

## Fundamentals of Python

- \* Token : Smallest individual unit of the program is called token.
- 17. Keyword : Reserved words in the programming language (Python) is called keyword.

For example :- if , for , while , else

- 21. Identifier : Naming rules for the variable is known as identifier.

Rules :-

- i) It can't start with the digit.
- ii) It can't have white space .
- iii) Case Sensitive
- iv) You can't use any symbol except '-' and '\$'.
- v) It can have any length .
- vi) It can't be a keyword .
- vii) It should be meaningful word towards the program .

Sr. No.	Valid	Invalid
17.	$a_1 = 10$ $a_2 = 20$	$1a = 10$ $2b = 20$
21.	$xy = 20$	$x y = 20$

Sr. No.	Valid	Invalid
3).	$\text{goldprice} = 46000$ $\text{Goldprice} = 47000$ $\text{print(Goldprice)}$ $47000$	
4).	$\text{gold-price} = 47000$	$a^* b = 10$
5).	$abcde\bar{fghi}jkl = 70$	
6).	<del><math>if</math></del> $= IF = 70$	$if = 70$
7).	$\text{Mark} = 90$ $\text{Per cent} = 78.32$	

### 3). Literals (constant value)

For examples :  $\text{marks} = 10$   
 $\text{Per cent} = 96.83$   
 $\text{Sname} = "GIS"$

#### 4). Punctuators (Symbols) :

Ex : [ ], ( ), { }, ' ', '`', :, ,

Punctuators

`abc = 321`

`print(abc) # 321`

`a, b, c = 3, 2, 1`

`print(a,b,c) # 3 2 1`

`print(abc) # 321`

`print(a) # 3`

`print(b) # 2`

`print(c) # 1`

#### 5). Operators :

\* List of operators

1). Arithmetic (+ - \* / % \*\* //)

2). Relational (< <= > >= == !=)

3). Logical (and or not)

4). Assignment (=)

[+=] -= [\*=] /= [\*=] //=[ ]

5). Bitwise operator (& | ^)

6). Shift operator (<< >>)

7). membership (in, not in)

8). Identity (is, is not)

(i) Arithmetic operators (+ - \* / % \*\* //)

Ex : `a = 5`

`b = 3`

```
print ("a+b =", a+b) # 8  
print ("a-b =", a-b) # 2  
print ("a*b =", a*b) # 15  
print ("a/b =", a/b) # 1.66  
print ("a% =", a%b) # 2  
print ("a//b =", a//b) # 1  
print ("a**b =", a**b) # 125
```

### (ii) Relational Operator.

num1 = 25

num2 = 6

num3 = 25

```
→ print ("num1 > num2 =", num1 > num2)  
→ print ("num1 >= num3 =", num1 >= num3)  
→ # num1 > num2 = True  
→ # num1 >= num3 = True  
→ print ("num1 <= num2 =", num1 <= num2)  
# num1 <= num2 = False  
→ print ("num1 < num3 =", num1 < num3)  
# num1 < num3 = False  
→ print ("num1 == num3 =", num1 == num3)  
# num1 == num3 = True  
→ print ("num1 == num2 =", num1 == 2)  
# num1 == num2 = False  
→ print ("num1 != num3 =", num1 != num3)  
# num1 != num3 = False  
→ print ("num1 != num2 =", num1 != num2)  
# num1 != num2 = True
```

## (iii) Logical Operator

```
num1 = 25
```

```
num2 = 6
```

```
num3 = 25
```

```
print(num1 > num2 and num2 < num3)
```

```
# True
```

```
print(num1 > num2 and num2 > num3)
```

```
# False
```

```
print(num1 > num2 or num2 < num3)
```

```
# True
```

```
print(num1 > num2 or num2 > num3)
```

```
# True
```

```
print(not(num1 > num2))
```

```
# False
```

```
print((num1 < num2 and num2 < num3) or  
      num3 > num2)
```

```
# True
```

## (iv) Assignment Operator

```
a = 25
```

```
b = 15
```

```
a += 3 # a = a + 3
```

```
print(a) # 28
```

```
b *= 4 # b = b * 4
```

```
print(b) # 60
```

```
a // 3 # a = a / 3
```

```
print(a) # 9
```

$b/4 = 4$  #  $b = b/4$   
print(b) # 15.0

Exercise :-

$$x = 10$$

$$y = 25$$

$$x + 5 \quad \# \quad \underline{x = 15}$$

$$y - 5 \quad \# \quad \underline{y = 20}$$

$$x^{**} = 2 \quad \# \quad \underline{x = 225}$$

$$y // 6 \quad \# \quad \underline{y = 3}$$

$$\underline{\text{print}(x, y)} \quad \# \quad \underline{225 \ 3}$$

(V) Bitwise (& | ^)

	$2^7$	$2^6$	$2^5$	$2^4$	$2^3$	$2^2$	$2^1$	$2^0$
	128	64	32	16	8	4	2	1
31				1	1	1	1	1
10				0	1	0	1	0
$10 \rightarrow 31 \& 10$				0	1	0	1	0
	128	64	32	16	8	4	2	1
31					1	1	1	1
10				0	1	0	1	0
$31 \rightarrow 31   10$				1	1	1	1	1
	128	64	32	16	8	4	2	1
31					1	1	1	1
10				0	1	0	1	0
$21 \rightarrow 31 ^ 10$				1	0	1	0	1

$$31 \& 10 = 8 + 2 = \underline{10}$$

$$31 | 10 = 16 + 8 + 4 + 2 + 1 = \underline{31}$$

$$31 ^ 10 = 16 + 4 + 1 = \underline{21}$$

A	B	$A \wedge B$
1	1	0
1	0	1
0	1	1
0	0	0

	128	64	32	16	8	4	2	1
47			1	0	1	1	1	1
30			0	1	1	1	1	0
$\frac{14}{(8+4+2)} \rightarrow 47 \& 30$			0	0	1	1	1	0
47			1	0	1	1	1	1
30			0	1	1	1	1	0
$\frac{63}{\cancel{47}} \rightarrow 47   30$ $(32+16+8+4+2+1)$			1	1	1	1	1	1
47			1	0	1	1	1	1
30			0	1	1	1	1	0
$\frac{49}{(32+16+1)} \rightarrow 47^{\wedge} 30$			1	1	0	0	0	1

$$\rightarrow (19 \& 24) \mid 37 = 53$$

$$\rightarrow (72 \& 47)^{\wedge} (39 | 42) = 39$$

(vi) Shift ( $<<$ ,  $>>$ )

	$2^6$	$2^5$	$2^4$	$2^3$	$2^2$	$2^1$	$2^0$
	64	32	16	8	4	2	1
27			1	1	0	1	1
$27 << 1$			1	0	1	1	0

$(32+16+4+2=54)$

$2^6$	$2^5$	$2^4$	$2^3$	$2^2$	$2^1$	$2^0$
64	32	16	8	4	2	1
31		1	1	1	1	1
$31 \ll 2$	1	1	1	1	0	0
$(64 + 32 + 16 + 8 + 4 = 124)$						

64	32	16	8	4	2	1
27		1	1	0	1	1
$27 \gg 1$		1	1	0	1	1
$(8 + 4 + 1 = 13)$						
↑ I will not count						

64	32	16	8	4	2	1
47	0	1	0	1	1	1
$47 \gg 2$	0	0	0	1	0	1
$(8 + 2 + 1 = 11)$						
↑↑ I will not count						

### (vii) Membership Operator (in , not in)

Example :  $a = "Gajera"$

$b = "g"$

`print(b in a)` # True

`print("G" in a)` # True

`print("g" in a)` # False

`print("g" not in a)` # True

### (viii) Identity Operator (is , is not)

Example 8  $a = "GIS"$

$b = "gis"$

`print(a is b)` # False

```
print(a is not b)    # True  
print("is" is b)    # False  
print("is" is b)    # True
```

# Example : find output (2 Marks)

data1 = 95

data2 = 3

data1 // data2 # data1 = data1//data2  
95//3

print(data1) # 31

print(data2) (data1 & data2) # 3

	36	16	8	4	2	1
31		1	1	1	1	1
3					1	1
31 & 3					1	1

# find output

P = 31

Q = 27

R = 43

P += Q

R -= 8

print(P, Q, R) # 58 27 35

X = P/Q

Z = P^R

print(X, Y) # 58  $\frac{25}{27}$

# Example :- find output (2 Marks)

$$d_1 = 95$$

print ( $d_1 \ll 4$ )

2048	1024	512	256	128	64	32	16	8	4	2	1
					1	0	1	1	1	0	0

$$\rightarrow 1024 + 256 + 128 + 64 + 32 + 16 \rightarrow \underline{\underline{1520}}$$

# Example : find output

$$d_1 = 37$$

$$d_2 = 43$$

print ( $(d_1 \ll 2) \& (d_2 \gg 1)$ )

⇒ Input function :-



`input()` : used to take input from user

Syntax for String Value :-

`varName = input("statement")`

Syntax for int value :-

`varName = int(input("statement"))`

Syntax for float value :-

`varName = float(input("statement"))`

	int	float	string
int	YES	NO	NO
float	YES	YES	NO
string	YES	YES	YES

⇒ Example 1 :-

Take first name and last name from user  
and print both value in single statement.

`a1 = input("Enter your first name = ")`

`a2 = input("Enter your last name = ")`

`print(a1, a2)`

Output :-

Enter your first name = Raj

Enter your last name = Vaghani  
Raj Vaghani

⇒ Example 2 :

Total of 5 subject and make average of it.  
by taking input from user.

phy = int(input("Enter mark of phy = "))

chem = int(input("Enter mark of chem = "))

eng = int(input("Enter mark of Eng = "))

ip = int(input("Enter mark of IP = "))

math = int(input("Enter mark of maths = "))

total = phy + chem + eng + ip + math

print ("Total of 5 subject is : ", total)

print ("Average of 5 subject is : ", total / 5)

Output :

Enter mark of phy = 85

Enter mark of chem = 75

Enter mark of Eng = 96

Enter mark of IP = 76

Enter mark of maths = 63

Total of 5 subject is : 395

Average of 5 subject is : 79.0

⇒ Example 3 :

Take 2 input in terms of float and perform  
each arithmetic operators on them (+ - \* / % \*\*  
//).

```

S1 = float(input("Enter value 1="))
S2 = float(input("Enter value 2="))
print ("S1+S2=", S1+S2)
print ("S1-S2=", S1-S2)
print ("S1*S2=", S1*S2)
print ("S1/S2=", S1/S2)
print ("S1%S2=", S1%S2)
print ("S1**S2=", S1**S2)
print ("S1//S2=", S1//S2)
    
```

**Output :-**

Enter value 1 = 85

Enter value 2 = 3

S1 + S2 = 88.0

S1 - S2 = 82.0

S1 \* S2 = 255.0

S1 / S2 = 28.33

S1 % S2 = 1.0

S1 \*\* S2 = 614125.0

S1 // S2 = 28.0

⇒ Example 4: Take the first name, last name and age from the user and print the answer in given format:-

Ex:- If first name is Raj and second name is Vaghani and age is 17 then output should be,

My name is Raj Vaghani, I am 17 years old.

fn = input('Enter your first name :')

ln = input('Enter your last name :')

age = int(input('Enter your age :'))

print('My name is ', fn, ln, ', I am ', age, ' years old.')

Output :-

My name is Raj Vaghani, I am 17 years old.

⇒ Example 5 : Take 2 input in term of integer in variable d<sub>1</sub> and d<sub>2</sub> and perform each relational operator on them. ( < <= > >= == != )

```
d1 = int(input('Enter 1st value : '))
d2 = int(input('Enter 2nd value : '))
print("d1 < d2", d1 < d2)
print("d1 > d2", d1 > d2)
print("d1 <= d2", d1 <= d2)
print("d1 >= d2", d1 >= d2)
print("d1 == d2", d1 == d2)
print("d1 != d2", d1 != d2)
```

Output :-

False Enter 1st value : 15

True Enter 2nd value : 30

False False

True

False

True

False

True

⇒ Example 6 : Take 3 input from user in term of float, named variable a, b, c and perform the given equation :-

$$D = \frac{a^2 + b^2 + c^2}{2a}$$

a = float(input("Enter value of a : "))

b = float(input("Enter value of b : "))

c = float(input("Enter value of c : "))

$$D = (a^{**} 2 + b^{**} 2 + c^{**} 2) / (2 * a)$$

print(D)

Output :-

Enter value of a : 3

Enter value of b : 4

Enter value of c : 5

8.33

⇒ Example 7 : Write the program to perform the given equation by taking suitable input from user.

$$X = \frac{b^2 - 4ac}{2a}$$

a = float(input("Enter value of a : "))

b = float(input("Enter value of b : "))

c = float(input("Enter value of c : "))

$$X = (b^{**} 2 - 4 * a * c) / (2 * a)$$

print(X)

Output :-

Enter value of a : 3

Enter value of b : 8

Enter value of c : 7

-10.44

- \* Example 8 : Prove the given equation by taking suitable input from users :

$$c(c+d)^2 = c^2 + 2cd + d^2$$

c = float(input("Enter c = "))

d = float(input("Enter d = "))

x = (c+d)\*\*2

y = c\*\*2 + 2\*c\*d + d\*\*2

print(x, " i.e. x, is same as ", y, " i.e. y")

Output :-

Enter c = 5

Enter d = 3

64.0 i.e. x is same as 64.0 i.e. y

\* Import Statement

⇒ import math

```
print (math.sqrt(9))      # 3.0  
print (math.pow(9,2))     # 81.0  
print (math.ceil(13.2))   # 14  
print (math.floor(13.2))  # 13
```

⇒ import ~~m~~ math as m

```
print (m.sqrt(9))        # 3.0  
print (m.pow(9,2))       # 81.0  
print (m.ceil(13.2))     # 14  
print (m.floor(13.2))    # 13
```