Python From Scratch
Python Booleans & Python Operators

Lesson 5 Content

Python Booleans

Booleans represent one of two values: True or False.

Boolean Values

In programming you often need to know if an expression is True or False.
You can evaluate any expression in Python, and get one of two answers, True or False.

When you compare two values, the expression is evaluated and Python returns the Boolean answer:

Example

```
print(10 > 9)
print(10 == 9)
print(10 < 9)
```

When you run a condition in an if statement, Python returns True or False:

Example

Print a message based on whether the condition is True or False:

```
a = 200
b = 33
if b > a:
  print("b is greater than a")
else:
  print("b is not greater than a")
```

Evaluate Values and Variables

The bool() function allows you to evaluate any value, and give you True or False in return,

Example

Evaluate a string and a number:

```
print(bool("Hello"))
print(bool(15))
```

Evaluate two variables:

```
x = "Hello"
y = 15
print(bool(x))
print(bool(y))
```

Most Values are True

Almost any value is evaluated to True if it has some sort of content.
Any string is True, except empty strings.
Any number is True, except 0.
Any list, tuple, set, and dictionary are True, except empty ones.

Example

The following will return True:

```
bool("abc")
bool(123)
bool(["apple", "cherry", "banana"])
```

Some Values are False

In fact, there are not many values that evaluate to False, except empty values, such as (), [], {}, "", the number 0, and the value None. And of course the value False evaluates to False.

Example

The following will return False:

```
bool(False)
bool(None)
bool(0)
bool("")
bool(())
bool([])
bool({})
```

One more value, or object in this case, evaluates to False, and that is if you have an object that is made from a class with a __len__ function that returns 0 or False:

Example

```
class myclass():
  def __len__(self):
    return 0
myobj = myclass()
print(bool(myobj))
```

Functions can Return a Boolean

You can create functions that returns a Boolean Value:

Example

Print the answer of a function:

```
def myFunction() :
  return True

print(myFunction())
```

You can execute code based on the Boolean answer of a function:

Example

Print "YES!" if the function returns True, otherwise print "NO!":

```
def myFunction() :
  return True

if myFunction():
  print("YES!")
else:
  print("NO!")
```

Python also has many built-in functions that return a boolean value, like the isinstance() function, which can be used to determine if an object is of a certain data type:

Example

Check if an object is an integer or not:

```
x = 200
print(isinstance(x, int))
```

Exercise:

The statement below would print a Boolean value, which one?

```
print(10 > 9)
```

Python Operators

Operators are used to perform operations on variables and values.
In the example below, we use the + operator to add together two values:

Example : `print(10 + 5)`

Python divides the operators in the following groups:

- Arithmetic operators
- Assignment operators
- Comparison operators
- Logical operators
- Identity operators
- Membership operators
- Bitwise operators

Python Arithmetic Operators

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

Python Arithmetic Operators

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

Operator	Name	Example
==	Equal	x == y
!=	Not equal	x != y
>	Greater than	x > y
<	Less than	x < y
>=	Greater than or equal to	x >= y
<=	Less than or equal to	x <= y

Python Assignment Operators

Assignment operators are used to assign values to variables:

Operator	Example	Same As
=	x = 5	x = 5
+=	x += 3	x = x + 3
-=	x -= 3	x = x - 3
*=	x *= 3	x = x * 3
/=	x /= 3	x = x / 3
%=	x %= 3	x = x % 3
//=	x //= 3	x = x // 3
**=	x **= 3	x = x ** 3
&=	x &= 3	x = x & 3
|=	x |= 3	x = x | 3
^=	x ^= 3	x = x ^ 3
>>=	x >>= 3	x = x >> 3
<<=	x <<= 3	x = x << 3

Python Comparison Operators

Comparison operators are used to compare two values:

Operator	Name	Example
==	Equal	x == y
!=	Not equal	x != y
>	Greater than	x > y
<	Less than	x < y
>=	Greater than or equal to	x >= y
<=	Less than or equal to	x <= y

Python Logical Operators

Logical operators are used to combine conditional statements:

Operator	Description	Example
and	Returns True if both statements are true	x < 5 and x < 10
or	Returns True if one of the statements is true	x < 5 or x < 4
not	Reverse the result, returns False if the result is true	not(x < 5 and x < 10)

Python Identity Operators

Identity operators are used to compare the objects, not if they are equal, but if they are actually the same object, with the same memory location:

Operator	Description	Example
is	Returns True if both variables are the same object	x is y
is not	Returns True if both variables are not the same object	x is not y

Python Membership Operators

Membership operators are used to test if a sequence is presented in an object:

Operator	Description	Example
in	Returns True if a sequence with the specified value is present in the object	x in y
not in	Returns True if a sequence with the specified value is not present in the object	x not in y

Python Bitwise Operators

Bitwise operators are used to compare (binary) numbers:

Operator	Name	Description
&	AND	Sets each bit to 1 if both bits are 1
|	OR	Sets each bit to 1 if one of two bits is 1
^	XOR	Sets each bit to 1 if only one of two bits is 1
~	NOT	Inverts all the bits
<<	Zero fill left shift	Shift left by pushing zeros in from the right and let the leftmost bits fall off
>>	Signed right shift	Shift right by pushing copies of the leftmost bit in from the left, and let the rightmost bits fall off