

ED5340 - Data Science: Theory and Practise

L9 - Functions

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Course web page: <https://ed.iitm.ac.in/~raman/datascience.html>

Moodle page: Available at <https://courses.iitm.ac.in/>

Functions

Assuming you are aware of how functions work in C/C++

```
def function_name(arg1, arg2.....):    #Function definition
```

```
    statement1
```

```
    statement2
```

```
    .....
```

```
    return var_name(s)
```

```
a1 = .....; a2 = .....; .....
```

```
function_name(a1, a2, ..... ) #Calling the function with passing of arguments
```

Functions

Simple example

```
def cal_sum(x, y):    #Function definition
```

```
    s = (x + y)
```

```
    return s
```

```
a = 5
```

```
b = 10
```

```
su = cal_sum(a, b) #Calling the function with passing of arguments
```

```
print(su)
```

Functions

Interaction of arguments

- Positional arguments - order / type has to match
- Keyword arguments - order need not match
- Using both pos. and kw args.

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Demo using L9_functions.py

Functions

Variable length arguments

- Variable length positional arguments - number of args is not fixed
- Variable length keyword arguments - number of keyword args is not fixed

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Demo using L9_functions_var_args.py

CW:

(a) Function to find whether a given number is even or odd

(b) Given a list of integers, do (a)

when using both positional and keyword args

- In general, positional args before keyword args
- Fixed number of args before variable number
- Combining the above two - pos. args, var. pos. args, kwargs, var. kwargs
- Default arguments

Demo using L9_functions_combined.py

Recursion function

- A function that calls itself from within its body.
- Example function

```
def PrintNum(n):    #Function definition  
    PrintNum(n-1)  #Recursive call to the same function
```

```
PrintNum(10)    #calling of the function - this is when the function gets called
```

**CW: Code that function.
What are your observation(s)?**

Recursion function

Modification of the example function

```
def PrintNum(n):    #Function definition
```

```
    if PrintNum > 0
```

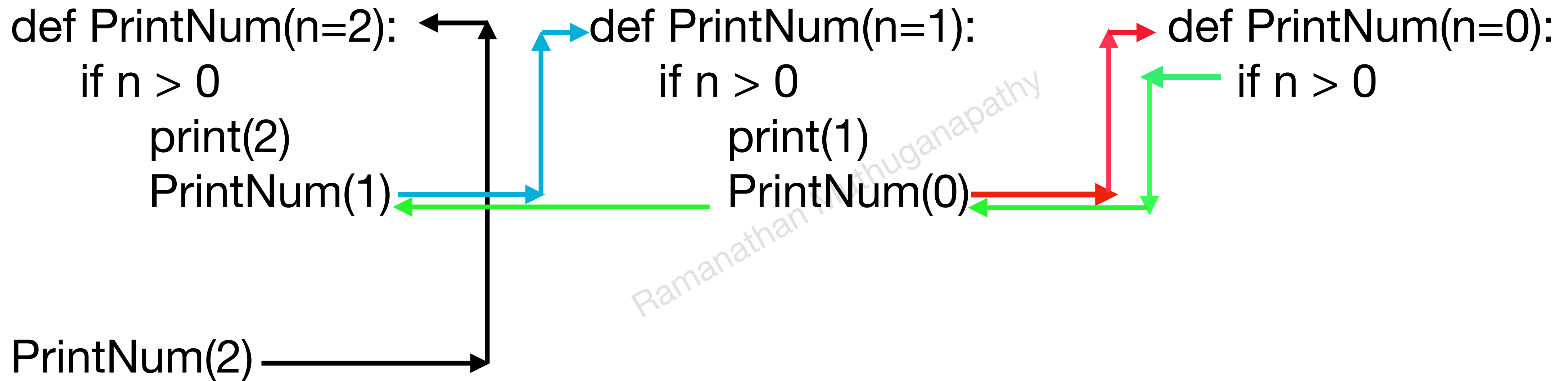
```
        print(n)
```

```
        PrintNum(n-1) #Recursive call to the same function
```

PrintNum(2) #calling of the function - this is when the function gets called

Recursion function

How does it work



Recursion function (Head recursion)

Modification of the example function

```
def PrintNum(n):    #Function definition
```

```
    if n > 0
```

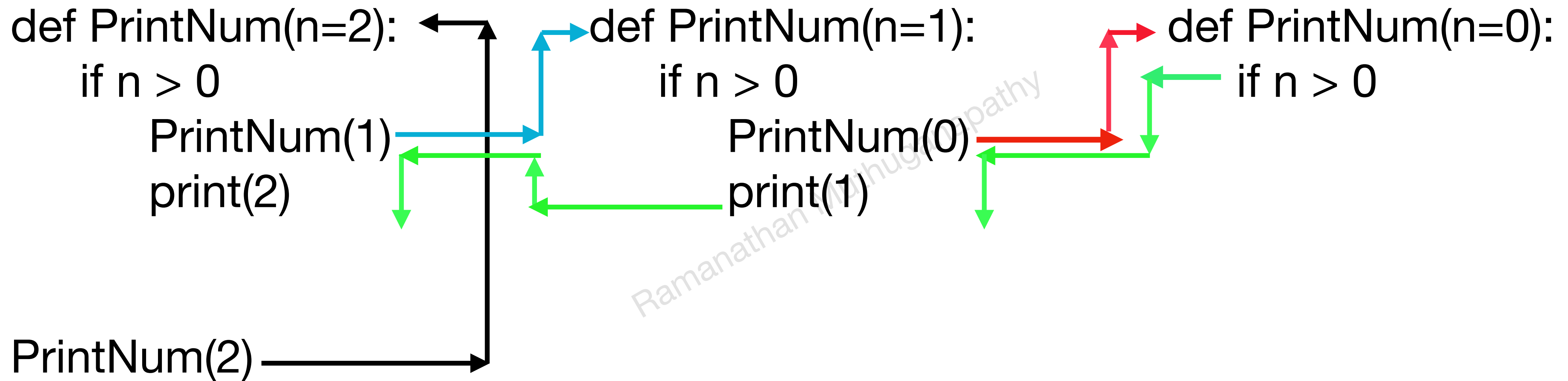
```
        PrintNum(n-1) #Recursive call to the function before other statements
```

```
    print(n)
```

```
PrintNum(2)    #calling of the function - this is when the function gets called
```

Recursion function

How does it work



Recursion function

Sum of 'n' values

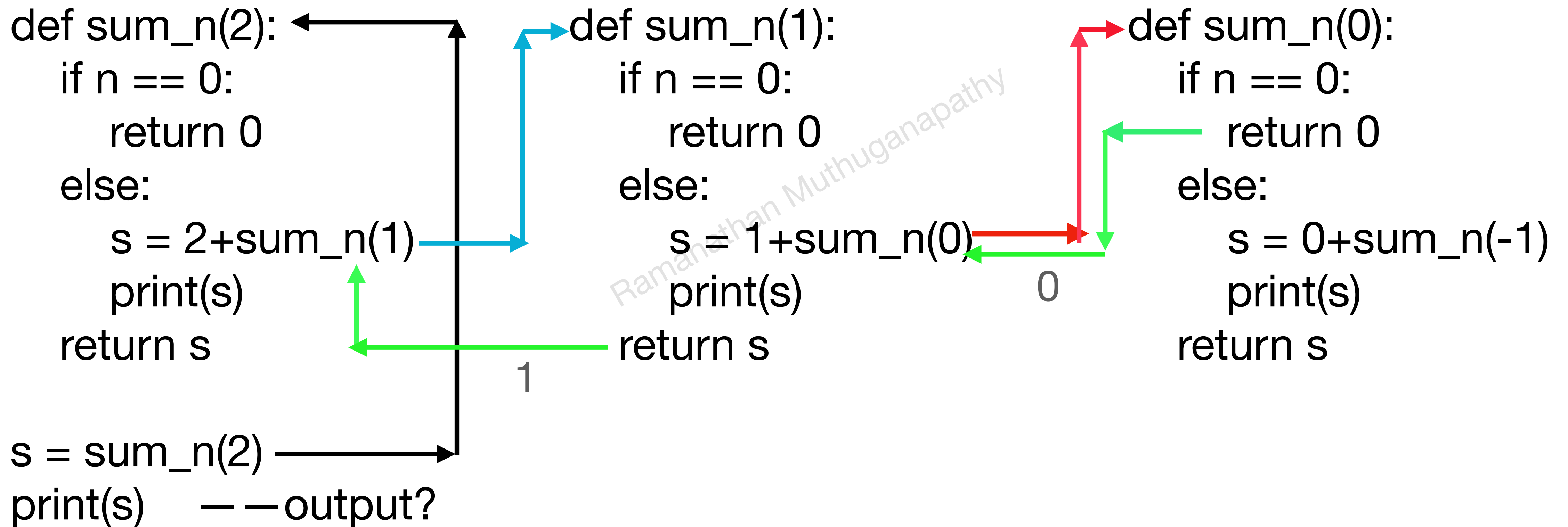
```
def sum_n(n):  
    if n == 0:  
        return 0  
    else:  
        s = n+sum_n(n-1)  
        print(s)  
  
    return s
```

```
s = sum_n(2)
```

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Recursion function

How does it work



CW: Do the factorial of any given value 'n' using recursion
HW: Series summation - odd factorial, even factorial,
exp(x), sin(x), etc. using recursion
HW: Find the sum of digits of a given integer

Lambda function

- It does not have a name
- used for short functional body
- can take multiple arguments but returns only one value
- also called as `anonymous` function

Lambda function

syntax and examples

- syntax is
 - lambda arguments : expression
- lambda a, b : (a+b) / 2
- you can also do the following:

```
avg = lambda a, b : (a+b) / 2
```

```
print(avg(10,30))
```

```
print(avg(100,245.6))
```

Demo using L9_lambda_functions.py

Map, filter and reduce functions

Use of lambda function

- Map applies a function to each element in a sequence
 - Returns a map, needs to be converted to a list
 - `map(function, sequence)`
- filter - filters the value in a sequence based on a function $a, b : (a+b) / 2$
 - `filter(function, sequence)`
- reduce - performs a rolling computation to sequential values in a sequence

Demo using L9_MapFilterReduce.py