ASSIGNMENT1-COLLATZ CONJECTURE

Submitted by
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Task 1: Building Collatz sequence

The algorithm in pseudo-code

Ask the user to enter a positive number (n)

IF number (n) is even then n = n/2

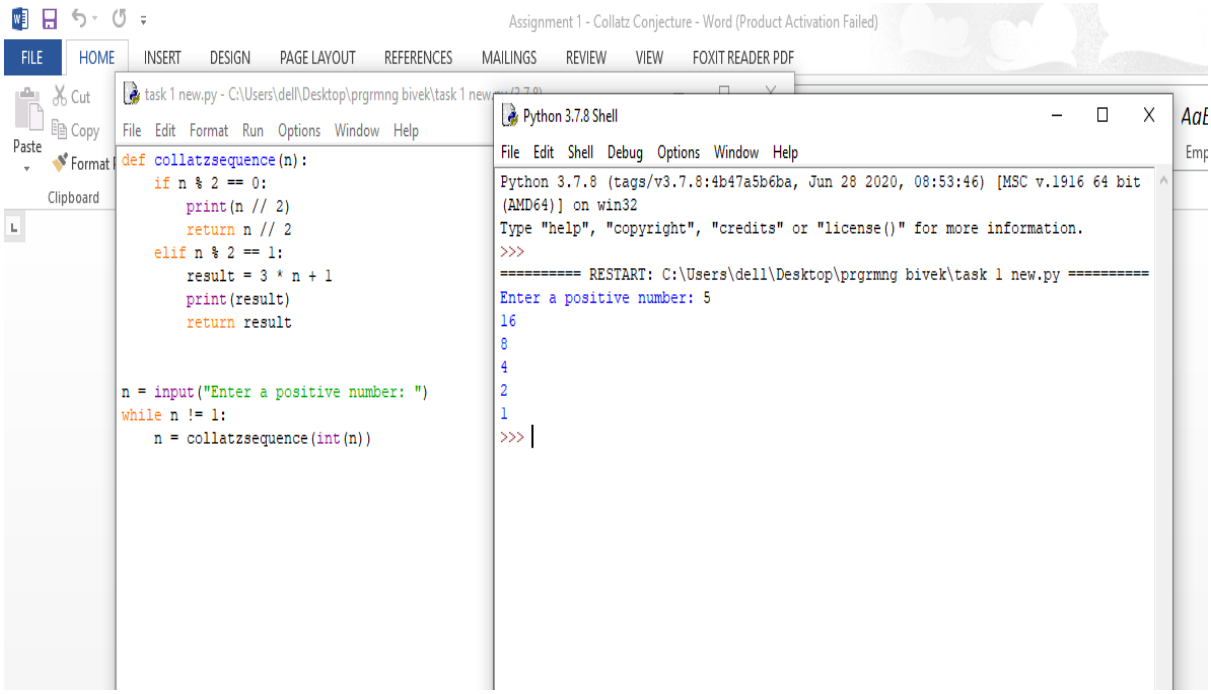
Else

If the number(n) is odd then find value of n as n = 3n+1

Repeat above process until the value of n reaches to 1.

Display all the sequences of n after it reaches to 1.

Python code and its output



Task 2 : Function Max Length

The algorithm in pseudo-code

Define the maxlength as (length of sequence, value responsible for it)

Ask the user to enter a positive number (k)

IF number (k) is even then k = k/2

Else

If the number(k) is odd then find value of k as k = 3k+1

Repeat above process until the value of n reaches to 1.

Again if the value of k is in the range of(1,m)

Find sequences of all number for 1 to m and store the value.

For the sequence of range (1,m), count the longest sequence and display length of sequence and number responsible for it as output.

Python code and its output

```
def collatzmaxlength(m, collatzmax):

    if m in collatzmax:
        return collatzmax[m]

    if(m == 1):
        collatzmax[m] = 1

    elif(m % 2 == 0):
        collatzmax[m] \
        = 1 \
           + collatzmaxlength(m//2, collatzmax)


    else:
        collatzmax[m] \
        = 1 \
          + collatzmaxlength(3 * m + 1, collatzmax)

    return collatzmax[m]

def collatzmax(m):

    collatzmax = {}

    collatzmaxlength(m, collatzmax)


    num, l =-1, 0

    for k in range(1, m):


        if k not in collatzmax:
            collatzmaxlength(k, collatzmax)

        max_value = collatzmax[k]
        if l < max_value:
            l = max_value
            num = k
```

```
Python 3.7.8 Shell
File  Edit  Shell  Debug  Options  Window  Help
Python 3.7.8 (tags/v3.7.8:4b47a5b6ba, Jun 28 2020, 08:53:46) [MSC v.1916 6
(AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
========== RESTART: C:\Users\dell\Desktop\prgrmng bivek\task 2.py ======
(9, 20)
>>>
```

Task 3: Function Max Value

The algorithm in pseudo-code

Dfeine the max value of all sequence as maxvalue(m)

Initially the max value is set as 0.

For the range of value k (1,m)

IF number (k) is even then k = k/2

Else

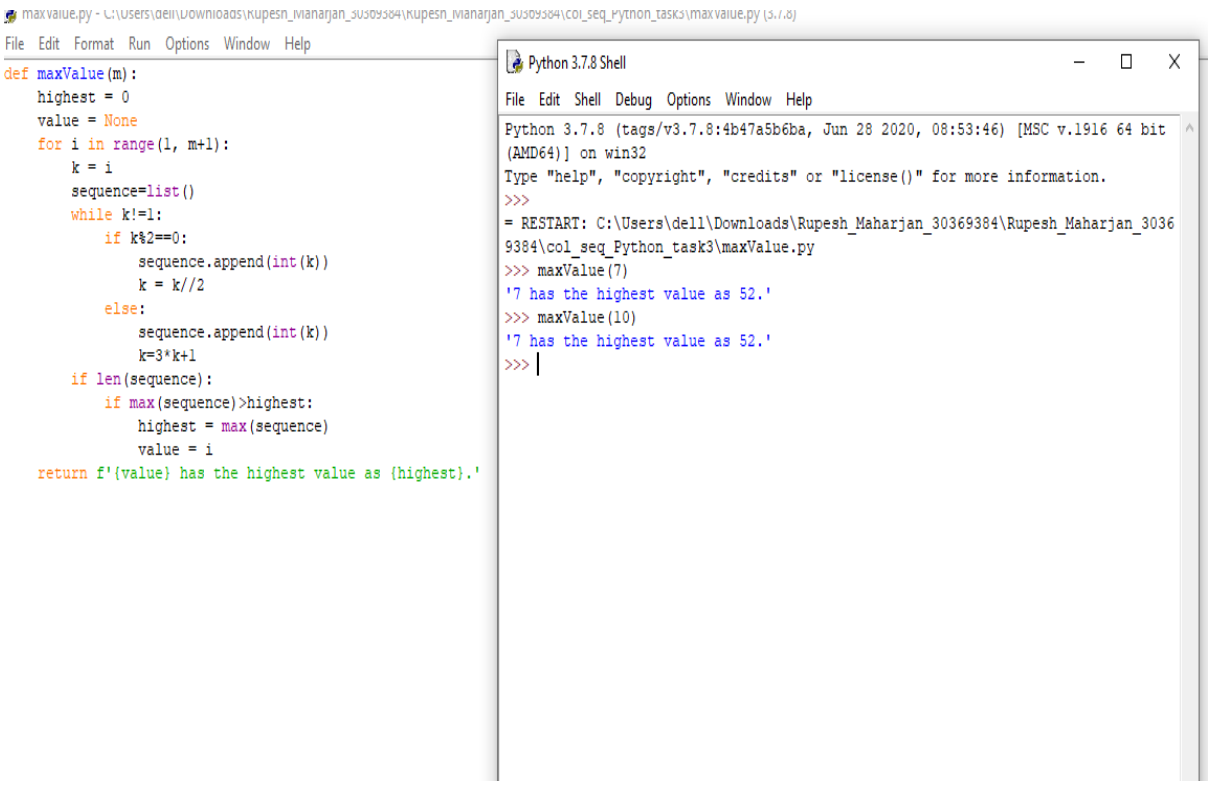
If the number(k) is odd then find value of k as k = 3k+1

Repeat above process until the value of n reaches to 1.

Find list of all sequence from 1 to m.

Find max value from all list and display it .

Python code and its output



Task 4: Function main()

The algorithm in pseudo-code

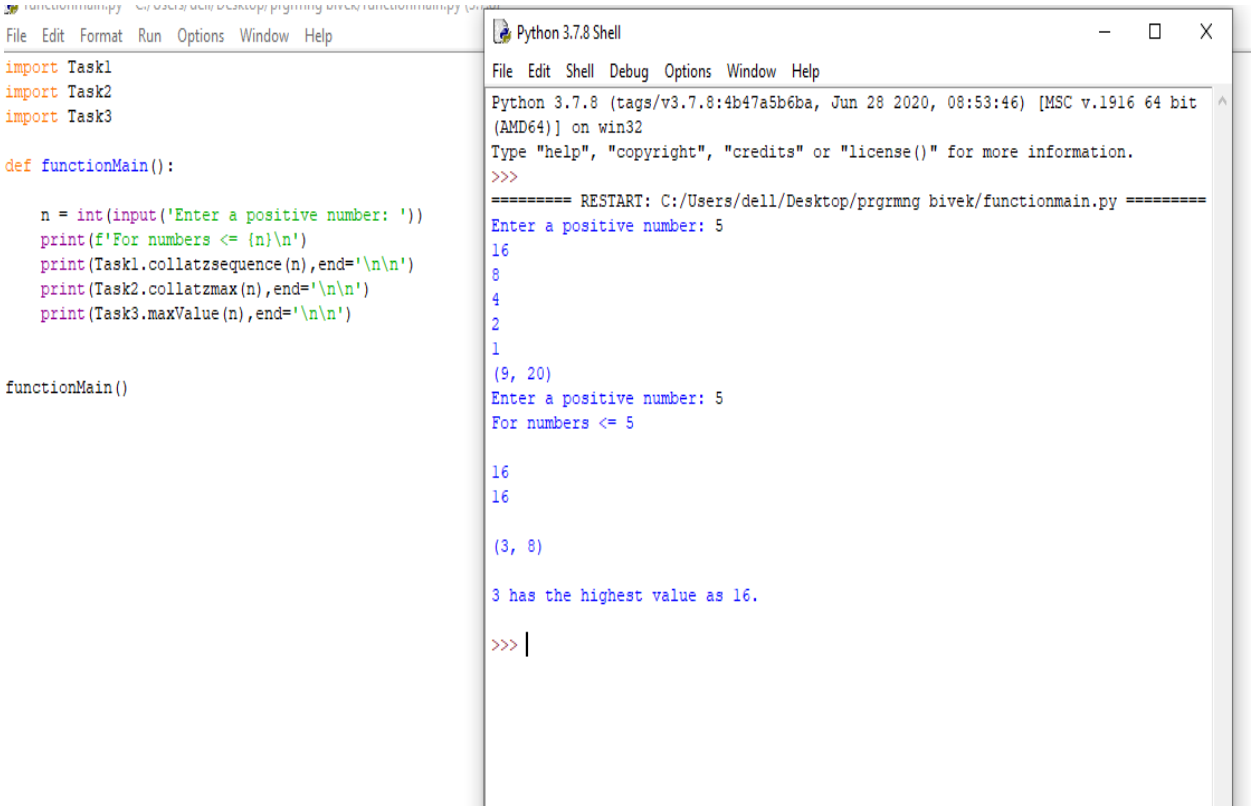
Import all the tasks like collatzsequence, maxLength and maxvalue and create a function main()

Ask the user to put the positive number n and

Call all the collatz_sequence, maxlangth and maxvalue function and display the result.

Call the function main() in the same file.

Python code and its output



```
File  Edit  Format  Run  Options  Window  Help
import Task1
import Task2
import Task3

def functionMain():

    n = int(input('Enter a positive number: '))
    print(f'For numbers <= {n}\n')
    print(Task1.collatzsequence(n),end='\n\n')
    print(Task2.collatzmax(n),end='\n\n')
    print(Task3.maxValue(n),end='\n\n')


functionMain()
```

```
Python 3.7.8 Shell
File  Edit  Shell  Debug  Options  Window  Help
Python 3.7.8 (tags/v3.7.8:4b47a5b6ba, Jun 28 2020, 08:53:46) [MSC v.1916 64 bit
(AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
========= RESTART: C:/Users/dell/Desktop/prgrmng bivek/functionmain.py =========
Enter a positive number: 5
16
8
4
2
1
(9, 20)
Enter a positive number: 5
For numbers <= 5

16
16

(3, 8)

3 has the highest value as 16.

>>>
```