TEC-322
Programming I: Data Structures With Python
Due: March 18, 2022

HULT INTERNATIONAL BUSINESS SCHOOL

Problem Set 01

March 13, 2022

Problem 1: nested looping, print() and range()

Write a loop-in-a-loop to create the following output:

```
10 9 8 7 6 5 4 3 2 1 0
9 8 7 6 5 4 3 2 1 0
8 7 6 5 4 3 2 1 0
7 6 5 4 3 2 1 0
6 5 4 3 2 1 0
5 4 3 2 1 0
4 3 2 1 0
3 2 1 0
2 1 0
1 0
0
```

(The tiny numbers on the left are line numbers and not part of the required output.)

You'll need a loop within a loop. The outer loop counts down from 10 to 0. The inner loop counts down from the current outer loop value to 0. Use the `print()` function's optional arguments. And remember that `print()` with no arguments simply prints a carriage return.

TIP: Check out the Python documentation for the range() function. Note the three-argument version of `range`: `range(start, stop[, step])` . Note also that the 'start' number can be greater than the 'stop' number, and that the step parameter can be a negative number.

Consult the Python documentation for the `print()` function. Note that there are options for the separator to insert when arguments are separated by a comma (using the `sep=` option). There are also ways for you to specify what Python does at the end of a print statement. By default, Python prints a carriage return. You can set it to something else (or to nothing) with the `end =` option.

https://docs.python.org/3/library/functions.html#func-range

https://docs.python.org/3/library/functions.html#print

Problem 2: A finance problem

Let's write code that will do some calculations to find how long it will take to save enough money for a down payment for a home.

- Ask the user for the user's annual salary.
- Ask the user for a target home price.
- Ask the user for an expected annual interest rate for investments.
- Ask the user what percentage of monthly salary to set aside for savings.

Remember that the `input()` function returns a string. Even if the input looks like a number, it's still a string. So you will need cast the input function's result to a numeric type. `float` is probably best choice.

With the information you gather from the user...

(a) Write a loop that will iterate once a month and add each cash contribution (calculated from the appropriate percentage of monthly salary) plus interest gains from previous contributions, and count how many months it will take until the user has saved enough for a down payment. Assume you need 20% of the house price for a down payment. Since you don't know how long it will take to save the money at the start of the loop, a `while` loop is probably your best bet. `break` out of the loop and print your results when you're achieved your goal.

The *monthly* interest earnings are

$$\text{interest earned this month} = \left(1 + \frac{\text{annual return on investments}}{12}\right) \times \text{cumulative savings as of last month}$$

(b) Print out the number of months to save the down payment, but also print out (i) how much of the down payment came from direct savings contributions vs. (ii) interest earned on earlier contributions. You'll need to update two variables on each pass through the loop to keep track of these two components of savings.

(c) Include a pay raise feature to the program that gives the user a 4% raise every year.

Example: Your user makes $\$72,000$ a year (that's $\$6,000$ per month), and they want to buy a house worth $\$300,000$. In that case, my calculations say you'll be saving for a little over 12 years. Ouch.

If you get a 4% raise each year, you'll be done saving after about 10 years. Ouch still.

General guidelines

Submit your problem set solution as code plus any comments. You should submit code in a .py file. You may include comments in your .py file using Python's commenting syntax. I recommend using the docstring format

```
"""
    Here is my extended comment it can go on and on and last for quite
        a bit and yet Python will ignore everything that's in the
        comment.
"""
```

Or you can submit a separate text file (or Word or PDF document) with your commentary. No Pages documents will be accepted. Convert Pages documents to PDF before submitting.