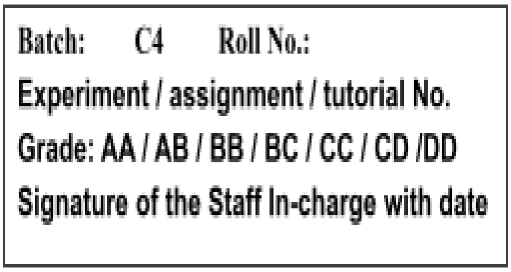

Batch: C4 Roll No.:

Experiment / assignment / tutorial No.

Grade: AA / AB / BB / BC / CC / CD /DD

Signature of the Staff In-charge with date

TITLE: Write a program to demonstrate the use of User-defined functions in Python

AIM: 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 for a character frequency counter function that takes a list of strings from the user as input and displays the frequency of each character in the list.

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OUTCOME: Students will be able to

CO1: Formulate problem statement and develop the logic (algorithm/flowchart) for its solution.

CO3: Use different Decision Making statements and Functions in Python.

Use of input output function, Use different Decision Making statements and user defined functions in Python.

Resource Needed: Python IDE

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
3. https://www.geeksforgeeks.org/python-strings/?ref=lbp

Theory:

1. Python Functions

A function is a block of code that 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 using 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 asterisks (**) 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 type 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 it in the pass statement to avoid getting an error.

2. Recursion Function

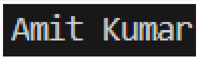
Python also accepts function recursion, which means a defined function can call itself. Recursion is a common mathematical and programming concept. It means that a function calls itself. This has the benefit of meaning that you can loop through data to reach a result. The developer should be very careful with recursion, as it can be quite easy to slip into writing a function that 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.

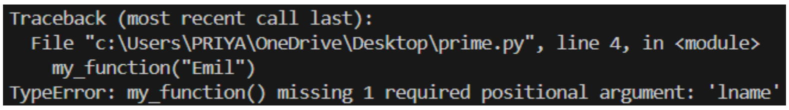
To a new programmer, it can take some time to work out how exactly this works, best way to find out is by testing and modifying it.

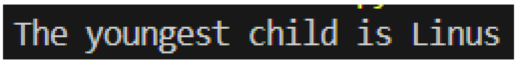
Problem Definition:

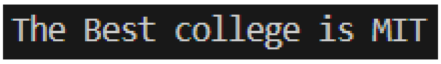
In the below table, the input variable, Python code, and output column is given. You have to complete a blank cell in every row.

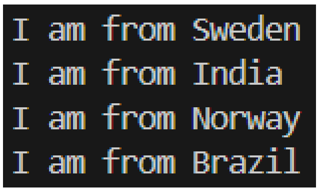
Python Code	Output

def my_function(fname,lname):
  print(fname+ " " + lname)
 	
my_function("Amit", "Kumar")
	
	Amit Kumar

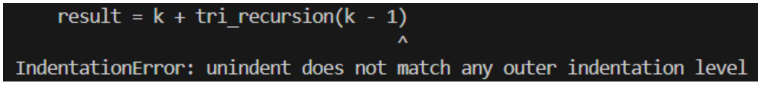
def my_function(fname, lname):
  print(fname + " " + lname)
 	
my_function("Emil")
	
	Traceback (most recent call last):
	  File "c:\Users\PRIYA\OneDrive\Desktop\prime.py", line 4, in <module>
	    my_function("Emil")
	TypeError: my_function() missing 1 required positional argument: 'lname'

def my_function(*kids):
 	
  print("The youngest child is " + kids[2])
 	
my_function("Emil", "Tobias", "Linus")
	
	The youngest child is Linus

def my_function(college3, college2, college1):
  print("The Best college is " + college3)
 	
my_function(**"MIT", "Stanford", "Harvard"**)
	
	The Best college is MIT

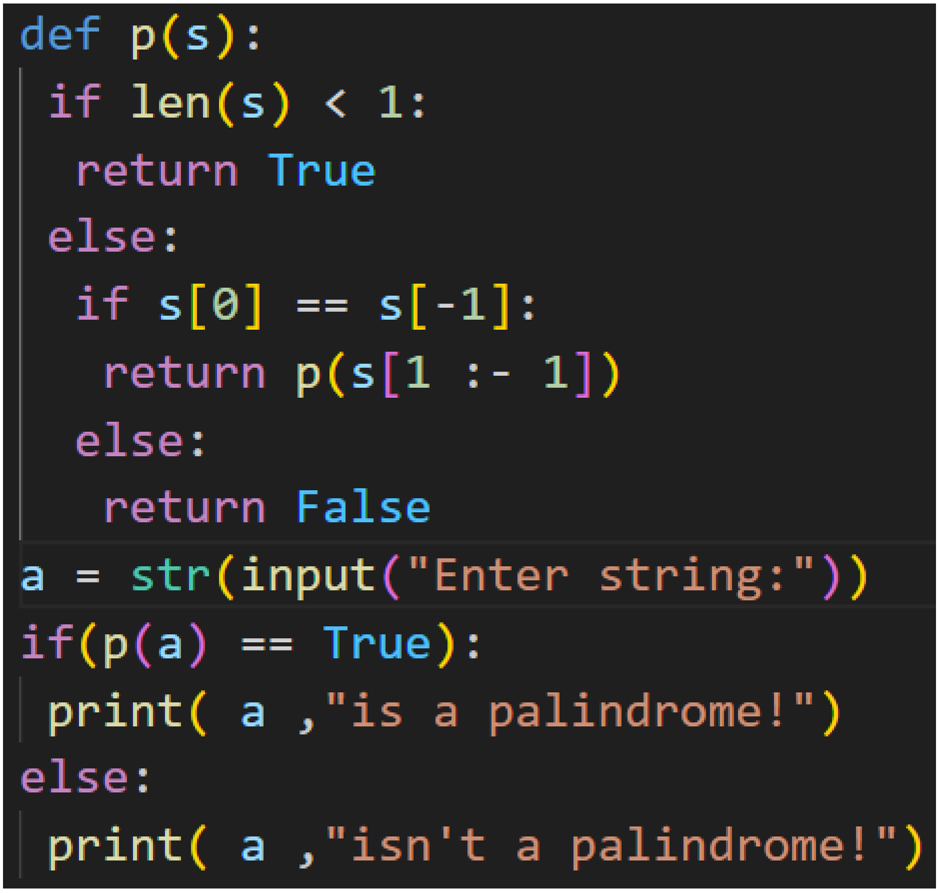
def my_function(**country= "Norway"**):
  print("I am from " + country)
 	
my_function("Sweden")
	
	I am from Sweden
	I am from India
	I am from Norway
	I am from Brazil

my_function("India")
my_function()
my_function("Brazil")	

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)
	
	`    result = k + tri_recursion(k - 1)`
	`                                    ^`
	`IndentationError: unindent does not match any outer indentation level`

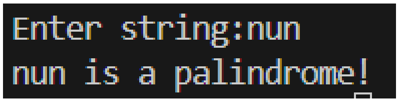
3. Write a Python program using a recursive function that takes a string as input from the user and displays whether the string is Palindrome.

Implementation detail

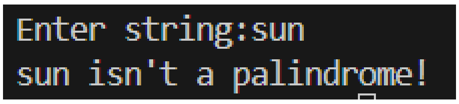


```
def p(s):
 if len(s) < 1:
  return True
 else:
  if s[0] == s[-1]:
   return p(s[1 :- 1])
  else:
   return False
a = str(input("Enter string:"))
if(p(a) == True):
 print( a ,"is a palindrome!")
else:
 print( a ,"isn't a palindrome!")
```

Output(s):



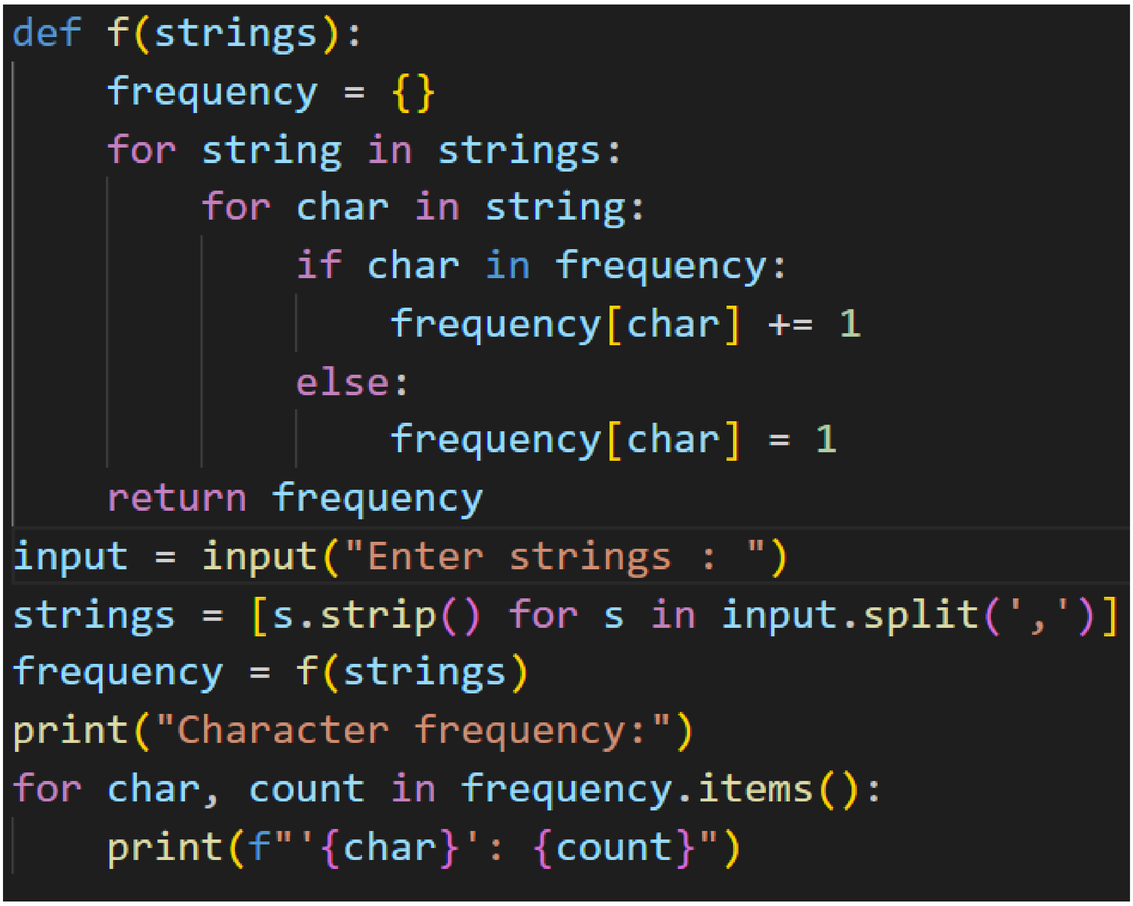
```
Enter string:nun
nun is a palindrome!
```



```
Enter string:sun
sun isn't a palindrome!
```

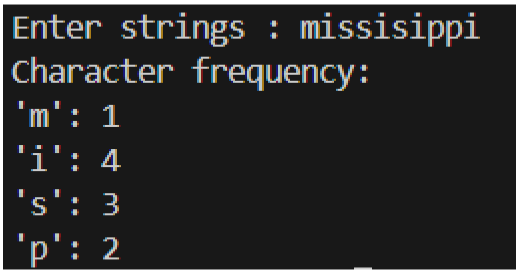
4. Write a Python program for a character frequency counter function that takes a list of strings from the user as input and displays the frequency of each character in the list.

Implementation details:



```
def f(strings):
    frequency = {}
    for string in strings:
        for char in string:
            if char in frequency:
                frequency[char] += 1
            else:
                frequency[char] = 1
    return frequency
input = input("Enter strings : ")
strings = [s.strip() for s in input.split(',')]
frequency = f(strings)
print("Character frequency:")
for char, count in frequency.items():
    print(f"'{char}': {count}")
```

Output(s):



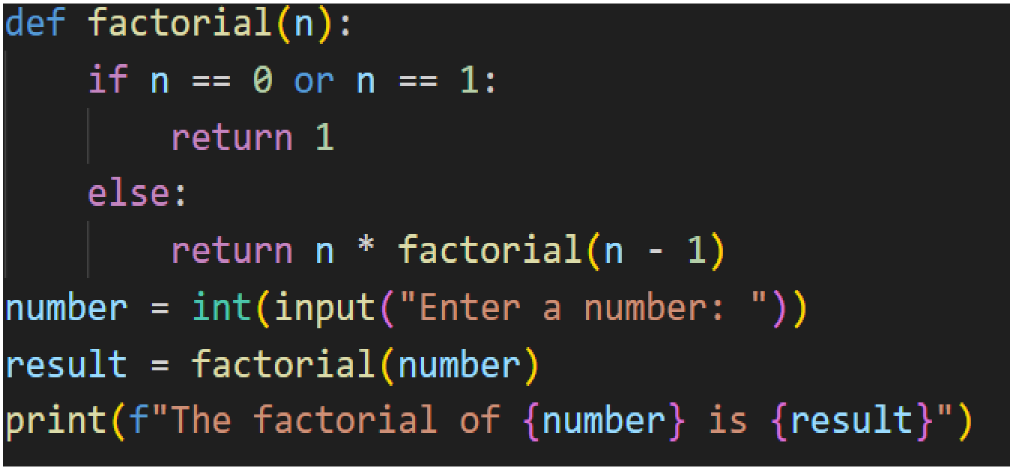
```
Enter strings : missisippi
Character frequency:
'm': 1
'i': 4
's': 3
'p': 2
```

Conclusion:
We are able to use decision making functions and formulate basic programs.

Post Lab Descriptive Questions

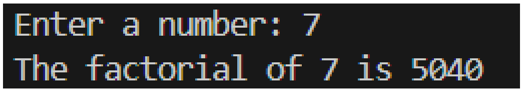
1. Virtual lab on Loop: https://python-iitk.vlabs.ac.in/exp/loops/
2. Virtual lab on String: https://python-iitk.vlabs.ac.in/exp/strings/
3. Write a Python program to calculate factorial using recursion

Implementation detail



```python
def factorial(n):
    if n == 0 or n == 1:
        return 1
    else:
        return n * factorial(n - 1)
number = int(input("Enter a number: "))
result = factorial(number)
print(f"The factorial of {number} is {result}")
```

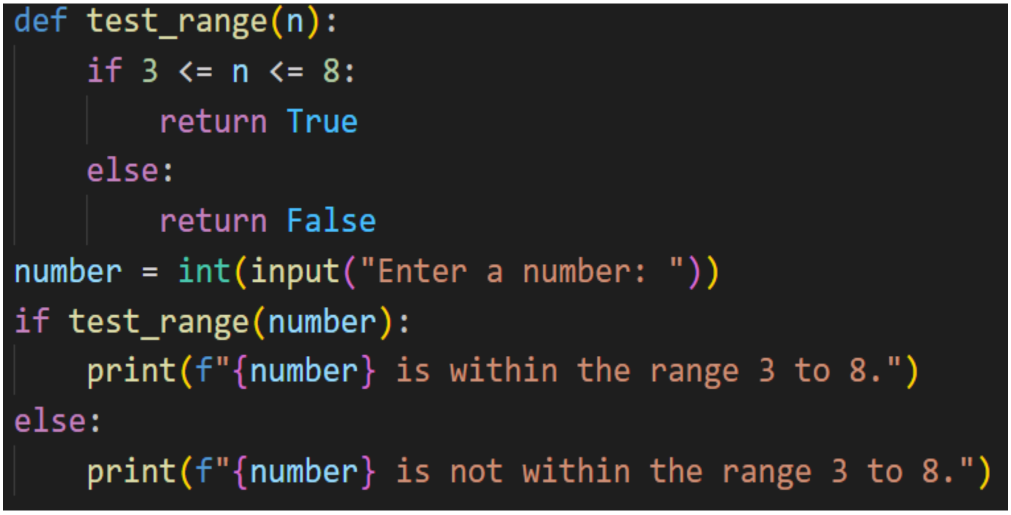
Output(s):



```
Enter a number: 7
The factorial of 7 is 5040
```

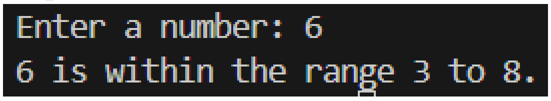
4. Define a function named 'test_range' that checks if a number 'n' is within the range 3 to 8 (inclusive)

Implementation detail

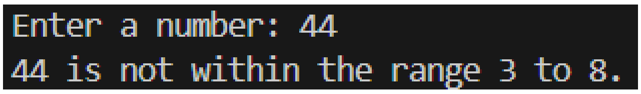


```python
def test_range(n):
    if 3 <= n <= 8:
        return True
    else:
        return False
number = int(input("Enter a number: "))
if test_range(number):
    print(f"{number} is within the range 3 to 8.")
else:
    print(f"{number} is not within the range 3 to 8.")
```

Output(s):



```
Enter a number: 6
6 is within the range 3 to 8.
```



```
Enter a number: 44
44 is not within the range 3 to 8.
```