

## Chapter 8 - Functions & Recursions

A function is a group of statements performing a specific task.

When a program gets bigger in size and its complexity grows, it gets difficult for a programmer to keep track on which piece of code is doing what!

A function can be reused by the programmer in a given program any number of

Example and Syntax of a function

The syntax of a function looks as follows:

```
def func1():  
    print("Hello")
```

This function can be called any number of times, anywhere in the program.

Function Call

Whenever we want to call a function, we put the name of the function followed by parenthesis as follows:

`func1()` → This is called function call

Function definition

The part containing the exact set of instructions which are executed during the function call.



Quick Quiz: Write a program to greet a user with "Good Day" using functions.

Types of functions in Python

- There are two types of functions in Python:
- 1> Built in functions → Already present in Python
  - 2> User defined functions → Defined by the user

Examples of built in function includes `len()`, `print()`, `range()` etc.

The `func1()` function we defined is an example of user defined function

Functions with arguments

A function can accept some values it can work with. We can put these values in the parenthesis. A function can also return values as shown below:

```
def greet(name):  
    gr = "Hello " + name  
    return gr
```

`a = greet("Harry")`

→ "Harry" is passed to greet in name  
→ a will now contain "Hello Harry"

Default Parameter Value

We can have a value as default argument in a function.

If we specify `name = "stranger"` in the line containing `def`, this value is used when no argument is passed.



For example :

```
def greet (name = "stranger") :  
    # function body
```

$\text{greet}()$   $\rightarrow$  Name will be "stranger" in function body (default)

$\text{greet}(\text{"Harry"})$   $\rightarrow$  Name will be "Harry" in function body (passed)

## Recursion

Recursion is a function which calls itself

It is used to directly use a mathematical formula as a function. For example :

$$\text{factorial}(n) = n \times \text{factorial}(n-1)$$

This function can be defined as follows :

```
def factorial(n):
```

if  $i == 0$  or  $i == 1$  :  $\rightarrow$  Base condition which doesn't call the function any further

return 1

else :

return  $n * \text{factorial}(n-1)$   $\rightarrow$  Function calling itself

This works as follows :

Factorial(4)

$\downarrow$

$\rightarrow$  [Function called]

$4 \times \text{factorial}(3)$

$4 \times [3 \times \text{factorial}(2)]$

$4 \times 3 \times [2 \times \text{factorial}(1)]$

$4 \times 3 \times 2 \times [1]$  [Function returned]



The programmer need to be extremely careful while working with recursion to ensure that the function doesn't infinitely keep calling itself. Recursion is sometimes the most direct way to code an algorithm.



## Chapter 8 - Practice Set

- 1 Write a program using function to find greatest of three numbers
- 2 Write a python program using function to convert Celsius to Fahrenheit
- 3 How do you prevent a python print() function to print a new line at the end?
- 4 Write a recursive function to calculate the sum of first  $n$  natural numbers.
- 5 Write a python function to print first  $n$  lines of the following pattern:  

```
* * *  
* *      → for n=3  
*
```
- 6 Write a python function which converts inches to cms
- 7 Write a python function to remove a given word from a list and strip it at the same time.
- 8 Write a python function to print multiplication table of a given number.



## Project 1: Snake, Water, Gun Game

We all have played snake, water gun game in our childhood. If you haven't, google the rules of this game and write a Python program capable of playing this game with the user.