

Lab 1a: Python Classes, and Testing!

Part 1

1. Review the code in `location.py`. Note that there is a class definition for a `Location` class, and an associated `__init__` method. In addition, there is code to create `Location` objects and print information associated with those objects.

```
Class Location:
    def __init__(self, name: str, lat: float, lon: float):
        self.name = name      # string for name of location
        self.lat = lat        # latitude in degrees (-90 to 90)
        self.long = long      # longitude in degrees (-180 to 180)
```

2. Without modifying the code, run `location.py` in whatever environment you wish (again, reference the Getting Started document if you need help in doing this)
3. Note the information that is printed out for each `Location` object – you should see something like this:
`Location 1: <__main__.Location object at 0x000001F6A2E0C7B8>`
4. Since we haven't provided any specific method to provide a representation for the class, Python uses a default method. What do you notice about the information for `loc1` and `loc4`?
5. Also note the result of the equal comparisons between the locations, in particular `loc1==loc3` and `loc1==loc4`. Make sure you understand why the results are what they are.
6. Now modify the `location.py` code, adding in the methods (`__eq__()` and `__repr__()`). See the `location_tests.py` to figure out what the `repr` method should look like.
7. Run the `location.py` code with the modifications made above.
8. Now review the information printed out for each location. The `__repr__` method of `Location` is now being used when printing the object.
9. Examine the results of the equal comparisons. How are they different from before the `__eq__` method was added?
10. Now that `__eq__` and `__repr__` functions have been added to the `Location` class, execute the `location_tests.py` file and observe the results. Add additional tests that will test the `__init__`, `__eq__` and `__repr__` functions.
11. Commit and push your updated `location.py` and `location_tests.py` files to GitHub for this part of the lab, and make sure you understand what the above questions are driving at, and if you have any uncertainties, ask! We'll also go over the answers later during lecture or lab time.

Part 2

1. In the `lab1a.py` file, complete the iterative function to find the maximum integer in a list of integers.

```
def max_list_iter(int_list: Optional[List]) -> Optional[int]:
    """finds the max of a list of numbers and returns the value (not the index)
    If int_list is empty, returns None. If list is None, raises ValueError"""
```

2. In the `lab1a.py` file, complete the function to reverse and return a list of integers. The original list is

not changed, and the reversed list is returned:

```
def reverse_list(int_list: Optional[List]) -> Optional[List]:  
    """reverses a list of numbers and returns the reversed list  
    If list is None, raises ValueError"""
```

3. In the `lab1a.py` file, complete the function to reverse a list of integers, mutating (changing) the original list. This function always returns `None` (the default return for Python functions):

```
def reverse_list_mutate(int_list: Optional[List]) -> None:  
    """reverses a list of numbers, modifying the input list, returns None  
    If list is None, raises ValueError"""
```

Test Cases

Many people tend to focus on writing code as the singular activity of a programmer, but testing is one of the most important tasks that one can perform while programming. Proper testing provides a degree of confidence in your solution. Systematic testing helps you to discover and then debug your code. Writing high quality test cases can greatly simplify the tasks of both finding and fixing bugs and, as such, **will save you time during development**. However, testing does not guarantee that your program is correct.

For this part of the lab you will practice writing some simple test cases to gain experience with the unittest framework. I recommend watching the first 20 minutes or so of the following video if you need more guidance on testing in Python. <https://www.youtube.com/watch?v=6tNS--WetLI>

Using your editor/IDE of choice, open the `lab1_test_cases.py` file. This file defines, using code that we will treat as a boilerplate for now, a testing class with a single testing function. You must add additional test cases to verify that your functions are correct.

Submission/Grading

Ensure that the following file have been submitted to GitHub by the due date:

- **location.py**
 - Updated per the instructions in Part 1
- **location_tests.py**
 - Comprehensive test cases as described in Part 1
- **lab1a.py**
 - Correct and well documented iterative **max_list_iter**, **reverse_list**, and **reverse_list_mutate** functions based on the template provided
- **lab1a_test_cases.py**
 - A complete set of test cases for the functions above. Your test cases should test boundary conditions and other possible errors based on the structure of your program. For each test provide a comment (or docstring) that explains what it is testing.