

C++ Programming

OBJECT ORIENTED PROGRAMMING FOR MECHATRONIC ENGINEERS

Programming Languages

❑ Levels of Programming Languages

- ❑ Low-level program (Machine language, Assembly)
- ❑ High-level program (C++, Java, Python)

❑ Two main groups

- ❑ Procedural Programming Languages (BASIC, C)
- ❑ Object Oriented Languages (C++, Java, C#)

C++

- ❑ One of the most powerful and popular programming languages
- ❑ Evolve from C
- ❑ Developed by **Bjarne Stroustrup** 1979 at Bell Laboratories
- ❑ Provide capabilities for Object Oriented Programming
- ❑ Current Version C++17

C++ Program Development Environment

- **Creating a program**

Editing a file with an editor.

- **Preprocessing**

Preprocessor program executes automatically before compiler's translation phase begins.

- **Compiling**

Translate C++ program into machine language code(object code)

- **Linking**

Linker links the object code with the libraries and creates an executable file. (eg:iostream, cmath)

- **Loading**

Loader takes the executable image from disk and transfers it to memory

- **Execution**

CPU takes instructions and execute

Simple C++ Program

```
//A program to print a welcoming message.
```

```
/* This is a comment. */
```

```
#include <iostream> //Preprocessing Directives
```

```
using namespace std; //standard namespace
```

```
int main() //Main is where program execution begins.
```

```
{
```

```
    cout << "Hello World" << endl; // a sentence within quotes ("Hello world"), is the  
                                     content inserted into the standard output
```

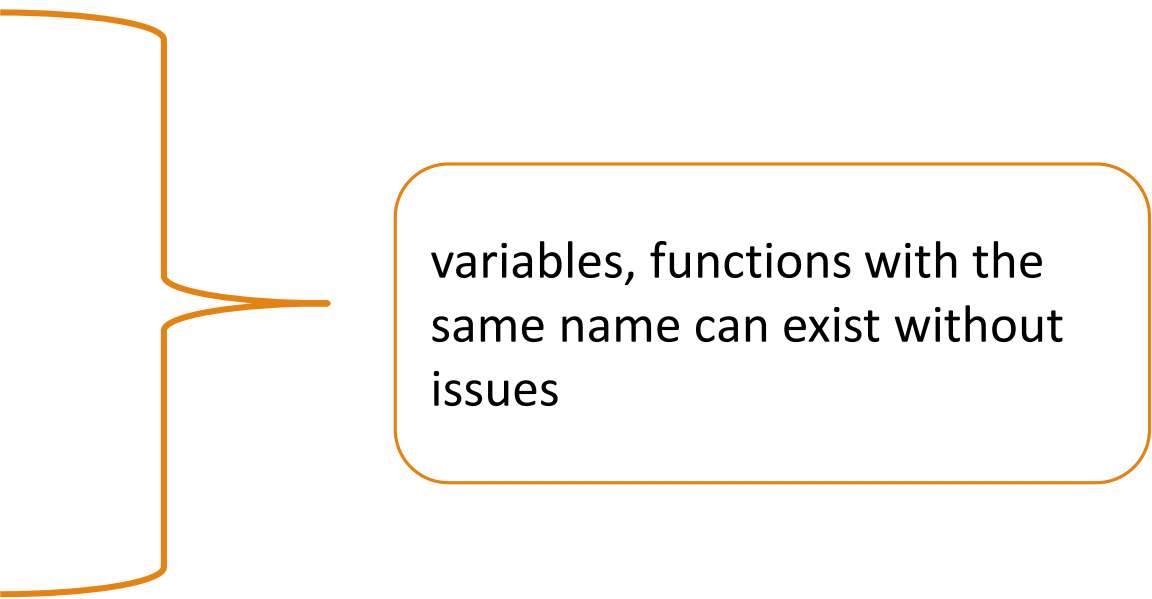
```
    return 0; //terminate main method
```

```
} // End of main method
```

Namespaces

```
Namespace Student{  
    Char name;  
    Int age;  
    Void register();  
}
```

```
} namespace teacher{  
    Char name;  
    Int age;  
}
```



variables, functions with the same name can exist without issues

Data types and Variables

- ❑ A variable is a location in the computer's memory where a value can be stored for use by a program.
- ❑ The format for the declaration of a variable is

`<data type> < Name of the variable>;`

Example:

- `int number;`
- `float length;`
- `char letter;`
- `double height;`

- ❑ C++ is **case sensitive**

i.e. `total` , `Total` and `TOTAL` are three different variable names

Group	Type names*	Notes on size / precision
Character types	<code>char</code>	Exactly one byte in size. At least 8 bits.
	<code>char16_t</code>	Not smaller than <code>char</code> . At least 16 bits.
	<code>char32_t</code>	Not smaller than <code>char16_t</code> . At least 32 bits.
	<code>wchar_t</code>	Can represent the largest supported character set.
Integer types (signed)	<code>signed char</code>	Same size as <code>char</code> . At least 8 bits.
	<code>signed short int</code>	Not smaller than <code>char</code> . At least 16 bits.
	<code>signed int</code>	Not smaller than <code>short</code> . At least 16 bits.
	<code>signed long int</code>	Not smaller than <code>int</code> . At least 32 bits.
	<code>signed long long int</code>	Not smaller than <code>long</code> . At least 64 bits.
Integer types (unsigned)	<code>unsigned char</code>	(same size as their signed counterparts)
	<code>unsigned short int</code>	
	<code>unsigned int</code>	
	<code>unsigned long int</code>	
	<code>unsigned long long int</code>	
Floating-point types	<code>float</code>	
	<code>double</code>	Precision not less than <code>float</code>
	<code>long double</code>	Precision not less than <code>double</code>
Boolean type	<code>bool</code>	
Void type	<code>void</code>	no storage
Null pointer	<code>decltype(nullptr)</code>	

Ref : <http://www.cplusplus.com>

Data types and Variables

The sizeof operator determines the storage size of a particular value, type, or variable in bytes during program compilation.

- Syntax:

sizeof(data type)

- Examples:

sizeof(long int)

sizeof(char)

Constants

- ❑ `const` qualifier is used to declare constant variables. Constants must be initialized with constant expression when they are declared and cannot be modified thereafter.

Example

```
const int inchesInAFoot = 12;
```

cin Command

```
int main(){  
    int x, y, z;  
    cout << "Enter a number: "; /* For single input */  
    cin >> x;  
  
    cout << "Enter 2 numbers: "; /* For multiple inputs */  
    cin >> y >> z;  
  
    cout << "Sum = " << (x+y+z);  
    return 0;  
}
```

Question

1) Write a C++ program to enter inches from the keyboard and display it in feet

1 inch == 0.083

2) Write a C++ program that inputs a five-digit integer, separates the integer into its digits and prints them separated by three spaces each.

Ex: if the user enters 34521, the program should print 3 4 5 2 1

Control Structures

Sequence

Executes statements one after the other in the order in which they are written

Selection

Decides which statement to execute next depending on a condition

Repetition

Performs statements repeatedly while a condition remains true

Selection Control Structure

Selection control structures in C++ are:

- if
- if –else
- switch

The format of the *if* statement is:

```
if (logical expression)  
    statement
```

The statement is executed if the logical expression is **true** and not executed if the logical expression is **false**.

The format of the if-else statement is:

```
if (logical expression)  
    statement 1  
else  
    statement 2
```

Statement 1 is executed if the expression is **true** and statement 2 is executed if the expression is **false**.

The format of the switch statement is:

```
switch (variable)  
{  
    case c1: statement1;  
        break;  
    case c2: statement2;  
        break;  
    ...  
    default: statement3;  
}
```

Repetition Control Structure

Repetition Control Structures in C++ are:

- while
- for
- do-while

Syntax of while loop is:

```
while ( boolean expr )  
{  
    statement 1;  
    statement 2;  
}
```

Syntax of counter controlled loop is:

```
for( int expr; boolean expr; increment expr )  
{  
    statement 1;  
    statement 2;  
}
```

Syntax of do-while loop is:

```
do  
{  
    statement 1;  
    statement 2;  
}while ( bool expr );
```

Question

- 1) Write a C++ program to check whether an integer is odd or even.
- 2) Write a program to enter 10 numbers from the keyboard and find the largest number.