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Curriculum
TUL - FS - T4
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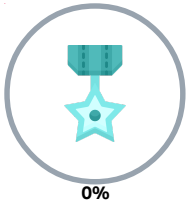

Python - Variable Annotations

- Master
- By: Emmanuel Turlay, Staff Software Engineer at Cruise
- Weight: 1
- Your score will be updated as you progress.

Concepts

For this project, we expect you to look at this concept:

- Advanced Python (/concepts/950)

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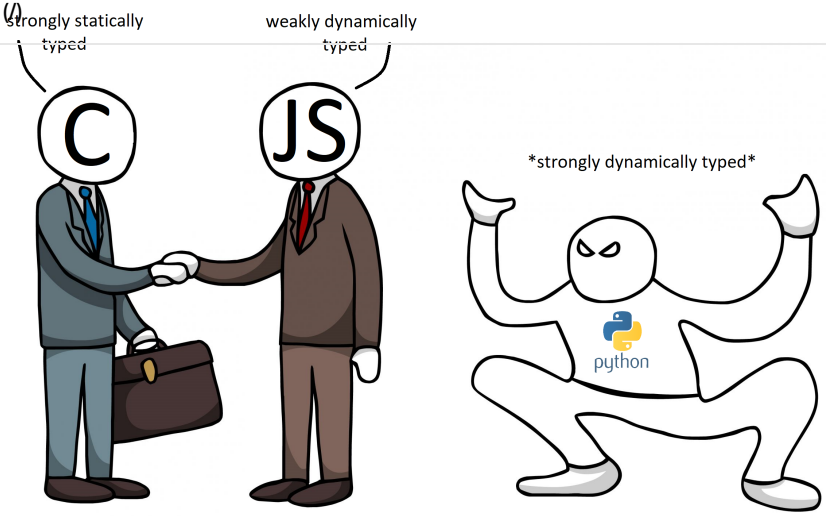


Resources

Read or watch:

- Python 3 typing documentation (/rltoken/HkhGh45geTWVPwYQtwZxuw)
- MyPy cheat sheet (/rltoken/puu3jc5JT5rMI2B7EYdnXA)

Learning Objectives

General

At the end of this project, you are expected to be able to explain to anyone (/rltoken/u8rxH9rCLFQwUn_V3bV7aw), **without the help of Google**:

- Type annotations in Python 3
- How you can use type annotations to specify function signatures and variable types
- Duck typing
- How to validate your code with `mypy`

Requirements

General

- Allowed editors: `vi`, `vim`, `emacs`
- All your files will be interpreted/compiled on Ubuntu 18.04 LTS using `python3` (version 3.7)
- All your files should end with a new line

- The first line of all your files should be exactly `#!/usr/bin/env python3`
- A `README.md` file, at the root of the folder of the project, is mandatory
- Your code should use the `pycodestyle` style (version 2.5.)
- All your files must be executable
- The length of your files will be tested using `wc`
- All your modules should have a documentation (`python3 -c 'print(__import__("my_module").__doc__)'`)
- All your classes should have a documentation (`python3 -c 'print(__import__("my_module").MyClass.__doc__)'`)
- All your functions (inside and outside a class) should have a documentation (`python3 -c 'print(__import__("my_module").my_function.__doc__)'` and `python3 -c 'print(__import__("my_module").MyClass.my_function.__doc__)'`)
- A documentation is not a simple word, it's a real sentence explaining what's the purpose of the module, class or method (the length of it will be verified)

Tasks

0. Basic annotations - add

mandatory

Write a type-annotated function `add` that takes a float `a` and a float `b` as arguments and returns their sum as a float.

```
bob@dylan:~$ cat 0-main.py
#!/usr/bin/env python3
add = __import__('0-add').add

print(add(1.11, 2.22) == 1.11 + 2.22)
print(add.__annotations__)

bob@dylan:~$ ./0-main.py
True
{'a':  <class 'float'>, 'b': <class 'float'>, 'return': <class 'float'>}
```

Repo:

- GitHub repository: `holbertonschool-web_back_end`
- Directory: `python_variable_annotations`
- File: `0-add.py`

Help | Review your work | >_ Get a sandbox **0/5** pts

1. Basic annotations - concat

mandatory

Write a type-annotated function `concat` that takes a string `str1` and a string `str2` as arguments and returns a concatenated string

```
bob@dylan:~$ cat 1-main.py
#!/usr/bin/env python3
concat = __import__('1-concat').concat

str1 = "egg"
str2 = "shell"

print(concat(str1, str2) == "{}{}".format(str1, str2))
print(concat.__annotations__)

bob@dylan:~$ ./1-main.py
True
{'str1': <class 'str'>, 'str2': <class 'str'>, 'return': <class 'str'>}
```

Repo:

- GitHub repository: `holbertonschool-web_back_end`
- Directory: `python_variable_annotations`
- File: `1-concat.py`

Help | Review your work | >_ Get a sandbox **0/5** pts

2. Basic annotations - floor

mandatory

Write a type-annotated function `floor` which takes a float `n` as argument and returns the floor of the float.

```
bob@dylan:~$ cat 2-main.py
#!/usr/bin/env python3

import math

floor = __import__('2-floor').floor

ans = floor(3.14)

print(ans == math.floor(3.14))
print(floor.__annotations__)
print("floor(3.14) returns {}, which is a {}".format(ans, type(ans)))

bob@dylan:~$ ./2-main.py
True
{'n': <class 'float'>, 'return': <class 'int'>}
floor(3.14) returns 3, which is a <class 'int'>
```

Repo:

- GitHub repository: `holbertonschool-web_back_end`
- Directory: `python_variable_annotations`
- File: `2-floor.py`

Help | Review your work | >_ Get a sandbox **0/5** pts

3. Basic annotations - to string

mandatory

Write a type-annotated function `to_str` that takes a float `n` as argument and returns the string representation of the float.

```
bob@dylan:~$ cat 3-main.py
#!/usr/bin/env python3
to_str = __import__('3-to_str').to_str

pi_str = to_str(3.14)
print(pi_str == str(3.14))
print(to_str.__annotations__)
print("to_str(3.14) returns {} which is a {}".format(pi_str, type(pi_str)))

bob@dylan:~$ ./3-main.py
True
{'n': <class 'float'>, 'return': <class 'str'>}
to_str(3.14) returns 3.14, which is a <class 'str'>
```

Repo:

- GitHub repository: `holbertonschool-web_back_end`
- Directory: `python_variable_annotations`
- File: `3-to_str.py`

Help | Review your work | >_ Get a sandbox **0/5** pts

4. Define variables

mandatory

Define and annotate the following variables with the specified values:

- `a` , an integer with a value of 1
- `pi` , a float with a value of 3.14
- `i_understand_annotations` , a boolean with a value of True
- `school` , a string with a value of “Holberton”

```
bob@dylan:~$ cat 4-main.py
#!/usr/bin/env python3

a = __import__('4-define_variables').a
pi = __import__('4-define_variables').pi
i_understand_annotations = __import__('4-define_variables').i_understand_annotations
school = __import__('4-define_variables').school

print("a is a {} with a value of {}".format(type(a), a))
print("pi is a {} with a value of {}".format(type(pi), pi))
print("i_understand_annotations is a {} with a value of {}".format(type(i_understand_annota
tions), i_understand_annotations))
print("school is a {} with a value of {}".format(type(school), school))

bob@dylan:~$ ./4-main.py
a is a <class 'int'> with a value of 1
pi is a <class 'float'> with a value of 3.14
i_understand_annotations is a <class 'bool'> with a value of True
school is a <class 'str'> with a value of Holberton
```

Repo:

- GitHub repository: `holbertonschool-web_back_end`
- Directory: `python_variable_annotations`
- File: `4-define_variables.py`

Help | Review your work | >_ Get a sandbox **0/10** pts

5. Complex types - list of floats

mandatory

Write a type-annotated function `sum_list` which takes a list `input_list` of floats as argument and returns their sum as a float.

```
bob@dylan:~$ cat 5-main.py
#!/usr/bin/env python3

sum_list = __import__('5-sum_list').sum_list

floats = [3.14, 1.11, 2.22]
floats_sum = sum_list(floats)
print(floats_sum == sum(floats))
print(sum_list.__annotations__)
print("sum_list(floats) returns {} which is a {}".format(floats_sum, type(floats_sum)))

bob@dylan:~$ ./5-main.py
True
{'input_list': typing.List[float], 'return': <class 'float'>}
sum_list(floats) returns 6.470000000000001 which is a <class 'float'>
```

Repo:

- GitHub repository: `holbertonschool-web_back_end`
- Directory: `python_variable_annotations`
- File: `5-sum_list.py`

Help | Review your work | >_ Get a sandbox

0/5 pts

6. Complex types - mixed list

mandatory

Write a type-annotated function `sum_mixed_list` which takes a list `mxd_lst` of integers and floats and returns their sum as a float.


```
bob@dylan:~$ cat 6-main.py
#!/usr/bin/env python3

sum_mixed_list = __import__('6-sum_mixed_list').sum_mixed_list

print(sum_mixed_list.__annotations__)
mixed = [5, 4, 3.14, 666, 0.99]
ans = sum_mixed_list(mixed)
print(ans == sum(mixed))
print("sum_mixed_list(mixed) returns {} which is a {}".format(ans, type(ans)))

bob@dylan:~$ ./6-main.py
{'mxd_lst': typing.List[typing.Union[int, float]], 'return': <class 'float'>}
True
sum_mixed_list(mixed) returns 679.13 which is a <class 'float'>
```

Repo:

- GitHub repository: `holbertonschool-web_back_end`
- Directory: `python_variable_annotations`
- File: `6-sum_mixed_list.py`

Help | Review your work | >_ Get a sandbox

0/5 pts

7. Complex types - string and int/float to tuple

mandatory

Write a type-annotated function `to_kv` that takes a string `k` and an int OR float `v` as arguments and returns a tuple. The first element of the tuple is the string `k`. The second element is the square of the int/float `v` and should be annotated as a float.

```
bob@dylan:~$ cat 7-main.py
#!/usr/bin/env python3

to_kv = __import__('7-to_kv').to_kv

print(to_kv.__annotations__)
print(to_kv("eggs", 3))
print(to_kv("school", 0.02))

bob@dylan:~$ ./7-main.py
{'k': <class 'str'>, 'v': typing.Union[int, float], 'return': typing.Tuple[str, float]}
('eggs', 9)
('school', 0.0004)
```

Repo:

- GitHub repository: `holbertonschool-web_back_end`

- Directory: `python_variable_annotations`
- File: `7-to_kv.py`

Help | Review your work | >_ Get a sandbox **0/5** pts

8. Complex types - functions

mandatory

Write a type-annotated function `make_multiplier` that takes a float `multiplier` as argument and returns a function that multiplies a float by `multiplier`.

```
bob@dylan:~$ cat 8-main.py
#!/usr/bin/env python3

make_multiplier = __import__('8-make_multiplier').make_multiplier
print(make_multiplier.__annotations__)
fun = make_multiplier(2.22)
print("{}".format(fun(2.22)))

bob@dylan:~$ ./8-main.py
{'multiplier': <class 'float'>, 'return': typing.Callable[[float], float]}
4.928400000000001
```

Repo:

- GitHub repository: `holbertonschool-web_back_end`
- Directory: `python_variable_annotations`
- File: `8-make_multiplier.py`

Help | Review your work | >_ Get a sandbox **0/5** pts

9. Let's duck type an iterable object

mandatory

Annotate the below function's parameters and return values with the appropriate types

```
def element_length(lst):
    return [(i, len(i)) for i in lst]
```



```
bob@dylan:~$ cat 9-main.py
#!/usr/bin/env python3

element_length =  __import__('9-element_length').element_length

print(element_length.__annotations__)

bob@dylan:~$ ./9-main.py
{'lst': typing.Iterable[typing.Sequence], 'return': typing.List[typing.Tuple[typing.Sequenc
e, int]]}
```

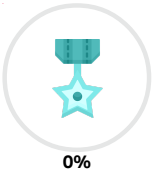
Repo:

- GitHub repository: `holbertonschool-web_back_end`
- Directory: `python_variable_annotations`
- File: `9-element_length.py`

Help | Review your work | >_ Get a sandbox **0/3** pts

Done with the mandatory tasks? Unlock 3 advanced tasks now! (/projects/2342/unlock_optionals)

Score



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Your score will be updated as you progress.

Please review **all the tasks** before you start the peer review.

Review all the tasks | Skip this project