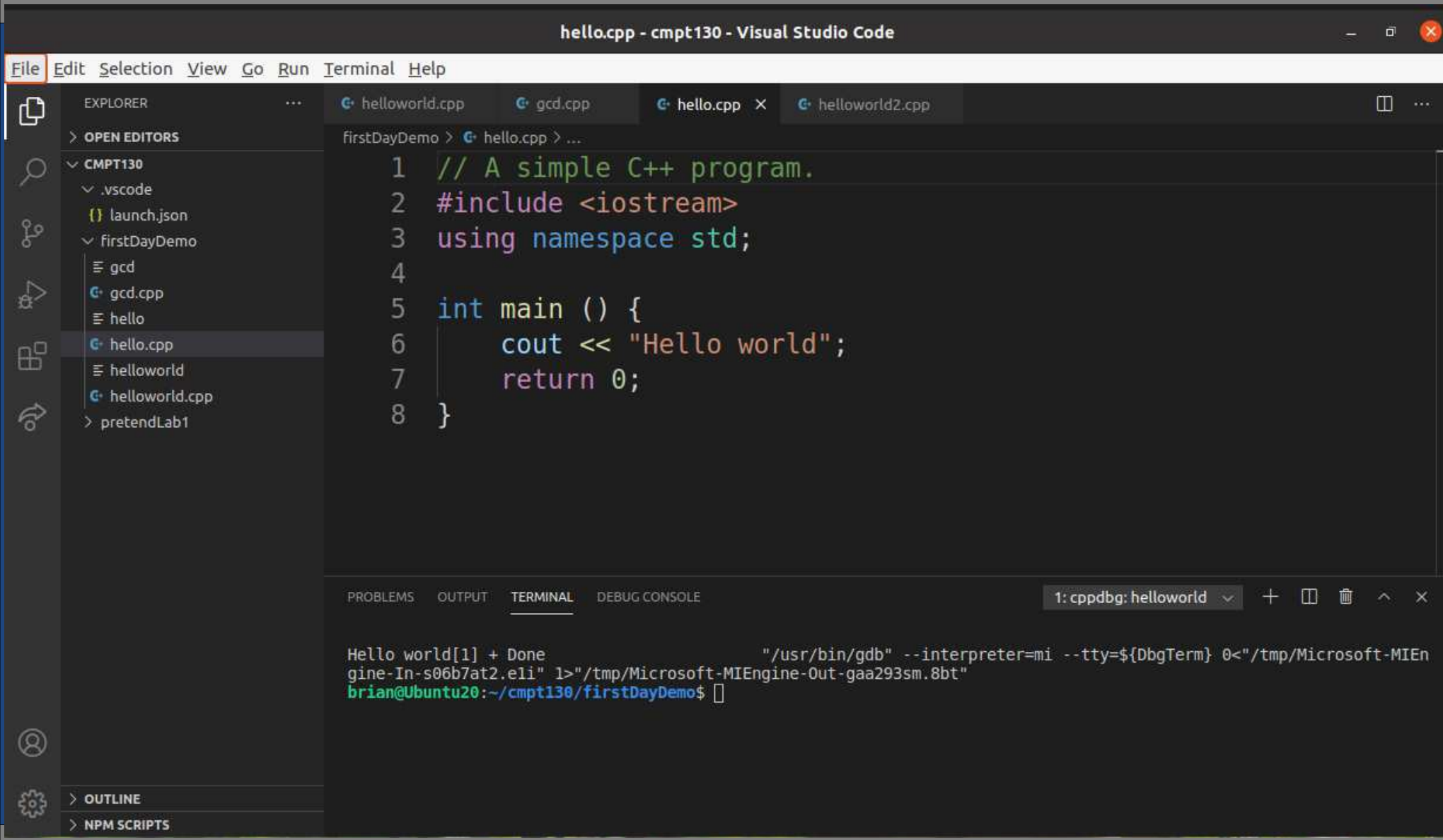
- We write C++ code; computer runs machine code.

- Build:..
- Tool Options
  - IDE:..
    All tasks done through graphical user interface (UI)
  - Terminal Development:
    All tasks done through a command prompt.

Tools Options



Visual Studio Code



The cout Object

cout

- cout (Pronounced “C Out”, not “kout”)
  -
  - Think of it as character out, or console out.
- cout is a stream object:
  - It operates on a stream (sequence) of characters.
- << is the stream-insertion operator:
  - Use it to push text into cout
    cout << "Wow! Programming is fun!";
  - Think of << as an arrow point to the left:

Multiple Strings

- You can send multiple different strings to cout:

```
// Displaying multiple strings.
#include <iostream>
using namespace std;

int main () {
      cout << "Programming is " << "great fun ";
      cout << "all the time!";

      return 0;
}
```

Notice all the strings are run together, even though they are from separate statements.

Common Problem

- What is the problem with the following?

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

int main () {
    // Demonstrate a common problem
    cout << "My favourite numbers are: ";
    cout << "0";
    cout << "42";
    cout << "73";
    return 0;
}
```

Line Feeds

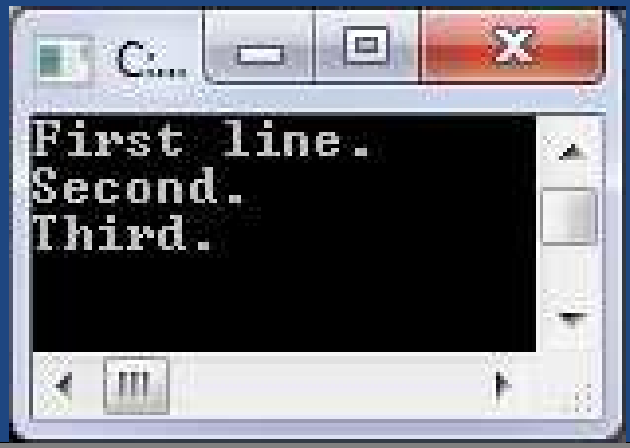
- Can put line feeds in with either:
  - End Line Stream Manipulator: endl

```
cout << "First line." << endl;
cout << "Second." << endl << "Third.";
```

  - New Line Character: "\n"

```
cout << "First line.\n";
cout << "Second.\n" << "Third.";
```

..



Special Characters

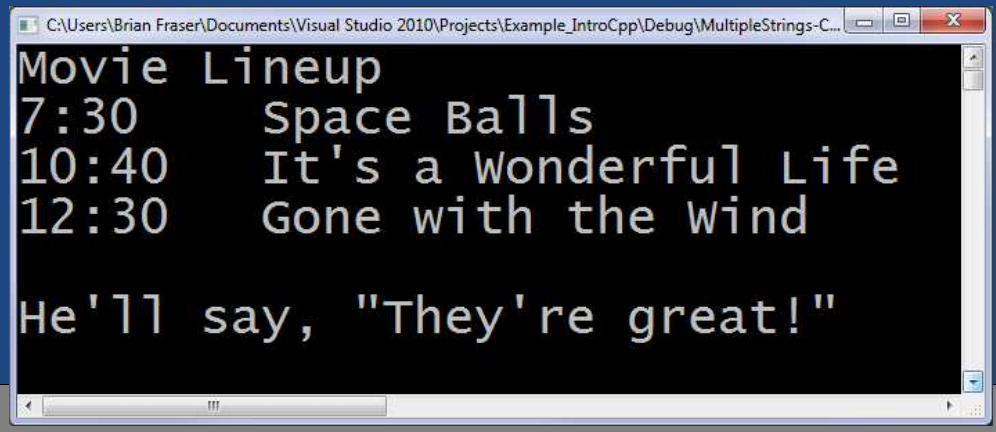
- Escape Sequences:

  ..
  - New line: "One \n on \n top"
  - Tabs (line up): "Age: \t"
  - A \ character: "Up \\ down"
  - A ' character: "I\'m lovin\' programming!"
  - A " character: "I said, \"Yes!\" too"
- Note that the escape sequence must be inside a string, whereas endl must not be in the string.

Escape Sequence Example

```
// Demonstrate escape sequences and endl
#include <iostream>
using namespace std;

int main () {
      cout << "Movie Lineup\n";
      cout << "7:30\tSpace Balls" << endl;
      cout << "10:40\tIt\'s a Wonderful Life" << endl;
      cout << "12:30\tGone with the Wind"<<endl<<endl;
      cout << "He'll say, \"They\'re great!\"\n";
      return 0;
}
```



Spot the Mistakes

```
// Show some common mistakes.
#include <iostream>
using namespace std;

int main () {
      // Spot the mistakes:
      cout << "C++ is fun! endl";
      cout << "Computers are awesome!" << \n;
      cout << "Amazing stuff!/n";
      cout << "I say "Yeah!"" >> endl;
      return 0;
}
```

Review

1) Write one or more C++ statements which output the following (including tabs, and line-feeds):

```
Name:          "Brian"
Fav-Colour:    Green
```

Errors

To err is human,
but to really foul things up
you need a computer.

Paul Ehrlich

1982: Bug in software controlling Soviet pipeline causes largest man-made non-nuclear explosion in history.

Errors

- Compile Error
  -
  - Syntax errors, such as forgetting a ;
  - Semantic errors, such as invalid type casting.
- Run-time Error
  - Errors causing...
    such as an un-checked divide by zero (exceptions).
- Logical Error
  -
  - Caused by programmer error (bug).

Debugging

- Most (all?) large programs have bugs.
  - You'll spend a large amount of time debugging!
- QA is Quality Assurance
  - The task of showing the program is..
  - Cannot reasonably prove that there are no bugs:
    - Can show it works for..
      Ex: square root of 16?
    - Can show it works for..
      Ex: square root of 0? -1? 4 billion?

Summary

- Simple program: "Hello world!"
- Output to the console with cout.
  - cout << "One " << "Two";
  - cout << "With 2 line feeds\n" << endl;
- Compile C++ code to machine code.
- Escape Sequence: \n, \t, \\, \', \"
- 3 types of errors:
  - Compile, run-time, logical.