	SHRI SANT GAJANAN MAHARAJ COLLEGE OF ENGG.	**LABORATORY MANUAL**
	PRACTICAL EXPERIMENT INSTRUCTION SHEET	
	EXPERIMENT TITLE: Write a python program to find factorial of a number using Recursion	
EXPERIMENT NO. : **SSGMCE/WI/IT/01/3IT09/01**	ISSUE NO. : 00	ISSUE DATE : 30.07.2023
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LABORATORY : 3IT09 COMPUTER SKILL LAB – I	SEMESTER : III	PAGE: 1 OF 2

1.0) AIM: Write a python program to find factorial of a number using Recursion

2.0) SCOPE: The scope of this Python program is to calculate the factorial of a given positive integer using recursion. It aims to demonstrate the application of recursive functions in solving mathematical problems.

3.0) FACILITIES/ APPARATUS:

1. Python development environment (e.g., IDLE)
2. Input mechanism (keyboard)
3. Computer with Python installed

4.0) THEORY:

Program Description:

1. Function for Factorial (factorial): The program defines a function named factorial(n) that calculates the factorial of a given positive integer n using recursion. Factorial is the product of all positive integers from 1 to n.

2. Recursive Logic: The factorial() function employs recursion to calculate the factorial. The logic can be described as follows:

    - If the input n is equal to 0, the function returns 1 because the factorial of 0 is defined as 1.

    - For any positive integer n, the function recursively calls itself with the argument n - 1 and multiplies the result by n. This process continues until n becomes 0, at which point the recursion stops.

3. User Input: The program takes user input to enter a positive integer for which the factorial needs to be calculated.

4. Input Validation: It checks if the entered number is negative. If the number is negative, it prints a message stating that factorial is not defined for negative numbers.

5. Calculation and Display: If the number is not negative, the program calculates the factorial using the factorial() function and displays the result.

Example:

Consider the following code snippet:

```
def factorial(n):
    if n == 0:
        return 1
    else:
        return n * factorial(n - 1)

num = int(input("Enter a positive integer: "))

if num < 0:
    print("Factorial is not defined for negative numbers.")
elif num == 0:
    print("The factorial of 0 is 1.")
else:
    result = factorial(num)
    print(f"The factorial of {num} is {result}")
```

1. We define a function factorial(n) that calculates the factorial of a number n using recursion.
2. In the factorial() function: If n is equal to 0, we return 1, as the factorial of 0 is defined as 1.

   Otherwise, we recursively calculate the factorial by multiplying n with the factorial of n - 1.
3. We take input from the user to enter a positive integer.

4. We check if the entered number is negative. If it's negative, we print a message indicating that factorial is not defined for negative numbers.

5. If the number is not negative, we calculate the factorial using the factorial() function and display the result.

Program

```
# Function to calculate factorial using recursion
def factorial(n):
    if n == 0:
        return 1
    else:
        return n * factorial(n - 1)

# Input from the user
num = int(input("Enter a positive integer: "))

# Check if the number is negative
if num < 0:
    print("Factorial is not defined for negative numbers.")
elif num == 0:
    print("The factorial of 0 is 1.")
else:
    result = factorial(num)
    print(f"The factorial of {num} is {result}")
```

Output

Example Output:

```
Enter a positive integer: 5
The factorial of 5 is 120
```

In this example, the program calculates the factorial of 5, which is 5 x 4 x 3 x 2 x 1 = 120, using recursion.

This program demonstrates the use of recursion to solve a mathematical problem, finding the factorial of a number.

4.2) Program Execution:

Program Execution Line by Line:

- Lines 1-7: We define a function named factorial(n) to calculate the factorial using recursion. The base case checks if n is 0 and returns 1; otherwise, it multiplies n with the factorial of n - 1.
- Lines 9-14: We take user input to enter a positive integer and store it in the variable num.
- Lines 16-19: We perform input validation by checking if num is negative. If it is negative, we print a message indicating that factorial is not defined for negative numbers.
- Lines 21-24: If num is not negative, we call the factorial() function to calculate the factorial and display the result.

5.0) Conclusion:

In conclusion, this Python program illustrates the use of recursive functions to calculate the factorial of a positive integer. Students can learn about the concept of recursion, base cases, and how recursive functions work. It also emphasizes the importance of input validation in handling user inputs.

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Through this exercise, students can gain a deeper understanding of both mathematical concepts and programming techniques.