

Python Programming

Recursive Functions

Practice 3

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Print $3n+1$ Sequence

- A $3n+1$ goes as following
- Start from a number n
- If this number is even, next number in sequence is $n / 2$
- If this number is odd, next number in sequence is $3 * n + 1$
- If this number is 1 = end of sequence
- E.g. Start from 5: **5 16 8 4 2 1**
- E.g. Start from 6: 6 3 10 **5 16 8 4 2 1**
- E.g. Start from 9: 7 22 11 34 17 52 26 13 40 20 10 5 16 8 4 2 1
- Write a recursive function to print it
 - Stop the video and try

Print $3n+1$ Sequence

```
3 def print_3n_plus_1(n):
4     print(n, end=' ')
5
6     if n == 1:
7         return
8
9     if n % 2 == 0:
10        print_3n_plus_1(n // 2)
11    else:
12        print_3n_plus_1(3 * n + 1)
13
14
15 print_3n_plus_1(6) # 6 3 10 5 16 8 4 2 1
```

Let's trace it

```
print_3n_plus_1(5)  
  print 5  
  Print_3n_plus_1 (3*5+1)
```

```
print_3n_plus_1(10)  
  print 10  
  Print_3n_plus_1 (10 / 2)
```

```
print_3n_plus_1(3)  
  print 3  
  Print_3n_plus_1 (3*3+1)
```

```
print_3n_plus_1(6)  
  print 6  
  Print_3n_plus_1 (6/2)
```

Let's trace it

```
print_3n_plus_1(5)
  print 5
  Print_3n_plus_1 (3*5+1)
```

```
print_3n_plus_1(10)
  print 10
  Print_3n_plus_1 (10 / 2)
```

```
print_3n_plus_1(3)
  print 3
  Print_3n_plus_1 (3*3+1)
```

```
print_3n_plus_1(6)
  print 6
  Print_3n_plus_1 (6/2)
```

```
print_3n_plus_1(2)
  print 2
  Print_3n_plus_1 (2/2)
```

```
print_3n_plus_1(4)
  print 4
  Print_3n_plus_1 (4/2)
```

```
print_3n_plus_1(8)
  print 8
  Print_3n_plus_1 (8/2)
```

```
print_3n_plus_1(16)
  print 16
  Print_3n_plus_1 (16/2)
```

```
print_3n_plus_1(1)
  print 1
```

“Acquire knowledge and impart it to the people.”

“Seek knowledge from the Cradle to the Grave.”