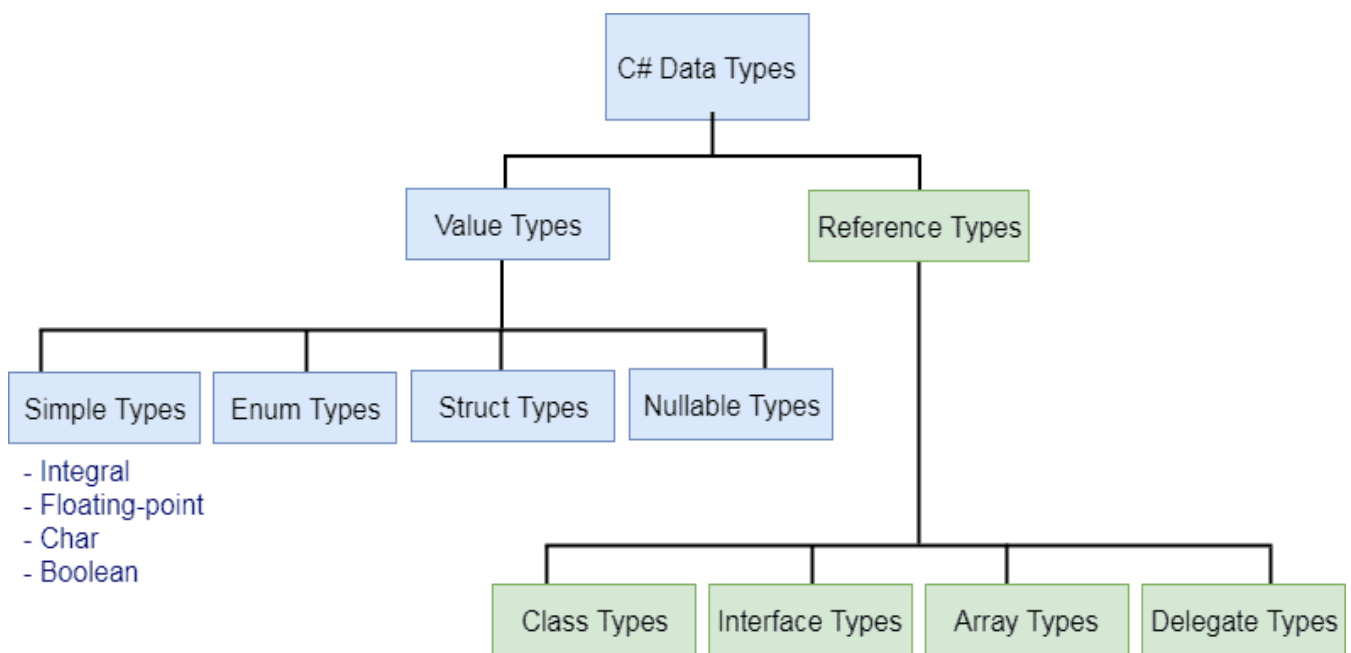


### Data Types

Data types specify the different sizes and values that can be stored in the memory using by variable. The values, or data, contained in variables are classified into categories known as data types. In this chapter, you will learn about C# data types, variables, and the operation that can be performed on them. In C# Language mainly categorized data types in two types: Value types and Reference types.

1. **Value data types:** The value data types include Boolean, char, byte, short, int , long, float and double. They are called primitive or predefine data types also.
2. **Reference types:** The reference data types because they refer to objects like include Classes, Interfaces, and Arrays.



Type	Description	Range	Suffix
byte	8-bit unsigned integer	0 to 255	
sbyte	8-bit signed integer	-128 to 127	
short	16-bit signed integer	-32,768 to 32,767	
ushort	16-bit unsigned integer	0 to 65,535	
int	32-bit signed integer	-2,147,483,648 to 2,147,483,647	
uint	32-bit unsigned integer	0 to 4,294,967,295	u
long	64-bit signed integer	-9,223,372,036,854,775,808 to 9,223,372,036,854,775,807	l
ulong	64-bit unsigned integer	0 to 18,446,744,073,709,551,615	ul

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Type	Description	Range	Suffix
float	32-bit Single-precision floating point type	-3.402823e38 to 3.402823e38	f
double	64-bit double-precision floating point type	-1.79769313486232e308 to 1.79769313486232e308	d
decimal	128-bit decimal type for financial and monetary calculations	(+ or -)1.0 x 10e-28 to 7.9 x 10e28	m
char	16-bit single Unicode character	Any valid character, e.g. a,*, \x0058 (hex), or\u0058 (Unicode)	
bool	8-bit logical true/false value	True or False	
object	Base type of all other types.		
string	A sequence of Unicode characters		
DateTime	Represents date and time	0:00:00am 1/1/01 to 11:59:59pm 12/31/9999	

## Variables

In programming, a variable is a container (storage area) to hold data. To indicate the storage area, each variable should be given a unique name (identifier). Variable names are just the symbolic representation of a memory location. In a program you can put any value into it, and then retrieve the value later for use in calculation. Each variable will contain different values at different times, depending on the requirements. This mean variables can be change value during the execution of program but data type cannot be change in C# language.

A variable's specific data type is very important in programming because the data type helps determine the manner in which the value is stored and how much memory the computer allocates for the data stored in the variable. The data type also governs the kinds of operations that can be performed on a variable.

### Rules of variable name declarations:

The variable value can be change during the execution of program. The name you assign to a variable is called identifier also. Some rules of variable declaration are following.

- Identifier/Variable name must be start a character or underscore like salary, Name, Father\_Name etc\_
- Identifier/Variable may contain uppercase and lowercase Letters, Numbers, or underscore
- Identifier/Variable cannot contain special character and spaces.
- Identifier/Variable are case sensitive.
- Identifier/Variable cannot contain reserve words or keywords of c# language.

- **Convention Of variable:**

```
variableName = Content ;
Father_Name = Content;
ConvanceAllownace = Content;
```

### Constants/Literals

A constant is a value or an identifier whose value cannot be altered during the execution of the C# program. A constant is a variable whose value cannot change once it has been assigned. If you try to change the constant in the program, C# (the C# Compiler) sends an error message. This happens because you can only assign a value to a constant once. A constant can make our program more easily read and understood by others. To define a variable as a constant, we just need to add the keyword “**const**” in front of the variable declaration. As a rule, we write constants in capital letters to differentiate them from ordinary variables.

**Syntax:** `const double PI = 3.1415926536;`

### Example

```
using System;

namespace Constant
{
    class Program
    {
        static void Main(string[] args)
        {
            const float PI = 3.142f;
            const string MyName = "Muhammad Masood";

            Console.WriteLine(" My name is " + MyName);
            Console.WriteLine(" Pi Value is " + PI);
        }
    }
}
```

A screenshot of a Windows command prompt window. The title bar shows the path C:\WINDOWS\system32\cmd.exe. The command prompt displays the output of a C# program: "My name is Muhammad Masood", "Pi Value is 3.142", and "Press any key to continue . . .". The cursor is positioned at the end of the last line.

### Concatenation

The C# concatenation operator (+) is used to combine two string or other type's values to create one string. Concatenation is the process of appending one string to the end of another string. You concatenate strings by using the + operator. For string literals and string constants, concatenation occurs at compile time; no run-time concatenation occurs. For string variables, concatenation occurs only at run time.

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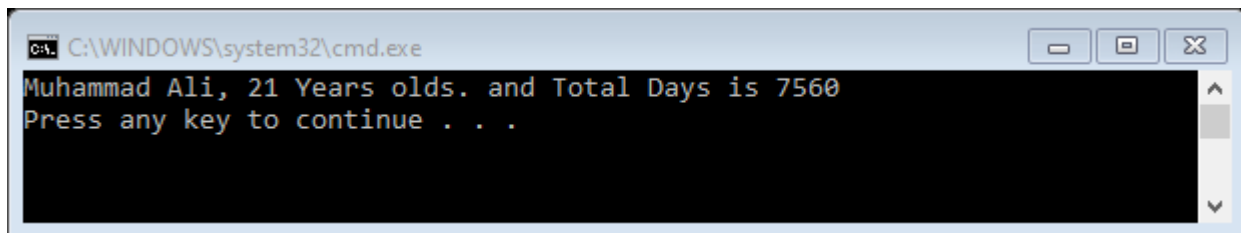
Page | 8

## Example

```
using System;

namespace Constant
{
    class Program
    {
        static void Main(string[] args)
        {
            string name = "Muhammad Ali";
            byte age = 21;
            string newstring = name + ", " + age + " Years olds. and Total Days is " + (age * 360);

            Console.WriteLine(newstring);
        }
    }
}
```



```
C:\WINDOWS\system32\cmd.exe
Muhammad Ali, 21 Years olds. and Total Days is 7560
Press any key to continue . . .
```

## Declaring and Initializations of variable:

The process of specifying and creating a variable name is called declaring the variable. In C# you must declare and it could be initialize a variable in the same line statement.

**Syntax:** `DataType Variable_Name = value Initialize;`

The value you assign to a variable can be a literal string, a integer number or character or a Boolean value or floating point value etc.

### Explanation:

```
string Name = "Sara Khan";
```

*Here "Sara Khan " is a string value assign in variable Name*

```
Int BasicSalary = 45000;
```

*Here 45000 is a integer numeric value assign in variable BasicSalary.*

```
Male = True;
```

*Here True is a Boolean value in Male variable*

```
float height= 5.6f;
```

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*Here 5.6f is a floating point value in Height variable*

### **Strongly/Static typed Programming**

Strongly or Static typed programming language is in every variable must be declared with a data type and data type cannot be change after declaration. C#, C# and C++ are strongly or Static typed programming languages.

### **Loosely/Dynamic typed Programming**

A loosely typed Programming is a programming language that does not require a variable to be defined. You can declare a variable, but it doesn't require you to classify the type of variable. Loose typing is also known as dynamic typing because the data type for a variable can be change after it has been declared. PHP and Perl is a loosely typed programming language.

### Exercise

#### Theory Questions:

1. What difference between variables and constant?
2. Name and describe the four data type in C#.
3. Explain the purpose of the Boolean data type.
4. What do you mean by strongly and loosely typed programming?
5. What is Concatenation?

#### Practical Questions:

1. Write a simple program of the following output using Constants.  
Student Roll Number is 001  
Student Name is ABC XYZ  
Student Address is R-77 Block 17 B. Area AL-Noor Society Karachi  
Father Salary of students is Rs. 68,000
2. Write make a simple program to set your G.R No. and Name in the variables and display G.R No. and name by Console.WriteLine() method/ functions.

#### Objective & MCQ's

1. Positive and negative number and 0 with no decimal places belong to which data type.
  - a) Double
  - b) Float
  - c) String
  - d) Integer
2. Which of the following is a valid variable name?
  - a) TotalSalary ;
  - b) Total Salary;
  - c) \$TotalSalary;
  - d) Total-Salary;

3. Which is the correct syntax for declaring a variable and assigning it a string?
  - a) Name="Muhammad";
  - b) Name=Muhammad;
  - c) "Muhmmad"= Name;
  - d) Name = "Muahammad"
  
4. How many decimal places does an integer store
  - a) One decimal
  - b) Two decimal
  - c) Three decimal
  - d) Integer does not store decimal places.
  
5. Variable name could be starting which symbol.
  - a) \_ (underscore)
  - b) @
  - c) \$
  - d) %
  
6. Combine the two or more string or other value by using concatenation \_\_\_ symbol
  - a) &
  - b) \*
  - c) +
  - d) . (dot)
  
7. String constant value
  - a) Must be enclosed in double quotes
  - b) Must be enclosed in commas
  - c) Must be enclosed in round parentheses
  - d) Must be square brackets

8. A constant is case-sensitive by default. By convention, constant identifiers are should be \_\_\_\_.
- a) Lower case
  - b) Camel case
  - c) Upper case
  - d) Normal case
9. We use the \_\_\_\_\_ keyword to create constant.
- a) define()
  - b) Include
  - c) final
  - d) const
10. A loosely typed programming language \_\_\_\_\_.
- a) Does not required data typed of a variable to be declared.
  - b) Requires data types of variables to be declared
  - c) Does not have variable
  - d) Does not have different data types.