❖ Tokens

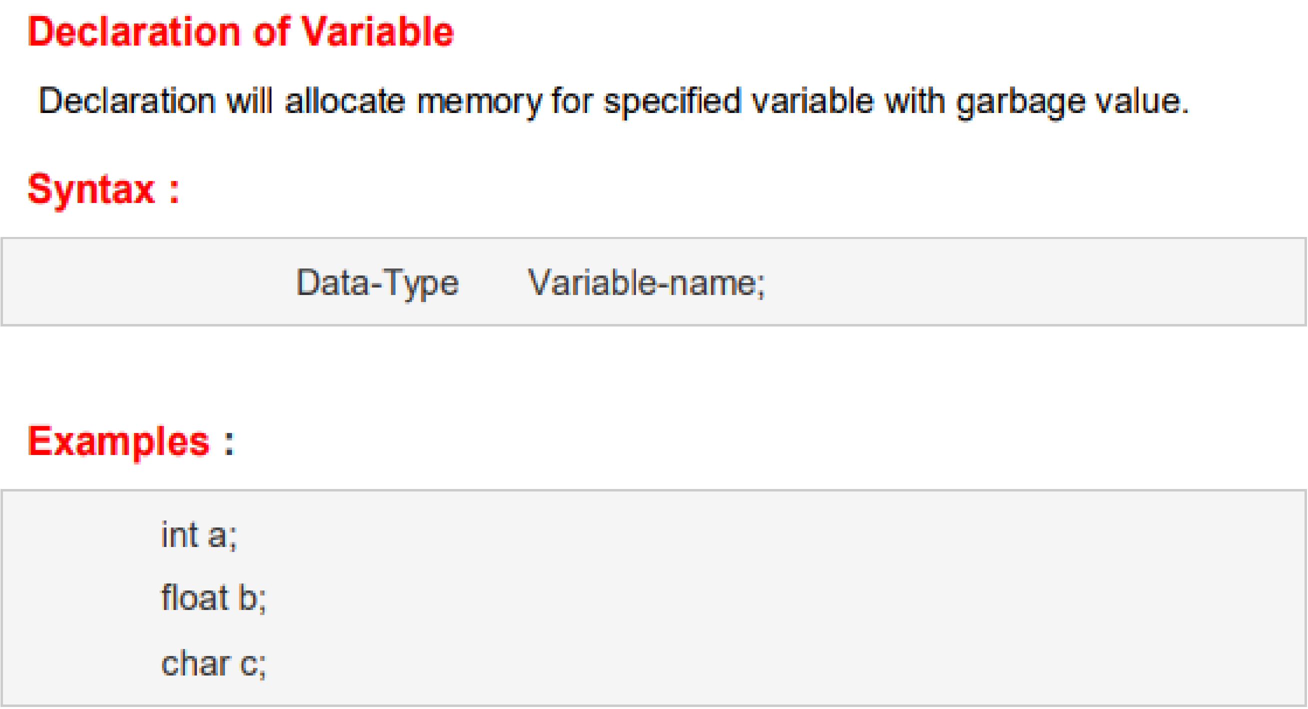
- A token is the smallest element of a C++ program that is meaningful to the compiler. It act as building blocks of a program.
- The following tokens are available in C++ keywords, identifiers, constants, variables, and operators described in this section are examples of tokens. Punctuation characters such as brackets ([ ]), braces ({ }), parentheses (( )), and commas (,) are also tokens.

➢ Name of tokens

✓ Keywords
✓ Identifiers
✓ Constants
✓ Variables
✓ Operators
✓ Punctuation

❖ Variables

- In C++ a variable is a place to store information. A variable is a location in your computer's memory in which you can store a value and from which you can later retrieve that value.
- Data value is Change or may change due to some calculation during the program execution.
- When you define a variable in C++, you must tell the compiler what kind of variable it is: an integer, a character, and so forth.
- When you run your program, it is loaded into RAM from the disk file. All variables are also created in RAM.



Declaration of Variable

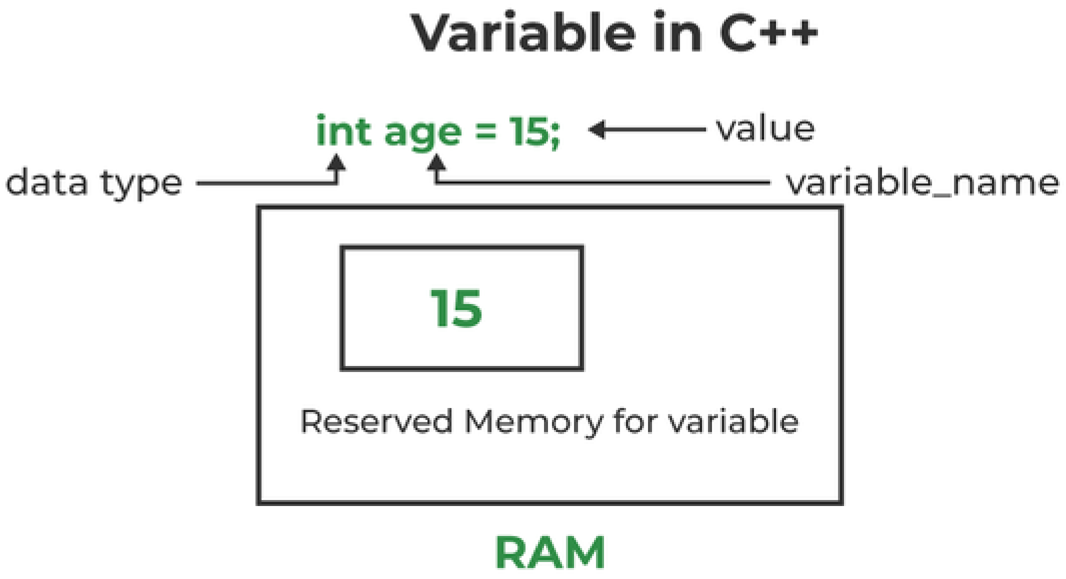
Declaration will allocate memory for specified variable with garbage value.

Syntax :

```
Data-Type     Variable-name;
```

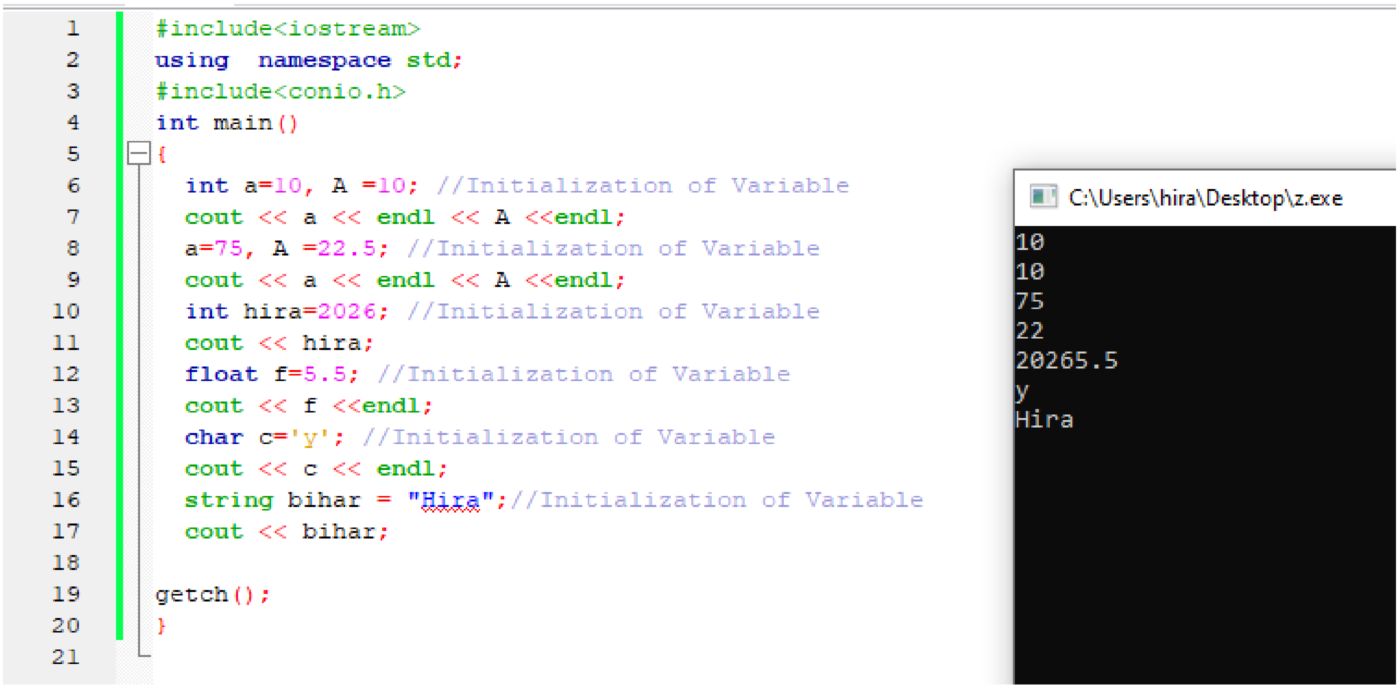
Examples :

```
int a;
float b;
char c;
```



❖ Initialization of Variable in Program

Initialization means assigning value to declared variable. Every value will overwrite the previous value.

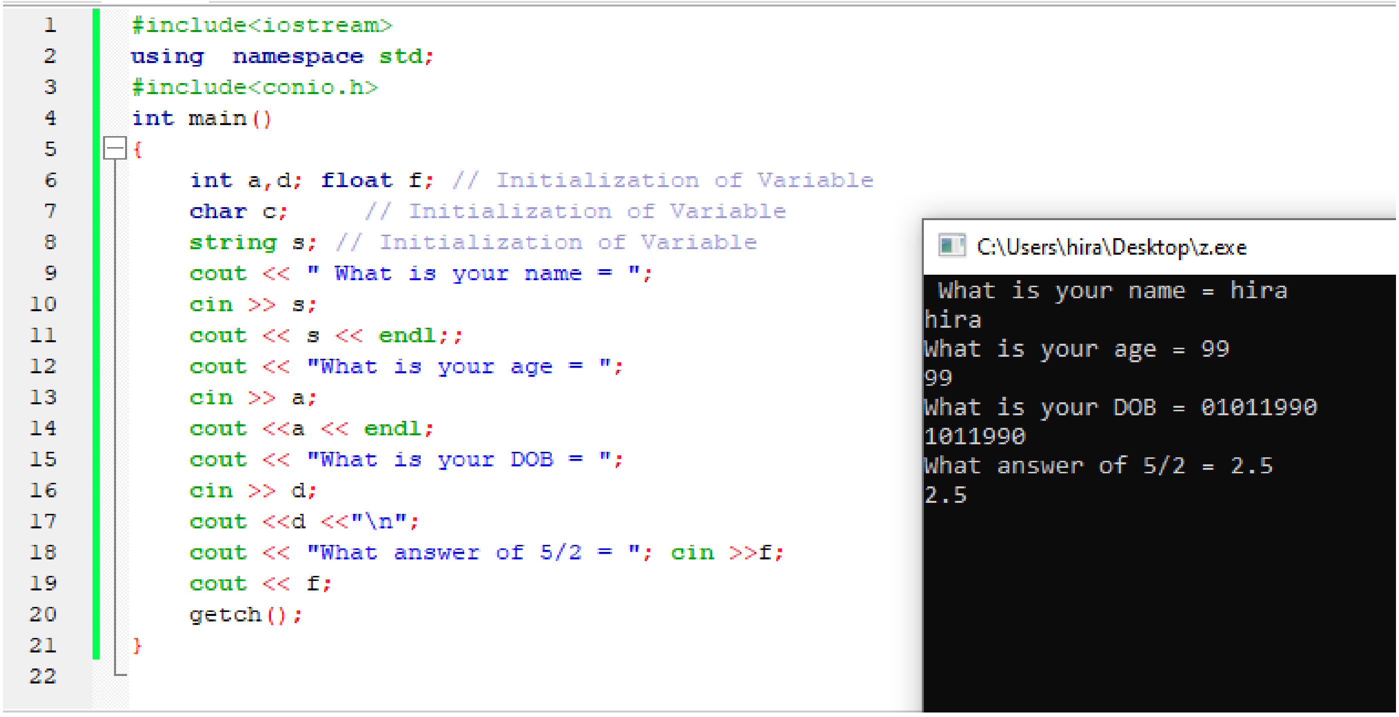


```
#include<iostream>
using  namespace std;
#include<conio.h>
int main()
{
    int a=10, A =10; //Initialization of Variable
    cout << a << endl << A <<endl;
    a=75, A =22.5; //Initialization of Variable
    cout << a << endl << A <<endl;
    int hira=2026; //Initialization of Variable
    cout << hira;
    float f=5.5; //Initialization of Variable
    cout << f <<endl;
    char c='y'; //Initialization of Variable
    cout << c << endl;
    string bihar = "Hira";//Initialization of Variable
    cout << bihar;

getch();
}
```

```
10
10
75
22
20265.5
y
Hira
```

Q. Write a program to print name, age, DOB of user & what answer of 5/2 in c++.



```
#include<iostream>
using  namespace std;
#include<conio.h>
int main()
{
    int a,d; float f; // Initialization of Variable
    char c;     // Initialization of Variable
    string s; // Initialization of Variable
    cout << " What is your name = ";
    cin >> s;
    cout << s << endl;;
    cout << "What is your age = ";
    cin >> a;
    cout <<a << endl;
    cout << "What is your DOB = ";
    cin >> d;
    cout <<d <<"\n";
    cout << "What answer of 5/2 = "; cin >>f;
    cout << f;
    getch();
}
```

```
 What is your name = hira
hira
What is your age = 99
99
What is your DOB = 01011990
1011990
What answer of 5/2 = 2.5
2.5
```

6. "Optimize or "Minimize" above c++ program. (Write a program to print name, age, DOB of user & what answer of 5/2 in c++.)

OR

Reduce the number of lines while keeping the same logic.

7. Write a program to print your 10th class marks in percentage.

8. Write a program to store a value in an integer variable and display it on the screen.

❖ C++ Identifiers

In C++ programming language, identifiers are the unique names assigned to variables, functions, classes, structs, or other entities within the program.

➢ Rule = How to write Variable_name / Identifiers

i. It must begin with alphabet or underscore. (e.g – a2, Hira, _2, bihar_sharif, …….)

ii. No other symbol is allowed (e.g – a$, a.b, x-1,…)

iii. 1st variable name cannot start with a digit (e.g – 2a, 8x,….)

iv. C++ has reserved keywords that cannot be used as identifiers.

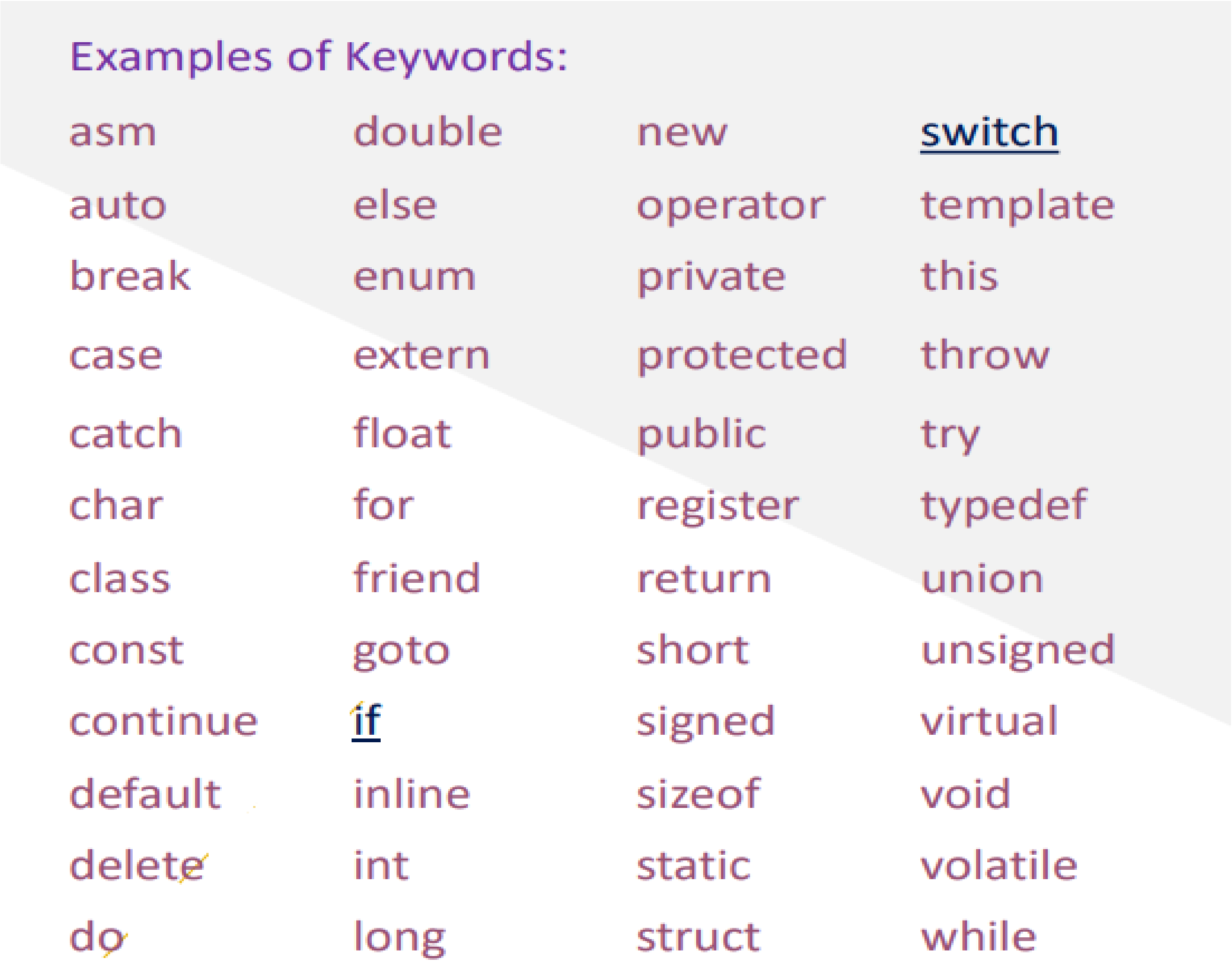
v. Identifier must be unique in its namespace.

Valid Identifiers	Invalid Identifiers
• Hira; • A; • num; • bihar_sharif; • a2; • sum;	• 1hira (start with digit) • bihar sharif (space not allow) • goto (keyword) • 2a; (start with digit) • Bihar@123 (special symbol not allow)

❖ Keywords

- It is also called Pre-define words / Reserved word /type of token
- Keywords (reserved words) have special meanings to the C++ compiler and are always written or typed in lower cases.
- Keywords are words that the language uses for a special purpose, such as void, int, public, etc.
- It can’t be used for a variable name or function name or any other identifiers.

- The total count of keywords is 95, in which 32 keywords present in C language.
- Categorization of c++ keywords ☟



Examples of Keywords:

asm
auto
break
case
catch
char
class
const
continue
default
delete
do

double
else
enum
extern
float
for
friend
goto
if
inline
int
long

new
operator
private
protected
public
register
return
short
signed
sizeof
static
struct

switch
template
this
throw
try
typedef
union
unsigned
virtual
void
volatile
while

❖ Constants

- Constants (often referred to as Literals) are data items that never change their value during the execution of the program.

Type of Constants

The following types of constants are available in C++.

✓ Integer Constants
✓ Character Constants
✓ Floating Point Constants
✓ Strings Constants

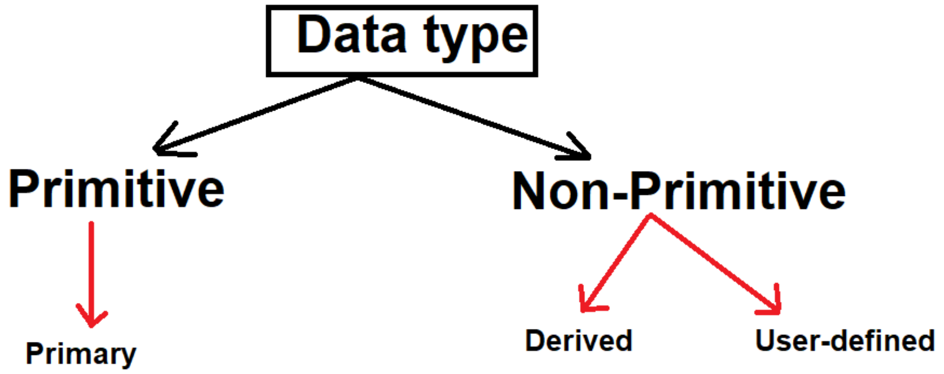
- **Integer constant**-Consists of the digits.
  - ✓ Example :- 10, -555,10A(hexa form), 22,-9,......
- **Float constant**-Consists of the digits with decimal.
  - ✓ Example :- 3.0, -7.5, -0.067, 45.55, 2.5e3,.......
- **Character constant**-single character enclose with in a part of single quote.
  - ✓ Example :- ‘A’, ‘9’, ‘#’, ...
- **String constant**- Collection is sequence of characters enclosing in double quotes.
  - ✓ Example :- “Hira”, “New Delhi”, ...

❖ Data Type

- The data type determines the kind of information that may be stored in the variable. Variables are classified according to their data type.
- Whenever a variable is defined in C++, the compiler allocates memory for that variable based on the data type with which it is declared.
- The programmer can select the data type appropriate to the needs of the application. Data types specify the size and types of values to be stored.

C++ supports the following data types:

1. Primary or Built-in or Fundamental/Basic data type
2. Derived data types
3. User-defined data types



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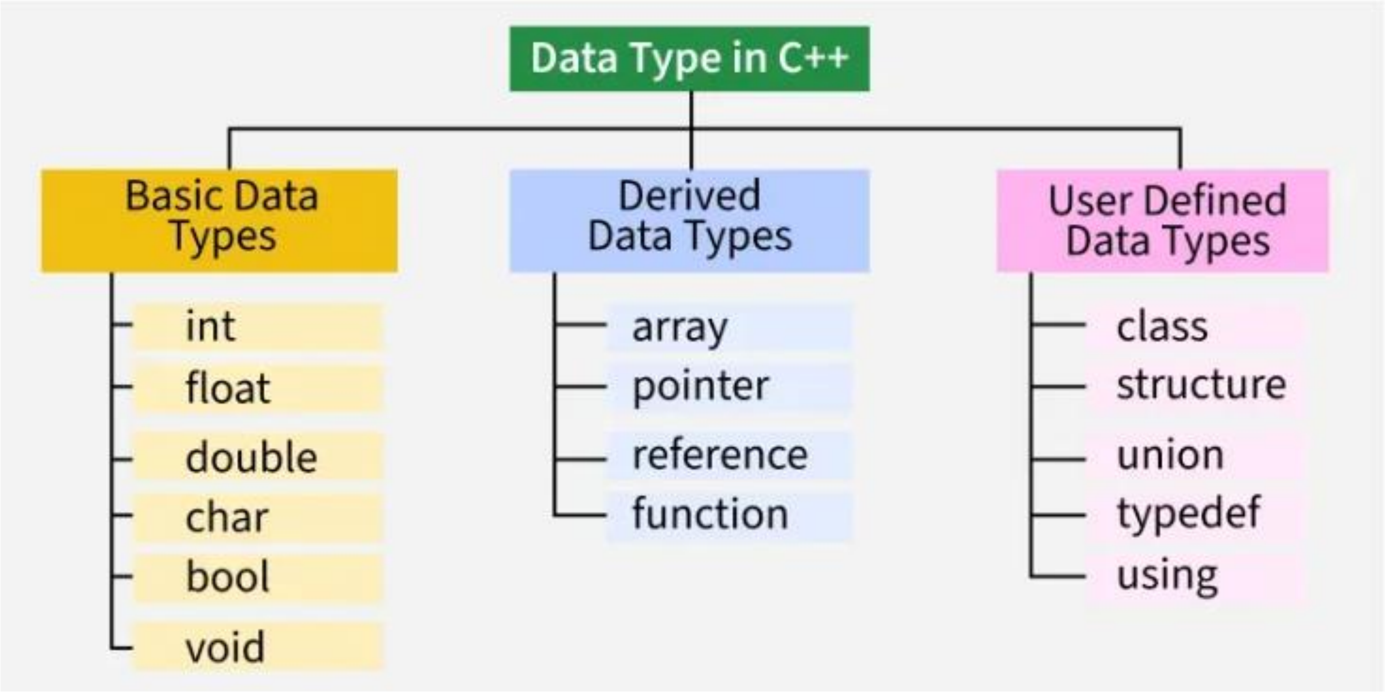
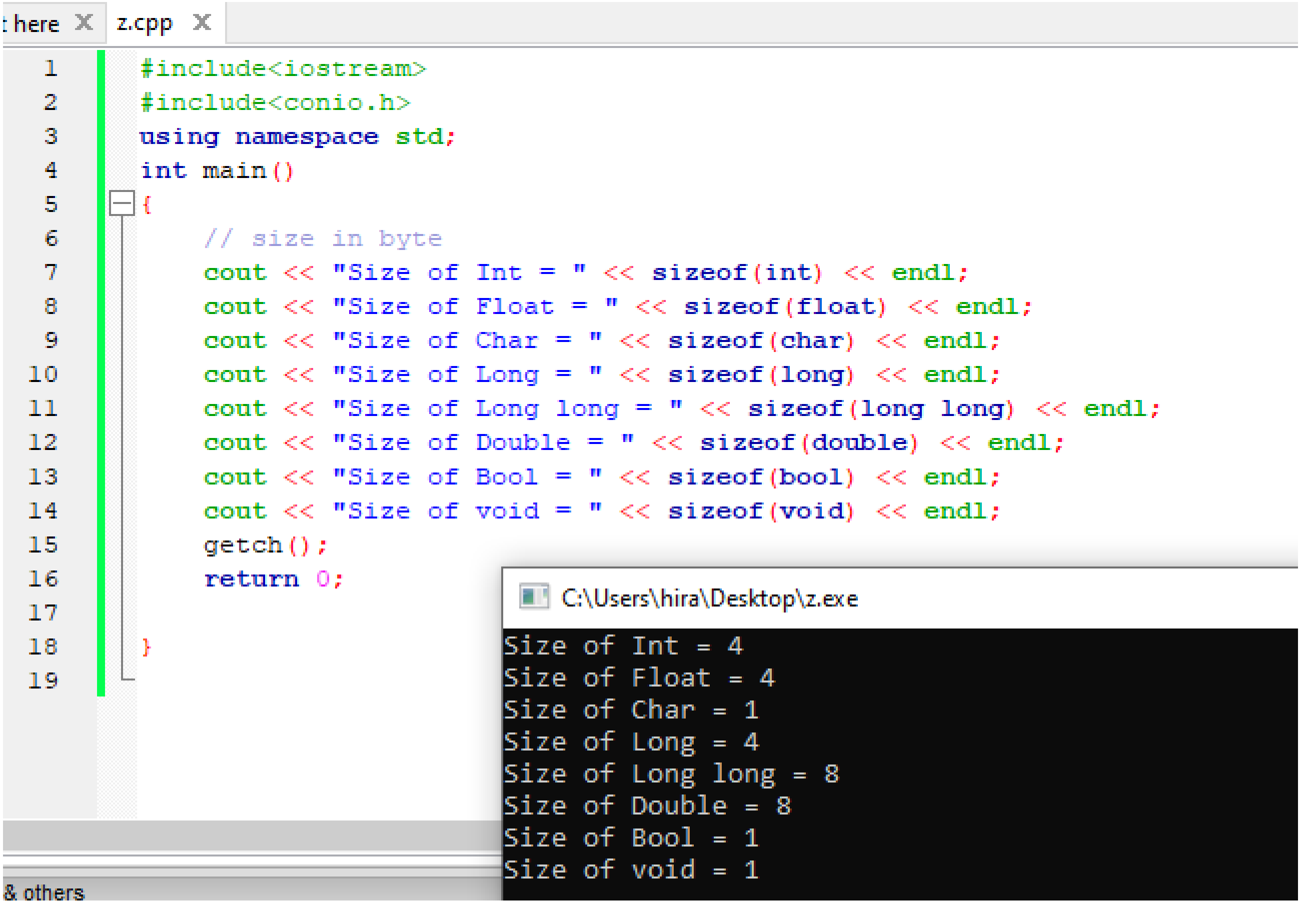


❖ Size of Primitive Data type

(64 bit compilers – 2025-2026)

Data Type	**Size (byte)**	**Use**	**Range**
int	4	To store integers numbers	-2147483648 to 2147483647
long	4	For large integers numbers	-2147483648 to 2147483647
long long	8	For very large integers numbers	-9223372036854775808 to 9223372036854775807
float	4	For decimal numbers	-3.4 * 10^38 to3.4*10^38
double	8	For high precision decimal numbers	+- 1.7 * 10^308
long double	8	For extra high precision decimal numbers (some compiler 12/16)	+- 1.1 * 10^4932
char	1	To store a single character	‘A’, ‘a’, ‘0’, …..
bool	1	To store true/false values	True/false



```cpp
#include<iostream>
#include<conio.h>
using namespace std;
int main()
{
    // size in byte
    cout << "Size of Int = " << sizeof(int) << endl;
    cout << "Size of Float = " << sizeof(float) << endl;
    cout << "Size of Char = " << sizeof(char) << endl;
    cout << "Size of Long = " << sizeof(long) << endl;
    cout << "Size of Long long = " << sizeof(long long) << endl;
    cout << "Size of Double = " << sizeof(double) << endl;
    cout << "Size of Bool = " << sizeof(bool) << endl;
    cout << "Size of void = " << sizeof(void) << endl;
    getch();
    return 0;

}
```

```
Size of Int = 4
Size of Float = 4
Size of Char = 1
Size of Long = 4
Size of Long long = 8
Size of Double = 8
Size of Bool = 1
Size of void = 1
```

❖ C++ Modifiers

- Modifiers are used with primary data types like int, float, char to control size, sign, or behavior.

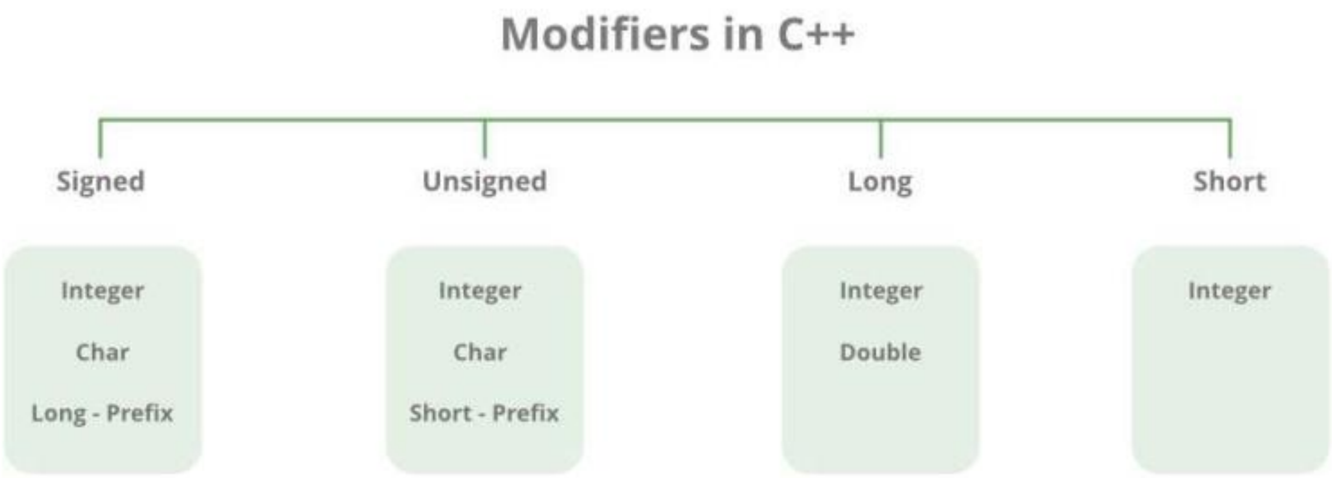
Data type modifiers available in C++ are:

✓ Signed → Can store positive & negative values

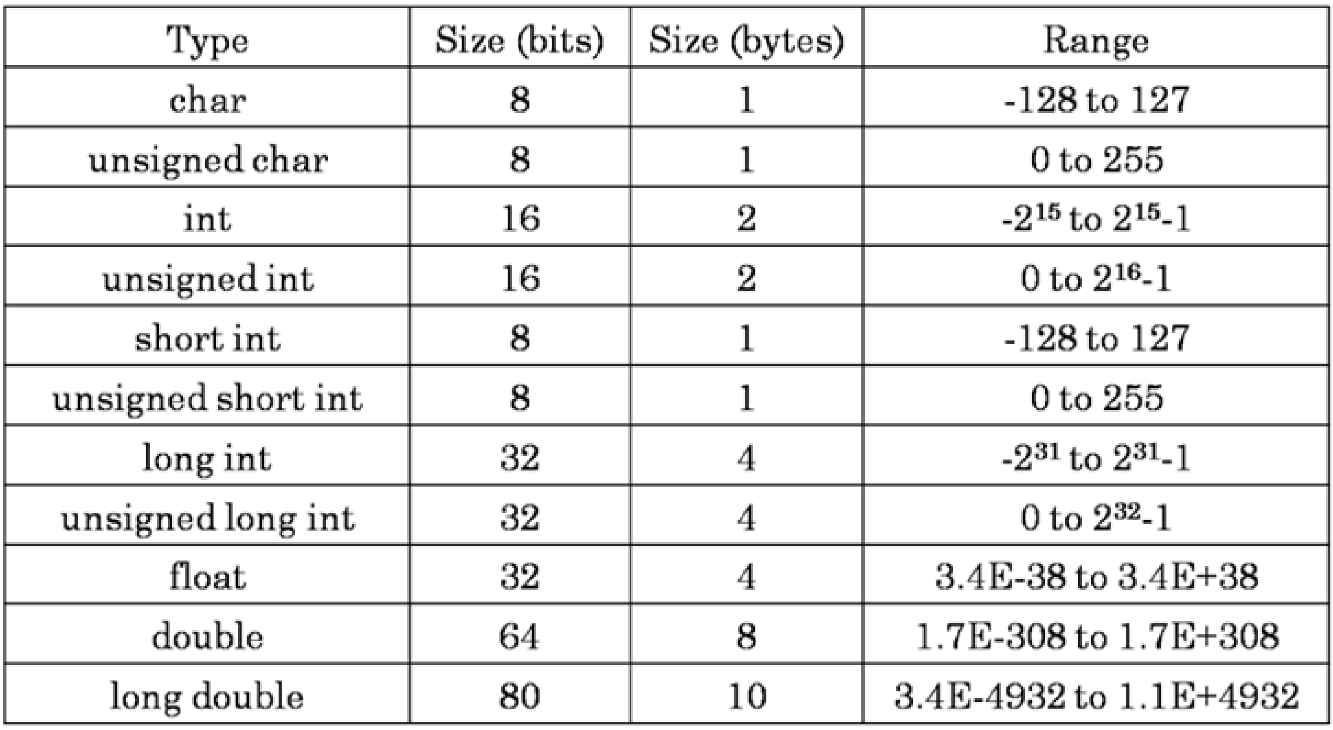
✓ Unsigned → Can store only positive values

✓ Short → Reduces the size of integer type

✓ Long → increases the size of integer type



Old 16bit /Turbo C++ sizes



Type	Size (bits)	Size (bytes)	Range
char	8	1	-128 to 127
unsigned char	8	1	0 to 255
int	16	2	-2^{15} to $2^{15}-1$
unsigned int	16	2	0 to $2^{16}-1$
short int	8	1	-128 to 127
unsigned short int	8	1	0 to 255
long int	32	4	-2^{31} to $2^{31}-1$
unsigned long int	32	4	0 to $2^{32}-1$
float	32	4	3.4E-38 to 3.4E+38
double	64	8	1.7E-308 to 1.7E+308
long double	80	10	3.4E-4932 to 1.1E+4932

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