Computer Programming
Python #7 – Hailstones

Background:

There is an interesting series of positive integers known as hailstones. Hailstones are formed by being given a starting integer and generating the next integer based on the one that immediately precedes it in the series as follows:

- If the previous integer was even, the next integer in the series is half of it.
- If the previous integer was odd, the next integer is three times the previous integer plus one.

Although the numbers in the series goes up and down (like hailstones in cloud before they fall to the ground), the series eventually settles into a steady state of 4, 2, 1, 4, 2, 1…

For example, starting at 21, the hailstones series is:

21, 64, 32, 16, 8, 4, 2, 1, 4, 2, 1…

For 21, the series required 5 steps before the steady state was reached.

Starting at 101, the hailstone series is:

101, 304, 152, 76, 38, 19, 58, 29, 88, 44, 22, 11, 34, 17, 52, 26, 13, 40, 20, 10, 5, 16, 8, 4, 2, 1, 4, 2,1…

For 101, the series required 23 steps before the steady state was reached.

Assignment:

1. In your Computer Programming folder, create a folder titled *first_last_python_7*. Start IDLE. Create a new file. Save it in your *first_last_python_7* folder as *hailstones.py*.
2. At the top of the file, create a function called *hailstones* that accepts one parameter called *value*.
3. Inside the function, you will print the number of steps it took before the steady state was reached. You will need to figure out how to keep track of the number of steps and when you should stop processing. You will output a string that looks like this:

   ```
   x steps were necessary for y
   ```

   where x is the number of steps, and y is the initial value

Test:

4. Test your function by putting the following lines of code **after** your function definition:

   ```
   hailstones(21)
   hailstones(101)
   hailstones(1000)
   hailstones(8769
   ```

5. If you did your code correctly, your output should look like this:

   ```
   5 steps were necessary for 21
   23 steps were necessary for 101
   109 steps were necessary for 1000
   138 steps were necessary for 8769
   ```

6. Now replace the 4 lines of code you added in step 4 with these lines of code:

```
hailstones(15)
hailstones(2056)
hailstones(4001)
hailstones(7945)
hailstones(9532)
hailstones(11789)
```

7. Run the program.
8. Create a text document called output.txt in your *first_last_python_7* folder. Copy the output from the Python shell, paste it in your *output.txt* file, and save the file.

Before you turn this assignment in, make sure that your *first_last_python_7* folder has 2 files:

1. *output.txt*
2. *hailstones.py*

Zip your *first_last_python_7* folder and turn it in in the usual manner.