Python Datatypes

Agenda

- **Concatenating Strings**
- **The Slice Operator In Strings**
- **Operators In Python**

String Concatenation

- **Example:**

```
s1="Good"
s2="Morning"
s3=s1+s2
print(s3)
```

- **Output:**

GoodMorning

- **Example:**

```
s1="Good"
s2="Morning"
s3=s1+" "+s2
print(s3)
```

- **Output:**

Good Morning

The Slicing Operator

- Slicing means pulling out a sequence of characters from a string .
- For example , if we have a string **“Industry”** and we want to extract the word **“dust”** from it , then in **Python** this is done using slicing.
- To slice a string , we use the operator[ ] as follows:
- **Syntax: s[x:y]**
- **x** denotes the **start index** of slicing and **y** denotes the **end index** . But **Python** ends slicing at **y-1** index.

The Slicing Operator

- **Example:**

```
s="Industry"
print(s[2:6])
```

- **Example:**

```
s="Welcome"
print(s[3:6])
```

The Slicing Operator

- **Example:**

```
s="Mumbai"
print(s[0:3])
```

- **Example:**

```
s="Mumbai"
print(s[0:10])
```

The Slicing Operator

- **Example:**

```
s="Python"
print(s[2:2])
```

- **Example:**

```
s="Python"
print(s[6:10])
```

The Slicing Operator

- **Example:**

```
s="welcome"
print(s[1:])
```

- **Example:**

```
s="welcome"
print(s[:3])
```

The Slicing Operator

- **Example:**

```
s="welcome"
print(s[:])
```

- **Example:**

```
s="welcome"
print(s[])
```

The Slicing Operator

- **Example:**

```
s="welcome"
print(s[-4:-1])
```

- **Example:**

```
s="welcome"
print(s[-1:-4])
```

Using Step Value

- String slicing can accept a **third parameter** also after the two index numbers.
- The **third parameter** is called **step value.**
- So the complete syntax of slicing operator is:

  s[begin:end:step]

- Step value indicates *how many characters to move forward after the first character is retrieved* from the string and it's default value is **1** , but can be changed as per our choice.

The Slicing Operator

- **For Example:**

```
s="Industry"
print(s[2:6])
```

- **Can also be written as :**

```
s="Industry"
print(s[2:6:1])
```

- **Example:**

```
s="Industry"
print(s[2:6:2])
```

Operators

- **Operators** are special symbols in that carry out different kinds of **computation** on values.

- **For example** : **2+3**

- In the expression **2+3** , **+** is an operator which performs addition of **2** and **3** , which are called **operands**

Types Of Operators In Python

- Arithmetic operators
- Comparison operators or Relational operators
- Logical operators
- Assignment operators
- Identity operators
- Membership operators

Operator in python

- **Operators** are special symbols in **Python** or in any other language which can manipulate the value of **operands.**

- The value that the **operator** operates on is called the operand.

- For example: here 2+3=5. Here, + is the **operator** that performs addition and 2 and 3 represent the operands.

Arithmetic Operator

Arithmetic operators are used with numeric values to perform common mathematical operations:

Operator	Name	Example	
+	Addition	x + y	
-	Subtraction	x - y	
*	Multiplication	x * y	
/	Division	x / y	
%	Modulus	x % y	
**	Exponentiation	x ** y	
//	Floor division	x // y	

Arithmetic Operator

```
x = 5
y = 3
print(x + y)
print(x - y)
print(x * y)
print(x/y)
Print(x%y)#It's used to get the remainder of a division problem.
print(x**y)
print(x//y)#the floor division // rounds the result down to the nearest whole number
```

Relational Operators In Python

- Relational Operators
- Relational Operators With Strings
- Chaining Of Relational Operators
- Special Behavior Of == and !=

Relational Operators In Python

Relational operators are used to **compare** values.

They either return **True** or **False** according to the condition.

These operators are:

Operator	Meaning
>	**Greater Than**
<	**Less Than**
>=	**Greater Than Equal To**
<=	**Less Than Equal To**
==	**Equal To**
!=	**Not Equal To**

The 6 Basic Relational Operators

```
a=10
b=4
print("a=",a,"b=",b)
print("a > b",a>b)
print("a < b",a<b)
print("a==b",a==b)
print("a!=b",a!=b)
print("a>=b",a>=b)
print("a<=b",a<=b)
```

Relational Operators With Strings

Relational Operators can also work with **strings** .

When applied on **string operands** , they compare the **unicode** of corresponding characters and return **True** or **False** based on that comparison.

As discussed previuosly , this type of comparison is called **lexicographical comparison**

Relational Operators With Strings

```
a="Ramesh"
b="Rajesh"
print("a=",a,"b=",b)
print("a > b",a>b)
print("a < b",a<b)
print("a==b",a==b)
print("a!=b",a!=b)
print("a>=b",a>=b)
print("a<=b",a<=b)
```

Relational Operators With Strings

If we want to check the UNICODE value for a particular letter , then we can call the function ord().

It is a built in function which accepts only one character as argument and it returns the UNICODE number of the argument passed

Example:

ord('A')

ord('m')

ord('j')

Relational Operators With Strings

```
a= "BHOPAL"
b= "bhopal"
print("a=",a,"b=",b)
print("a > b",a>b)
print("a < b",a<b)
print("a==b",a==b)
print("a!=b",a!=b)
print("a>=b",a>=b)
print("a<=b",a<=b)
```

Will This Code Run ?

```
a=True
b=False
print("a=",a,"b=",b)
print("a > b",a>b)
print("a < b",a<b)
print("a==b",a==b)
print("a!=b",a!=b)
print("a>=b",a>=b)
print("a<=b",a<=b)
```

Yes , the code will successfully Run because True is 1 and False is 0

What about this code?

```
a='True'
b='False'
print("a=",a,"b=",b)
print("a > b",a>b)
print("a < b",a<b)
print("a==b",a==b)
print("a!=b",a!=b)
print("a>=b",a>=b)
print("a<=b",a<=b)
```

Yes , this code will also successfully Run but 'True' and 'False' will be handled as strings

Special Behavior Of Relational Operators

Python allows us to **chain** multiple **relational operators** in one **single statement**.

For example the expression **1<2<3** is perfectly valid in **Python**

However when **Python** evaluates the expression , it returns **True if all individual conditions are true** , otherwise it returns **False**

Cascading Of Relational Operators

- **Example:**

  print(7>6>5)

- **Example:**

  print(5<6>7)

- **Example:**

  print(5>6>7)

- **Example:**

  print(5<6<7)

Special Behavior Of == And !=

== compares its **operands** for **equality** and if they are of **compatible types** and **have same value** then it returns **True** otherwise it returns **False**

Similarly **!=** compares it's **operands** for **inequality** and if they are of **incompatible types** or **have different value** then it returns **True** otherwise it returns **False**

Special Behavior Of == And !=

- **Example:**

  print(10==10)

- **Example:**

  print(10==20)

- **Example:**

  print(10==“10”)

- **Example:**

  print(10==True)

- **Example:**

  print(1==True)

- **Example:**

  print(“A”==“A”)

- **Example:**

  print(“A”==“65”)

- **Example:**

  print(“A”==65)

Special Behavior Of == And !=

- **Example:**
  print(15==15.0)
- **Example:**
  print(15==15.01)
- **Example:**
  print(15!="15")
- **Example:**
  print(0 != False)
- **Example:**
  print(False!=True)
- **Example:**
  print(False != 0.0)
- **Example:**
  print(2+5j==2+5j)
- **Example:**
  print(2+5j!= 2)

Logical Operators In Python

Logical operators are used to combine **two or more conditions** and perform the logical operations using **Logical and**, **Logical or** and **Logical not**.

Operator	Meaning
and	It will return true when both conditions are true
or	It will returns true when at-least one of the condition is true
not	If the condition is true, logical NOT operator makes it false

Behavior Of
Logical and Operator

```
>>> a=40
>>> b=20
>>> c=50
>>> a>b and a>c
False
```

```
>>> a=40
>>> b=20
>>> c=50
>>> a>b or a>c
True
```

```
>>> a=40
>>> b=20
>>> c=50
>>> a>b and c>a
True
```

```
>>> a=40
>>> b=20
>>> c=50
>>> b>a or b>c
False
```

Behavior Of Logical Operators With Non Boolean

Python allows us to apply logical operators with **non boolean types** also

But before we understand how these operators work with **non boolean** types, we must understand some very important points

Behavior Of Logical Operators With Non Boolean

1. **None**, **0** , **0.0** ,**””** are all **False** values

2. The return value of **Logical and & Logical or operators** is never **True** or **False** when they are applied on **non boolean** types.

Behavior Of Logical Operators With Non Boolean

3. If the **first value** is **False** , then **Logical and** returns **first value** , otherwise it returns the **second value**

4. If the **first value** is **True** , then **Logical or** returns **first value** , otherwise it returns the **second value**

5. When we use **not operator** on **non boolean** types , it returns **True** if it's operand is **False**(in any form) and **False** if it's operand is **True** (in any form)

Logical Operators On Non Boolean Types

- **Example:**
  5 and 6
- **Example:**
  5 and 0
- **Example:**
  0 and 10
- **Example:**
  6 and 0
- **Example:**
  'Sachin' and 10
- **Example:**
  'Sachin' and 0
- **Example:**
  'Indore' and 'Bhopal'
- **Example:**
  'Bhopal' and 'Indore'

Logical Operators On Non Boolean Types

- **Example:**
  0 and 10/0
- **Example:**
  10/0 and 0
- **Example:**
  5 or 6
- **Example:**
  5 or 0
- **Example:**
  0 or 10
- **Example:**
  6 or 0
- **Example:**
  ‘Sunny’ or 10
- **Example:**
  ‘Sunny’ or 0
- **Example:**
  ‘Indore’ or ‘Bhopal’

Logical Operators
On Non Boolean Types

- **Example:**
  0 or 10/0
- **Example:**
  10/0 or 0
- **Example:**
  not 5
- **Example:**
  not 0
- **Example:**
  not ‘Sunny’
- **Example:**
  not ‘’

Assignment Operators In Python

The **Python Assignment Operators** are used to assign the values to the declared variables.

Equals (**=**) operator is the most commonly used assignment operator in Python.

For example:

- **a=10**

Assignment Operators In Python

Shortcut for assigning same value to all the variables

- **x=y=z=10**

Shortcut for assigning different value to all the variables

- **x,y,z=10,20,30**

Guess The Output

```
a,b,c=10,20

print(a,b,c)
```

Output:

ValueError : Not enough values to unpack

```
a,b,c=10,20,30,40

print(a,b,c)
```

Output:

ValueError : Too many values to unpack

Compound Assignment Operators

Python allows us to combine **arithmetic operators** as well as **bitwise operators** with assignment operator.

For example: The statement

- **x=x+5**

Can also be written as

- **x+=5**

Compound Assignment Operators

Operator	Example	Meaning
+=	x+=5	x=x+5
-=	x-=5	x=x-5
***=**	x*=5	x=x*5
/=	x/=5	x=x/5
%=	x%=5	x=x%5
//=	x//=5	x=x//5
****=**	x**=5	x=x**5
&=	x&=5	x=x&5
!=	x!=5	x=x!5
^=	x^=5	x=x^5
>>=	x>>=5	x=x>>5
<<=	x<<=5	x=x<<5

Guess The Output

```
a=10
print(++a)
```

Output:

10

```
a=10
print(a++)
```

Output:

SyntaxError : Invalid Syntax

Conclusion:
Python does not has any **increment operator** like **++.**

Rather it is solved as **+(+x)** i.e **+(+10)** which is **10**

However the expression **a++** is an error as it doesn't make any sense

Guess The Output

```
a=10

print(--a)
```

Output:

10

```
a=10

print(a--)
```

Output:

SyntaxError : Invalid Syntax

Conclusion:
Python does not has any **decrement operator** like **--.**

Rather it is solved as **-(-x)** i.e **-(-10)** which is **10**

However the expression **a--** is an error as it doesn't make any sense

Guess The Output

```
a=10
print(+++++a)
```

Output:

10

```
a=10
print(-----a)
```

Output:

-10

Identity Operators

Identity operators in Python are **is** and **is not**

They serve 2 purposes:

- **To verify if two references point to the same memory location or not**

AND

- **To determine whether a value is of a certain class or type**

Behavior Of is and is not

The operator **is** returns **True** if the operands are **identical** , otherwise it returns **False**.

The operator **is not** returns **True** if the operands are **not identical** , otherwise it returns **False**.

Guess The Output

```
a=2

b=3

c=a is b

print(c)
```

Explanation:

Since a and b are pointing

to 2 different objects, so

the operator is returns False

```
a=2

b=2

c=a is b

print(c)
```

Explanation:

Since a and b are pointing

to same objects, so

the operator is returns True

Examples Of is Operator

```
a=2
b=type(a) is int
print(b)
```

Output:

True

Explanation:

type(a) is int **evaluates to True because**

2 is indeed an integer number.

```
a=2
b=type(a) is float
print(b)
```

Output:

False

Explanation:

type(a) is float **evaluates to False**

because 2 is not a float number.

Examples Of is not Operator

a="Delhi"

b="Delhi"

c=a is not b

print(c)

Output:

False

Explanation:

Since a and b are pointing

to the same object, so

the operator is not returns False

a="Delhi"

b="delhi"

c=a is not b

print(c)

Output:

True

Explanation:

Since a and b are pointing

to 2 differentobjects, so

Membership Operators

Membership operators are used to test whether a value or variable is found in a sequence (**string**, **list**, **tuple**, **set** and **dictionary**).

There are 2 **Membership operators**

- **in**
- **not in**

Behavior Of in and not in

in: The **‘in’** operator is used to check if a value exists in a sequence or not

not in : The **‘not in’** operator is the opposite of **‘in’** operator. So, if a value does not exists in the sequence then it will return a **True** else it will return a **False**.

Examples Of in Operator

```
a="Welcome"

b="om"

print(b in a)
```

Output:

True

```
a="Welcome"

b="mom"

print(b in a)
```

Output:

False

Examples Of not in Operator

```
primes=[2,3,5,7,11]

x=4

print(x not in primes)
```

Output:

True

```
primes=[2,3,5,7,11]

x=5

print(x not in primes)
```

Output:

False

Precedence Of Operators

There can be more than one operator in an expression.

To evaluate these type of expressions there is a rule called **precedence** in all programming languages .

It guides the order in which operation are carried out.

Precedence And Associativity

Operator	Name
()	Parentheses
**	Exponent
+x, -x, ~x	Unary plus, Unary minus, Bitwise NOT
*, /, //, %	Multiplication, Division, Floor div,Mod
+, -	Addition, Subtraction
<<, >>	Bitwise shift operators
&	Bitwise AND
^	Bitwise XOR
|	Bitwise OR
==, !=, >, >=, <, <=, is, is not, in, not in	Comparisons, Identity, Membership operators
not	Logical NOT
and	Logical AND
or	Logical OR

Guess The Output

```
a=6/2+3**4
print(a)
```

Output:

84.0

```
a=20-12//3**2
print(a)
```

Output:

19

```
a=25/(2+3)**2
print(a)
```

Output:

1.0

Associativity Of Operators

When two operators have the same precedence, **Python** follows **associativity**

Associativity is the order in which an expression is evaluated and almost all the operators have **left-to-right associativity**.

For example, **multiplication** and **division** have the same precedence. Hence, if both of them are present in an expression, **left one is evaluates first**.

Guess The Output

```
a=5*2//3

print(a)
```

Output:

3

```
a=5*(2//3)

print(a)
```

Output:

0

Guess The Output

```
a=2**3**2
print(a)
```

Output:

512

```
a=(2**3)**2
print(a)
```

Output:

64

Exercise

- **WAP to accept two numbers from the user and display their sum**

Code:

```
a=int(input("Enter first num:"))

b=int(input("Enter second num:"))

c=a+b

print("Nos are",a,"and",b)

print("Their sum is",c)
```

Exercise

- **WAP to accept radius of a Circle from the user and calculate area and circumference**

Code:

```
radius=float(input("Enter radius:"))

area=3.14*radius**2

circum=2*3.14*radius

print("Area is",area)

print("Circumference is",circum)
```

Accepting Different Values

- **WAP to accept roll number , grade and percentage as input from the user and display it back**

Code

```
roll=int(input("Enter roll no:"))
name=input("Enter name:");
per=float(input("Enter per:"))
print("Roll no is",roll)
print("Name is",name)
print("Per is",per)
```

Exercise

- **Write a program that asks the user to enter his/her name and age. Print out a message , displaying the user's name along with the year in which they will turn 100 years old.**

```
What is your name ? Sachin
How old are you ? 36
Hello Sachin
You will be 100 years old in the year 2082
```

Accepting Multiple Values In One Line

In **Python** , the **input( )** function can read and return a complete line of input as a string.

However , we can split this input string into individual values by using the function **split( )** available in the class **str**

The function **split( )** , breaks a string into multiple strings by using **space** as a separator

Accepting Multiple Values In One Line

To understand , working of **split( )** , consider the following example:

```
text="I Love Python"

word1,word2,word3=text.split()

print(word1)

print(word2)

print(word3)
```

Accepting Multiple Values In One Line

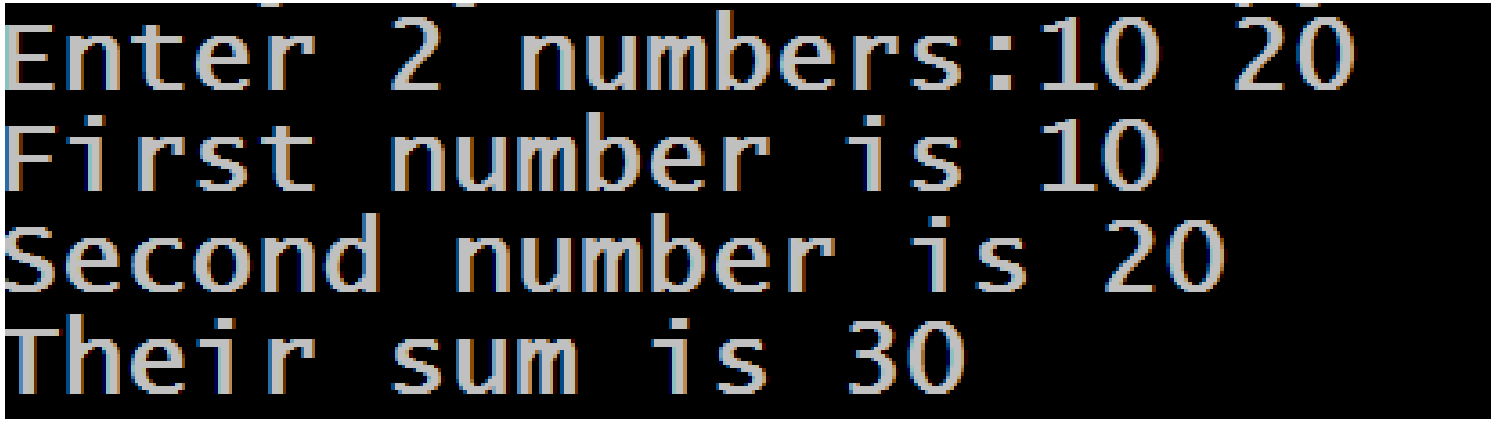
```
text=input("Type a 3 word message")

word1,word2,word3=text.split()

print("First word",word1)

print("Second word",word2)

print("Third word",word3)
```

An Important Point!

The number of variables on left of assignment operator and number of values generated by **split()** must be the same

Exercise

Write a program that asks the user to input 2 integers and adds them . Accept both the numbers in a single line only



Solution

Code:

```
s=input("Enter 2 numbers:")

a,b=s.split()

print("First number is",a);

print("Second number is",b)

c=int(a)+int(b)

print("Their sum is",c)
```

Accepting Multiple Values Separated With ,

By default **split( )** function considers , space as a separator

However , we can use any other symbol also as a separator if we pass that symbol as argument to **split( )** function

For example , if we use comma **,** as a separator then we can provide comma separated input

Example

Code:

```
s=input("Enter 2 numbers separated with comma:")
a,b=s.split(",")
print("First number is",a);
print("Second number is",b)
c=int(a)+int(b)
print("Their sum is",c)
```

```
Enter 2 numbers separated with comma:2,4
First number is 2
Second number is 4
Their sum is 6
```

Accepting Different Values In One Line

Code:

```
s=input("Enter roll no,name and per:")

roll,name,per=s.split()

print("Roll no is",roll)

print("Name is",name)

print("Per is",per)
```

```
Enter roll no,name and per:10 Sachin 78.9
Roll no is 10
Name is Sachin
Per is 78.9
```