Basic and I/O Libraries in C++

Understanding the building blocks of the C++ Standard Library and how to manage data streams.

What is a Library?

Definition

A library is a collection of pre-written, reusable code—including functions, classes, and variables. It provides ready-to-use functionalities to perform common tasks.

Why Use Them?

- **Time-Saving:** No need to rewrite common code (like printing to the screen).
- **Optimized:** Library code is often highly optimized for performance and security.
- **Standardized:** Ensures your code is portable and works across different compilers.

The C++ Standard Library

Core Language

Provides fundamental utilities, data types (like `int`, `char`), and functions used by the language itself.

STL (Containers)

The Standard Template Library, which includes powerful containers like `std::vector`, `std::map`, and `std::list`.

I/O & Utilities

Manages input/output streams, file systems, string manipulation, and mathematical functions.

How to Use a Library

1. The `#include` Directive

Use this preprocessor directive at the top of your file to paste the header file contents into your program.

```
#include
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```

2. The `std::` Namespace

Access Standard Library features using the `std` namespace and the scope resolution operator (`::`).

```
// Accessing 'cout' from 'std'
std::cout << "Hello!";
```

Focus: I/O Libraries

The Library

- Stands for **Input/Output Stream**. This is the most fundamental I/O library.
- `std::cin` : The standard **input** stream (keyboard). Uses the extraction operator `>>` .
- `std::cout` : The standard **output** stream (console). Uses the insertion operator `<<` .
- `std::cerr` / `std::clog` : Standard error streams for logging issues and errors.

The Library

- Stands for **File Stream**.
- Provides the tools to read from and write to files on your computer's disk.
- `std::ifstream` : "Input File Stream". Used for reading data **from** a file.
- `std::ofstream` : "Output File Stream". Used for writing data **to** a file.

Other I/O Libraries

"Input/Output Manipulators". Used to format your output: setting width, precision, alignment, etc.

```
std::setw(10)
```

"String Stream". Lets you treat a `std::string` in memory just like a file or console stream. Great for parsing text.

```
std::stringstream ss;
```

Other "Basic" Libraries

Defines the `std::string` class for creating and manipulating text far more easily than C-style char arrays.

The most common STL container. A dynamic, resizable array that automatically manages its own memory.

Includes C-style math functions like `sqrt()` (square root), `pow()` (power), and trigonometric functions.