

C++ Basics

(Part 1)

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Why you should prefer C++

(For Competitive Programming)

- Efficiency and Speed
- Most popular language for CP
- In-built Data Structures and Algorithms (STL)

Goal

To understand:

- Constants and datatypes
- Input/Output
- Different types of operators
- Conditional statements

We will be able to write simple programs by the end using conditional statements and arithmetic operators (eg. A-F grade assigner)

Simplest C++ program

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

int main() {
    cout << "Hello world!" << endl;
}
```

Constants in C++

- Integer constants: 4 | 62 | -90
- Decimal constants: 3.14 | 12.0 | 0.33333
- Character constants: 'f' | '5' | '~' | '\n'
- String literal: "Hello :D" | "MyP@ssw0rd123!"

Output in C++

To output a value, we use the cout operator as follows: `cout << value;`

To print multiple values in the same line:
`cout << value1 << value2 << value3;`

To start printing in a new line: `endl` or `'\n'`

Arithmetic operators in C++

Arithmetic Operators:

- 1) + Addition
- 2) - Subtraction
- 3) * Multiplication
- 4) / Division (Quotient)
- 5) % Modulo (Remainder)

NOTE: C++ follows the BODMAS rule

Variables

Variables are containers that stores specific types of data. They can be modified with the assignment operator “=”

Syntax: `datatype variable_name = value;`

Variables

Variable names cannot:

- Have spaces (use underscore instead)
- Start with a digit
- Be reserved by the compiler (Keywords not allowed)
- Already taken by another variable (in the same scope)

NOTE: Keywords/Variables are case sensitive

Datatypes

Datatypes are used to set the “type” of a variable. For example, `int` is used to declare integer variables.

Two types of datatypes:

- Primitive datatypes
- Derived datatypes

Common Primitive datatypes

1. int (long long int, unsigned int, etc.)
2. char
3. bool
4. float (double, long double)
5. Special type: void

Common Derived datatypes

1. string
2. vector
3. map
4. set
5. priority_queue

Arithmetic Assignment Operators

1. +=
2. -=
3. *=
4. /=
5. %=

Unary Operators

Operators that only need one value/operand are called unary operators.

1. +
2. -
3. ++
4. --

Input in C++

To input a value, we use the cin operator as follows: `cin >> value;`

To print multiple values in the same line:
`cin >> value1 >> value2 >> value3;`

NOTE: Each input value must be separated by a space or a new line.

Check your understanding - 1

1. How will you declare a character equal to exclamatory mark?
2. Take two values a , b as input, and output three values: $a+b$ and $a*b$ and a/b

a/b should be a decimal, not an integer

Conditions and Relational Operators

Conditions return a boolean value depending on whether the expression is true or false.

Conditional operators:

`==, !=`

Relational operators:

`<, >, <=, >=`

Logical operators

Logical operators perform operations on boolean values or expressions that result in Boolean values.

1. “(expr1) && (expr2)” checks whether BOTH are true.
2. “(expr1) || (expr2)” checks whether EITHER one is true.
3. “!(expr)” returns the OPPOSITE of the result of “expr”

The operators are called AND, OR, NOT operators respectively

Conditional statements

Conditional statements execute a different block of code depending on the boolean value of a condition.

Syntax:

```
if (condition) {  
    // something  
} else if (another_condition) {  
    // something  
} else {  
    // something  
}
```

Scope

A scope is a region of the program.

Every pair of curly braces creates a new scope.

The variables inside the scope cannot be used outside the scope.

Check Your Understanding 2

1. Given someone's age, tell whether they are a child, adult, or a senior citizen.

0-17 : Child

18-64 : Adult

65+ : Senior Citizen

2. Take input of 3 numbers x, y, z and output the maximum using if statements

Exercise

Write a program to take the marks of a student as an input, and output the grade.

0-35 : F

35-50 : E

50-60 : D

60-70 : C

70-85 : B

85-100 : A

If the input is not in the range [0-100], then output it is invalid.

Resources

- <https://www.programiz.com/cpp-programming> (learning C++ in general)
 - <https://www.programiz.com/cpp-programming/operators> (all operators)
 - https://www.w3schools.com/cpp/cpp_conditions.asp (operators, if-statements)
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- <https://forms.gle/p2DtZzQuQ2xmutae8>

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Thank you!