Python Conditions and If statements

Python supports the usual logical conditions from mathematics:

* Equals: a == b
* Not Equals: a != b
* Less than: a < b
* Less than or equal to: a <= b
* Greater than: a > b
* Greater than or equal to: a >= b

These conditions can be used in several ways, most commonly in "if statements" and loops.

An "if statement" is written by using the if keyword.

Example

If statement:

a = 33  
b = 200  
if b > a:  
  print("b is greater than a")

In this example we use two variables, a and b, which are used as part of the if statement to test whether b is greater than a. As a is 33, and b is 200, we know that 200 is greater than 33, and so we print to screen that "b is greater than a".

Indentation

Python relies on indentation (whitespace at the beginning of a line) to define scope in the code. Other programming languages often use curly-brackets for this purpose.

Example

If statement, without indentation (will raise an error):

a = 33  
b = 200  
if b > a:  
print("b is greater than a") # you will get an error

Elif

The elif keyword is pythons way of saying "if the previous conditions were not true, then try this condition".

Example

a = 33  
b = 33  
if b > a:  
  print("b is greater than a")  
elif a == b:  
  print("a and b are equal")

In this example a is equal to b, so the first condition is not true, but the elif condition is true, so we print to screen that "a and b are equal".

Else

The else keyword catches anything which isn't caught by the preceding conditions.

Example

a = 200  
b = 33  
if b > a:  
  print("b is greater than a")  
elif a == b:  
  print("a and b are equal")  
else:  
  print("a is greater than b")

In this example a is greater than b, so the first condition is not true, also the elif condition is not true, so we go to the else condition and print to screen that "a is greater than b".

You can also have an else without the elif:

Example

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

Short Hand If

If you have only one statement to execute, you can put it on the same line as the if statement.

Example

One line if statement:

if a > b: print("a is greater than b")

Short Hand If ... Else

If you have only one statement to execute, one for if, and one for else, you can put it all on the same line:

Example

One line if else statement:

a = 2  
b = 330  
print("A") if a > b else print("B")

This technique is known as **Ternary Operators**, or **Conditional Expressions**.

You can also have multiple else statements on the same line:

Example

One line if else statement, with 3 conditions:

a = 330  
b = 330  
print("A") if a > b else print("=") if a == b else print("B")

And

The and keyword is a logical operator, and is used to combine conditional statements:

Example

Test if a is greater than b, AND if c is greater than a:

a = 200  
b = 33  
c = 500  
if a > b and c > a:  
  print("Both conditions are True")

Or

The or keyword is a logical operator, and is used to combine conditional statements:

Example

Test if a is greater than b, OR if a is greater than c:

a = 200  
b = 33  
c = 500  
if a > b or a > c:  
  print("At least one of the conditions is True")

Nested If

You can have if statements inside if statements, this is called *nested* if statements.

Example

x = 41  
  
if x > 10:  
  print("Above ten,")  
  if x > 20:  
    print("and also above 20!")  
  else:  
    print("but not above 20.")

Python Loops

Python has two primitive loop commands:

* while loops
* for loops

The while Loop

With the while loop we can execute a set of statements as long as a condition is true.

Example

Print i as long as i is less than 6:

i = 1  
while i < 6:  
  print(i)  
  i += 1

**Note:** remember to increment i, or else the loop will continue forever.

The while loop requires relevant variables to be ready, in this example we need to define an indexing variable, i, which we set to 1.

The break Statement

With the break statement we can stop the loop even if the while condition is true:

Example

Exit the loop when i is 3:

i = 1  
while i < 6:  
  print(i)  
  if i == 3:  
    break  
  i += 1

The continue Statement

With the continue statement we can stop the current iteration, and continue with the next:

Example

Continue to the next iteration if i is 3:

i = 0  
while i < 6:  
  i += 1  
  if i == 3:  
    continue  
  print(i)

The else Statement

With the else statement we can run a block of code once when the condition no longer is true:

Example

Print a message once the condition is false:

i = 1  
while i < 6:  
  print(i)  
  i += 1  
else:  
  print("i is no longer less than 6")

## Python For Loops

A for loop is used for iterating over a sequence (that is either a list, a tuple, a dictionary, a set, or a string).

This is less like the for keyword in other programming languages, and works more like an iterator method as found in other object-orientated programming languages.

With the for loop we can execute a set of statements, once for each item in a list, tuple, set etc.

### Example

Print each fruit in a fruit list:

fruits = ["apple", "banana", "cherry"]  
for x in fruits:  
  print(x)

The for loop does not require an indexing variable to set beforehand.

## Looping Through a String

Even strings are iterable objects, they contain a sequence of characters:

### Example

Loop through the letters in the word "banana":

for x in "banana":  
  print(x)

## The break Statement

With the break statement we can stop the loop before it has looped through all the items:

### Example

Exit the loop when x is "banana":

fruits = ["apple", "banana", "cherry"]  
for x in fruits:  
  print(x)  
  if x == "banana":  
    break

### Example

Exit the loop when x is "banana", but this time the break comes before the print:

fruits = ["apple", "banana", "cherry"]  
for x in fruits:  
  if x == "banana":  
    break  
  print(x)

## The continue Statement

With the continue statement we can stop the current iteration of the loop, and continue with the next:

### Example

Do not print banana:

fruits = ["apple", "banana", "cherry"]  
for x in fruits:  
  if x == "banana":  
    continue  
  print(x)

## The range() Function

To loop through a set of code a specified number of times, we can use the range() function,

The range() function returns a sequence of numbers, starting from 0 by default, and increments by 1 (by default), and ends at a specified number.

### Example

Using the range() function:

for x in range(6):  
  print(x)

Note that range(6) is not the values of 0 to 6, but the values 0 to 5.

The range() function defaults to 0 as a starting value, however it is possible to specify the starting value by adding a parameter: range(2, 6), which means values from 2 to 6 (but not including 6):

### Example

Using the start parameter:

for x in range(2, 6):  
  print(x)

The range() function defaults to increment the sequence by 1, however it is possible to specify the increment value by adding a third parameter: range(2, 30, **3**):

### Example

Increment the sequence with 3 (default is 1):

for x in range(2, 30, 3):  
  print(x)

## Else in For Loop

The else keyword in a for loop specifies a block of code to be executed when the loop is finished:

### Example

Print all numbers from 0 to 5, and print a message when the loop has ended:

for x in range(6):  
  print(x)  
else:  
  print("Finally finished!")

## Nested Loops

A nested loop is a loop inside a loop.

The "inner loop" will be executed one time for each iteration of the "outer loop":

### Example

Print each adjective for every fruit:

adj = ["red", "big", "tasty"]  
fruits = ["apple", "banana", "cherry"]  
  
for x in adj:  
  for y in fruits:  
    print(x, y)

## The pass Statement

for loops cannot be empty, but if you for some reason have a for loop with no content, put in the pass statement to avoid getting an error.

### Example

for x in [0, 1, 2]:  
  pass

A function is a block of code which only runs when it is called.

You can pass data, known as parameters, into a function.

A function can return data as a result.

## Creating a Function

In Python a function is defined using the def keyword:

### Example

def my\_function():  
  print("Hello from a function")

## Calling a Function

To call a function, use the function name followed by parenthesis:

### Example

def my\_function():  
  print("Hello from a function")  
  
**my\_function()**

## Arguments

Information can be passed into functions as arguments.

Arguments are specified after the function name, inside the parentheses. You can add as many arguments as you want, just separate them with a comma.

The following example has a function with one argument (fname). When the function is called, we pass along a first name, which is used inside the function to print the full name:

### Example

def my\_function(**fname**):  
  print(fname + " Refsnes")  
  
my\_function(**"Emil"**)  
my\_function(**"Tobias"**)  
my\_function(**"Linus"**)

Arguments are often shortened to args in Python documentations.

## Parameters or Arguments?

The terms parameter and argument can be used for the same thing: information that are passed into a function.

From a function's perspective:

A parameter is the variable listed inside the parentheses in the function definition.

An argument is the value that is sent to the function when it is called.

## Number of Arguments

By default, a function must be called with the correct number of arguments. Meaning that if your function expects 2 arguments, you have to call the function with 2 arguments, not more, and not less.

### Example

This function expects 2 arguments, and gets 2 arguments:

def my\_function(fname, lname):  
  print(fname + " " + lname)  
  
my\_function("Emil", "Refsnes")

If you try to call the function with 1 or 3 arguments, you will get an error:

### Example

This function expects 2 arguments, but gets only 1:

def my\_function(fname, lname):  
  print(fname + " " + lname)  
  
my\_function("Emil")

## Arbitrary Arguments, \*args

If you do not know how many arguments that will be passed into your function, add a \* before the parameter name in the function definition.

This way the function will receive a tuple of arguments, and can access the items accordingly:

### Example

If the number of arguments is unknown, add a \* before the parameter name:

def my\_function(\*kids):  
  print("The youngest child is " + kids[2])  
  
my\_function("Emil", "Tobias", "Linus")

Arbitrary Arguments are often shortened to \*args in Python documentations.

## Keyword Arguments

You can also send arguments with the key = value syntax.

This way the order of the arguments does not matter.

### Example

def my\_function(child3, child2, child1):  
  print("The youngest child is " + child3)  
  
my\_function(child1 = "Emil", child2 = "Tobias", child3 = "Linus")

The phrase Keyword Arguments are often shortened to kwargs in Python documentations.

## Arbitrary Keyword Arguments, \*\*kwargs

If you do not know how many keyword arguments that will be passed into your function, add two asterisk: \*\* before the parameter name in the function definition.

This way the function will receive a dictionary of arguments, and can access the items accordingly:

### Example

If the number of keyword arguments is unknown, add a double \*\* before the parameter name:

def my\_function(\*\*kid):  
  print("His last name is " + kid["lname"])  
  
my\_function(fname = "Tobias", lname = "Refsnes")

Arbitrary Kword Arguments are often shortened to \*\*kwargs in Python documentations.

## Default Parameter Value

The following example shows how to use a default parameter value.

If we call the function without argument, it uses the default value:

### Example

def my\_function(**country = "Norway"**):  
  print("I am from " + country)  
  
my\_function("Sweden")  
my\_function("India")  
my\_function()  
my\_function("Brazil")

## Passing a List as an Argument

You can send any data types of argument to a function (string, number, list, dictionary etc.), and it will be treated as the same data type inside the function.

E.g. if you send a List as an argument, it will still be a List when it reaches the function:

### Example

def my\_function(food):  
  for x in food:  
    print(x)  
  
fruits = ["apple", "banana", "cherry"]  
  
my\_function(fruits)

## Return Values

To let a function return a value, use the return statement:

### Example

def my\_function(x):  
  **return 5 \* x**  
print(my\_function(3))  
print(my\_function(5))  
print(my\_function(9))

## The pass Statement

function definitions cannot be empty, but if you for some reason have a function definition with no content, put in the pass statement to avoid getting an error.

### Example

def myfunction():  
  pass

## User Input

Python allows for user input.

That means we are able to ask the user for input.

The method is a bit different in Python 3.6 than Python 2.7.

Python 3.6 uses the input() method.

Python 2.7 uses the raw\_input() method.

The following example asks for the username, and when you entered the username, it gets printed on the screen:

### Python 3.6

username = input("Enter username:")  
print("Username is: " + username)

### Python 2.7

username = raw\_input("Enter username:")  
print("Username is: " + username)

Python stops executing when it comes to the input() function, and continues when the user has given some input.