Python Q&A

if __name__ == "__main__"

- Every module in Python has a special attribute called *__name__*. The value of *__name__* attribute is set to “*__main__*” when module is run as main program. Otherwise, the value of *__name__* is set to contain the name of the module.
- We use *if* ***__name__ ==*** “***__main__***” block to prevent (certain) code from being run when the module is imported.

Pass by value or pass by reference in Python?

```
def Change(var):
    var[0] = 'Changed’

def Original(var):
    var = 'Changed'

variable = ['Original’]
Original(variable)
print(variable)

Change(variable)
print(variable)
```

What’s the output?

Pass by value or pass by reference in Python?

```
def Change(var):
    var[0] = 'Changed’

def Original(var):
    var = 'Changed'

variable = ['Original’]
Original(variable)
print(variable)

Change(variable)
print(variable)
```

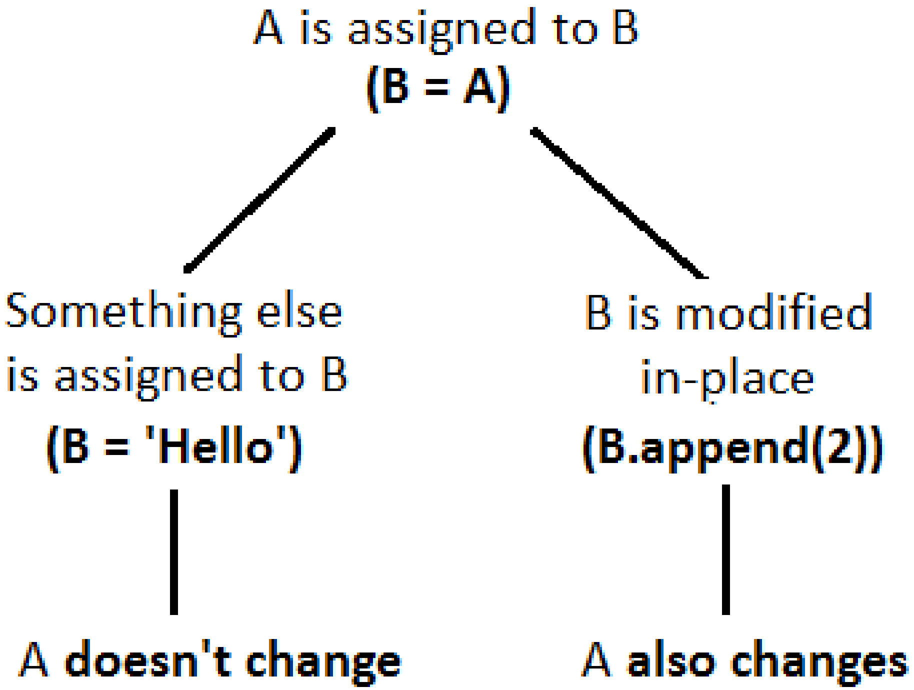
output

```
['Original’]
['Changed']
```

```
def Change(var):
   var[0] = ‘Changed’   #change the content that the reference var points to. Because var
                        # and variable refer to the same object, any changes to the object
                        # are reflected in both places

def Original(var):
   var = ‘Changed‘       # reassign the reference var to a different string object ‘Changed’,
                        # but the reference variable is separate and does not change.

variable = [‘Original’]   #variable is a reference to the string object 'Original'
Original(variable)         #When call  Original, will create a second reference var to
                           #the object 'Original'
print(variable)

Change(variable)
print(variable)
```

It is neither pass-by-value or pass-by-reference..
it is **”call-by-object”** or **”call by sharing”**. Or, if you prefer, **”call by object reference”**.

http://effbot.org/zone/call-by-object.htm
"...variables [names] are *not* objects; they cannot be denoted by other variables or referred to by objects.”
In the example, when the Original method is called--a **namespace** is created for it; and **var** becomes a name, within that namespace, for the string object 'Original'. That object then has a name **in two namespaces**. Next, var = 'Changed' binds **var** to a new string object, and thus the method's namespace forgets about 'Original'. Finally, that namespace is forgotten, and the string 'Changed' along with it.



A is assigned to B
(B = A)

Something else
is assigned to B
(B = 'Hello')

A **doesn't change**

B is modified
in-place
(B.append(2))

A **also changes**

*args, **kwargs

we can pass a variable number of arguments to a function using special symbols. There are two special symbols:
1)*args (Non-Keyword Arguments)
2)**kwargs (Keyword Arguments)

*args

The special syntax **args* in function definitions in python is used to pass a variable number of arguments to a function. It is used to pass a non-key worded, variable-length argument list.

- The syntax is to use the symbol * to take in a variable number of arguments; by convention, it is often used with the word args.
- What **args* allows you to do is take in more arguments than the number of formal arguments that you previously defined. With **args*, any number of extra arguments can be tacked on to your current formal parameters (including zero extra arguments).
- For example : we want to make a multiply function that takes any number of arguments and able to multiply them all together. It can be done using *args.
- Using the *, the variable that we associate with the * becomes an iterable meaning you can do things like iterate over it, run some higher-order functions such as map and filter, etc.

```
# *args for variable number of
arguments
def myFun(*argv):
    for arg in argv:
        print (arg)

myFun('Hello,', 'Welcome', 'to', ‘AI')
```

```
Hello,
Welcome
to
AI
```

```
# *args with first extra arguments
def myFun(arg1, *argv):
    print ("First argument :", arg1)
    for arg in argv:
        print("Next argument through *argv :", arg)

myFun('Hello,', 'Welcome', 'to', ‘AI')
```

```
First argument : Hello,
Next argument through *argv : Welcome
Next argument through *argv : to
Next argument through *argv :AI
```

**kwargs

The special syntax **kwargs in function definitions in python is used to pass a keyworded, variable-length argument list. We use the name kwargs with the double star. The reason is because the double star allows us to pass through keyword arguments (and any number of them).

- A keyword argument is where you provide a name to the variable as you pass it into the function.
- One can think of the *kwargs* as being a dictionary that maps each keyword to the value that we pass alongside it. That is why when we iterate over the *kwargs* there doesn’t seem to be any order in which they were printed out.

```
# **kwargs for variable number of keyword arguments
def myFun(**kwargs):
    for key, value in kwargs.items():
        print("%s == %s" %(key, value))


#Driver code
myFun(first ='CS', mid ='303', last='Lab2')
```

```
first == CS
mid == 303
last == Lab2
```

```
# **kargs for variable number of keyword arguments with
# one extra argument.

def myFun(arg1, **kwargs):
    for key, value in kwargs.items():
        print("%s == %s" %(key, value))


#Driver code
myFun(‘Hi', first ='CS', mid ='303', last='Lab2')
```

```
first == CS
mid == 303
last == Lab2
```

```
def myFun(arg1, arg2, arg3):
    print("arg1:", arg1)
    print("arg2:", arg2)
    print("arg3:", arg3)
# Now we can use *args or **kwargs to
# pass arguments to this function :
args = ("CS", "303", "Lab2")
myFun(*args)

kwargs = {"arg1" :"CS", "arg2" : "303", "arg3" : "Lab2"}
myFun(**kwargs)
```

output

```
arg1: CS
arg2: 303
arg3: Lab2
arg1: CS
arg2: 303
arg3: Lab2
```

```
def myFun(*args,**kwargs):
    print("args: ", args)
    print("kwargs: ", kwargs)


# Now we can use both *args ,**kwargs
# to pass arguments to this function :
myFun('CS','303','Lab2',first="CS",mid="303",last="Lab2")
```

```
args: ('CS', '303', 'Lab2’)
kwargs: {'first': 'CS', 'mid': '303', 'last': 'Lab2'}
```

For in Python vs List Comprehension

- Store the items of iterable string ‘python‘ to a list.

For:

```
list_letters = []

for letter in ‘python‘:
    list_letters.append(letter)

print(list_letters)
```

List Comprehension(列表推导式)：

```
list_letters = [ letter for letter in ‘python' ]
print(list_letters)
```

Simple List Comprehension Examples

Get cubic numbers of 0,1,2,3：

```
[x**3 for x in range(0,4)]
```

Get all even numbers less than 50:

```
[x for x in range(0,50) if x%2==0 ]
```

Get all vowels in string ‘python’:

```
[x for x in ‘python' if x in ['A','E','I','O','U']]
```

Loop in Python vs List Comprehension

```
for (set of values to iterate):
    if (conditional filtering):
        output_expression()
```

vs

```
[ output_expression() for(set of values to iterate) if(conditional filtering) ]
```

Advantages of List Comprehension

- Short codes
- Execute faster: List Comprehensions are 35% faster than FOR loop and 45% faster than map function.

LC is a simple but powerful technique and can help you accomplish a variety of tasks with ease. Things to keep in mind:

- LC will **always return a result**, whether you use the result or nor.
- The iteration and conditional expressions can **be nested with multiple instances**.

Even the overall LC can be nested inside another LC.

- **Multiple variables** can be iterated and **manipulated at same time**.

More List Comprehension Examples

- Take two list of same length as input and return a dictionary with one as keys and other as values.

```
dic = {}
for i in range(len(keys)):
   dic[keys[i]] = values[i]
```

```
{ keys[i] : values[i] for i in range(len(keys)) }
```

- Create a matrix containing the different powers of ‘number’ variable.

```
[[i**p for p in range(2,7) ] for i in range(1,6) ]]
```

_ in python

- **Can represent the values that you don’t care**

_ is to represent the value that you don’t care or will not be used later in the program. If you apply a linter like Flake8 to your program, you will get an error from the linter (F841) if you have a variable name assigned but never used. Assigning variables that you don’t care to _ can solve this problem.

- **Represent the last expression in the interpreter**

The special identifier _ is used in the interactive interpreter to store the result of the last evaluation. It is stored in the builtin module.

- **Visual separator for digit grouping purposes**

From Python 3.6, underscore _ can also be used as a visual separator for digit grouping purposes. As stated in PEP515, it works for integers, floating-point, and complex number literals.

Can represent the values that you don’t care

```
# Example 1:uses _ to represent the index of each element in a list
for _ in range(5):
  print("I don't care about index")

# Example 2:only care about year, month and day from the tuple
year, month, day, _,  _, _ = (2020, 7, 10, 12, 10, 59)
# year=2020, month=7, day=10
# so can assign _ to the rest (hour, minute, second).
# But if print out _, only get the last expression which is 59
print(_) # 59

# Example 3:supports extended iterable unpacking
# You can use *_ to represent multiple values.
# Here _ actually represents a list of values that we want to ignore.
year, *_, second = (2020, 7, 10, 12, 10, 59) # year=2020
print(_) # [7, 10, 12, 10]
```

output

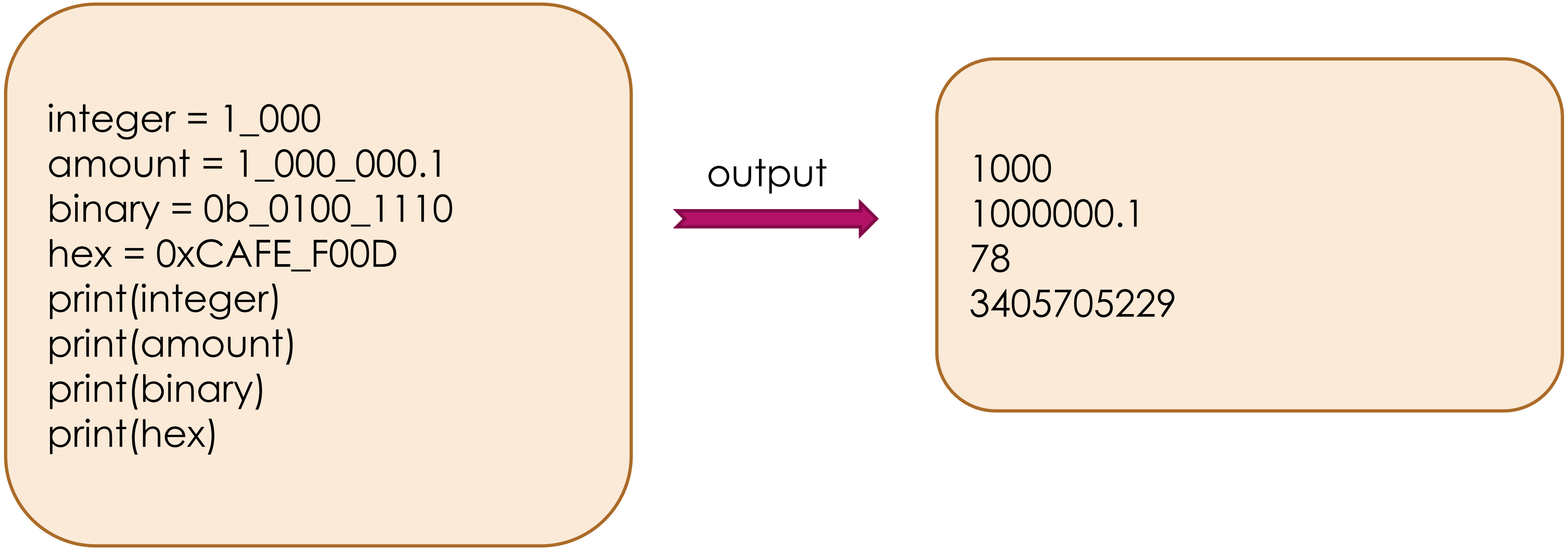
```
I don't care about index
I don't care about index
I don't care about index
I don't care about index
I don't care about index
59
[7, 10, 12, 10]
```

Lambda function also supports _

```
animals = ['dog', 'cat', 'parrot', 'rabbit']

# here we intend to change all animal names
# to upper case and return the same
uppered_animals = list(map(lambda animal: str.upper(animal), animals))
```

```
animals = ['dog', 'cat', 'parrot', 'rabbit']

# here we intend to change all animal names
# to upper case and return the same
uppered_animals = list(map(lambda _: str.upper(_), animals))
```

Visual separator for digit grouping purposes

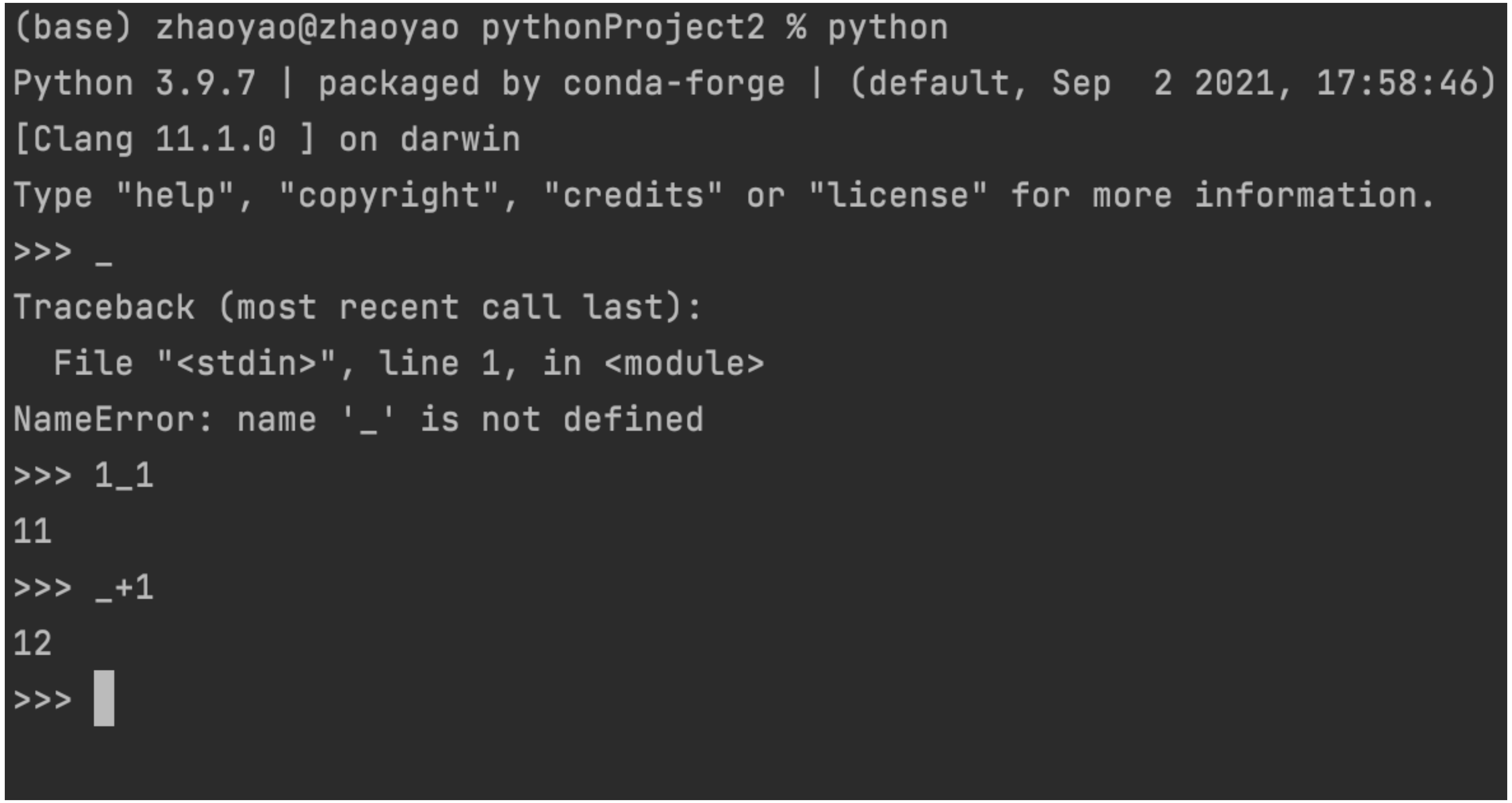


```
integer = 1_000
amount = 1_000_000.1
binary = 0b_0100_1110
hex = 0xCAFE_F00D
print(integer)
print(amount)
print(binary)
print(hex)
```

output

```
1000
1000000.1
78
3405705229
```

Represent the last expression in the interpreter



```
(base) zhaoyao@zhaoyao pythonProject2 % python
Python 3.9.7 | packaged by conda-forge | (default, Sep  2 2021, 17:58:46)
[Clang 11.1.0 ] on darwin
Type "help", "copyright", "credits" or "license" for more information.
>>> _
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
NameError: name '_' is not defined
>>> 1_1
11
>>> _+1
12
>>> 
```

The import system in Python

- https://docs.python.org/3/reference/import.html