

# Tutorial 6 - C++ Header Files & Operators

## Header Files

1. `#include` → Used to include header files in C++ programs.
2. **Types of Header Files:**
  - **System Header Files:** Provided with the compiler (e.g., `#include<iostream>`).
    - Functions like `cin` and `cout` are defined in `<iostream>`.
  - **User-Defined Header Files:** Created by the programmer.
    - Syntax: `#include "filename.h"` (must be in the current directory).

## Operators in C++

- **Definition:** Symbols used to perform operations (arithmetic, comparison, logical, etc.).
- **Types of Operators:**

### a. Arithmetic Operators

- Perform basic math operations.

Examples:

- `+` → Addition
- `-` → Subtraction
- `*` → Multiplication
- `/` → Division
- `%` → Modulus (remainder)
- Increment/Decrement:
  - `a++` → Post-increment (prints `a` first, then increments).
  - `++a` → Pre-increment (increments `a` first, then prints).
  - `a--` → Post-decrement.
  - `--a` → Pre-decrement.

### b. Assignment Operators

- Assign values to variables.

Examples:

- `=` → Assignment (e.g., `a = 5`).
- `+=`, `-=`, `*=`, `/=`, `%=` → Compound assignment.

### c. Comparison Operators

- Compare two values and return `1` (true) or `0` (false).

Examples:

- `==` → Equal to.
- `!=` → Not equal to.
- `>=` → Greater than or equal to.
- `<=` → Less than or equal to.
- `>` → Greater than.
- `<` → Less than.

### d. Logical Operators

- Compare two expressions and return a boolean result.

Examples:

- `&&` → Logical AND (true if both conditions are true).

- `||` → Logical OR (true if at least one condition is true).
- `!` → Logical NOT (inverts the result).

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### Code Example

```
1 #include<iostream>
2 using namespace std;
3
4 int main() {
5     int a = 4, b = 5;
6
7     // Arithmetic Operators
8     cout << "Arithmetic Operators:\n";
9     cout << "a + b = " << a + b << endl;
10    cout << "a - b = " << a - b << endl;
11    cout << "a * b = " << a * b << endl;
12    cout << "a / b = " << a / b << endl;
13    cout << "a % b = " << a % b << endl;
14    cout << "a++ = " << a++ << endl;
15    cout << "++a = " << ++a << endl;
16    cout << "a-- = " << a-- << endl;
17    cout << "--a = " << --a << endl;
18
19    // Comparison Operators
20    cout << "\nComparison Operators:\n";
21    cout << "a == b: " << (a == b) << endl;
22    cout << "a != b: " << (a != b) << endl;
23    cout << "a >= b: " << (a >= b) << endl;
24    cout << "a <= b: " << (a <= b) << endl;
25    cout << "a > b: " << (a > b) << endl;
26    cout << "a < b: " << (a < b) << endl;
27
28    // Logical Operators
29    cout << "\nLogical Operators:\n";
30    cout << "((a == b) && (a < b)): " << ((a == b) && (a < b)) << endl;
31    cout << "((a == b) || (a < b)): " << ((a == b) || (a < b)) << endl;
32    cout << "!(a == b): " << !(a == b) << endl;
33
34    return 0;
35 }
36
```

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### Short Notes

#### Header Files

- `#include` imports header files.
  - **System Header Files:** Predefined (e.g., `<iostream>`).
  - **User-Defined Header Files:** Created by the programmer (e.g., `"filename.h"`).

#### Operators

1. **Arithmetic Operators:** `+`, `-`, `*`, `/`, `%`.
  - Increment/Decrement: `++`, `--`.
2. **Assignment Operators:** Assign values (`=`, `+=`, etc.).

3. **Comparison Operators:** Compare values ( `==` , `!=` , `>=` , `<=` , `>` , `<` ).

4. **Logical Operators:** Work with boolean logic ( `&&` , `||` , `!` ).