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Operators and Order of Precedence

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Operators

- Operators are special symbols that represent computations like addition and multiplication.
- The values the operator is applied to, are called operands.
  - Ex: c=a+b
  - Here + is an operator
  - a,b are operands

Types of operator

- Arithmetic operators
- Comparison (Relational) operators
- Logical (Boolean) operators
- Bitwise operators
- Assignment operators

Arithmetic operators

Arithmetic operators are used to perform mathematical operations like addition, subtraction, multiplication etc

Operator	Meaning	Example
+	Add two operands	x + y
-	Subtract right operand from the left	x - y
*	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)

Example

```
x = 15
y = 4

# Output: x + y = 19
print('x + y =',x+y)

# Output: x - y = 11
print('x - y =',x-y)

# Output: x * y = 60
print('x * y =',x*y)

# Output: x / y = 3.75
print('x / y =',x/y)

# Output: x // y = 3
print('x // y =',x//y)

# Output: x ** y = 50625
print('x ** y =',x**y)
```

Comparison operators

- Comparison operators are used to compare values. It either returns True orFalse according to the condition

Operator	Meaning	Example
>	Greater than	x > y
<	Less than	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

Example

```
x = 10
y = 12

# Output: x > y is False
print('x > y  is',x>y)

# Output: x < y is True
print('x < y  is',x<y)

# Output: x == y is False
print('x == y is',x==y)

# Output: x != y is True
print('x != y is',x!=y)

# Output: x >= y is False
print('x >= y is',x>=y)

# Output: x <= y is True
print('x <= y is',x<=y)
```

Logical operators

- Logical operators are and, or, not 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

Example

```
x = True
y = False

# Output: x and y is False
print('x and y is',x and y)

# Output: x or y is True
print('x or y is',x or y)

# Output: not x is False
print('not x is',not x)
```

Bitwise operators

- Bitwise operators act on operands as if they were string of binary digits. It operates bit by bit, hence the name.

Operator	Meaning	Example
&	Bitwise AND	x& y
|	Bitwise OR	x | y
~	Bitwise NOT	~x
^	Bitwise XOR	x ^ y

Example

```
x=1
y=10
Print("x&y is",x&y)
Print("x|y is",x|y)
Print("x^y is",x^y)
Print("x~y is",x~y)
```

Assignment operators

- Assignment operators are used in Python to assign values to variables.

Operator	Meaning	Example
=	x = 5	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

Example

```
x=5
y=10
z=0
Print("x and y is",x+y)
z+=5
Print("Z value is",z)
Z*=5
Print("Z value is",z)
```

Order of Precedence

- When more than one operator appears in an expression, the order of evaluation depends on the **rules of precedence**
- For mathematical operators, Python follows mathematical convention.
- The acronym **PEMDAS is a useful way to remember the rules:**

- Parentheses have the highest precedence
- Expression in parentheses are evaluated first
  - 2 * (3-1) is 4
  - (1+1)**(5-2) is 8.
- Exponentiation has the next highest precedence
  - 2**1+1 is 3, not 4
  - 3*1**3 is 3, not 27.
- Multiplication and Division have the same precedence, which is higher than Addition and Subtraction
  - 2*3-1 is 5, not 4
  - 6+4/2 is 8, not 5

- Operators with the same precedence are evaluated from left to right (except exponentiation).
  - degrees / 2 * pi
- The division happens first and the result is multiplied by pi.

Thank You