C++ Programming Tutorial

C++ PROGRAMMING TUTORIAL

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C Language Overview

C is called a high level, Compiler language. The aim of any high level computer language is to provide and easy and natural way of giving a program of instructions to the computer.

C, computer programming language developed in the early 1970s by American computer scientist Dennis M. Ritchie at Bell Laboratories (formerly AT&T Bell Laboratories).

Why to use C?

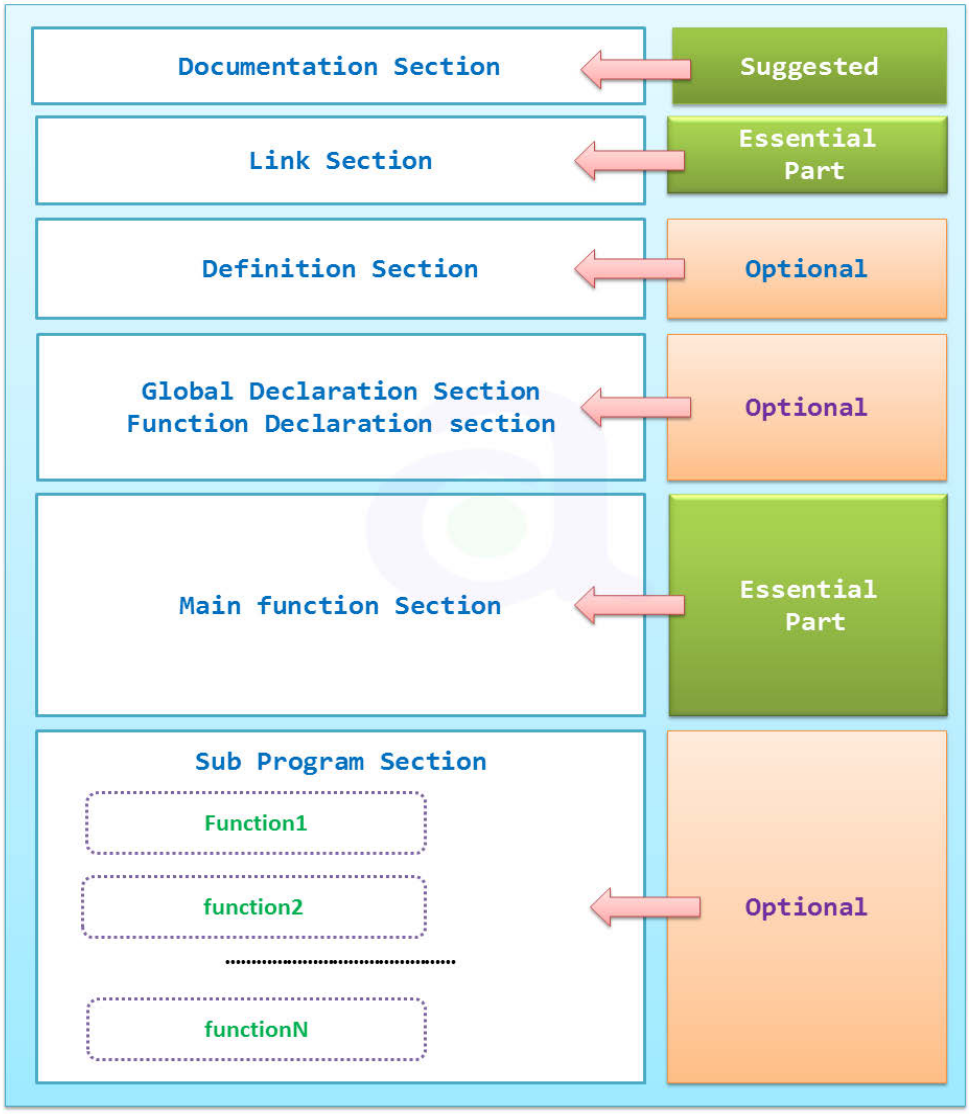
C was initially used for system development work, in particular the programs that make up the operating system. C was adopted as a system development language because it produces code that runs nearly as fast as code written in assembly languag e.Some examples of the use of C might be:

- Operating Systems
- Language Compilers
- Assemblers
- Text Editors
- Print Spoolers
- Network Drivers
- Modern Programs
- Database

C Programs

A C program can vary from 3 lines to millions of lines and it should be written into one or more text files with extension ".c"; for example, hello.c. You can use "Turbo C++", "Visual Studio Code" or any other text editor to write your C program into a file.

C Program Structure



1. Document section : It is the section in which you can give comments to make the program more interactive. The compiler won't compile this and hence this portion would not be displyed on the output screen. Example:- /* This a comment */
2. Preprocessor/link Section : This section involves the use of header files that are to included necessarily program. Example:- #include<iostream.h>, #include<conio.h>
3. Definition section : This section involves the variable definition and declaration in C. Example:- return x-y
4. Global declaration section : This section is used to define the global variables to be used in the programs, that means you can use these variables throughout the program. Example:- int subtract = 0;
5. Function declaration section : This section gives the information about a function that includes, the data type or the return type, the parameters passed or the arguments. Example:- int all (int, int);
6. Main function : It is the major section from where the execution of the program begins. The main section involves the declaration and executable section. Example:- int main(){ content }, main(){ content }
7. User-defined function section : When you want to define your function that fulfills a particular requirement, you can define them in this section. Example:- int all (int x, int y)

```
/*Documentation Section:
  Program Name: program to find the area of circle
  Author: Rumman Ansari
  Date : 12/01/2013
*/
```

```
#include"stdio.h" //Link section
#include"conio.h" //Link section
```

```
#define PI 3.14 //Definition section
```

```
float area; //Global declaration section
void message(); //function prototype declaration section
```

```
void main()
{
  float r;                          //Declaration part
  printf("Enter the radius \n");    //Executable part
  scanf("%f",&r);
  area=PI*r*r;                      // Calculation Part
  printf("Area of the circle=%f \n",area);
  message();                        // Function Calling
}
```

```
// Sub function
void message()
{
  printf("This Sub Function \n");
  printf("we can take more Sub Function \n");
}
```

Examples Of C Programs

Example 1 :

```
1  #include<stdio.h>
2  #include<conio.h>
3
4  using namespace std; //For standard
       programming
5
6  main(){
7      printf("Hello World");
8      getch();
9  }
```

Example 2 :

```
1  #include<stdio.h>
2  #include<conio.h>
3
4  main(){
5      char ch = 'A'; //This is a character
6      char str[10] = "Welcome"; // This is a
           String
7      float flt = 10.234; // This is a Float
           Number
8      int no = 150;
9      double dbl = 20.123456; // This is a
           Double number
10     printf("Character is %c\n",ch);
11     printf("String is %s\n",str);
12     printf("Float value is %f\n",flt);
13     printf("Integer value is %d\n",no);
14     printf("Double value is %f\n",dbl);
15     getch();
16 }
```

Example 3 :

```c
#include<stdio.h> //Headers
#include<conio.h>

main(){
    //Declearing variables
    int a,b,sum,sub,mult,div,mod;
    //Creating input fields
    printf("Enter the 1st number : ");
    scanf("%d",&a);
    printf("Enter the 2nd number : ");
    scanf("%d",&b);
    //Calculating
    sum=a+b;
    sub=a-b;
    mult=a*b;
    div=a/b;
    mod=a%b;
    //Printing results
    printf("Sum = %d",sum);
    printf("Sub = %d",sub);
    printf("Mult= %d",mult);
    printf("Div = %d",div);
    printf("Mod = %d",mod);
}
```

C++

C++ Programs

A C++ file format contains ".cpp" file format. C++ is a upgraded version or latest version of C. The rules are same in C or C++ syntax and some little things will be changed. So Let's Start C++...

Examples of C++ Programs

Example 1 :

```
1  #include<iostream.h> //In Visual Studio Code
       use <iostream>
2  #include<stdio.h>
3  #include<conio.h>
4
5  using namespace std; // For standered
       programming
6
7  main(){
8      cout<<"Hello World";
9      getch(); // For run program infinite
           time unless user press any key
10 }
11
```

Example 2 :

```
#include<iostream.h>
#include<stdio.h>
#include<conio.h>

using namespace std;

main(){
    int x,y,z;
    cout<<"Enter the 1st number : ";
    cin>>x;
    cout<<"Enter the 2nd number : ";
    cin>>y;
    z=x+y;
    cout<<"\nTotal = "<<z;
    getch();
}
```

Example 3 :

```
1   #include<iostream.h> //In Visual Studio Code
        use <iostream>
2   #include<stdio.h>
3   #include<conio.h>
4
5   using namespace std;
6
7   main(){
8       int x,y,z;
9       for (x=1;x<=10;x++){
10          cout<<x<<endl;
11      }
12      getch();
13  }
```

Example 4:

```
1   #include<iostream.h> //In Visual Studio Code
        use <iostream>
2   #include<stdio.h>
3   #include<conio.h>
4
5   using namespace std;
6
7   main(){
8       int x,y,z;
9       for (x=1;x<=5;x++){
10          for (y=1;y<=x;y++){
11              cout<<x;
12          }
13      }
14      getch();
15  }
```

Example 5 :

```
1  #include<iostream.h> //In Visual Studio Code
       use <iostream>
2  #include<stdio.h>
3  #include<conio.h>
4
5  using namespace std;
6
7  main(){
8      int x,y,z;
9      cout <<"Enter a number : ";
10     cin>>x;
11     if (x%2==0){
12         cout<<"Even";
13     }
14     else{
15         cout<<"Odd";
16     }
17     getch();
18 }
```

Example 6 :

```
1   #include<iostream.h> //In Visual Studio Code
        use <iostream>
2   #include<stdio.h>
3   #include<conio.h>
4
5   using namespace std;
6
7   main(){
8       int x,y,z;
9       x=1;
10      while (x<=5){
11          cout<<"Shyam\n";
12          x++;
13      }
14      getch();
15  }
```

Example 7 :

```
#include<iostream.h> //In Visual Studio Code
    use <iostream>
#include<stdio.h>
#include<conio.h>

using namespace std;

main(){
    int x;
    x=1;
    do{
        cout<<"Shyam\n";
        x++;
    }
    while (x<=5);
    getch();
}
```

Example 8 :

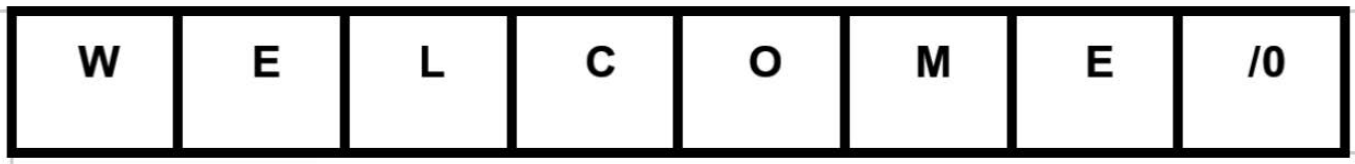
```
#include<iostream.h> //In Visual Studio Code use <iostream>
#include<stdio.h>
#include<conio.h>
#include<string.h>

using namespace std;

main(){
    int x, y, z, n;
    n = 1;
    char m;
    do{
        cout<<"Enter the 1st number : ";
        cin>>x;
        cout<<"Enter the 2nd number : ";
        cin>>y;
        z=x+y;
        cout<<"Total = "<<z;
        n++;
        cout<<"\nPress E for exit\n";
        cin>>n;
    }
    while(n!=0);
}
```

Example 9 :

```
#include<iostream.h> //In Visual Studio Code use <iostream>

using namespace std;

main(){
    int x;
    cout<<"Choose a number between 1 & 3 : "
        <<endl;
    cin>>x;

    switch(x){
        case 1:
        cout<<"You have choosed 1";
        break;

        case 2:
        cout<<"You have choosed 2";
        break;

        case 3:
        cout<<"You have choosed 3";
        break;

        default:
        cout<<"Please choose between 1 & 3!"
            ;
    }
}
```

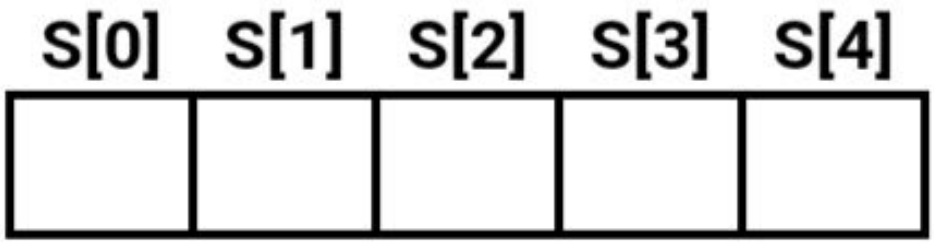
Strings

In C programming, array of character are called string. String is terminated by null character /0.
For example "WELCOME" here 'welcome' is a string, when compiler encounters strings, it appends null character at the end of string.



Declaration of strings

Strings are declared in C in similar manner as arrays. Only difference is that string are of char type.
char S[5]



Strings can also be declared using pointer char *p.

Initialisation of strings

In C strings can be initialised in different number of ways.

char c[ ]="abcd";
or,
char c[5]="abcd";
or,
char c[ ]={'a','b','c','d','/0'};
or,
char c[5]={'a','b','c','d','/0'};

Example 1 :

```
1   #include<iostream.h> //In Visual Studio Code
        use <iostream>
2
3   using namespace std; //For Visual Studio
        Code
4
5   main(){
6       char x[100];
7       cout<<"Enter your name : ";
8       cin>>x;
9       cout<<x;
10  }
```

Example 2 :

```
#include<iostream.h> //In Visual Studio Code use <iostream>
#include<conio.h>
#include<stdio.h>

using namespace std; //For Visual Studio Code

main(){
    char name[30],ch;
    int i=0;
    cout<<"Enter your name : ";

    while(ch!='\n'){ //terminates if user hit enter
        ch=getchar();
        name[i]=ch;
        i++;
    }
    name[i]='\0'; //inserting null character at end
    cout<<name;
    getch();
}
```

Function

In C programming a function is a segment that groups code to perform a specific task. A C program has at least one function main(). Without main() function there is technically no C program.

Types of C functions

There are two types of function in C programming.

- Library Function
- User Defined Function

Library Function : These functions are the inbuilt function in C programming system.

User Defined Function : C allows programmer to define their own function according to their requirement. These types of functions are known as user defined functions.

Example 1 :

```
1  #include<iostream.h> //In Visual Studio Code
       use <iostream>
2  #include<stdio.h>
3
4  using namespace std; //For Visual Studio
       Code
5  int add(int a,int b); //Function prototype
       (declaration)
6
7
8  main(){
9      int num1,num2,sum;
10     cout<<"Enter two numbers to add : \n";
11     cin>>num1>>num2;
12     sum=add(num1,num2); //Function call
13     cout<<"Total : "<<sum;
14     return 0;
15 }
16
17 int add(int a,int b){ //Function declarator
18     int add; // Start of function
           declaration
19     add=a+b;
20     return add; //return statement of
           function
21 } //end of function defination
```

Pointer

C pointer is a variable that stores/points the address of another variable. C pointer is used to allocate memory dynamically i.e. at run time. The pointer variable might be belonging to any of the data type such as *int, float, char, double, short* etc. Whenever a variable is declared, system will allocate a location to that variable in the memory, to hold value. This location will have its own address number.

Syntax : data_type*var_name

Example 1 :

```
int*p;char*p;
int*ip; // Pointer to a Integer
double*dp; // Pointer to a double
float*fp; // Pointer to a float
char*ch; // Pointer to a character
```

Example 2 :

```
#include<stdio.h>

int main(){
    int x=7;
    int x_ptr=8x;
    printf("x : %d\n",x);
    printf("x_ptr : %d",x_ptr);
}
```

The value of x is always the same, but x_ptr different from computer to computer

Array

Array is nothing but the collection of elements of similar data types C language provides a data structure called the array. Which can store a fixed size sequential collection of elements of the same type. An array is used to store a collection of data, but also is often more useful to think of an array as a collection of variables of the same type.

Syntax : <data_type>array_name[size 1][size 2]

Syntax Parameter	Significance
data_type	Data type of each element of the array
array_name	Valid variable name
size	Dimensions of the array

Example 1 :

```
1  #include<iostream.h>
2
3  using namespace std; //For standered uses
4
5  void main(){
6      int i;
7      int roll[]={80,82,73,78,67,89};//compile
           time array initialization
8      for(i=0;i<6;i++)
9      {
10         cout<<roll[i]<<endl;
11     }
12 }
```

Example 2 :

```
1   #include<stdio.h>
2   #include<conio.h>
3   #include<iostream.h>
4
5   using namespace std; //For standered uses
6
7   void main(){
8       int arr[4];
9       int i,j;
10      cout<<"Enter array element : \n";
11      for(i=0;i<4;i++){
12          cin>>arr[i];//Run time array
                initialization
13      }
14      for (j=0;j<4;j++){
15          cout<<arr[j]<<"\t";
16      }
17      getch();
18  }
```

Example 3 :

```
#include<stdio.h>
#include<conio.h>

using namespace std; //For standered uses

int main(){
    int a[50],b[50],c,d,sum[50];
    clrscr();
    printf("Enter Array Length:");
    scanf("%d",&c);
    printf("/n Enter %d elements for a[]:\n"
          ,c);
    for(d=1;d<=c;d++){
        scanf("%d",&a[d]);
    }
    printf("/n Enter %d elements for b[]:\n"
          ,c);
    for(d=1;d<=0;d++){
        scanf("%d",&b[d]);
    }
    printf("\n a[]\t b[]\t a[]+[b]");
    for(d=1;d<=c;d++){
        sum [d]=a[d]+b[d];
        printf("In %d \t %d \t %d",a[d],b[d]
               ,sum[d]);
    }
}
```

Example 4 :

```
#include<iostream>
#include<conio.h>
#include<stdio.h>

int main(){
    char line[150];
    int i,v,c,d,s,o,w;
    char ch;
    o=v=c=ch=d=s=o=w;
    printf("----------------------");
    printf("\n\tINPUT");
    printf("\n----------------------");
    printf("\n\nEnter a sentence : ");
    gets(line);

    for(i=0; line[i]!='\0'; i++){
        ch=line[i];
        if(ch=='a'|| ch=='e' || ch=='i' ||
            ch=='o' || ch=='u' || ch=='A' ||
            ch=='E' || ch=='I' || ch=='O' ||
            ch=='U')
            v++;
        else if((ch>='a' && ch<='z') || (ch
            >='A' && ch<='Z'))
            c++;
        else if(ch>='0' && ch<='9')
            d++;
        else if(ch==' ')
            s++;
    }
    for(i = 0; line[i]!='\0'; i++){
        if(line[i]==' ' && line[i+1]!=' ')
        w++;
    }
    printf("\n----------------------");
    printf("\n\tOUTPUT");
    printf("\n----------------------\n");
    printf("\nVowels : %d", v);
    printf("\nConsonats : %d", c);
    printf("\nDigit : %d", d);
    printf("\nBlank spaces : %d", s);
    printf("\nWords : %d", w+1);
    getch();
}
```

Structure

In the C language structures are used to group together different types of variables under the same name. For example you could create a structure *'telephone'* which is made up of a string (that is used to hold the name of the person) and an integer (that is used to hold the telephone number).
Keyword *'struct'* is used for creating a structure.

Syntax :

```
struct structure_name{
   data_type member 1;
   data_type member 2;
   data_type member 3...;
};
```

Syntax Example :

```c
struct telephone {
    char *name;
    int number;
}
```

With the declaration of the structure you have created a new type, called *telephone*. Before you can use the type telephone you have to *create a variable of the type telephone.*

```c
#include<stdio.h>

struct telephone{
    char *name;
    int number;
};

int main(){
    struct telephone index;
    return 0;
}
```

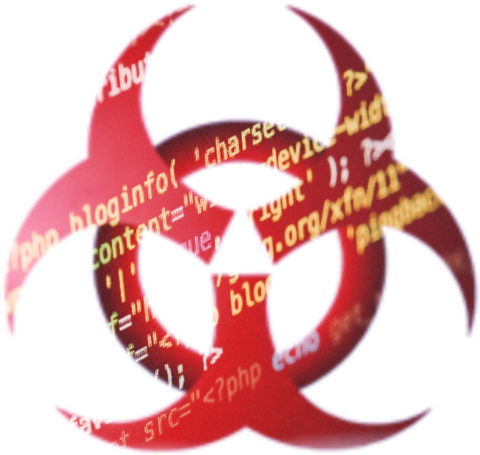
Example 1 :

```c
#include<stdio.h>
#include<conio.h>

struct telephone{
    char *name;
    int number;
};

int main(){
    struct telephone index;
    index.name='Graham Bell';
    index.number=1847;
    printf("Name : %s",index.name);
    printf("\nNumber : %d",index.number);
    getch();
}
```

Example 2 :

```c
#include<iostream>
#include<conio.h>
#include<stdio.h>

int main{
    struct emp e;
    printf("Enter name : ");
    scanf("%s",e.n);
    printf("\nEnter basic : ");
    scanf("%if",&e.bs);
    
    if(e.bs>=15000){
        e.hr=(e.bs*10)/100;
    }
    else if(e.bs>=10000){
        e.hr=(e.bs*8.5)/100;
    }
    else
    e.hr=(e.bs*5)/100;
    e.pf=(e.bs*12.5)/100;
    e.t=(e.bs+e.hr)-e.pf;
    
    printf("-:Employee Information:-");
    printf("\nName : %s",e.n);
    printf("\nBasic : %2if",e.bs);
    printf("\nHRA : %2if",e.hr);
    printf("\nPF : %2if",e.pf);
    printf("\nTotal : %2if",e.t);
}

struct emp{
    char n[10];
    double bs, hr, h, pf, t;
};
```

~:End:~



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