# Programming Languages CSc11300 In-Class Exercise 3

Send your codes to the instructor via e-mail. Make a single script file that includes example results as comments. Add your name and the session, (morning/afternoon) (ayuksel@ccny.cuny.edu) Google or any other search engine use is not allowed. Internet copy-paste answers will be scored 0 as well as anonymous files you send. Just mathematical solutions will not be accepted. The user must make the inputs, not the programmer.

1. *The Collatz Conjecture* is a conjecture in mathematics that concerns a sequence defined as follows: start with any positive integer *n*. Then each term is obtained from the previous term as follows: if the previous term is even, the next term is one half the previous term. If the previous term is odd, the next term is 3 times the previous term plus 1. The conjecture is that no matter what value of *n*, the sequence will always reach 1.

   Write a python program to print The Collatz Conjecture starting from the given number *n*. Handle invalid inputs. (Do NOT use while/for loops.) (40pts)

$$f(n) = \begin{cases} \frac{n}{2} & \text{if } n \equiv 0 \pmod 2 \\ 3n+1 & \text{if } n \equiv 1 \pmod 2 \end{cases}$$

*Figure: Function f(n) of The Collatz Conjecture, creates a sequence from a given number.*

Example: If n=4, then the program prints 4,2,1

If n=7, then the program prints 7,22,11,34,17,52,26,13,40,20,10,5,16,8,4,2,1 (Printing format being horizontal or vertical does not matter)

2. The Python3 program below crashes in some conditions. Modify the program and prevent it from crashing for all of these conditions. (30pts)

```
a = int(input("Enter a number:"))
b = int(input("Enter a number:"))
print(a / b)
```

3. Write a Python program to print all prime factors of a number *n*. (Do not use Python lists. You may print duplicate factors) (15pts)

4. Write a Python function to print all prime numbers that are less than or equal to some number *n*. (Do not use Python lists) (15pts)