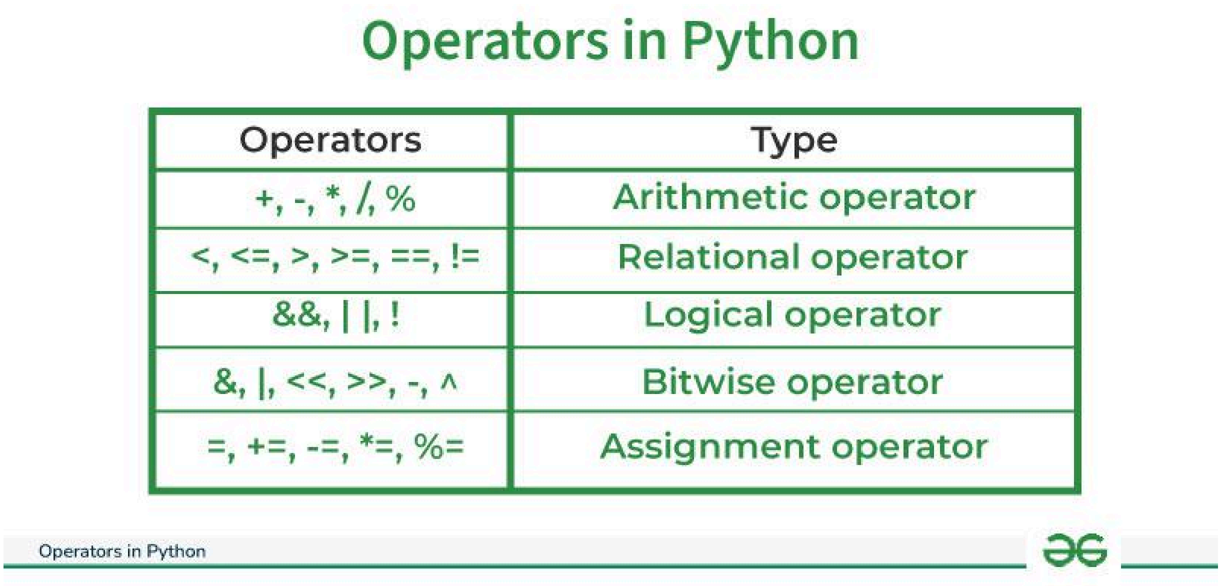
Python Operators

In Python programming, Operators in general are used to perform operations on values and variables. These are standard symbols used for the purpose of logical and arithmetic operations. In this article, we will look into different types of **Python operators.**

- OPERATORS: These are the special symbols. Eg- + , * , /, etc.
- OPERAND: It is the value on which the operator is applied.

Types of Operators in Python

1. Arithmetic Operators
2. Comparison Operators
3. Logical Operators
4. Bitwise Operators
5. Assignment Operators
6. Identity Operators and Membership Operators



Operators in Python

Operators	Type
+, -, *, /, %	Arithmetic operator
<, <=, >, >=, ==, !=	Relational operator
&&, | |, !	Logical operator
&, |, <<, >>, -, ^	Bitwise operator
=, +=, -=, *=, %=	Assignment operator

Operators in Python

Arithmetic Operators in Python

Python Arithmetic operators are used to perform basic mathematical operations like **addition, subtraction, multiplication**, and **division**.

In Python 3.x the result of division is a floating-point while in Python 2.x division of 2 integers was an integer. To obtain an integer result in Python 3.x floored (// integer) is used.

Operator	Description	Syntax
+	Addition: adds two operands	x + y
–	Subtraction: subtracts two operands	x – y
*	Multiplication: multiplies two operands	x * y
/	Division (float): divides the first operand by the second	x / y
//	Division (floor): divides the first operand by the second	x // y
%	Modulus: returns the remainder when the first operand is divided by the second	x % y
**	Power: Returns first raised to power second	x ** y

Example of Arithmetic Operators in Python

Division Operators

In Python programming language **Division Operators** allow you to divide two numbers and return a quotient, i.e., the first number or number at the left is divided by the second number or number at the right and returns the quotient.

There are two types of division operators:

1. Float division
2. Floor division

Float division

The quotient returned by this operator is always a float number, no matter if two numbers are integers. For example:

Example: The code performs division operations and prints the results. It demonstrates that both integer and floating-point divisions return accurate results. For example, **’10/2'** results in **‘5.0’**, and **‘-10/2’** results in **‘-5.0’**.

Python

```python
print(5/5)
print(10/2)
print(-10/2)
print(20.0/2)
```

Output:

```
1.0
5.0
-5.0
10.0
```

Integer division(Floor division)

The quotient returned by this operator is dependent on the argument being passed. If any of the numbers is float, it returns output in float. It is also known as Floor division because, if any number is negative, then the output will be floored. For example:

Example: The code demonstrates integer (floor) division operations using the **‘//’** Python operators. It provides results as follows: **’10//3'** equals **‘3’**, **‘-5//2’** equals **‘-3’**, ‘**5.0//2'** equals **‘2.0’**, and **‘-5.0//2’** equals **‘-3.0’**. Integer division returns the largest integer less than or equal to the division result.

Pythons

```
print(10//3)
print (-5//2)
print (5.0//2)
print (-5.0//2)
```

Output:

```
3
-3
2.0
-3.0
```

Precedence of Arithmetic Operators in Python

The precedence of Arithmetic Operators in Python is as follows:

1. P – Parentheses
2. E – Exponentiation
3. M – Multiplication (Multiplication and division have the same precedence)
4. D – Division
5. A – Addition (Addition and subtraction have the same precedence)
6. S – Subtraction

The modulus of Python operators helps us extract the last digit/s of a number. For example:

- x % 10 -> yields the last digit
- x % 100 -> yield last two digits

Arithmetic Operators With Addition, Subtraction, Multiplication, Modulo and Power

Here is an example showing how different Arithmetic Operators in Python work:

Example: The code performs basic arithmetic operations with the values of **'a'** and **'b'**. It adds **('+')**, subtracts **('-')**, multiplies **('*')**, computes the remainder **('%')**, and raises a to the power of **'b (**)'**. The results of these operations are printed.

Python

```
a = 9
b = 4
add = a + b

sub = a - b

mul = a * b

mod = a % b

p = a ** b
print(add)
print(sub)
print(mul)
print(mod)
print(p)
```

Output:

```
13

5

36

1

6561
```

Note: *Refer to Differences between / and // for some interesting facts* *about these two Python operators.*

Comparison of Python Operators

In Python Comparison of Relational operators compares the values. It either returns **True** or **False** according to the condition.

Operator	Description	Syntax
>	Greater than: True if the left operand is greater than the right	x > y
<	Less than: True if the 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 the left operand is greater than or equal to the right	x >= y
<=	Less than or equal to True if the left operand is less than or equal to the right	x <= y

= is an assignment operator and == comparison operator.

Precedence of Comparison Operators in Python

In Python, the comparison operators have lower precedence than the arithmetic operators. All the operators within comparison operators have the same precedence order.

Example of Comparison Operators in Python

Let’s see an example of Comparison Operators in Python.

Example: The code compares the values of **‘a’** and **‘b’** using various comparison Python operators and prints the results. It checks if **‘a’** is greater than, less than, equal to, not equal to, greater than, or equal to, and less than or equal to **‘b’**.

Python

```python
a = 13
b = 33

print(a > b)
print(a < b)
print(a == b)
print(a != b)
print(a >= b)
print(a <= b)
```

Output

```
False
True
False
True
False
True
```

Logical Operators in Python

Python Logical operators perform **Logical AND**, **Logical OR**, and **Logical NOT** operations. It is used to combine conditional statements.

Operator	Description	Syntax
and	Logical AND: True if both the operands are true	x and y
or	Logical OR: True if either of the operands is true	x or y
not	Logical NOT: True if the operand is false	not x

Precedence of Logical Operators in Python

The precedence of Logical Operators in Python is as follows:

1. Logical not
2. logical and
3. logical or

Example of Logical Operators in Python

The following code shows how to implement Logical Operators in Python:

Example: The code performs logical operations with Boolean values. It checks if both **‘a’** and **‘b’** are true (**‘and’**), if at least one of them is true (**‘or’**), and negates the value of **‘a’** using **‘not’**. The results are printed accordingly.

Python

```python
a = True
b = False
print(a and b)
print(a or b)
print(not a)
```

Output

```
False
True
False
```

Bitwise Operators in Python

Python Bitwise operators act on bits and perform bit-by-bit operations. These are used to operate on binary numbers.

Operator	Description	Syntax
&	Bitwise AND	x & y
|	Bitwise OR	x | y
~	Bitwise NOT	~x
^	Bitwise XOR	x ^ y
>>	Bitwise right shift	x>>
<<	Bitwise left shift	x<<

Precedence of Bitwise Operators in Python

The precedence of Bitwise Operators in Python is as follows:

1. Bitwise NOT
2. Bitwise Shift
3. Bitwise AND
4. Bitwise XOR
5. Bitwise OR

Bitwise Operators in Python

Here is an example showing how Bitwise Operators in Python work:

Example: The code demonstrates various bitwise operations with the values of **'a'** and **'b'**. It performs bitwise **AND (&)**, **OR (|)**, **NOT (~)**, **XOR (^)**, **right shift (>>)**, and **left shift (<<)** operations and prints the results. These operations manipulate the binary representations of the numbers.

Python

```python
a = 10
b = 4
print(a & b)
print(a | b)
print(~a)
print(a ^ b)
print(a >> 2)
print(a << 2)
```

Output

```
0
14
-11
14
2
40
```

Assignment Operators in Python

Python Assignment operators are used to assign values to the variables.

Operator	Description	Syntax
=	Assign the value of the right side of the expression to the left side operand	x = y + z
+=	Add AND: Add right-side operand with left-side operand and then assign to left operand	a+=b a=a+b
-=	Subtract AND: Subtract right operand from left operand and then assign to left operand	a-=b a=a-b

Operator	Description	Syntax
*=	Multiply AND: Multiply right operand with left operand and then assign to left operand	a*=b a=a*b
/=	Divide AND: Divide left operand with right operand and then assign to left operand	a/=b a=a/b
%=	Modulus AND: Takes modulus using left and right operands and assign the result to left operand	a%=b a=a%b
//=	Divide(floor) AND: Divide left operand with right operand and then assign the value(floor) to left operand	a//=b a=a//b
**=	Exponent AND: Calculate exponent(raise power) value using operands and assign value to left operand	a**=b a=a**b
&=	Performs Bitwise AND on operands and assign value to left operand	a&=b a=a&b
|=	Performs Bitwise OR on operands and assign value to left operand	a|=b a=a|b

Operator	Description	Syntax
^=	Performs Bitwise xOR on operands and assign value to left operand	a^=b a=a^b
>>=	Performs Bitwise right shift on operands and assign value to left operand	a>>=b a=a>>b
<<=	Performs Bitwise left shift on operands and assign value to left operand	a <<= b a= a << b

Assignment Operators in Python

Let’s see an example of Assignment Operators in Python.

Example: The code starts with **‘a’** and **‘b’** both having the value 10. It then performs a series of operations: addition, subtraction, multiplication, and a left shift operation on **‘b’**. The results of each operation are printed, showing the impact of these operations on the value of **‘b’**.

Python

```python
a = 10
b = a
print(b)
b += a
print(b)
b -= a
print(b)
b *= a
print(b)
b <<= a
print(b)
```

Output

```
10
20
10
```

```
100
102400
```

Identity Operators in Python

In Python, **is** and **is not** are the identity operators both are used to check if two values are located on the same part of the memory. Two variables that are equal do not imply that they are identical.

```
is          True if the operands are identical
is not      True if the operands are not identical
```

Example Identity Operators in Python

Let’s see an example of Identity Operators in Python.

Example: The code uses identity operators to compare variables in Python. It checks if **‘a’** is not the same object as **‘b’** (which is true because they have different values) and if **‘a’** is the same object as **‘c’** (which is true because **‘c’** was assigned the value of **‘a’**).

Python

```python
a = 10
b = 20
c = a

print(a is not b)
print(a is c)
```

Output

```
True
True
```

Membership Operators in Python

In Python, **in** and **not in** are the membership operators that are used to test whether a value or variable is in a sequence.

```
in          True if value is found in the sequence
not in      True if value is not found in the sequence
```

Examples of Membership Operators in Python

The following code shows how to implement Membership Operators in Python:

Example: The code checks for the presence of values **‘x’** and **‘y’** in the list. It prints whether or not each value is present in the list. **‘x’** is not in the list, and **‘y’** is present, as indicated by the printed messages. The code uses the **‘in’** and **‘not in’** Python operators to perform these checks.

Python

```
x = 24
y = 20
list = [10, 20, 30, 40, 50]

if (x not in list):
    print("x is NOT present in given list")
else:
    print("x is present in given list")

if (y in list):
    print("y is present in given list")
else:
    print("y is NOT present in given list")
```

Output

```
x is NOT present in given list
y is present in given list
```

Ternary Operator in Python

in Python, Ternary operators also known as conditional expressions are operators that evaluate something based on a condition being true or false. It was added to Python in version 2.5.

It simply allows testing a condition in a **single line** replacing the multiline if-else making the code compact.

> ***Syntax :*** *[on_true] if [expression] else [on_false]*

Examples of Ternary Operator in Python

The code assigns values to variables **'a'** and **'b'** (10 and 20, respectively). It then uses a conditional assignment to determine the smaller of the two values and assigns it to the variable **'min'**. Finally, it prints the value of **'min'**, which is 10 in this case.

Python

```python
a, b = 10, 20
min = a if a < b else b

print(min)
```

Output:

```
10
```

Precedence and Associativity of Operators in Python

In Python, Operator precedence and associativity determine the priorities of the operator.

Operator Precedence in Python

This is used in an expression with more than one operator with different precedence to determine which operation to perform first.

Let's see an example of how Operator Precedence in Python works:

Example: The code first calculates and prints the value of the expression **10 + 20 * 30**, which is 610. Then, it checks a condition based on the values of the **'name'** and **'age'** variables. Since the name is "**Alex"** and the condition is satisfied using the or operator, it prints **"Hello! Welcome."**

Python

```python
expr = 10 + 20 * 30
print(expr)
name = "Alex"
age = 0

if name == "Alex" or name == "John" and age >= 2:
    print("Hello! Welcome.")
else:
    print("Good Bye!!")
```

Output

```
610
Hello! Welcome.
```

Operator Associativity in Python

If an expression contains two or more operators with the same precedence then Operator Associativity is used to determine. It can either be Left to Right or from Right to Left.

The following code shows how Operator Associativity in Python works:

Example: The code showcases various mathematical operations. It calculates and prints the results of division and multiplication, addition and subtraction, subtraction within parentheses, and exponentiation. The code illustrates different mathematical calculations and their outcomes.

Python

```python
print(100 / 10 * 10)
print(5 - 2 + 3)
print(5 - (2 + 3))
print(2 ** 3 ** 2)
```

Output

```
100.0
6
0
512
```

To try your knowledge of Python Operators, you can take out the quiz on Operators in Python.

Python Operator Exercise Questions

Below are two Exercise Questions on Python Operators. We have covered arithmetic operators and comparison operators in these exercise questions. For more exercises on Python Operators visit the page mentioned below.

Q1. Code to implement basic arithmetic operations on integers

Python

```python
num1 = 5
num2 = 2
sum = num1 + num2
difference = num1 - num2
product = num1 * num2
quotient = num1 / num2
remainder = num1 % num2
print("Sum:", sum)
print("Difference:", difference)
print("Product:", product)
print("Quotient:", quotient)
print("Remainder:", remainder)
```

Output

```
Sum: 7
Difference: 3
Product: 10
Quotient: 2.5
Remainder: 1
```

Q2. Code to implement Comparison operations on integers

Python

```python
num1 = 30
num2 = 35
if num1 > num2:
    print("The first number is greater.")
elif num1 < num2:
    print("The second number is greater.")
else:
    print("The numbers are equal.")
```

Output

```
The second number is greater.
```

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