Assignment – 01

Question - WAP calculate the factorial of a number using a loop and recursion

Using loop Method -

```python
#WAP for factorial using loop Method

a = int(input("Enter a number: ")) # user Input
f = 1 # factorial
c=0 # counter
for i in range(1,a+1):
    f = f*i
    c=c+1 #To count the number loop "iterations" taken
print("The factorial of",a,"is",f)
print("Number of iterations taken:", C)

```

Output –

```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL

PS C:\Users\aryan\Downloads\attachments> & C:/Users/aryan/AppData/Local/Micr
Enter a number: 36
The factorial of 36 is 371993326789901217467999448150835200000000
No of loop run is:  36
PS C:\Users\aryan\Downloads\attachments> & C:/Users/aryan/AppData/Local/Micr
Enter a number: 10
The factorial of 10 is 3628800
No of loop run is:  10
PS C:\Users\aryan\Downloads\attachments>
```

Using Recursion Method –

```python
# WAP to find the Factorial using Recursions method

C= 0 # counter
def F(n):
    global C
    if n == 0:
        return 1
    else:
        C = C + 1
        return n * F(n-1)

a = int(input("Enter a number: ")) # User Input
print("The Factorial of", a, "is", F(a))
print("Number of recursions taken:", C) # No of Recursions taken

```

Output –

```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL

PS C:\Users\aryan\Downloads\attachments> & C:/Users/aryan/AppDat
Enter a number: 25
The Factorial of 25 is 15511210043330985984000000
Number of recursions taken: 25
PS C:\Users\aryan\Downloads\attachments> & C:/Users/aryan/AppDat
Enter a number: 9
The Factorial of 9 is 362880
Number of recursions taken: 9
PS C:\Users\aryan\Downloads\attachments>
```

Analysis

- Time Complexity –

Loop method – O(n)

Recursion Method – O(n)

- Space Complexity –

Loop method – O(1)

Recursion Method – O(n)

Both programmes are simple to understand, and both cases' time complexity is the same. Function calls have less overhead therefore, the loop method can be quicker. The recursion approach, on the other hand, is more effective because it does not require looping or multiple function calls. While the in-loop method has a constant space complexity, recursion has a linear space complexity.

Recursion method is better than loop method