

| **TITLE:**  Recursion and Lambda Function |
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**AIM:** To implement recursion function and lambda function

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**Expected OUTCOME of Experiment:**

**CO2:** Use different Decision making statements and Functions in Python.

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**Resource Needed: Python IDE**

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**Theory:**

## Python Functions

A function is a block of code which only runs when it is called. You can pass data, known as parameters, into a function. A function can return data as a result.

## Creating a Function

## In Python a function is defined using the def  keyword:

Example: def my\_function():  
   print("Hello from a function")

## Arguments

## Information can be passed into functions as arguments.

## Arguments are specified after the function name, inside the parentheses. You can add as many arguments as you want, just separate them with a comma.

## Parameters or Arguments?

## The terms parameter and argument can be used for the same thing: information that is passed into a function. From a function's perspective:

## A parameter is the variable listed inside the parentheses in the function definition.

## An argument is the value that is sent to the function when it is called.

## Number of Arguments

## By default, a function must be called with the correct number of arguments i.e. if your function expects 2 arguments; you have to call the function with 2 arguments, not more, and not less.

## Keyword Arguments

You can also send arguments with the key = value syntax.

This way the order of the arguments does not matter.

## Arbitrary Keyword Arguments, \*\*kwargs

If you do not know how many keyword arguments will be passed into your function, add two asterisk: \*\* before the parameter name in the function definition.

This way the function will receive a dictionary of arguments, and can access the items accordingly

## Default Parameter Value

The following example shows how to use a default parameter value.

If we call the function without argument, it uses the default value:

## Passing a List as an Argument

## You can send any data types of argument to a function (string, number, list, dictionary etc.), and it will be treated as the same data type inside the function.

## Return Values

To let a function return a value, use the return statement:

## The pass Statement

Function definitions cannot be empty, but if you for some reason have a function definition with no content, put in the pass statement to avoid getting an error.

## Recursion

## Python also accepts function recursion, which means a defined function can call itself.

## Recursion is a common mathematical and programming concept. It means that a function calls itself. This has the benefit of meaning that you can loop through data to reach a result.

The developer should be very careful with recursion as it can be quite easy to slip into writing a function which never terminates, or one that uses excess amounts of memory or processor power. However, when written correctly recursion can be a very efficient and mathematically-elegant approach to programming.

To a new programmer it can take some time to work out how exactly this works, best way to find out is by testing and modifying it.

**3. Lambda function**

A lambda function is a small anonymous function.

A lambda function can take any number of arguments, but can only have one expression. Syntax of Lambda Function is given below

*lambda*arguments *:*expression

Lambda functions can take any number of arguments:

**Problem Definition:**

1. In below table input variable, python code and output column is given. You have to complete blank cell in every row.

| S.No | Python Code | Output |
| --- | --- | --- |
| 1. | def my\_function(fname, lname):   print(fname + " " + lname)  my\_function("Amit", "Kumar") | Amit Kumar |
| 2. | def my\_function(fname, lname):   print(fname + " " + lname)  my\_function("Emil") | Traceback (most recent call last):    File "c:/Users/Students/Desktop/0/expt5.py", line 9, in <module>     my\_function("Emil")  TypeError: my\_function() missing 1 required positional argument: 'lname' |
| 3. | def my\_function(\*kids):      print("The youngest child is " + kids[2])  my\_function("Emil", "Tobias", "Linus") | The youngest child is Linus |
| 4. | def my\_function(college3, college2, college1):   print("The Best college is " + college3)  my\_function(**“KJSCE”,”KC”,”HR”**) | The Best college is  KJSCE |
| 5. | def my\_function(**country= "Norway"**):   print("I am from " + country)  my\_function("Sweden") my\_function("India") my\_function() my\_function("Brazil") | I am from Sweden  I am from India  I am from Norway  I am from Brazil |
| 6. | def tri\_recursion(k):        if(k > 0):      result = k + tri\_recursion(k - 1)      print(result)       else:      result = 0       return result  print("Recursion Example Results")  tri\_recursion(6) | Recursion Example Results  1  3  6  10  15  21 |
| 7. | print((lambda x: x\*2) (9)) | 18 |
| 8. | twice = lambda x: x\*2  print(twice(9)) | 18 |

1. Write a Python program using a recursive function that takes a string as input from the user and displays whether the string is Palindrome or not.
2. Write a Python program to separate out even and odd numbers from the list entered by user by using Lambda function

**Books/ Journals/ Websites referred:**

1. Reema Thareja, *Python Programming: Using Problem Solving Approach*, Oxford University Press, First Edition 2017, India
2. Sheetal Taneja and Naveen Kumar, *Python Programming: A modular Approach*, Pearson India, Second Edition 2018,India

**Implementation:**

**2]**

**def is\_palindrome(s):**

**if len(s) < 1:**

**return True**

**else:**

**if s[0] == s[-1]:**

**return is\_palindrome(s[1:-1])**

**else:**

**return False**

**a=str(input("Enter string:"))**

**if(is\_palindrome(a)==True):**

**print("String is a palindrome.")**

**else:**

**print("String is not a palindrome.")**

**3]**

**num\_list = list(map(int, input("Enter a list of numbers :").split()))**

**e\_l = list(filter(lambda x:x%2==0,num\_list))**

**o\_l = list(filter(lambda x:x%2!=0,num\_list))**

**e\_c=len(e\_l)**

**o\_c=len(o\_l)**

**print("Even Numbers:",e\_c)**

**print("Odd Numbers:",o\_c)**

**print("Even Numbers list :",e\_l)**

**print("Odd Numbers list:",o\_l)**

**Output(s):**

2]

Enter string:1331

String is a palindrome.

Enter string:hello

String is not a palindrome.

3]

Enter a list of numbers :1 2 3 4 5 6 7 8 9

Even Numbers: 4

Odd Numbers: 5

Even Numbers list : [2, 4, 6, 8]

Odd Numbers list: [1, 3, 5, 7, 9]

**Conclusion:**

**Thus, we learned about lambda and recursion functions .**

**Post Lab Descriptive Questions**

1. Write a python program to calculate factorial using recursion
2. What are the common functional programming methods that use lambdas?

**1]**

**def recur\_factorial(n):**

**if n == 1:**

**return n**

**else:**

**return n\*recur\_factorial(n-1)**

**num = int(input("Enter number:"))**

**if num < 0:**

**print("Sorry, factorial does not exist for negative numbers")**

**elif num == 0:**

**print("The factorial of 0 is 1")**

**else:**

**print("The factorial of", num, "is", recur\_factorial(num))**

**OUTPUT:**

**Enter number:5**

**The factorial of 5 is 120**

**2]**

**The common functional programming methods that use lambdas are map , filter ,reduce and many more.**

**Date: 31-3-23                                                 Signature of faculty in-charge**