

Northern University, Nowshera

Programming Fundamentals

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(Week 1) Lecture 1 and 2

Objectives: Learning objectives of this lecture are

- **Introduction to C++**
- **Create a C++ project in visual studio**
- **Write a basic C++ program**
- **View error list**
- **Data types**
- **Identifier**



Lecture # 1 Introduction

In this course we shall be studying fundamentals of programming using C + +. The inception of C++ programming language began in 1979 when Bjarne Stroustrup was working in his Ph.D. thesis. During that period Stroustrup used to work with Simula (regarded as the first language to support OOP paradigm).

Why programming? *Steve Jobs once said, "Everybody in this country should learn how to program a computer... because it teaches you how to think."* Computer programming is an enormously flexible tool that you can use to do amazing things that are otherwise either manual and labor some or are just impossible. If you're using a smartphone, a chat app or if you're unlocking your car with the push of a button, then you must know that all these things are using some kind of programming. You're already immersed in the programs of different types. In fact, software is running your life. What if you learn and start running these programs according to your will? By learning how to program doesn't mean that you have a responsibility of creating the next Facebook or the next Dropbox. No! Rewind a little and see what made these big websites like Facebook, Dropbox, YouTube and others come into being. There was a need - someone suffered from the lack of something. And then, he dared to address that need because he could. He knew there was a way to solve that problem and make things easier for himself and probably others. You don't have to learn computer programming to solve the problems of the world, but you can very well solve yours. Here are some reasons why you should learn to code today.

1. Coding develops structured and creative thinking
2. Programming makes things easier for you
3. Learning to program teaches you persistence

C++ is a high level (language syntax is easily understandable by humans) programming language. As C ++ is a language so it holds almost all attributes of a language. It has alphabet sets (English alphabets, Digits and special characters) however **reserved words** of a language are written in **lower case**. C ++ is a case sensitive (upper case is considered different from lower case i.e A is not equal to a C ++ treats both as different symbols) language. Using C++ we can write different program (set of instruction), program written in C ++ is called source code this source code is compiled by compiler (a software that converts source code into object code) and converts into object code. We shall be using visual studio for writing our programs.

1. Introduction about visual studio

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Tahir javed

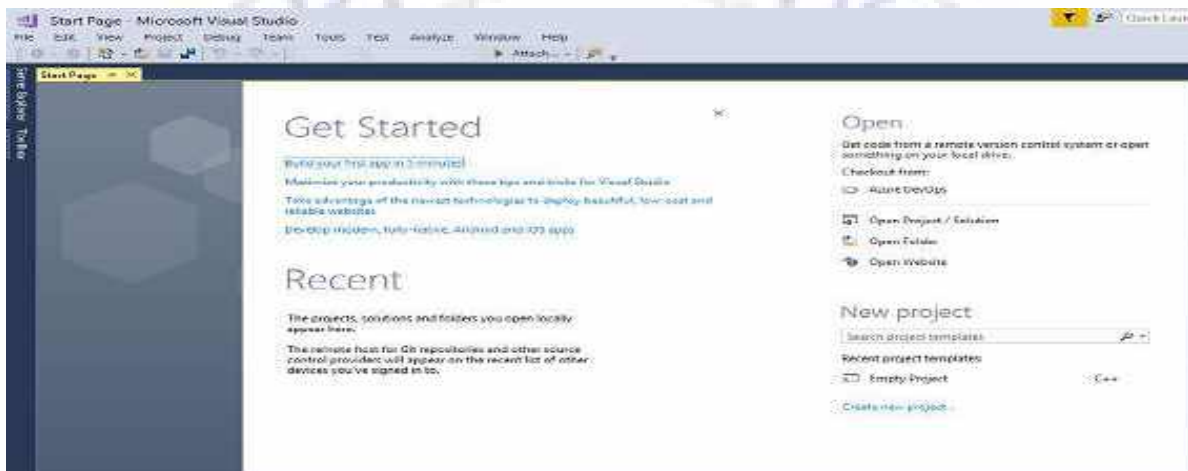
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Microsoft Visual Studio is an integrated development environment (IDE) from Microsoft. It is used to develop computer programs, as well as websites, web apps, web services and mobile apps. VS has different version, latest version is 2017. Visual studio can be downloaded using URL <https://visualstudio.microsoft.com/downloads/>. Install latest version available.

1.1 Creating a project

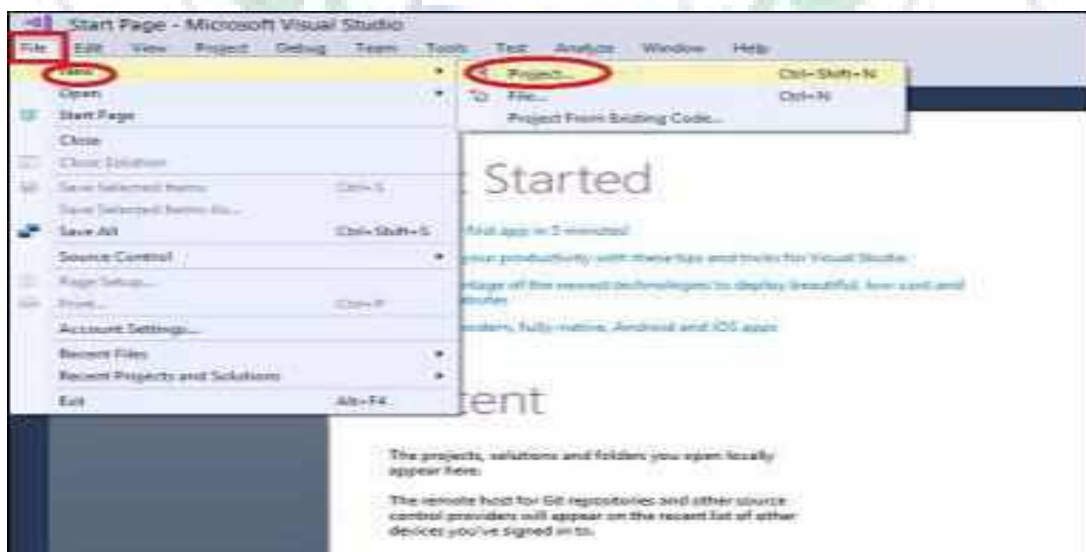
Visual studio is very user friendly it's easy to use. Now we will create a project in visual studio using C++ language. Open Visual studio and follow instruction, once you have opened visual studio you will be seeing following screen (visual studio 2017)



There are three ways to create a new project

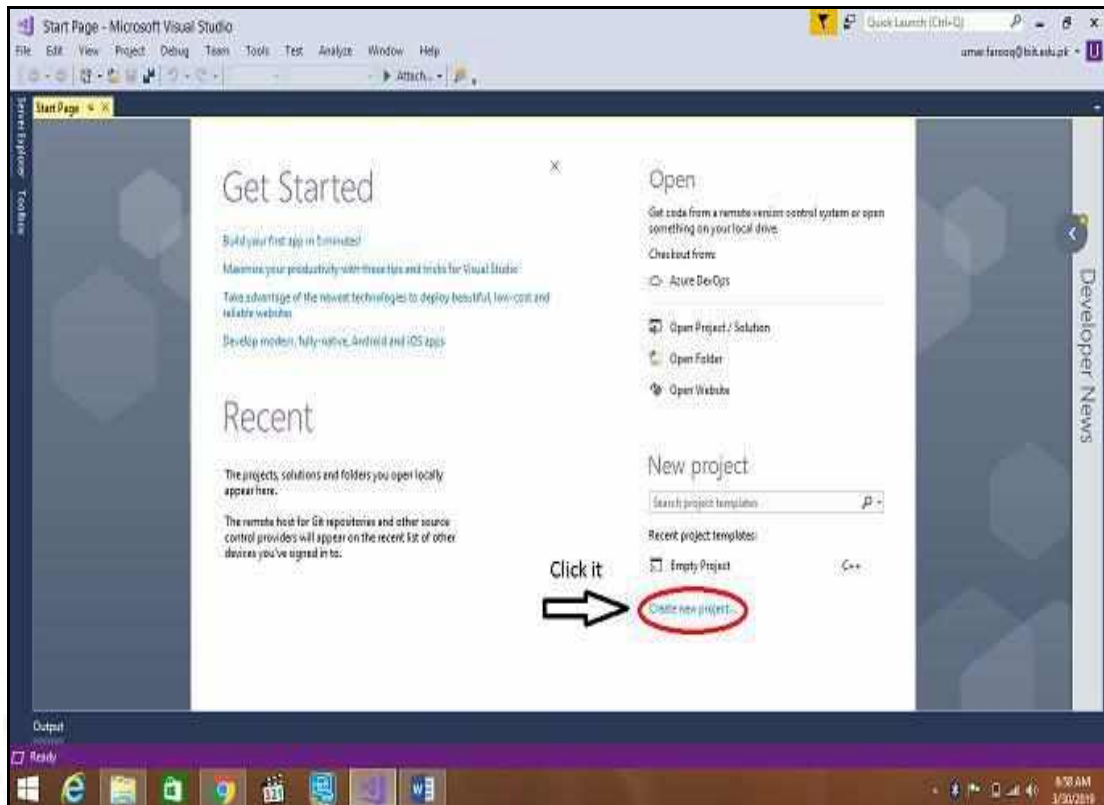
Way 1: Press ctrl + shift + n to open a new project window.

Way 2: On top left of screen click File under that select New and click project



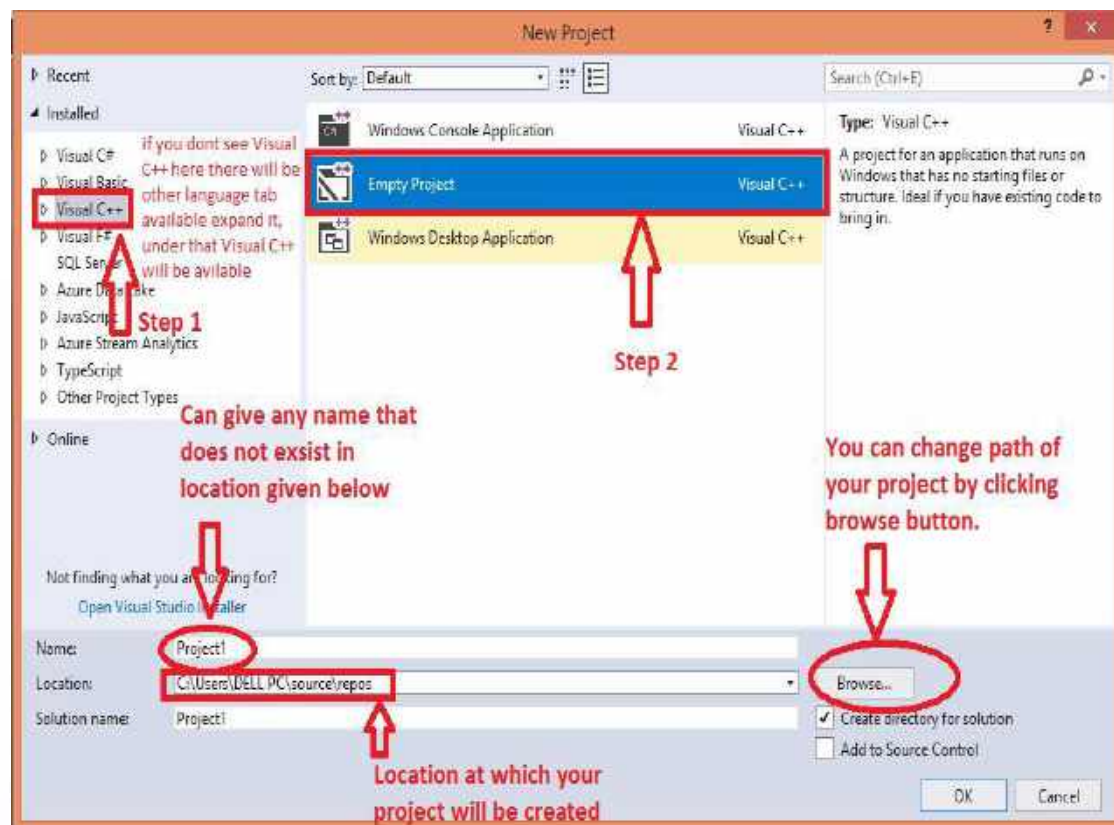
Way 3

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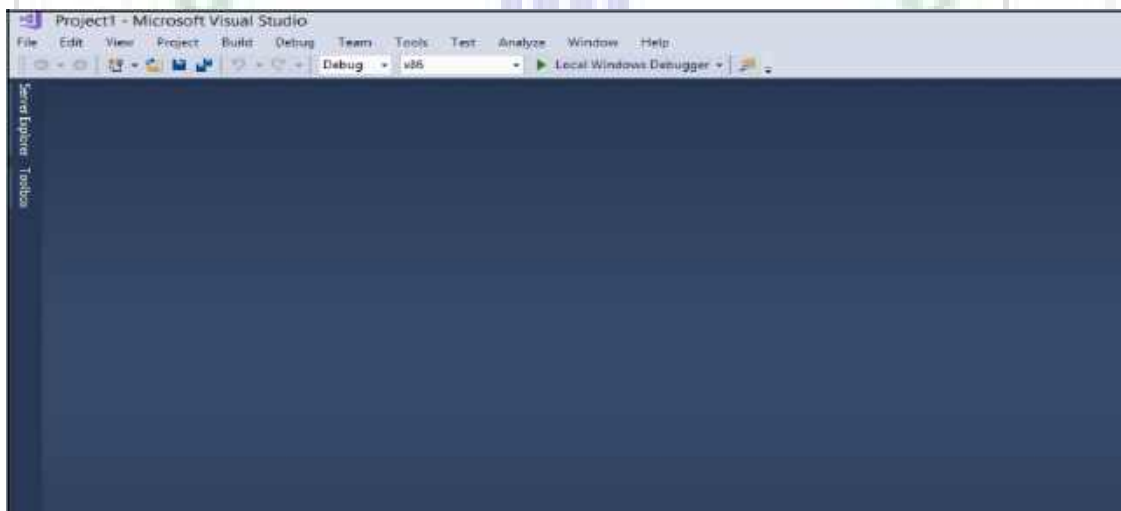


After following any of the above way you will be seeing following window.

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Click Ok button on right corner of above figure. After that you will see following figure.

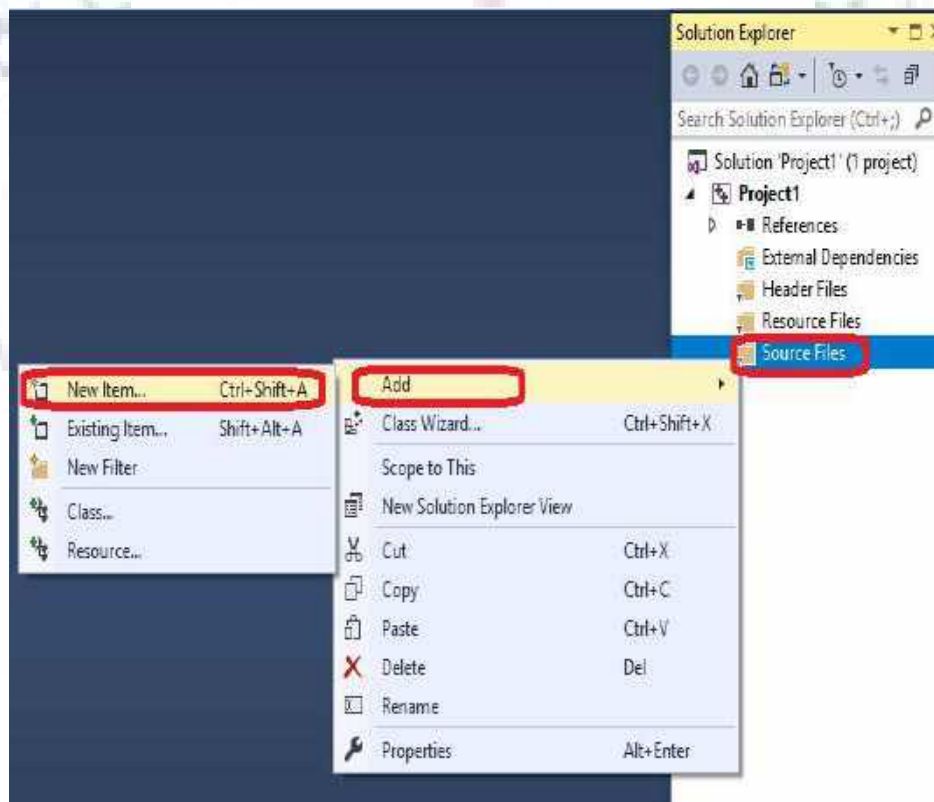


Look at left or right side of above window, are you seeing solution explorer? If yes than expand it, if no than follow figure given below or click ctrl + alt + L

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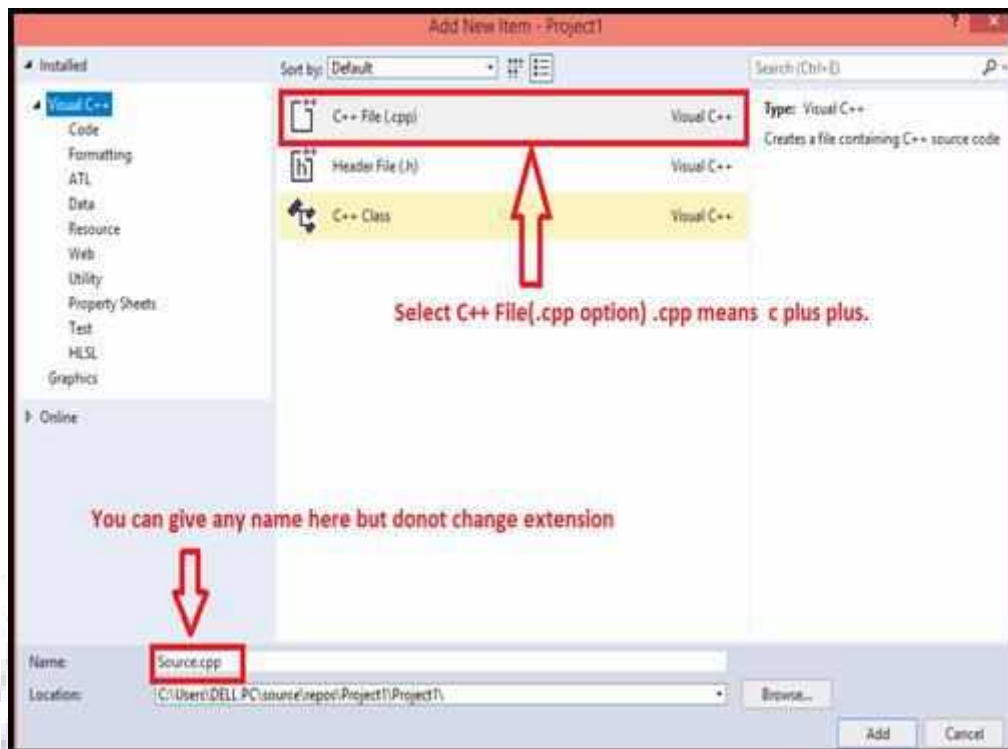


Click on solution explorer, solution explorer will appear either at right or left of screen. Next step is to add a source file to your project. Press ctrl + shift + a or follow figure given below.

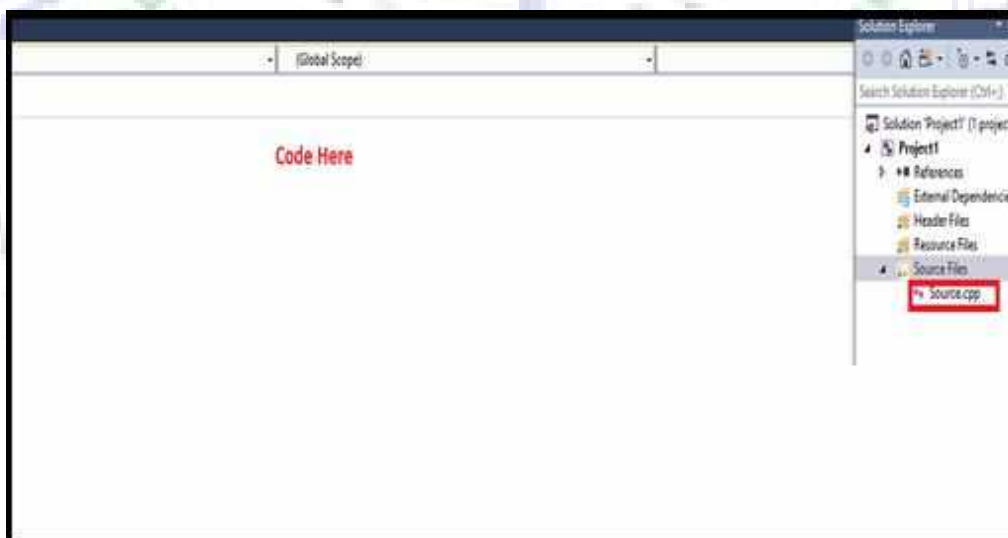


When you click on new item following window will appear.

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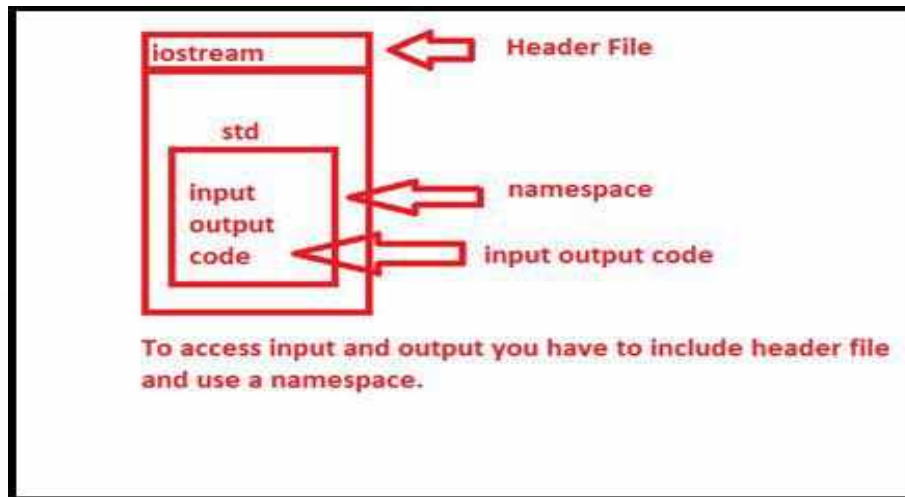
Click Add button on right of screen.



1.2 Writing first program

Start your program first line should be `#include "iostream"` or `#include <iostream>`. An `iostream` (input output stream) is a header file that is used for input and output purpose, `iostream` must be included if you want to input or output. If you want to input or output only `iostream` is not enough you have to also write statement `using namespace std;` C++ has already defined some statements input and output are also predefined that are inside namespace `std`, as shown in figure given below.

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Next we write `void main()`.

```
#include "iostream"
using namespace std;
void main()
{
    // code here
}
```

Our first program is to write a statement that prints "Welcome to BIIT".

```
1 #include "iostream"
2 using namespace std;
3 void main()
4 {
5     cout << "Welcome to BIIT ";
6 }
```

Any thing inside double quotes is displayed on screen except escape sequences

Console output

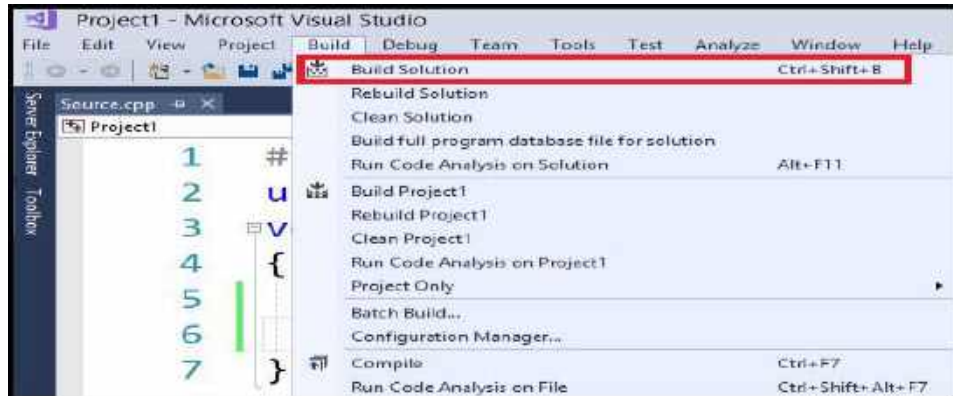
Insertion operator

`cout` is used to display on console window.

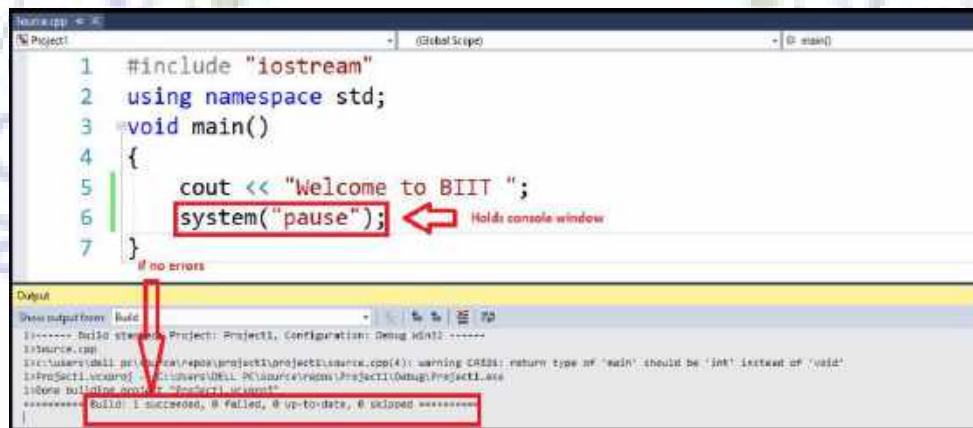
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1.3 Building and running a program

A program can be build using a shortcut key ctrl + shift + b or you can follow figure given below to build a project.



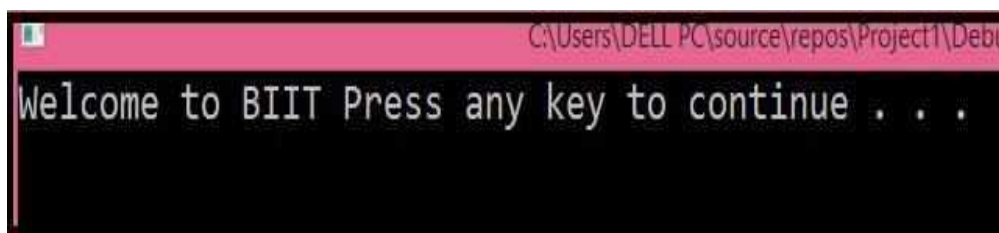
If program contains no error you will see message build succeed in output window.



If program contains error you will see following messages in output window



Now run a programming if it has no errors using ctrl + f5 you will see output on console window.



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In above output **Press any key to continue . . .** is because of `system("pause");`

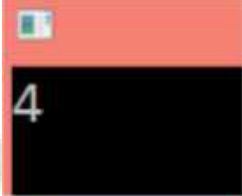
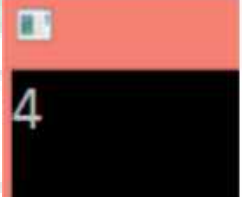
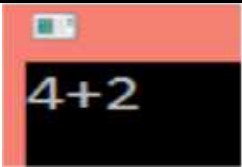
1.4 Error List

For a programmer it's very important to resolve the error. Compiler is like your advisor when you do mistake it guides you to correct path. Compiler detects error, if there is an error compiler generates an error list. Syntax error occurs when you violates rule of writing a statement. Figure given below demonstrates how to view an error list or you can press `ctrl + e`.



2. Program

Programs given below explains cout in detail.

Program	Output	Remarks
<pre>#include "iostream" using namespace std; void main() { cout << "4"; }</pre>		Any thing written inside double quotations is displayed as it is on the screen.
<pre>#include "iostream" using namespace std; void main() { cout << 4; }</pre>		Same output as above but this time 4 is not written inside double quotation. Compiler understand constant values or arithmetic expression
<pre>#include "iostream" using namespace std; void main() { cout << "4+2"; }</pre>		Any thing written inside double quotations is displayed as it is on the screen.

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<pre>#include "iostream" using namespace std; void main() { cout << 4+2; }</pre>		Will solve 4+2 and display its answer
--	---	---------------------------------------

Escape sequences are written inside double quotations but are not displayed, rather every escape sequence have specific function. Following table explains about some of escape sequences.

Escape sequence	Character represented
\a	Alert (Beep, Bell) (added in C89)[1]
\b	Backspace
\n	Newline (Line Feed); see notes below
\r	Carriage Return
\t	Horizontal Tab
\v	Vertical Tab
\\	Backslash
\'	Apostrophe or single quotation mark
\"	Double quotation mark
\?	Question mark (used to avoid tri graphs)

Program	Output	Remarks
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```
#include "iostream"
using namespace std;
void main()
{
    cout << "Welcome to
    BIIT"; }
```



Will print Welcome to BIIT



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Lecture # 2 Data Types

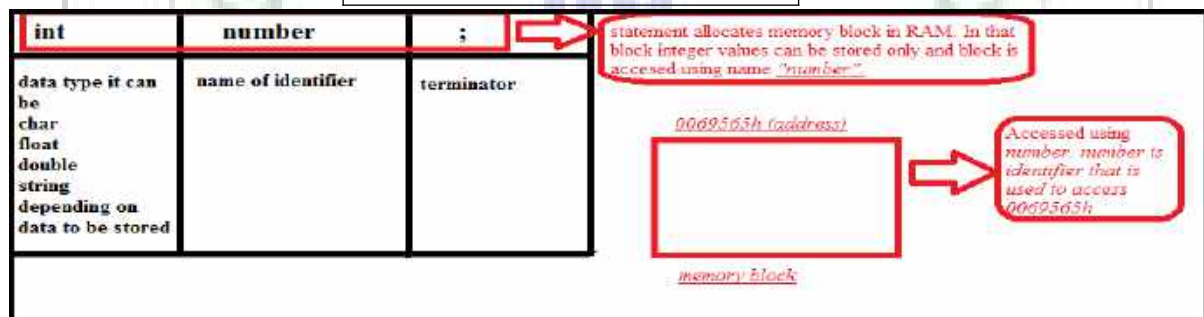
Data in real life exist in different forms like text, integers, floating numbers and character. In programming our goal is how to tackle the data? In C++ there are different data types for handling different data. Some of the data types are given below.

Data	Type	C++	Example
Numbers (negative and positive)	Integers	short int long	1,2 ,21,34, -2, -90
Numbers (only positive)	Integers	unsigned int unsigned short unsigned long	Only positive numbers 1, 23, 34, 45, 56
Numbers with decimal points	Float	float double	2.5 , 4.5, 5.6, 2.6
Characters	Characters	char	A , b , f, 1 ,2, @
Text data	String	string	Pakistan is a nuclear Power

2. Identifiers:

For storing, accessing and modifying data we need a memory block. Memory block have a specific size depending on type of data to be stored. Programmer request for memory using specific statement, syntax for identifier declaration is given below.

data type name of identifier ;



Statement	Description
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int number ;	This statement is known as identifier declaration. After execution of this statement a memory block is created as follow. A123456H (number) This memory block has address A123456H in our program we can access this block with its name i.e “number”. Note that every time a program is run memory block created will be at some different location for example if we run this statement another time memory address might be B123456H. We need not worry about memory address because each time name for address is same. In this case name will “number”
number = 9 ;	= (assignment operator) is used to assign values to identifiers. On the left hand side of this operator there should be an identifier. A123456H (number) 9
cout << number ;	Printing value of an identifier. For printing a value memory address of number is accessed and value inside that address is printed. As in above statement 9 was assigned to number so the value printed will be 9.
number = 14 ;	14 is being assigned to number. What about the previous value 9? Every time an identifier is assigned a value its previous value is overwritten as follow A123456H (number) 9 14 If we print the value 14 will be displayed.
number = 6.5;	You might be thinking that this statement is error as we are assigning floating number to an integer. This statement is a valid statement, there arises a question that which value will be stored. If we analyze 6.5 we can write it as 6 + 0.5. 6 being an integer is stored in number. A123456H (number) 14 6
int number1 = 8 ;	Identifier initialization, assigning value to identifiers at the time of declaration. A52968H (number1) 8

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float num1 , num2 ;	Two memory blocks are created for storing float values B12345H (num1) C123456H (num2)																										
num1 = 9 ; num2 = 0.2 ;	will assign 9 to num1 and 9.2 to num2 B12345H (num1) 9.0 C123456H (num2) 0.2																										
number = num2 ;	Will assign value of num2 to number, num2 is a float and number is integer. As we have already learnt that integer cannot store floating value. But can store integer part out of floating number. Value of num2 is 0.2. 0 will be stored in number as 0.2 = 0 + 0.2 A123456H (number) 0 In the same way float can be assigned integer value also.																										
char ch ;	Will declare an identifier of char type. Note that every symbol on your key board is character. Every char has two value one the char value and the other value is called ASCII value. Following is a table for some char and their ASCII values. <table><thead><tr><th>Char</th><th>ASCII value</th></tr></thead><tbody><tr><td>0</td><td>48</td></tr><tr><td>1</td><td>49</td></tr><tr><td>2</td><td>50</td></tr><tr><td>3</td><td>51</td></tr><tr><td>4</td><td>52</td></tr><tr><td>5</td><td>53</td></tr><tr><td>6</td><td>54</td></tr><tr><td>7</td><td>55</td></tr><tr><td>8</td><td>56</td></tr><tr><td>9</td><td>57</td></tr><tr><td>A-Z</td><td>{65(A), 66(B), 67(C)....., 90(Z)}</td></tr><tr><td>a-z</td><td>{97(a), 98(b), 99(c)....., 122(z)}</td></tr></tbody></table>	Char	ASCII value	0	48	1	49	2	50	3	51	4	52	5	53	6	54	7	55	8	56	9	57	A-Z	{65(A), 66(B), 67(C)....., 90(Z)}	a-z	{97(a), 98(b), 99(c)....., 122(z)}
Char	ASCII value																										
0	48																										
1	49																										
2	50																										
3	51																										
4	52																										
5	53																										
6	54																										
7	55																										
8	56																										
9	57																										
A-Z	{65(A), 66(B), 67(C)....., 90(Z)}																										
a-z	{97(a), 98(b), 99(c)....., 122(z)}																										

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ch= ' A '	Whenever you assign a value to char data type it must be enclosed in single quote. D12345H A → Character 65 → ASCII Value A char data type stores only one char. Combination of characters is not stored.
ch= 66 ;	After reading above description you might be thinking its error, but it is not an error an integer value can be assigned to character. This integer value is treated as an ASCII value. D12345H B → Character 66 → ASCII Value If we print ch as cout <<ch ; B will be printed as output.
number = ch ;	A char is assigned to integer. If a char is assigned to an integer it will save its ASCII value. In this case number will have. A123456H (number) / 66
number = 'a';	Is it an error? No, we have learnt that an integer's value can be stored in integer data type, but here we are assigning a char to an integer every char has an ASCII value. ASCII values are integer value. ASCII value of a is 97, so 97 will be stored in number. A123456H (number)

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~~66~~ 97

Size of memory blocks depend upon data types in case of int and float 4byte memory is reserved and in case of char 1 byte memory is reserved.

