MA305 – Classwork #3
Lists, loops and control flow in Python

1. The **hailstone sequence** starting at an integer $n > 0$ is generated by the repeated application of the three rules.

1. If $n = 1$, the sequence ends.

2. If n is even, the next number in the sequence is $n/2$.

3. If n is odd, the next number in the sequence is $3n + 1$.

Write a program in Python (name it "cw3.py") that reads a positive integer n from keyboard and generates (prints) the hailstone sequence (as a list) starting at the integer n.

```python
hs=[n]
while True:
    print(n,end=' ')
    if n == 1:
        break
    elif n%2 == 0:
        n = n//2
    else:
        n = 3*n+1
    hs.append(n)
print(hs)
```

Print the hailstone sequence of 25, 26, and 27. How many numbers are there in the hailstone sequence of $25, 26$ and 27?

2. Make a log of your work using the Unix command `script`.

(i) `$ script`
`$ cat cw3.py`
`$ chmod u+x cw3.py`
`$ ./cw3.py`   (now, run your code with $n = 25, 26, 27$)
`$ exit`   (exit from script).

(ii) Edit and CLEAN up the typescript file.
Note: To remove all those annoying `^M` control characters from the typescript file, download the shell script `clnM` from Canvas and place it in the same directory where you have your typescript file, make it executable and run it on your typescript file.
`$ chmod u+x clnM`
`$ ./clnM typescript`
This will delete `^M` only. Clean the other control characters manually. You may type the following in the command line within `vi`
`:1,$s/^V^G//g`   (`^V^G` is [CTRL V CTRL G])

3. Rename file "typescript" to "cw3script.txt" and submit the script "cw3script.txt" using the `mail` command.

```
$ cp typescript cw3script.txt
$ mail -s "305:cw3" 305 < cw3script.txt
```

Submit the code cw3.py" through your course Canvas.

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4. Homework. All hailstone sequences stop eventually (**Collatz conjecture**). How do you modify the hailstone program ("cw3.py") to display the number of numbers in the hailstone sequence $h(n)$ of a given positive integer $1 \le n \le 100$.

n	$h(n)$
1	1
2	2
3	8
4	3
5	6