3.Write C programs that demonstrate the mathematical analysis of non-recursive and recursive algorithms.

Program:

```
import time
def linear_search(arr, target):
    for i in range(len(arr)):
        if arr[i] == target:
            return i
    return -1
def
analyze_linear_search_time_complexity(input_s
ize):
    start_time = time.time()
    data = list(range(input_size))
    target = input_size - 1
    linear_search(data, target)
    end_time = time.time()
    execution_time = end_time - start_time
    return execution_time
input_sizes = [1000, 2000, 3000]
print("Non-recursive algorithm: Linear Search")
for size in input_sizes:
    linear_search_time =
analyze_linear_search_time_complexity(size)
    print(f"Input size: {size}")
```

```
    print(f"Linear search time:
{linear_search_time} seconds")
    print()
    Program:
    import time
    def factorial(n):
        if n == 0:
            return 1
        return n * factorial(n-1)
    def
analyze_factorial_time_complexity(input_size):
        start_time = time.time()
        factorial(input_size)
        end_time = time.time()
        execution_time = end_time - start_time
        return execution_time
    input_sizes = [100, 200, 300]

    print("Recursive algorithm: Factorial
Calculation")
    for size in input_sizes:
        factorial_time =
analyze_factorial_time_complexity(size)

        print(f"Input size: {size}")
        print(f"Factorial calculation time:
{factorial_time} seconds")
```

print()

Output:

```
C:\Users\srika\Desktop\CSA0863\pythonProject\.venv\Scripts\python.exe C:\Users\srika\Desktop\CSA0863\pythonProject\problem.py
Non-recursive algorithm: Linear Search
Input size: 1000
Linear search time: 0.0 seconds

Input size: 2000
Linear search time: 0.0 seconds

Input size: 3000
Linear search time: 0.001043558120727539 seconds
```

Output:

```
C:\Users\srika\Desktop\CSA0863\pythonProject\.venv\Scripts\python.exe C:\Users\srika\Desktop\CSA0863\pythonProject\problem.py
Recursive algorithm: Factorial Calculation
Input size: 100
Factorial calculation time: 0.0 seconds

Input size: 200
Factorial calculation time: 0.0 seconds

Input size: 300
Factorial calculation time: 0.0 seconds
```

Time complexity:O(n)