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# LAB 03

## Summary

| Items | Description |
|---|---|
| Course Title | Programming Fundamentals |
| Lab Title | Stream Insertion/Extraction Operations |
| Duration | 3 Hours |
| Operating System/Tool/Language | Ubuntu/ g++/ C++ |
| Objective | Input/ Output Operations in C++ |

### Exercise 1: A Simple First Program

You need to perform the following to complete the task.

1. Open the Terminal (Ctrl + Alt + t)
2. Installation g++

lab@lab-OptiPlex-330:~$ **sudo apt install g++**

Note: g++ is already install on lab PCs

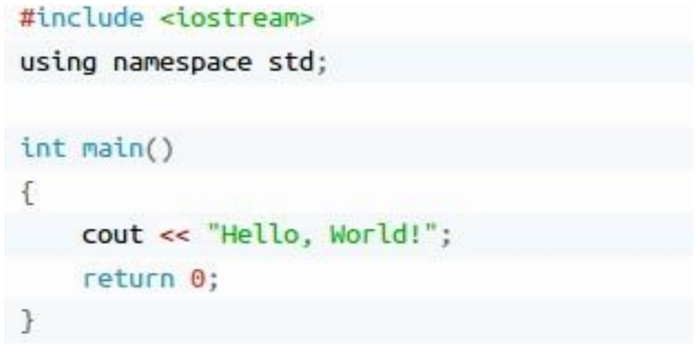
3. Create file of .cpp file extension using touch command

~$ **touch helloworld.cpp**

4. Now open the text editor using gedit command

~$ **gedit helloworld.cpp**

5. Write the following code in helloworld.cpp file.



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

int main()
{
    cout << "Hello, World!";
    return 0;
}
```

6. Save and close the file.
7. compile and execute it

~$ g++ -o hello helloworld.cpp

~$./hello

## 1. Standard output (cout)

cout is a C++ stream object, used for standard output by default is the screen. For formatted output operations, cout is used together with the insertion operator, which is written as << (i.e., two "less than" signs).

```
cout << "Output sentence"; // prints Output sentence on screen
cout << 120;               // prints number 120 on screen
cout << x;                 // prints the value of x on screen
```

## 2. Standard input (cin)

In most program environments, the standard input by default is the keyboard, and the C++ stream object defined to access it is cin.
For formatted input operations, cin is used together with the extraction operator, which is written as >> (i.e., two "greater than" signs). This operator is then followed by the variable where the extracted data is stored. For example:

```
int age; cin
>> age;
```

### Example: cin with extraction operator:

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

When you run the program, a possible output will be:

```
Enter a number: 9
Enter 2 numbers: 1 5
Sum = 15
```

## 3. Constants and Variables:

**Constants:** A specific alphabetical and/or numeric value that is never changed.

**For Ex**. PI - 3.14159

**Variables:** The value that can be changed.

**For Ex**. ShoeCost = 56.00 and ShoeCost = 35.00

## 4. Data Types:

### 4.1 int - integer: a whole number.

This data type is used to define an integer number (-…. -3, -2,-1,0,1,2,3….). A single integer occupies 2 bytes. For example: int a; declares that you want to create an int variable called a. To assign a value to our integer variable we would use the following C statement: a=10;

### 4.2 float - floating point value: i.e. a number with a fractional part.

A float, or floating point, number has about seven digits of precision and a range of about 1.E-36 to E+36. A float takes four bytes to store.

### 4.3 double - a double-precision floating point value.

A double, or double precision, number has about 13 digits of precision and a range of about 1.E-303 to 1.E+303. A double takes eight bytes to store.

**Note**: Single precision and Double precision basically differs in the number of digits represented after the decimal point. Double precision number will represent more digits after the decimal point than a single precision number. Example: Single precision – 32.75 and double precision – 32.7543

### 4.4 char - a single character.

Used to define characters. A single character occupy 1 byte.

To assign, or store, a character value in a char data type is easy - a character variable is just a symbol enclosed by single quotes.

char a;

char a = ‘10’;

## 5. Escape Sequences

Character combinations consisting of a backslash (\) followed by a letter or by a combination of digits are called "escape sequences." To represent a newline character, single quotation mark, or certain other characters in a character constant, you must use escape sequences. An escape sequence is regarded as a single character and is therefore valid as a character constant. Escape sequences are used to format our output. The following escape sequences can be used to print out special characters.

| **Escape Sequence** | **Description** |
|---|---|
| **\n** | Newline |

|  |  |
|---|---|
| **\t** | Horizontal tab |
| **\** | Backslash |

|  |  |
|---|---|
| **\'** | Single quote |
| **\"** | Double quote |

To insert a line break, a new-line character shall be inserted at the exact position the line should be broken. In C++, a new-line character can be specified as \n (i.e., a backslash character followed by a lowercase n). For example:

```
cout << "First sentence.\n";
cout << "Second sentence.\nThird sentence.";
```

This produces the following output:

```
First sentence.
Second sentence.
Third sentence.
```

Alternatively, the endl manipulator can also be used to break lines. For example:

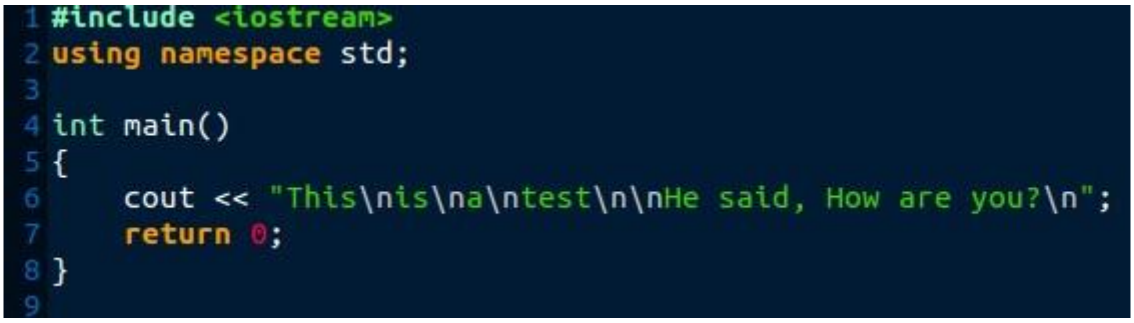
```
cout << "First sentence." << endl;
cout << "Second sentence." << endl;
```

Output

```
First sentence.
Second sentence.
```

## Example 2.1

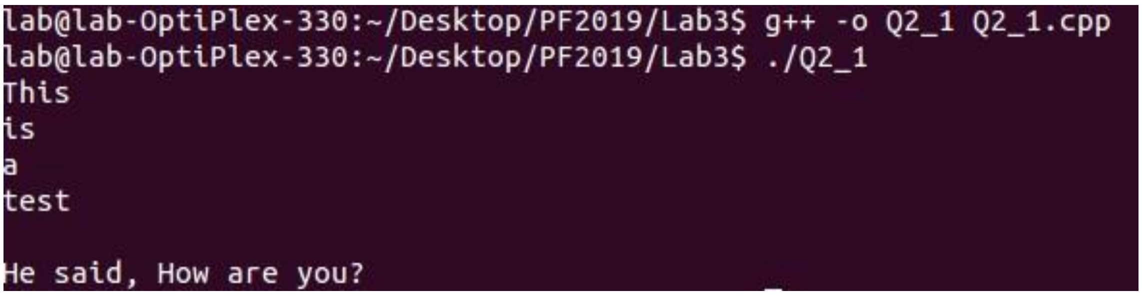
Following program shows the use of Newline Escape Sequence (\n)



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

int main()
{
    cout << "This\nis\na\ntest\n\nHe said, How are you?\n";
    return 0;
}
```

Output



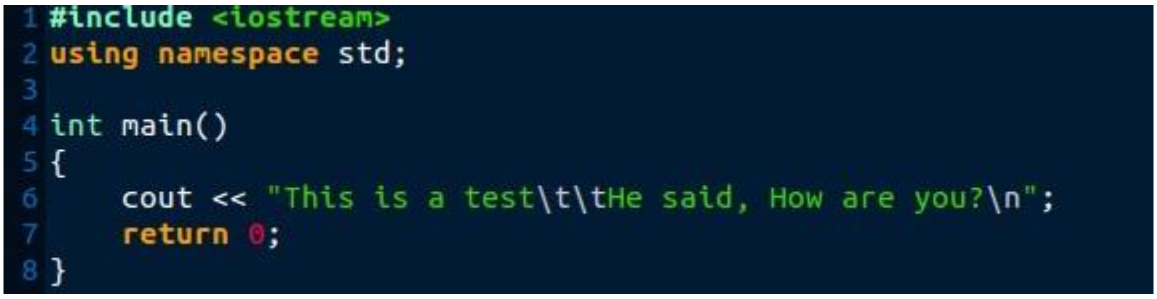
```
lab@lab-OptiPlex-330:~/Desktop/PF2019/Lab3$ g++ -o Q2_1 Q2_1.cpp
lab@lab-OptiPlex-330:~/Desktop/PF2019/Lab3$ ./Q2_1
This
is
a
test

He said, How are you?
```

Your turn: Edit above given code and use endl manipulator.

## Example 2.2

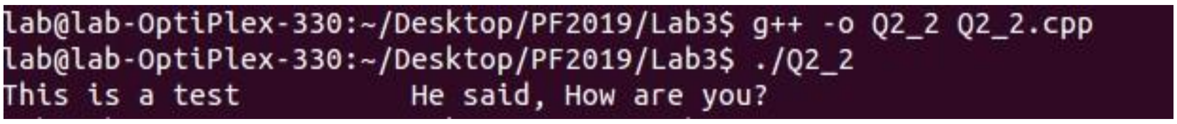
This program shows the use of Horizontal tab Escape Sequence (\t)



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

int main()
{
    cout << "This is a test\t\tHe said, How are you?\n";
    return 0;
}
```

Output

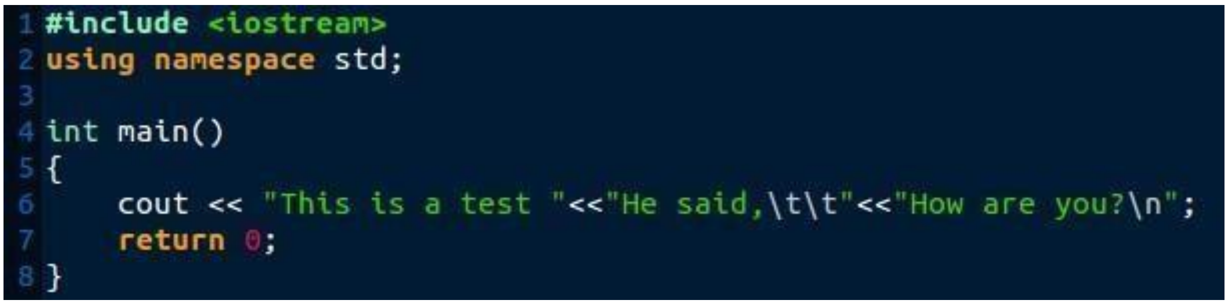


```
lab@lab-OptiPlex-330:~/Desktop/PF2019/Lab3$ g++ -o Q2_2 Q2_2.cpp
lab@lab-OptiPlex-330:~/Desktop/PF2019/Lab3$ ./Q2_2
This is a test          He said, How are you?
```

Now try escape sequences **\\ , \' , \"** yourself.

## Example 2.3

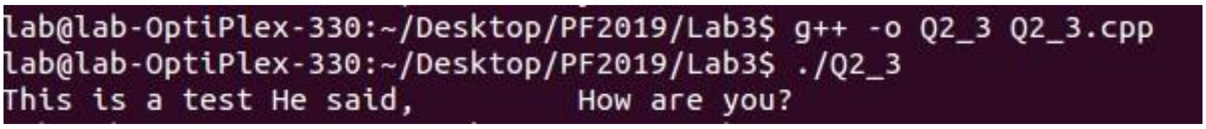
Program using multiple insertion operations (<<)



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

int main()
{
    cout << "This is a test "<<"He said,\t\t"<<"How are you?\n";
    return 0;
}
```

**Output**



```
lab@lab-OptiPlex-330:~/Desktop/PF2019/Lab3$ g++ -o Q2_3 Q2_3.cpp
lab@lab-OptiPlex-330:~/Desktop/PF2019/Lab3$ ./Q2_3
This is a test He said,         How are you?
```

## 6. **iomanip**

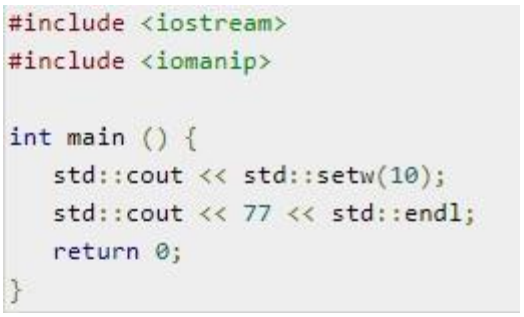
iomanip is a library that is used to manipulate the output of C++ program.

Below are some Parametric manipulators

### **6.1** setw

It is used to sets the field width to be used on output operations

Example



```
#include <iostream>
#include <iomanip>

int main () {
   std::cout << std::setw(10);
   std::cout << 77 << std::endl;
   return 0;
}
```

.

Now compile your code and see what the output is.

### **6.2** setprecision

It is used to sets the decimal precision to be used to format floating-point values on output operations.

Example

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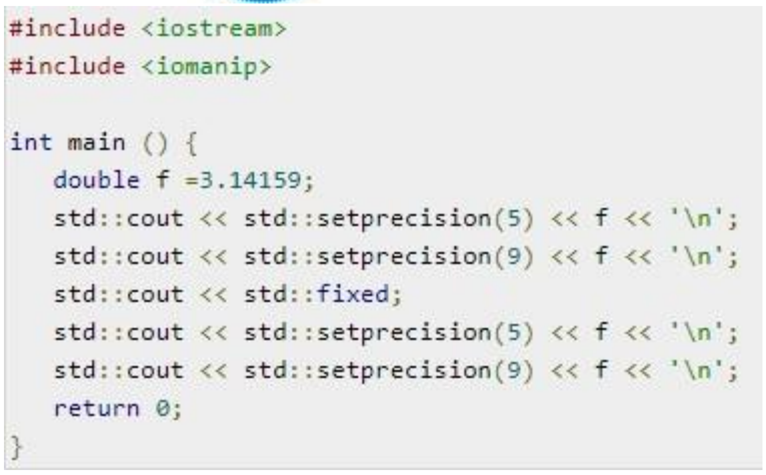
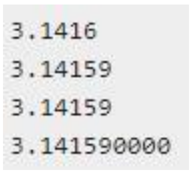


```
#include <iostream>
#include <iomanip>

int main () {
   double f =3.14159;
   std::cout << std::setprecision(5) << f << '\n';
   std::cout << std::setprecision(9) << f << '\n';
   std::cout << std::fixed;
   std::cout << std::setprecision(5) << f << '\n';
   std::cout << std::setprecision(9) << f << '\n';
   return 0;
}
```

**Output**



```
3.1416
3.14159
3.14159
3.141590000
```

## Exercise:

### Task#01

Write a program to input your name, roll number and CGPA and print that information.

### Task#02

Write a program that prints the following using COUT statement.

```
(1)       (2)                    (3)          (4)        (5)             (6)
   *         **********              *         *          *       *         *********
 ***          *           *        **             **      *      *          *********
*****         *           *          ***         ***          *             *********
 ***          *           *        ****       ****        *      *          *********
   *         **********            *****      *****       *       *         *********
```

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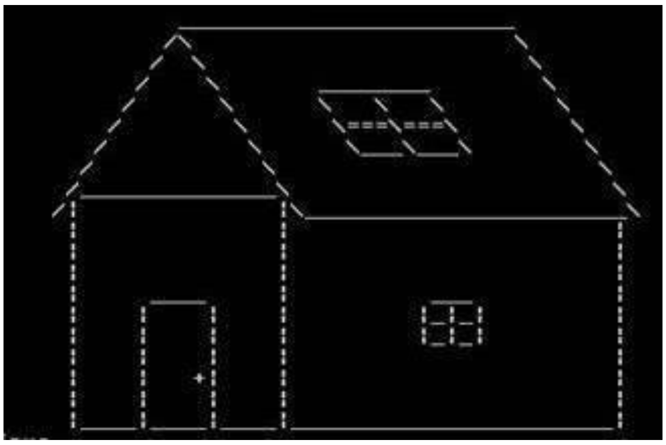
Task#03

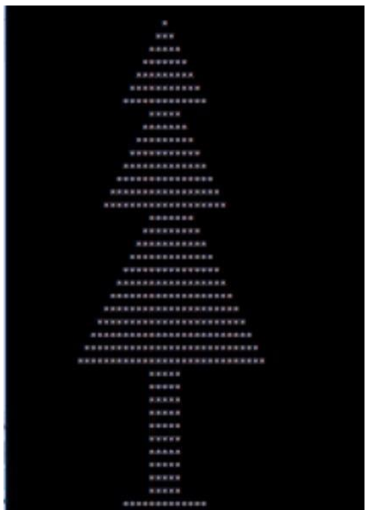
Write a program that prints the following using COUT & setw statement.



**Note:** Use **setw** function instead of space character

Task#04

Write a program to print the following using just ONE COUT statement & setw function



**Note:** Use **setw** function instead of space character

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**Submission Instructions:**

1. Save all .cpp files with your roll no and task number
   e.g. i21XXXX_Task01.cpp
2. Save all screenshots of terminal with your roll no and task number
3. Now create a new folder with name ROLLNO_LAB03 e.g. i21XXXX_LAB03
4. Move all your .cpp files to this newly created directory and compress it into .zip file.
5. Now you must submit this zipped file on Google Classroom.