

## Basics

Basic syntax and functions from the C++ programming language.

### Boilerplate

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

int main() {
    cout << "Welcome To CodeWithHarry";
    return 0;
}
```

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### cout <<

It prints output on the screen used with the insertion operator

```
cout << "This is C++ Programming";
```

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### cin >>

It takes input from the user used with the extraction operator

```
cin >> variable_name;
```

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## Data types

The data type is the type of data

## Character type

Typically a single octet(one byte). It is an integer type

```
char variable_name;
```

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## Integer type

The most natural size of integer for the machine

```
int variable_name;
```

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## Float type

A single-precision floating-point value

```
float variable_name;
```

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## Double type

A double-precision floating-point value

```
double variable_name;
```

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## Void type

Represents the absence of the type

```
void
```

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## Boolean type

```
bool
```

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## Escape Sequences

It is a sequence of characters starting with a backslash, and it doesn't represent itself when used inside string literal.

### Alarm or Beep

It produces a beep sound

```
cout<<"\a";
```

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### Backspace

It adds a backspace

```
cout<<"\b";
```

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### Form feed

```
cout<<"\f";
```

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## Newline

Newline Character

```
cout<<"\n";
```

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## Carriage return

```
cout<<"\r";
```

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## Tab

It gives a tab space

```
cout<<"\t";
```

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## Backslash

It adds a backslash

```
cout<<"\\";
```

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## Single quote

It adds a single quotation mark

```
cout<<"\'";
```

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## Question mark

It adds a question mark

```
cout<<"\?";
```

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## Octal No.

It represents the value of an octal number

```
cout<<"\nnn";
```

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## Hexadecimal No.

It represents the value of a hexadecimal number

```
cout<<"\xhh";
```

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## Null

The null character is usually used to terminate a string

```
cout<<"\0";
```

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## Comments

A comment is a code that is not executed by the compiler, and the programmer uses it to keep track of the code.

## Single line comment

```
// It's a single line comment
```

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## Multi-line comment

```
/* It's a  
multi-line  
comment  
*/
```

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## Strings

It is a collection of characters surrounded by double quotes

### Declaring String

```
// Include the string library  
#include <string>  
  
// String variable  
string variable1 = "Hello World";
```

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### append function

It is used to concatenate two strings

```
string firstName = "Harry ";
```

```
string lastName = "Bhai";  
string fullName = firstName.append(lastName);  
cout << fullName;
```

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## length function

It returns the length of the string

```
string variable1 = "CodeWithHarry";  
cout << "The length of the string is: " << variable1.length();
```

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## Accessing and changing string characters

```
string variable1 = "Hello World";  
variable1[1] = 'i';  
cout << variable1;
```

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## Maths

C++ provides some built-in math functions that help the programmer to perform mathematical operations efficiently.

### max function

It returns the larger value among the two

```
cout << max(25, 140);
```

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## min function

It returns the smaller value among the two

```
cout << min(55, 50);
```

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## sqrt function

It returns the square root of a supplied number

```
#include <cmath>
```

```
cout << sqrt(144);
```

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## ceil function

It returns the value of x rounded up to its nearest integer

```
double a=ceil(1.9);
```

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## floor function

It returns the value of x rounded down to its nearest integer

```
double a=floor(1.02);
```

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## pow function

It returns the value of x to the power of y



```
int a=pow(x, y);
```

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## Decision Making Instructions

Conditional statements are used to perform operations based on some condition.

### If Statement

```
if (condition) {  
    // This block of code will get executed, if the condition is  
    True  
}
```

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### If-else Statement

```
if (condition) {  
    // If condition is True then this block will get executed  
} else {  
    // If condition is False then this block will get executed  
}
```

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### if else-if Statement

```
if (condition) {  
    // Statements;  
}
```

```
else if (condition){  
    // Statements;  
}  
else{  
    // Statements  
}
```

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## Ternary Operator

It is shorthand of an if-else statement.

```
variable = (condition) ? expressionTrue : expressionFalse;
```

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## Switch Case Statement

It allows a variable to be tested for equality against a list of values (cases).

```
switch (expression)  
{  
    case constant-expression:  
        statement1;  
        statement2;  
        break;  
    case constant-expression:  
        statement;  
        break;  
    ...  
    default:
```

```
statement;  
}
```

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## Iterative Statements

Iterative statements facilitate programmers to execute any block of code lines repeatedly and can be controlled as per conditions added by the programmer.

### while Loop

It iterates the block of code as long as a specified condition is True

```
while (/* condition */)   
{   
    /* code block to be executed */   
}
```

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### do-while loop

It is an exit controlled loop. It is very similar to the while loop with one difference, i.e., the body of the do-while loop is executed at least once even if the condition is False

```
do   
{   
    /* code */   
} while (/* condition */);
```

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## for loop

It is used to iterate the statements or a part of the program several times. It is frequently used to traverse the data structures like the array and linked list.

```
for (int i = 0; i < count; i++)  
{  
    /* code */  
}
```

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## Break Statement

break keyword inside the loop is used to terminate the loop

```
break;
```

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## Continue Statement

continue keyword skips the rest of the current iteration of the loop and returns to the starting point of the loop

```
continue;
```

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## References

Reference is an alias for an already existing variable. Once it is initialized to a variable, it cannot be changed to refer to another variable. So, it's a const pointer.

## Creating References

```
string var1 = "Value1"; // var1 variable  
string &var2 = var1; // reference to var1
```

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## Pointers

Pointer is a variable that holds the memory address of another variable

### Declaration

```
datatype *var_name;  
  
var_name = &variable2;
```

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## Functions & Recursion

Functions are used to divide an extensive program into smaller pieces. It can be called multiple times to provide reusability and modularity to the C program.

### Function Definition

```
return_type function_name(data_type parameter...){  
    //code to be executed  
}
```

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## Function Call

```
function_name(arguments);
```

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## Recursion

Recursion is when a function calls a copy of itself to work on a minor problem. And the function that calls itself is known as the Recursive function.

```
void recurse()  
{  
    ... ..  
    recurse();  
    ... ..  
}
```

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## Object-Oriented Programming

It is a programming approach that primarily focuses on using objects and classes. The objects can be any real-world entities.

### class

```
class Class_name {  
    public: // Access specifier  
    // fields  
    // functions  
    // blocks
```

```
};
```

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## object

```
Class_name ObjectName;
```

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## Constructors

It is a special method that is called automatically as soon as the object is created.

```
class className { // The class
public: // Access specifier
className() { // Constructor
cout << "Code With Harry";
}
};
```

```
int main() {
className obj_name;
return 0;
}
```

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## Encapsulation

Data encapsulation is a mechanism of bundling the data, and the functions that use them and data abstraction is a mechanism of

exposing only the interfaces and hiding the implementation details from the user.

```
#include<iostream>
using namespace std;
class ExampleEncap{
private:
/* Since we have marked these data members private,
* any entity outside this class cannot access these
* data members directly, they have to use getter and
* setter functions.
*/
int num;
char ch;
public:
/* Getter functions to get the value of data members.
* Since these functions are public, they can be accessed
* outside the class, thus provide the access to data members
* through them
*/
int getNum() const {
return num;
}
char getCh() const {
return ch;
}
/* Setter functions, they are called for assigning the values
* to the private data members.
*/
}
```



```
void setNum(int num) {
    this->num = num;
}

void setCh(char ch) {
    this->ch = ch;
}

};

int main(){
    ExampleEncap obj;
    obj.setNum(100);
    obj.setCh('A');
    cout<<obj.getNum()<<endl;
    cout<<obj.getCh()<<endl;
    return 0;
}
```

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## File Handling

File handling refers to reading or writing data from files. C provides some functions that allow us to manipulate data in the files.

### Creating and writing to a text file

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

int main() {
    // Create and open a text file
```

```
ofstream MyFile("filename.txt");

// Write to the file
MyFile << "File Handling in C++";

// Close the file
MyFile.close();
}
```

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## Reading the file

It allows us to read the file line by line

```
getline()
```

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## Opening a File

It opens a file in the C++ program

```
void open(const char* file_name, ios::openmode mode);
```

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## in

Opens the file to read(default for ifstream)

```
fs.open ("test.txt", std::fstream::in)
```

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## **out**

Opens the file to write(default for ofstream)

```
fs.open ("test.txt", std::fstream::out)
```

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## **binary**

Opens the file in binary mode

```
fs.open ("test.txt", std::fstream::binary)
```

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## **app**

Opens the file and appends all the outputs at the end

```
fs.open ("test.txt", std::fstream::app)
```

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## **ate**

Opens the file and moves the control to the end of the file

```
fs.open ("test.txt", std::fstream::ate)
```

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## **trunc**

Removes the data in the existing file

```
fs.open ("test.txt", std::fstream::trunc)
```

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### **nocreate**

Opens the file only if it already exists

```
fs.open ("test.txt", std::fstream::nocreate)
```

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### **noreplace**

Opens the file only if it does not already exist

```
fs.open ("test.txt", std::fstream::noreplace)
```

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### **Closing a file**

It closes the file

```
myfile.close()
```

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## **Exception Handling**

An exception is an unusual condition that results in an interruption in the flow of the program.

### **try and catch block**

A basic try-catch block in python. When the try block throws an error, the control goes to the except block

```
try {
```

```
// code to try  
throw exception; // If a problem arises, then throw an  
exception  
}  
catch () {  
// Block of code to handle errors  
}
```