Lab 3.1 Variables and State

Introduction.

I would suggest that you create the directory "week03". For the file names, I put the prefix lab3.1.X- in front of each of the solutions so that they are in order in the directory, you can do that as well if you wish.

Types

1. Create a file called testTypes.py, in the file create 5 variables one for each of the following types:
   - int
   - float
   - boolean
   - str
   - list (look at w3schools.com)

   Use the **`type()`** function to check that the variables are of that type. Your program should output.

```
variable i is of type:<class 'int'> and value:3
variable fl is of type:<class 'float'> and value:3.5
variable is is of type:<class 'bool'> and value:True
variable memo is of type:<class 'str'> and value:how now Brown Cow
variable lots is of type:<class 'list'> and value:[]
```

```
i = 3
fl = 3.5
isa = True
memo = 'how now Brown Cow'
lots = []

print('variable {} is of type:{} and value:{}'.format('i', type(i), i))
print('variable {} is of type:{} and value:{}'.format('fl', type(fl), fl))
print('variable {} is of type:{} and value:{}'.format('is', type(isa), isa))
print('variable {} is of type:{} and value:{}'.format('memo', type(memo), memo))
print('variable {} is of type:{} and value:{}'.format('lots', type(lots), lots))
```

'lots' is a string that contains the letters l, o, t and s, not the variable lots

This is the variable lots

2. Write a program (sub.py) that reads in two numbers and subtracts the first one from the second one. The program should look like this when it is run.

```
Enter first number: 10
Enter second number: 4
10 minus 4 is 6
```

Answer

```
# Program to subtract on number from another.

# input reads in a string so we need to convert it into an int
# so we can perform mathematical operations

x = int(input("Enter first number: "))
y = int(input("Enter second number: "))
answer= x-y
print("{} minus {} is {} ".format(x, y, answer))
```

Input returns a str, so we need to convert this to an int if we are going to do arithmetic on it

Extra: when the program is running, try entering in something that is not an int eg 1.1 or hello

Will this cause an error?

3. Write a program (div.py) that reads in two numbers and divides the first one by the second and give the integer result and the remainder.

```
Enter first number: 10
Enter the number you want to divide by: 3
10 divided by 3 is 3 with remainder 1
```

Not 3.3

Answer

```
# program that reads in two numbers and
# outputs the integer answer and remainder

x = int(input("Enter first number: "))
y = int(input("Enter the number you want to divide by: "))
answer = int(x//y) # // gives the int division
remainder = x%y    # % gives the remainder

print("{} divided by {} is {} with remainder {}".format( x, y,
answer, remainder))
```

4. Write a program (randomGenerator.py) that prints out a random number between 1 and 10. You will need to import the module random.

```
# program that prints out a random number between 1 and 10

import random

number = random.randint(1,10)
print("here is a random number {}".format(number))
```

Extra try modifying the program so that the user inputs the range (more information on the random module can be found here

Looking ahead: Lists and tuples

5. Write a program (randomfruit.py) that prints out a random fruit.

```
> python randomfruit.py
A Random Fruit:Banana
> python randomfruit.py
A Random Fruit:Apple
```

Answer

```
# This program prints out a random fruit

import random

fruits = ['Apple', 'Orange', 'Banana', 'Pear']

# we want a random number between 0 and lenght-1
index = random.randint(0,len(fruits)-1)

fruit = fruits[index]
print("A Random Fruit:{}".format(fruit))
```

list is square brackets [ ]

There is a neater way of doing this, the random module can pick a random choice from a list, see later weeks.

And for this example we should have used a tuple, because we don't change the list

Modify the program in 6 (randomFruit2.py) so that it uses a tuple ( ) not a list [ ]. The functionality of the program will not change.

```
# This program prints out a random fruit

import random

fruits = ('Apple', 'Orange', 'Banana', 'Pear')

# we want a random number between 0 and lenght-1
index = random.randint(0,len(fruits)-1)

fruit = fruits[index]
print("A Random Fruit:{}".format(fruit))
```

Tuple is round brackets ( )

Extra: (Questions that I don't give the solution for)

6. Why does this expression cause an error? How can you fix it?

```
message = 'I have eaten ' + 99 + ' burritos.'
print (message)
```

7. Why is eggs a valid variable name while 100 is invalid?
8. What three functions can be used to get the integer, floating-point number, or string version of a value?