

K. J. Somaiya College of Engineering, Mumbai-77

Batch: C2-2 **Roll No.: 047**
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.

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:

Department of Department of Science and Humanities

K. J. Somaiya College of Engineering, Mumbai-77

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, **

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.

K. J. Somaiya College of Engineering, Mumbai-77

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.

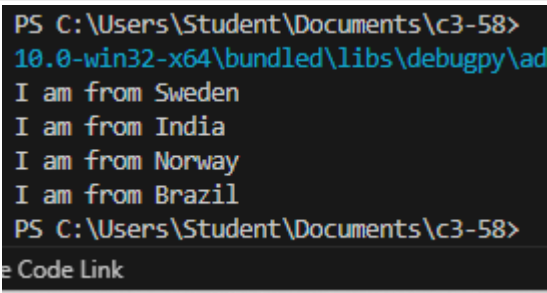
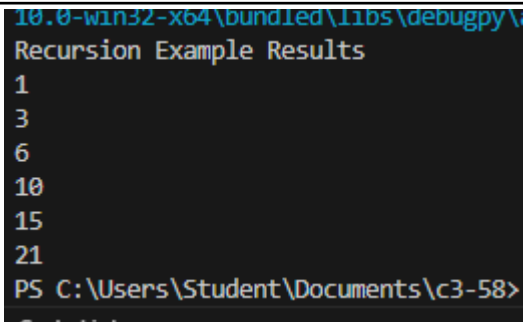
To a new programmer, it can take some time to work out how exactly this works, best way to find out is by testing and modifying it.

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
<pre>def my_function(fname,lname): print(fname+ " " + lname) my_function("Amit", "Kumar")</pre>	
<pre>def my_function(fname, lname): print(fname + " " + lname) my_function("Emil")</pre>	
<pre>def my_function(*kids): print("The youngest child is " + kids[2]) my_function("Emil", "Tobias", "Linus")</pre>	
<pre>def my_function(college3, college2, college1): print("The Best college is " + college3) my_function("MIT", "Stanford", "Harvard")</pre>	

K. J. Somaiya College of Engineering, Mumbai-77

<pre>def my_function(country= "Norway"): print("I am from " + country) my_function("Sweden") my_function("India") my_function() my_function("Brazil")</pre>	
<pre>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)</pre>	

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.
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:

Problem 3:

Algorithm:

1. Start
2. Define a function which takes a string as input
3. If the length of the string is less than one, it is automatically palindrome. Return True.
4. If the first index of the string is not equal to the last, the string is not palindrome. Return false.
5. Call the function again by removing the first and last indices to keep comparing till the middlemost indices are checked.
6. Take an input, if the function returns true, print that the string is Palindrome.

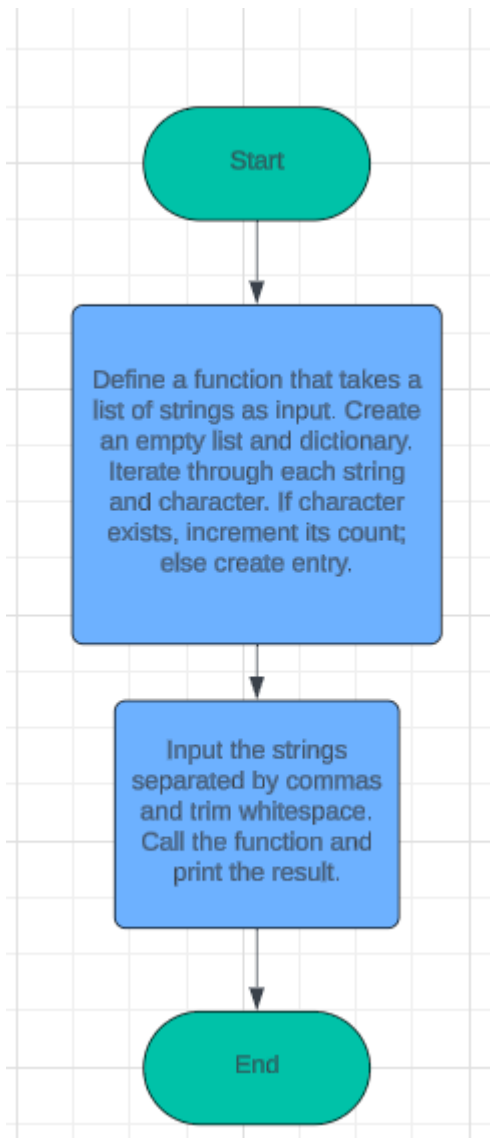
Department of Department of Science and Humanities

K. J. Somaiya College of Engineering, Mumbai-77

Else, print that the string is not Palindrome.

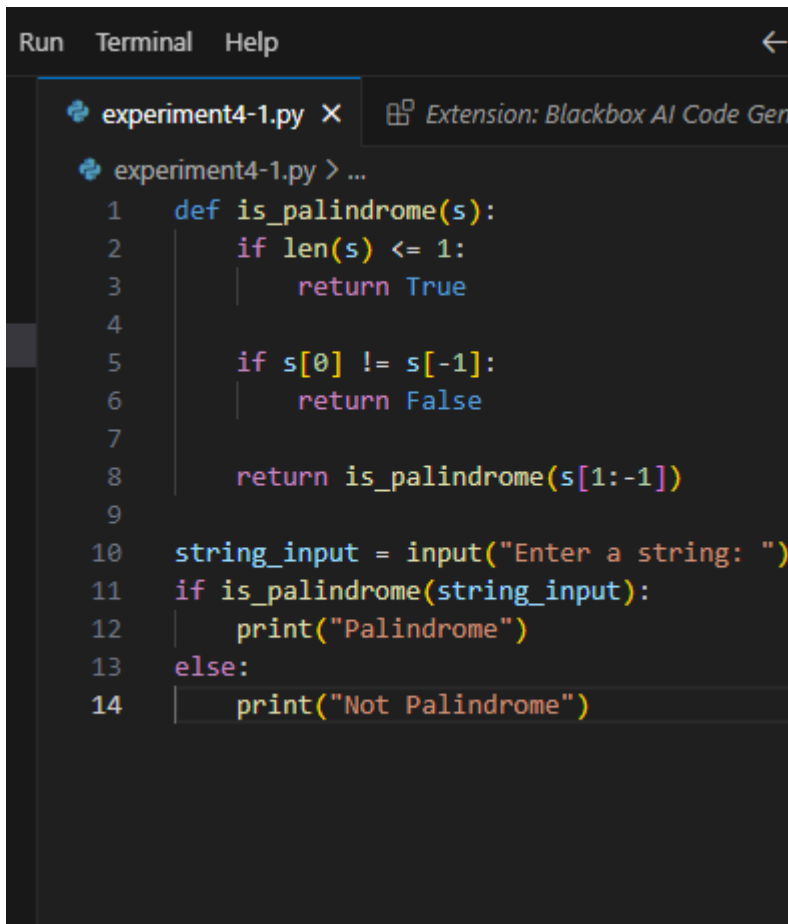
7. Stop.

Flowchart:



Code:

K. J. Somaiya College of Engineering, Mumbai-77



```

Run Terminal Help
experiment4-1.py X Extension: Blackbox AI Code Gen
experiment4-1.py > ...
1 def is_palindrome(s):
2     if len(s) <= 1:
3         return True
4
5     if s[0] != s[-1]:
6         return False
7
8     return is_palindrome(s[1:-1])
9
10 string_input = input("Enter a string: ")
11 if is_palindrome(string_input):
12     print("Palindrome")
13 else:
14     print("Not Palindrome")

```

Problem 4:

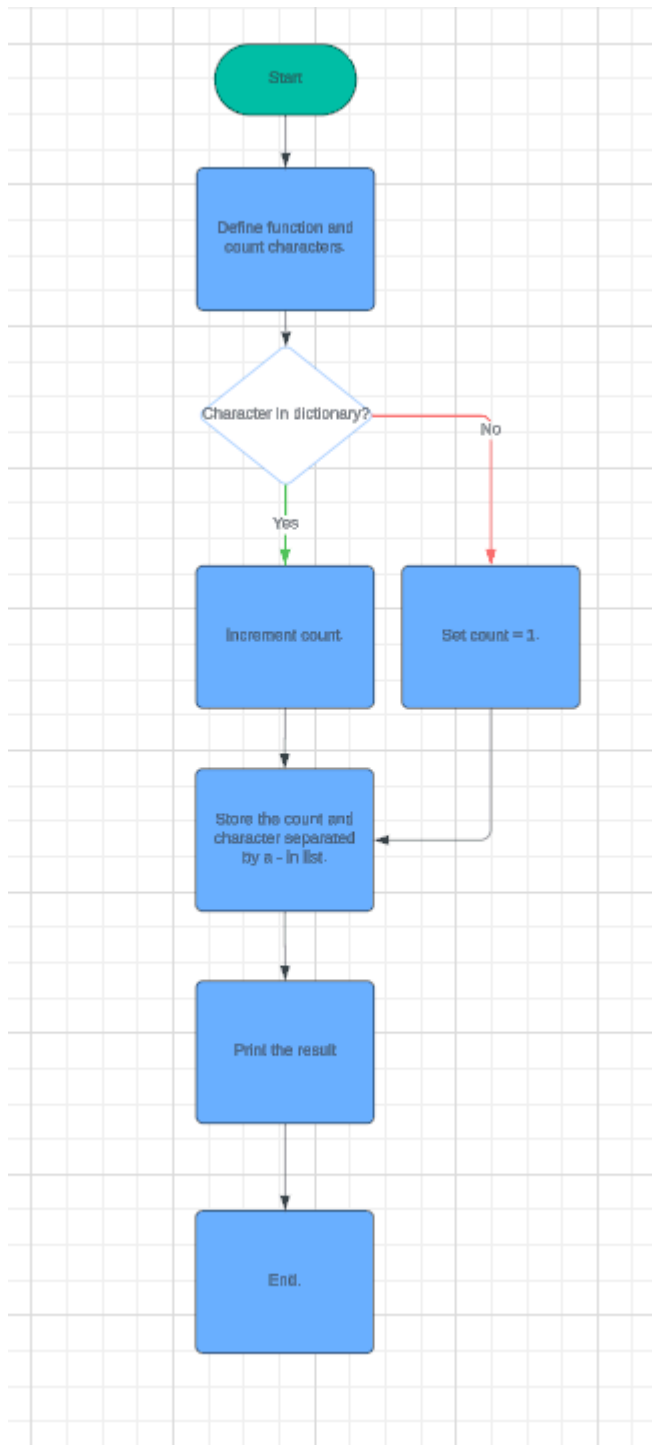
Algorithm:

1. Start
2. Define a function that takes a list of strings as input.
3. Create an empty list and dictionary
4. Iterate through each string in the list of strings and through each character in each string.
5. If the empty dictionary already has that character, increment the dictionary's value. If not, then create a new dictionary item as that character and set its count to 1.
6. Run a loop that runs for each value in frequency dictionary. For each item in dictionary, store the character and its count in the list we created earlier.
7. Input the string and separate them with , using split(','), also trim it to erase whitespaces.
8. Call the character_frequency function and pass the value of input_strings to it.
9. Print the function, which will eventually return l1, which is the list that stores characters and character counts.
10. End

Flowchart:

Department of Department of Science and Humanities

K. J. Somaiya College of Engineering, Mumbai-77



Code:

K. J. Somaiya College of Engineering, Mumbai-77

```

Terminal Help
experiment4-1.py x Extension: Blackbox AI Code Generation, Code Chat, Code Search
experiment4-1.py > ...
1 def character_frequency(strings):
2     l1=[]
3     frequency = {}
4     for string in strings:
5         for char in string:
6             if char in frequency:
7                 frequency[char] += 1
8                 # If we encounter same char again, we add to its counter value
9             else:
10                frequency[char] = 1
11                # If we encounter a char for the first time, we set its count to 1
12
13        for i in frequency:
14            m=str(i)+'-'+str(frequency[i])
15            l1.append(m)
16        return l1
17
18    input_strings = input("Enter strings and separate them with ,: ").split(',')
19
20    input_strings = [s.strip() for s in input_strings]
21    # Erasing leading and trailing whitespaces from each string
22
23    # Calculate frequency
24    frequency_count = character_frequency(input_strings)
25    print(frequency_count)
26

```

Output(s):

Problem 3:

```

10.0-win32-x64 (bundled) (110) (debugpy) (adap
Enter a string: hannah
Palindrome
PS C:\Users\Student\Documents\c3-58> ^C
PS C:\Users\Student\Documents\c3-58>
PS C:\Users\Student\Documents\c3-58> c:;
10.0-win32-x64\bundled\libs\debugpy\adapt
Enter a string: Montana
Not Palindrome
PS C:\Users\Student\Documents\c3-58>
are Code Link

```

Problem 4:

```

PS C:\Users\Student\Documents\c3-58>
PS C:\Users\Student\Documents\c3-58> c:; cd 'c:\Users\Student\Documents\
10.0-win32-x64\bundled\libs\debugpy\adapter\..\..\debugpy\launcher' '5784
Enter strings and separate them with ,: ashwera, richa, hasan, handa
['a-7', 's-2', 'h-4', 'w-1', 'e-1', 'r-2', 'i-1', 'c-1', 'n-2', 'd-1']
PS C:\Users\Student\Documents\c3-58>
are Code Link

```

Department of Department of Science and Humanities

K. J. Somaiya College of Engineering, Mumbai-77

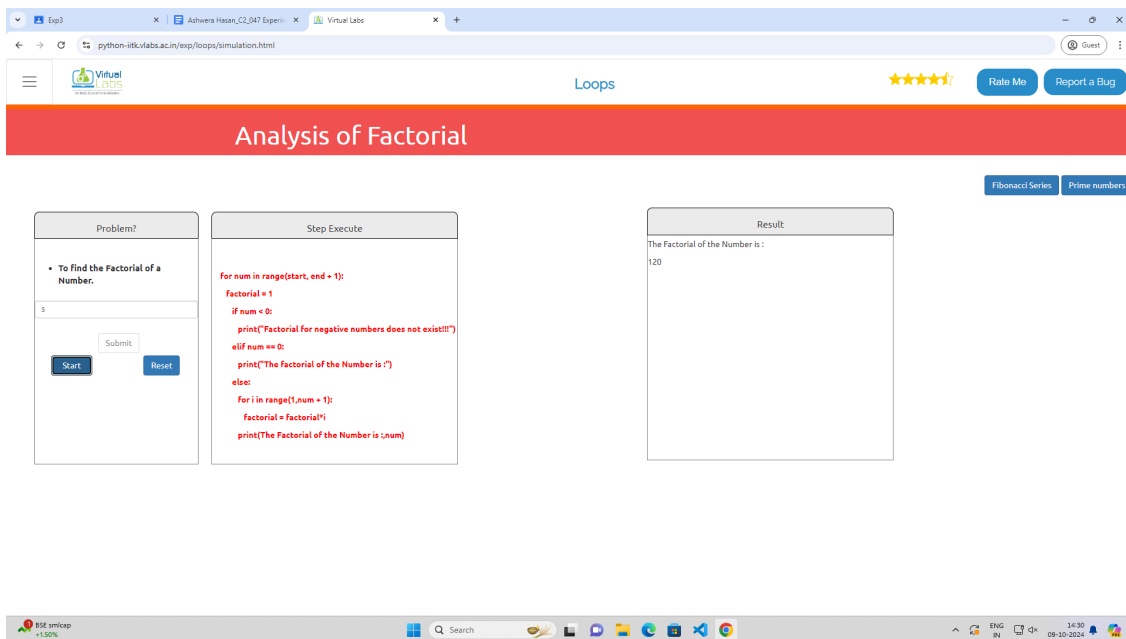
Conclusion:

Recursion in python is a powerful tool that helps with iterations, like in palindrome strings. Recursion can be used anywhere where a loop can be used. A function has a keyword “def”, followed by the function’s name. A function may or may not have a parameter and may or may not return a value.

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

1.



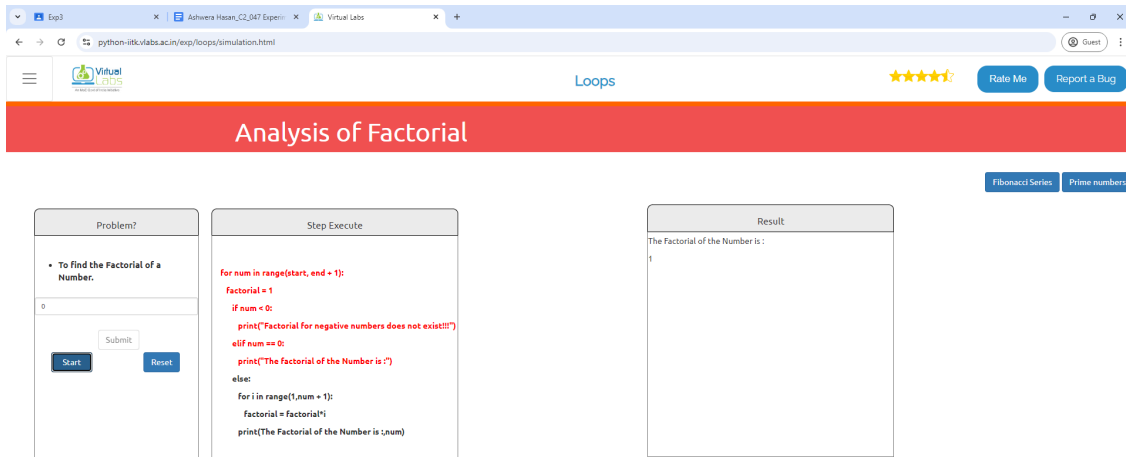
The screenshot shows a web browser window displaying a virtual lab titled "Analysis of Factorial". The interface includes a "Problem?" section with a text input field containing the number "5" and buttons for "Submit", "Start", and "Reset". The "Step Execute" section displays a Python code snippet for calculating the factorial of a number using a loop. The "Result" section shows the output: "The Factorial of the Number is : 120".

```

for num in range(start, end + 1):
    factorial = 1
    if num < 0:
        print("Factorial for negative numbers does not exist!!!")
    elif num == 0:
        print("The Factorial of the Number is 1")
    else:
        for i in range(1, num + 1):
            factorial = factorial * i
        print("The Factorial of the Number is :num)
  
```

The bottom of the screenshot shows a Windows taskbar with various application icons and a system clock indicating 14:30 on 09-10-2024.

K. J. Somaiya College of Engineering, Mumbai-77



Analysis of Factorial

Problem?

To Find the Factorial of a Number.

0

Submit

Start Reset

Step Execute

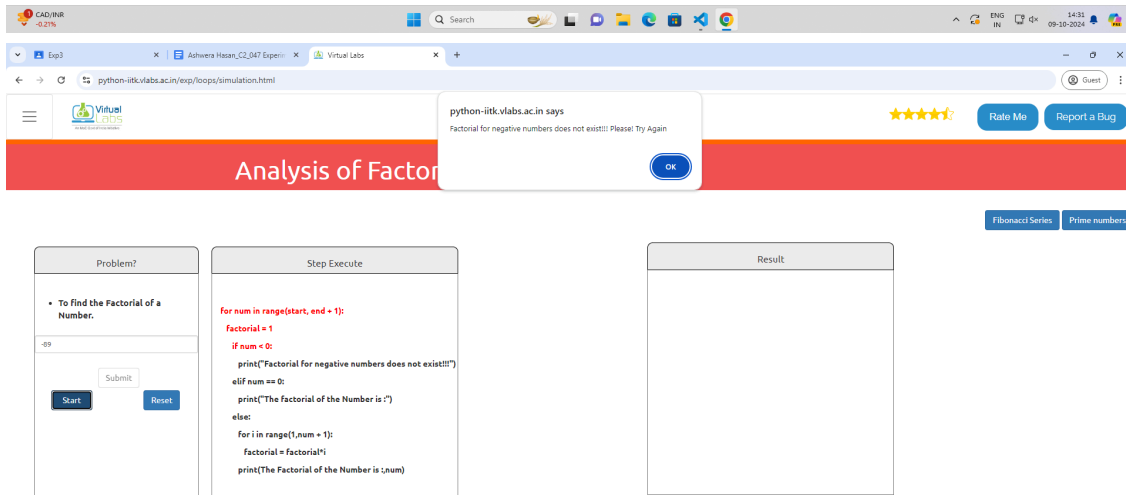
```
for num in range(start, end + 1):
    factorial = 1
    if num < 0:
        print("Factorial for negative numbers does not exist!!!")
    elif num == 0:
        print("The Factorial of the Number is 1")
    else:
        for i in range(1, num + 1):
            factorial = factorial * i
        print("The Factorial of the Number is :num)
```

Result

The Factorial of the Number is :

1

Fibonacci Series Prime numbers



python-iiitk.vlabs.ac.in says
Factorial for negative numbers does not exist!!! Please! Try Again

Analysis of Factorial

Problem?

To Find the Factorial of a Number.

-89

Submit

Start Reset

Step Execute

```
for num in range(start, end + 1):
    factorial = 1
    if num < 0:
        print("Factorial for negative numbers does not exist!!!")
    elif num == 0:
        print("The Factorial of the Number is 1")
    else:
        for i in range(1, num + 1):
            factorial = factorial * i
        print("The Factorial of the Number is :num)
```

Result

Fibonacci Series Prime numbers



2.

K. J. Somaiya College of Engineering, Mumbai-77

Exp3

Ashwera Hasan_C2_047 Exper...

Virtual Labs

python-iiitk.vlabs.ac.in/exp/loops/simulation.html

Guest

Virtual Labs

Loops

★★★★☆

Rate Me

Report a Bug

Analysis of Fibonacci Series

Back

Problem?

To Find the Fibonacci Series.

10

Submit

Start

Reset

Step Execute

```

n1 = 0
n2 = 1
count = 0
if nterms <= 0:
    print("Please enter a positive integer")
elif nterms == 1:
    print("Fibonacci sequence upto",nterms,"")
    print(n1)
else:
    print("Fibonacci sequence upto",nterms,"")
    while count < nterms:

```

Result

Fibonacci sequence upto nterms is :
0,1,1,2,3,5,8,13,21,34

Exp3

Ashwera Hasan_C2_047 Exper...

Virtual Labs

python-iiitk.vlabs.ac.in/exp/loops/simulation.html

Guest

Virtual Labs

Loops

★★★★☆

Rate Me

Report a Bug

Analysis of Fibonacci Series

Back

python-iiitk.vlabs.ac.in says
Please enter a positive integer

OK

Problem?

To Find the Fibonacci Series.

-23

Submit

Start

Reset

Step Execute

```

n1 = 0
n2 = 1
count = 0
if nterms <= 0:
    print("Please enter a positive integer")
elif nterms == 1:
    print("Fibonacci sequence upto",nterms,"")
    print(n1)
else:
    print("Fibonacci sequence upto",nterms,"")
    while count < nterms:

```

Result

NIFTY
+0.42%

Search

ENG IN

14:35
09-10-2024

K. J. Somaiya College of Engineering, Mumbai-77

Exp3

Ashwera Hasan_C2_047 Experim

Virtual Labs

python-itiitk.vlabs.ac.in/exp/loops/simulation.html

Guest

Virtual Labs

Any MATLAB Simulink of Video Initiative

Loops

★★★★★

Rate Me

Report a Bug

Analysis of Fibonacci Series

Back

Problem?

To Find the Fibonacci Series.

1

Submit

Start

Reset

Step Execute

```

n1 = 0
n2 = 1
count = 0
if nterms <= 0:
    print("Please enter a positive integer")
elif nterms == 1:
    print("Fibonacci sequence upto",nterms,"")
    print(n1)
else:
    print("Fibonacci sequence upto",nterms,"")
    while count < nterms:

```

Result

Fibonacci sequence upto nterms is :

0

PreTest:

Exp3

Ashwera Hasan_C2_047 Experim

Virtual Labs

python-itiitk.vlabs.ac.in/exp/loops/pretest.html

Guest

Virtual Labs

Any MATLAB Simulink of Video Initiative

Loops

★★★★★

Rate Me

Report a Bug

Theory

Pretest

Procedure

Simulation

Posttest

References

Feedback

1)What data type does the range() function generate?:

☐ a: int
☐ b: float
☒ c: list
☐ d: String

Which do we access key or the value while looping through a dictionary?

☐ a: key
☐ b: key and value in tuple format
☐ c: key and value in list format
☒ d: value

Which of the following function returns a randomly selected element from range?

☐ a: choice(seq)
☒ b: randrange(start,stop,step)
☐ c: random()
☐ d: seed()

Which of the following keyword is a valid placeholder for body of the function ?

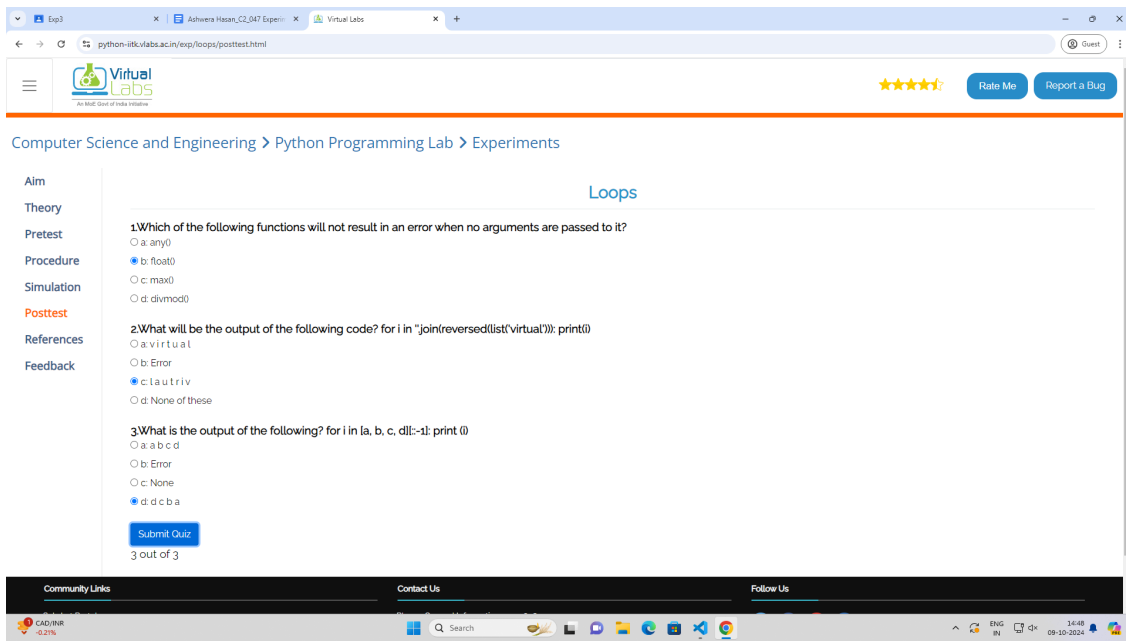
☐ a: continue
☐ b: break
☒ c: pass
☐ d: body

Submit Quiz

4 out of 4

PostTest:

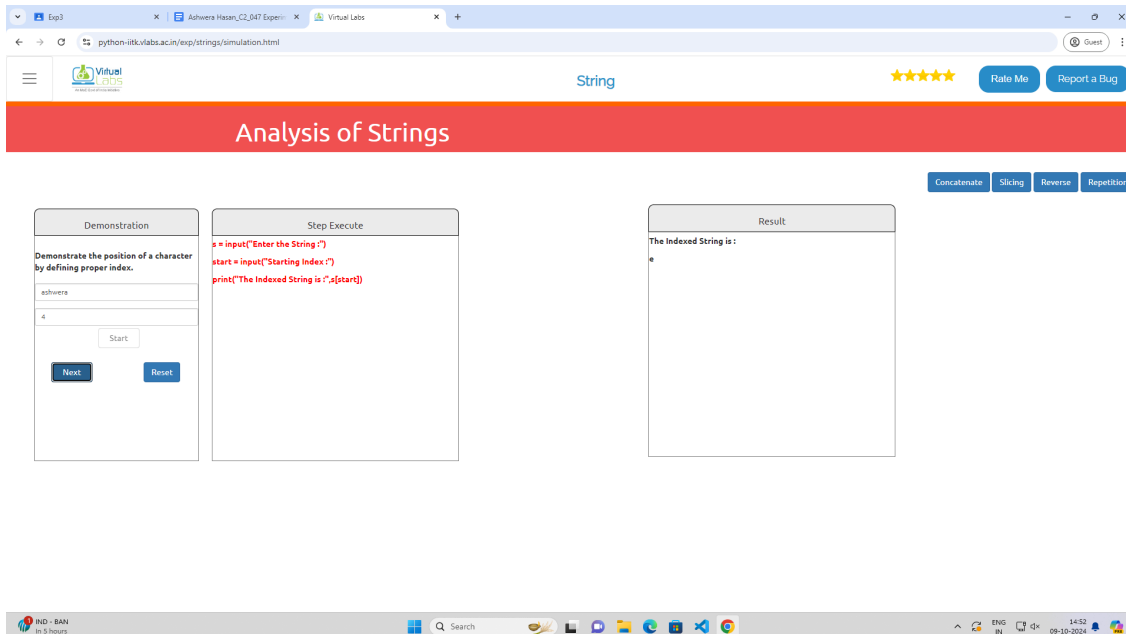
K. J. Somaiya College of Engineering, Mumbai-77



The screenshot shows the Virtual Labs interface for the 'Loops' experiment. The page title is 'python-itsk.vlabs.ac.in/exp/loops/posttest.html'. The interface includes a sidebar with navigation links: Aim, Theory, Pretest, Procedure, Simulation, Posttest (highlighted), References, and Feedback. The main content area displays three multiple-choice questions related to loops. The first question asks which function will not result in an error when no arguments are passed to it, with options a. any(), b. float(), c. max(), and d. divmod(). The second question asks for the output of a code snippet involving list reversal and joining. The third question asks for the output of a loop printing characters in reverse order. A 'Submit Quiz' button is visible at the bottom of the questions. The footer contains 'Community Links', 'Contact Us', and 'Follow Us' sections.

Virtual Lab Exp 2: Strings

1.



The screenshot shows the Virtual Labs interface for the 'String' experiment. The page title is 'python-itsk.vlabs.ac.in/exp/strings/simulation.html'. The interface includes a sidebar with navigation links: Aim, Theory, Pretest, Procedure, Simulation, Posttest, References, and Feedback. The main content area displays a simulation titled 'Analysis of Strings'. It features three panels: 'Demonstration' (showing a character position input), 'Step Execute' (showing Python code for string indexing), and 'Result' (showing the output 'The Indexed String is: e'). Navigation buttons like 'Concatenate', 'Slicing', 'Reverse', and 'Repetition' are visible at the top right of the simulation area. The footer contains 'Community Links', 'Contact Us', and 'Follow Us' sections.

K. J. Somaiya College of Engineering, Mumbai-77

Exp3

Ashwera Hasan_C2_047 Experim

Virtual Labs

python-iiitk.vlabs.ac.in/exp/strings/simulation.html

Guest

Virtual Labs

Virtual Labs

String

★★★★★

Rate Me

Report a Bug

Analysis of Strings

Back

Demonstration

Demonstrate how strings concatenate with each other.

What is your name?

Enter the String(optional)

Start

Next

Reset

Step Execute

```
s = input("Enter the String :")
s1 = input("Enter a String :")
s2 = input("Optional Enter a String :")
print(s + s1)
print(s + s1 + s2)
```

Result

The Concatenated String is :

What is your name?

Exp3

Ashwera Hasan_C2_047 Experim

Virtual Labs

python-iiitk.vlabs.ac.in/exp/strings/simulation.html

Guest

Virtual Labs

Virtual Labs

String

★★★★★

Rate Me

Report a Bug

Analysis of Strings

Back

Demonstration

Demonstrate the working of slicing the strings.

Ashwera Hasan is an engineer

5

9

Start

Next

Reset

Step Execute

```
s = input("Enter the String :")
start = input("Starting Index :")
end = input("Ending Index :")
print(s[start:end])
```

Result

The Sliced String is :

ra H

IND - BAN

in 3 hours

Search

ENG

IN

14:52

09-10-2024

K. J. Somaiya College of Engineering, Mumbai-77

The screenshot displays a web browser window with the URL `python-itkvlabs.ac.in/exp/strings/simulation.html`. The page features a red header with the title "Analysis of Strings" and a "Back" button. Below the header, the interface is divided into three main sections:

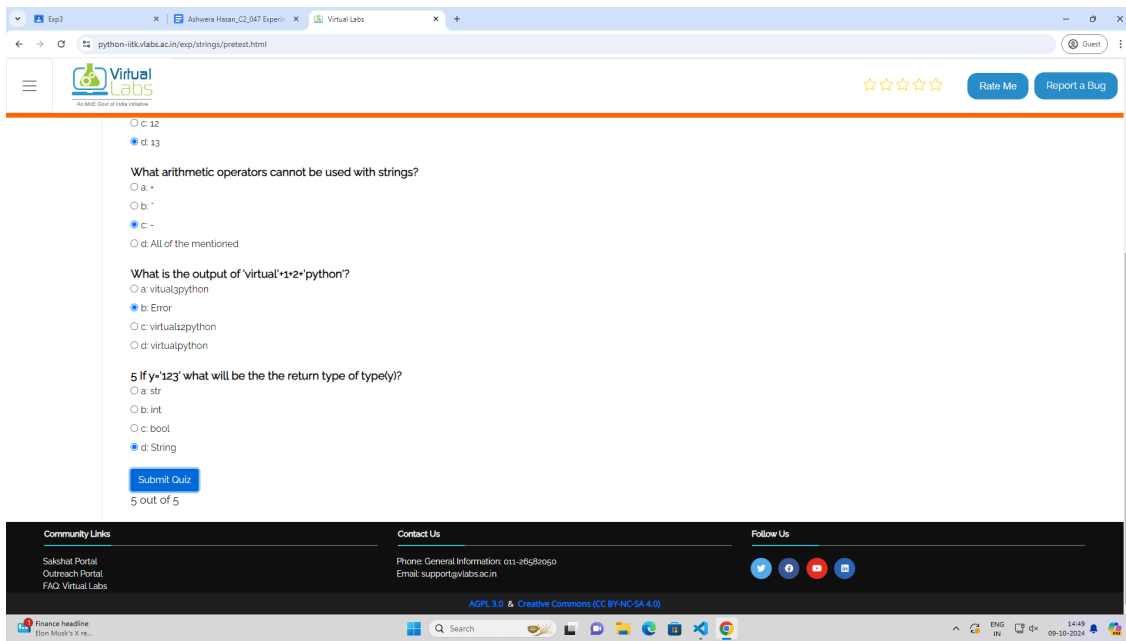
- Demonstration:** This section includes a text input field containing "OnionRings", a numeric input field containing "3", and "Start", "Next", and "Reset" buttons.
- Step Execute:** This section displays the Python code used for string repetition:


```
s = input("Enter the String :)")
n = input("Enter the Integer :)")
print(s*n)
```
- Result:** This section shows the output of the program: "The Repeated String is: OnionRingsOnionRingsOnionRings".

31°C Haze Search ENG IN 14:54 09-10-2024

PreTest

K. J. Somaiya College of Engineering, Mumbai-77



python-itiitk.vlabs.ac.in/exp/strings/pretest.html

Virtual Labs
An IITK Govt of India Initiative

Rate Me Report a Bug

What arithmetic operators cannot be used with strings?

☐ a. +
☐ b. *
☒ c. -
☐ d. All of the mentioned

What is the output of 'virtual'+1+2+'python'?

☐ a. virtualpython
☒ b. Error
☐ c. virtual2python
☐ d. virtualpython

5 If y='123' what will be the return type of type(y)?

☐ a. str
☐ b. int
☐ c. bool
☒ d. String

Submit Quiz

5 out of 5

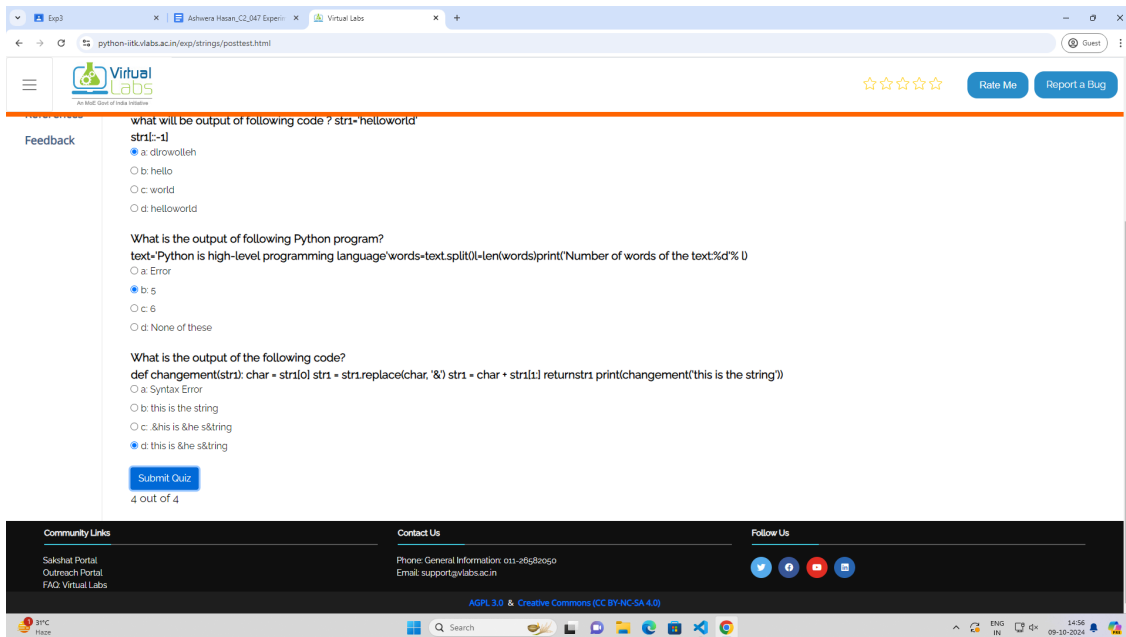
Community Links
Sakshat Portal
Outreach Portal
FAQ Virtual Labs

Contact Us
Phone: General Information 011-26582050
Email: support@vlabs.ac.in

Follow Us

AGPL 3.0 & Creative Commons (CC BY-NC-SA 4.0)

PostTest:



python-itiitk.vlabs.ac.in/exp/strings/posttest.html

Virtual Labs
An IITK Govt of India Initiative

Rate Me Report a Bug

Feedback

what will be output of following code ? str1='helloworld'

str1[-1]

☒ a. drowolleh
☐ b. hello
☐ c. world
☐ d. helloworld

What is the output of following Python program?

text=Python is high-level programming language words=text.split() l=len(words) print('Number of words of the text:%d'% l)

☐ a. Error
☒ b. 5
☐ c. 6
☐ d. None of these

What is the output of the following code?

def changement(str1): char = str1[0] str1 = str1.replace(char, '&') str1 = char + str1[1:] return str1 print(changement('this is the string'))

☐ a. Syntax Error
☐ b. this is the string
☐ c. &this is &he s&tring
☒ d. this is &he s&tring

Submit Quiz

4 out of 4

Community Links
Sakshat Portal
Outreach Portal
FAQ Virtual Labs

Contact Us
Phone: General Information 011-26582050
Email: support@vlabs.ac.in

Follow Us

AGPL 3.0 & Creative Commons (CC BY-NC-SA 4.0)

Department of Department of Science and Humanities