

# Chapter 7 :



## Computer Science

**Class XI (As per  
CBSE Board)**

An illustration of a laptop computer with a white body and a black keyboard. The screen is open and displays the text "Data Handling" in a large, bold, red font. The laptop is set against a background of orange binary code (0s and 1s) that is slightly blurred and receding into the distance.

**Data  
Handling**

A purple starburst graphic with multiple points, containing the text "New Syllabus 2019-20" in a bold, black, sans-serif font.

**New  
Syllabus  
2019-20**

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# Introduction

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Most of the computer programming language support data type, variables, operator and expression like fundamentals. Python also support these.

## Data Types

Data Type specifies which type of value a variable can store. `type()` function is used to determine a variable's type in Python.

# Data type continue

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## Data Types In Python

1. Number
2. String
3. Boolean
4. List
5. Tuple
6. Set
7. Dictionary

# Data type continue

---

## 1. Number In Python

**It is used to store numeric values**

**Python has three numeric types:**

1. Integers
2. Floating point numbers
3. Complex numbers.

# Data type continue

---

## 1. Integers

Integers or int are positive or negative numbers with no decimal point. Integers in Python 3 are of unlimited size.

e.g.

```
a= 100  
b= -100  
c= 1*20  
print(a)  
print(b)  
print(c)
```

**Output :-**

```
100  
-100  
200
```

# Data type continue

---

## Type Conversion of Integer

int() function converts any data type to integer.

**e.g.**

```
a = "101" # string
```

```
b=int(a) # converts string data type to integer.
```

```
c=int(122.4) # converts float data type to  
integer.
```

```
print(b)
```

```
print(c)Run Code
```

**Output :-**

101

122

# Data type continue

---

## 2. Floating point numbers

It is a positive or negative real numbers with a decimal point.

**e.g.**

```
a = 101.2
b = -101.4
c = 111.23
d = 2.3*3
print(a)
print(b)
print(c)
print(d)Run Code
```

**Output :-**

```
101.2
-101.4
111.23
6.8999999999999995
```

# Data type continue

---

## Type Conversion of Floating point numbers

float() function converts any data type to floating point number.

**e.g.**

```
a='301.4' #string
```

```
b=float(a) #converts string data type to floating point number.
```

```
c=float(121) #converts integer data type to floating point number.
```

```
print(b)
```

```
print(c)Run Code
```

**Output :-**

```
301.4
```

```
121.0
```



# Data type continue

---

## 3. Complex numbers

Complex numbers are combination of a real and imaginary part. Complex numbers are in the form of  $X+Yj$ , where  $X$  is a real part and  $Y$  is imaginary part.

e.g.

```
a = complex(5) # convert 5 to a real part val and zero imaginary part  
print(a)
```

```
b=complex(101,23) #convert 101 with real part and 23 as imaginary part  
print(b)Run Code
```

**Output :-**

(5+0j)

(101+23j)

# Data type continue

---

## 2. String In Python

A string is a sequence of characters. In python we can create string using single ( ' ') or double quotes ( " "). Both are same in python.

e.g.

```
str='computer science'  
print('str-', str) # print string  
print('str[0]-', str[0]) # print first char 'c'  
print('str[1:3]-', str[1:3]) # print string from position 1 to 3 'om'  
print('str[3:]-', str[3:]) # print string starting from 3rd char 'puter science'  
print('str *2-', str *2 ) # print string two times  
print("str +'yes'-", str +'yes') # concatenated string
```

**Output**

```
str- computer science  
str[0]- c  
str[1:3]- om  
str[3:]- puter science  
str *2- computer sciencecomputer science  
str +'yes'- computer scienceyes
```

# Data type continue

---

## Iterating through string

e.g.

```
str='comp sc'  
for i in str:  
    print(i)
```

### Output

**c**  
**o**  
**m**  
**p**  
  
**s**  
**c**

# Data type continue

---

## 3. Boolean In Python

It is used to store two possible values either true or false

e.g.

```
str="comp sc"
```

```
boo=str.isupper() # test if string contains upper case
```

```
print(boo)
```

**Output**

False

# Data type continue

---

## 4. List In Python

List are collections of items and each item has its own index value.

## 5. Tuple In Python

List and tuple, both are same except ,a list is mutable python objects and tuple is immutable Python objects. Immutable Python objects mean you cannot modify the contents of a tuple once it is assigned.

### e.g. of list

```
list =[6,9]
list[0]=55
print(list[0])
print(list[1])
```

### e.g. of tuple

```
tup=(66,99)
Tup[0]=3 # error message will be displayed
print(tup[0])
print(tup[1])
```

### OUTPUT

```
55
9
```

# Data type continue

---

## 6. Set In Python

It is an unordered collection of unique and immutable (which cannot be modified) items.

**e.g.**

```
set1={11,22,33,22}  
print(set1)
```

**Output**

**{33, 11, 22}**

# Data type continue

---

## 7. Dictionary In Python

It is an unordered collection of items and each item consist of a key and a value.

e.g.

```
dict = {'Subject': 'comp sc', 'class': '11'}  
print(dict)  
print ("Subject : ", dict['Subject'])  
print ("class : ", dict.get('class'))
```

### Output

```
{'Subject': 'comp sc', 'class': '11'}  
Subject : comp sc  
class : 11
```

# Operator

Operators are special symbols in Python that carry out arithmetic or logical computation. The value that the operator operates on is called the operand.

## Arithmetic operators

Used for mathematical operation

Operator	Meaning	Example
+	Add two operands or unary plus	$x + y$ $+2$
-	Subtract right operand from the left or unary minus	$x - y$ $-2$
*	Multiply two operands	$x * y$
/	Divide left operand by the right one (always results into float)	$x / y$
%	Modulus - remainder of the division of left operand by the right	$x \% y$ (remainder of $x/y$ )
//	Floor division - division that results into whole number adjusted to the left in the number line	$x // y$
**	Exponent - left operand raised to the power of right	$x ** y$ ( $x$ to the power $y$ )



# Operator continue

---

## Arithmetic operator continue

e.g.

```
x = 5
```

```
y = 4
```

```
print('x + y =',x+y)
```

```
print('x - y =',x-y)
```

```
print('x * y =',x*y)
```

```
print('x / y =',x/y)
```

```
print('x // y =',x//y)
```

```
print('x ** y =',x**y)
```

## OUTPUT

```
('x + y =', 9)
```

```
('x - y =', 1)
```

```
('x * y =', 20)
```

```
('x / y =', 1)
```

```
('x // y =', 1)
```

```
('x ** y =', 625)
```

- Write a program in python to calculate the simple interest based on entered amount ,rate and time

# Operator continue

---

## Arithmetic operator continue

### # EMI Calculator program in Python

```
def emi_calculator(p, r, t):  
    r = r / (12 * 100) # one month interest  
    t = t * 12 # one month period  
    emi = (p * r * pow(1 + r, t)) / (pow(1 + r, t) - 1)  
    return emi
```

### # driver code

```
principal = 10000;  
rate = 10;  
time = 2;  
emi = emi_calculator(principal, rate, time);  
print("Monthly EMI is= ", emi)
```

# Operator continue

---

## Arithmetic operator continue

### How to calculate GST

GST ( Goods and Services Tax ) which is included in netprice of product for get GST % first need to calculate GST Amount by subtract original cost from Netprice and then apply

GST % formula = **(GST\_Amount\*100) / original\_cost**

**# Python3 Program to compute GST from original and net prices.**

```
def Calculate_GST(org_cost, N_price):  
# return value after calculate GST%  
    return (((N_price - org_cost) * 100) / org_cost);
```

**# Driver program to test above functions**

```
org_cost = 100  
N_price = 120  
print("GST = ",end="")  
print(round(Calculate_GST(org_cost, N_price)),end="")  
print("%")
```

\* Write a Python program to calculate the standard deviation

# Operator continue

## Comparison operators

used to compare values

Operator	Meaning	Example
>	Greater than - True if left operand is greater than the right	$x > y$
<	Less than - True if left operand is less than the right	$x < y$
==	Equal to - True if both operands are equal	$x == y$
!=	Not equal to - True if operands are not equal	$x != y$
>=	Greater than or equal to - True if left operand is greater than or equal to the right	$x >= y$
<=	Less than or equal to - True if left operand is less than or equal to the right	$x <= y$

# Operator continue

---

## Comparison operators continue

e.g.

```
x = 101
```

```
y = 121
```

```
print('x > y is',x>y)
```

```
print('x < y is',x<y)
```

```
print('x == y is',x==y)
```

```
print('x != y is',x!=y)
```

```
print('x >= y is',x>=y)
```

```
print('x <= y is',x<=y)
```

### Output

```
('x > y is', False)
```

```
('x < y is', True)
```

```
('x == y is', False)
```

```
('x != y is', True)
```

```
('x >= y is', False)
```

```
('x <= y is', True)
```

# Operator continue

---

## Logical operators

Operator	Meaning	Example
and	True if both the operands are true	x and y
or	True if either of the operands is true	x or y
not	True if operand is false (complements the operand)	not x

**e.g.**

**x = True**

**y = False**

**print('x and y is',x and y)**

**print('x or y is',x or y)**

**print('not x is',not x)**

**Output**

**('x and y is', False)**

**('x or y is', True)**

**('not x is', False)**

# Operator continue

---

## Bitwise operators

Used to manipulate bit values.

Operator	Meaning	Example
&	Bitwise AND	<code>x &amp; y</code>
	Bitwise OR	<code>x   y</code>
~	Bitwise NOT	<code>~x</code>
^	Bitwise XOR	<code>x ^ y</code>
>>	Bitwise right shift	<code>x &gt;&gt; 2</code>
<<	Bitwise left shift	<code>x &lt;&lt; 2</code>

# Operator continue

---

## Bitwise operators continue

```
a = 6
b = 3
print ('a=',a,':',bin(a),'b=',b,':',bin(b))
c = 0
c = a & b;
print ("result of AND is ", c,':',bin(c))
c = a | b;
print ("result of OR is ", c,':',bin(c))
c = a ^ b;
print ("result of EXOR is ", c,':',bin(c))
c = ~a;
print ("result of COMPLEMENT is ",
c,':',bin(c))
c = a << 2;
print ("result of LEFT SHIFT is ", c,':',bin(c))
c = a >> 2;
print ("result of RIGHT SHIFT is ", c,':',bin(c))
```

## Output

```
('a=', 6, ':', '0b110', 'b=', 3, ':', '0b11')
('result of AND is ', 2, ':', '0b10')
('result of OR is ', 7, ':', '0b111')
('result of EXOR is ', 5, ':', '0b101')
('result of COMPLEMENT is ', -7, ':', '-0b111')
('result of LEFT SHIFT is ', 24, ':', '0b11000')
('result of RIGHT SHIFT is ', 1, ':', '0b1')
```



# Operator continue

## Python Membership Operators

Test for membership in a sequence

Operator	Description
in	Evaluates to true if it finds a variable in the specified sequence and false otherwise.
not in	Evaluates to true if it does not finds a variable in the specified sequence and false otherwise.

**e.g.**

```
a = 5
```

```
b = 10
```

```
list = [1, 2, 3, 4, 5 ]
```

```
if ( a in list ):
```

```
    print ("Line 1 - a is available in the given list")
```

```
else:
```

```
    print ("Line 1 - a is not available in the given list")
```

```
if ( b not in list ):
```

```
    print ("Line 2 - b is not available in the given list")
```

```
else:
```

```
    print ("Line 2 - b is available in the given list")
```

**output**

**Line 1 - a is available in the given list**

**Line 2 - b is not available in the given list**

# Operator continue

## Python Identity Operators

Operator	Description
is	Evaluates to true if the variables on either side of the operator point to the same object and false otherwise.
is not	Evaluates to false if the variables on either side of the operator point to the same object and true otherwise.

**e.g.**

```
a = 10
```

```
b = 10
```

```
print ('Line 1','a=',a,':',id(a), 'b=',b,':',id(b))
```

```
if ( a is b ):
```

```
    print ("Line 2 - a and b have same identity")
```

```
else:
```

```
    print ("Line 2 - a and b do not have same identity")
```

**OUTPUT**

```
('Line 1', 'a=', 10, ':', 20839436, 'b=', 10, ':', 20839436)
```

```
Line 2 - a and b have same identity
```

# Operator continue

**Operators Precedence** :highest precedence to lowest precedence table

Operator	Description
**	Exponentiation (raise to the power)
~ + -	Complement, unary plus and minus (method names for the last two are +@ and -@)
* / % //	Multiply, divide, modulo and floor division
+ -	Addition and subtraction
>> <<	Right and left bitwise shift
&	Bitwise 'AND'
^	Bitwise exclusive 'OR' and regular 'OR'
<= < > >=	Comparison operators
<> == !=	Equality operators
= %= /= //= -= += *= **=	Assignment operators
is is not	Identity operators
in not in	Membership operators
not or and	Logical operators

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# Expression

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**It is a valid combination of operators, literals and variable.**

- 1. Arithmetic expression :- e.g.  $c=a+b$**
- 2. Relational expression :- e.g.  $x>y$**
- 3. Logical expression :- a or b**
- 4. String expression :-  $c="comp"+"sc"$**

# Type conversion

---

The process of converting the value of one data type (integer, string, float, etc.) to another data type is called type conversion.

Python has two types of type conversion.

Implicit Type Conversion

Explicit Type Conversion

## Implicit Type Conversion:

In Implicit type conversion, Python automatically converts one data type to another data type. This process doesn't need any user involvement.

e.g.

```
num_int = 12
```

```
num_flo = 10.23
```

```
num_new = num_int + num_flo
```

```
print("datatype of num_int:",type(num_int))
```

```
print("datatype of num_flo:",type(num_flo))
```

```
print("Value of num_new:",num_new)
```

```
print("datatype of num_new:",type(num_new))
```

## OUTPUT

```
('datatype of num_int:', <type 'int'>)
```

```
('datatype of num_flo:', <type 'float'>)
```

```
('Value of num_new:', 22.23)
```

```
('datatype of num_new:', <type 'float'>)
```

# Type conversion

---

## Explicit Type Conversion:

In Explicit Type Conversion, users convert the data type of an object to required data type. We use the predefined functions like `int()`, `float()`, `str()` etc.

e.g.

```
num_int = 12
```

```
num_str = "45"
```

```
print("Data type of num_int:",type(num_int))
```

```
print("Data type of num_str before Type Casting:",type(num_str))
```

```
num_str = int(num_str)
```

```
print("Data type of num_str after Type Casting:",type(num_str))
```

```
num_sum = num_int + num_str
```

```
print("Sum of num_int and num_str:",num_sum)
```

```
print("Data type of the sum:",type(num_sum))
```

## OUTPUT

```
('Data type of num_int:', <type 'int'>)
```

```
('Data type of num_str before Type Casting:', <type 'str'>)
```

```
('Data type of num_str after Type Casting:', <type 'int'>)
```

```
('Sum of num_int and num_str:', 57)
```

```
('Data type of the sum:', <type 'int'>)
```

# math module

It is a standard module in Python. To use mathematical functions of this module, we have to import the module using `import math`.

Function	Description	Example
<code>ceil(n)</code>	It returns the smallest integer greater than or equal to n.	<code>math.ceil(4.2)</code> returns 5
<code>factorial(n)</code>	It returns the factorial of value n	<code>math.factorial(4)</code> returns 24
<code>floor(n)</code>	It returns the largest integer less than or equal to n	<code>math.floor(4.2)</code> returns 4
<code>fmod(x, y)</code>	It returns the remainder when n is divided by y	<code>math.fmod(10.5,2)</code> returns 0.5
<code>exp(n)</code>	It returns $e^n$	<code>math.exp(1)</code> return 2.718281828459045
<code>log2(n)</code>	It returns the base-2 logarithm of n	<code>math.log2(4)</code> return 2.0
<code>log10(n)</code>	It returns the base-10 logarithm of n	<code>math.log10(4)</code> returns 0.6020599913279624
<code>pow(n, y)</code>	It returns n raised to the power y	<code>math.pow(2,3)</code> returns 8.0
<code>sqrt(n)</code>	It returns the square root of n	<code>math.sqrt(100)</code> returns 10.0
<code>cos(n)</code>	It returns the cosine of n	<code>math.cos(100)</code> returns 0.8623188722876839
<code>sin(n)</code>	It returns the sine of n	<code>math.sin(100)</code> returns -0.5063656411097588
<code>tan(n)</code>	It returns the tangent of n	<code>math.tan(100)</code> returns -0.5872139151569291
<code>pi</code>	It is pi value (3.14159...)	It is (3.14159...)
<code>e</code>	It is mathematical constant e (2.71828...)	It is (2.71828...)

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