Beginning with C++

What is C++

C++ is a **high-level**, **general-purpose programming language** developed by **Bjarne Stroustrup** in the early **1980s**. It is an **extension of the C language** with **Object-Oriented Programming (OOP)** features like classes and objects.

- Key Points about C++:
  - Supports both **Procedure-Oriented** (like C) and **Object-Oriented Programming.**
  - Allows **low-level memory access** (similar to C) but also offers **high-level abstractions**.
  - Provides features like **encapsulation, inheritance, and polymorphism**.
  - Used for **system software, game development, embedded systems, real-time simulations,** and more.

Why Learn C++?

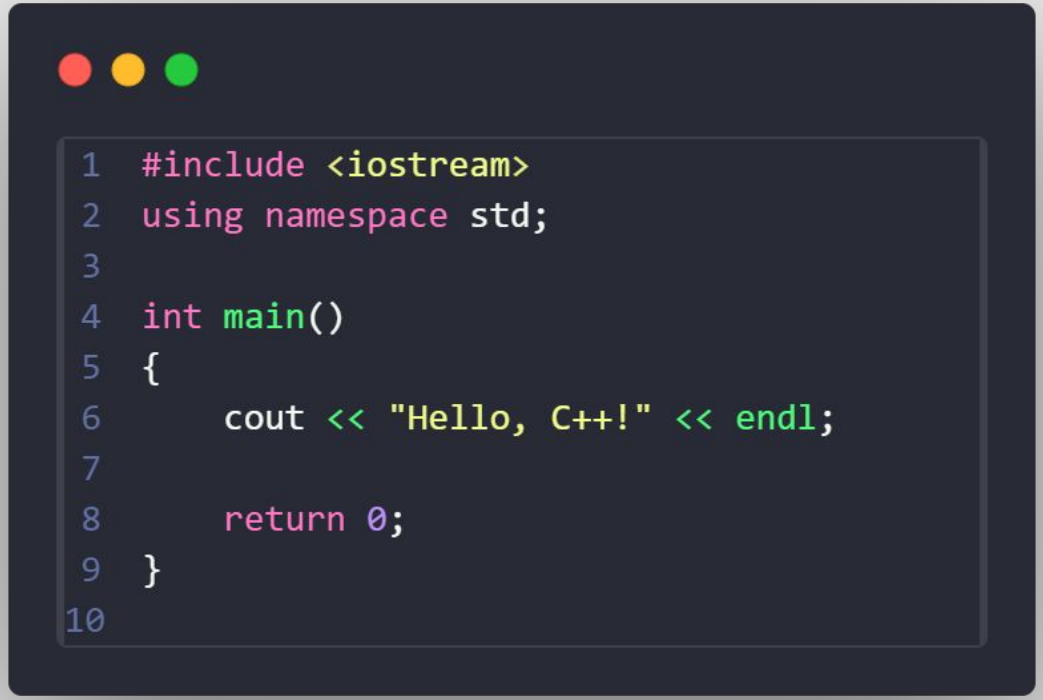
- **Fast and powerful**
- **Widely used** in industries
- Builds strong **problem-solving skills**
- Good stepping stone for learning other languages

Applications of C++

C++ is a **powerful** and **versatile** language, used in many important fields:

- **System Software**: Used for operating systems, device drivers, and file systems.
- **Game Development**: Powers game engines (e.g., Unreal Engine) and real-time graphics.
- **Embedded Systems**: Utilized in firmware and microcontroller programming for IoT devices.
- **Financial Systems**: Used in high-frequency trading platforms and banking software.
- **Database Management**: Powers database engines and query optimization.
- **Scientific Computing**: Applied in simulations, modeling, and high-performance computing.

Simple Example:



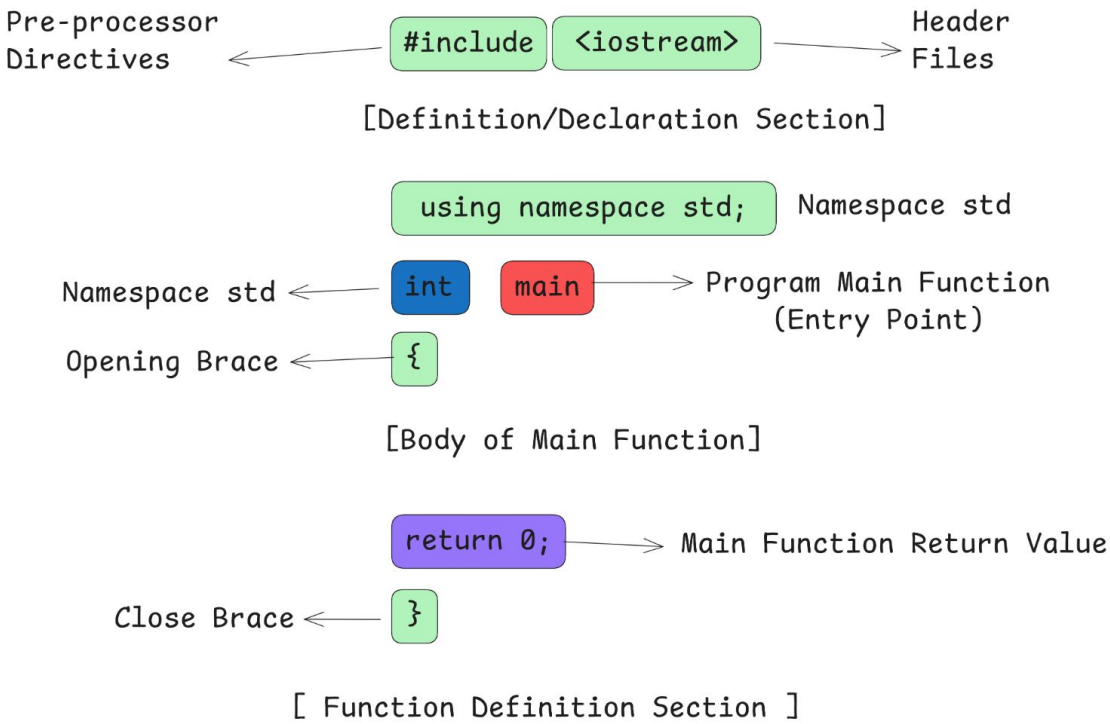
```cpp
#include <iostream>
using namespace std;

int main()
{
    cout << "Hello, C++!" << endl;

    return 0;
}

```

The basic Structure of a C++



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Preprocessor Directive

Preprocessor directives are **instructions** given to the **compiler** to **process** before actual compilation of the code begins.

They **start with #** symbol and are **handled by the preprocessor** (not the compiler directly).

Preprocessor directives are needed **because** they **prepare the code for the compiler**.
They **automate** tasks like:

- **Including libraries** (so you can use functions like cout without writing them yourself)
- **Defining constants or macros** (so you don't repeat yourself)
- **Managing conditional code** (so some parts of the code can be included or excluded automatically)
- **Reducing errors** (like preventing multiple inclusions of the same file)

Common Preprocessor Directives:

Directive	Purpose
#include	Includes header files
#define	Defines macros (constants or functions)
#undef	Undefined a macro
#ifdef	Checks if a macro is defined
#ifndef	Checks if a macro is not defined
#endif	Ends conditional preprocessor block
#pragma	Special commands to the compiler

Namespace

A **namespace** is used to **group names** (like variables, functions, classes) to **avoid conflicts** between names in different parts of a program.

If two libraries have a function with the same name, a **namespace** keeps them separate.

Important Points:

- Access namespace members using `::` (scope resolution operator).
- `using namespace std;` lets you use `cout`, `cin`, etc., without writing `std::cout`.

Namespace = *Name grouping + Name conflict protection*.

Return Type of `main()`

The **return type of** `main()` is `int`.

Why `int`?

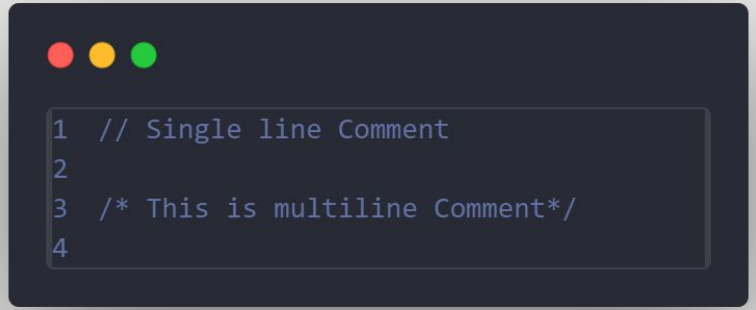
- `main()` returns an integer value to the **operating system**.
- `return 0;` means the program ended **successfully**.
- Any **non-zero value** usually means **an error occurred**.

Even if you **don't write** `return 0;`, modern C++ compilers automatically add it.
In **older C++ standards (C++98)**, you were required to write `return 0;` explicitly.

`int main()` means "When the program finishes, tell the OS whether it succeeded (0) or failed (non-0)."

Comments

- **Comments** are used to **explain code**; they are **ignored by the compiler**.
- Two types:
  - **Single-line comment**: `// This is a single-line comment`
  - **Multi-line comment**:



Some Exercise Question

1. Write a program to display “Hello World!” in C++.

2. WAP to display the following output.
I am from Nepal .
I Love my country.

3. Write a Program to input radius of circle and find its area.

4. Write a program to input length and breadth of a room and calculate and print its area and perimeter.

5. Write a program to calculate simple interest amount for deposit amount (P) kept in bank for (n) years at the rate of (r) simple interest per annum by implementing following categories of function.

✓ Function with arguments and with return value
✓ Function with no arguments and no return value
✓ Function with arguments but no return value
✓ Function with no arguments but with return value