

# AI Assisted Coding

## LAB 1

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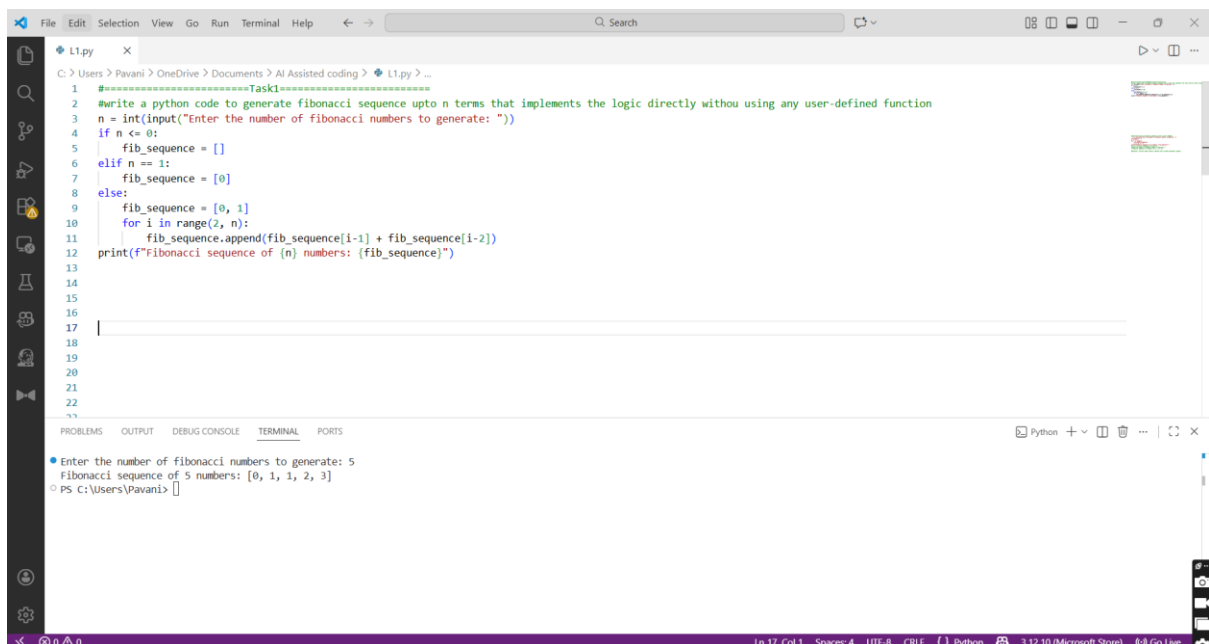
B-27

### Task 1: AI-Generated Logic Without Modularization (Fibonacci Sequence Without Functions)

#### PROMPT:

write a python code to generate fibonacci sequence upto n terms that implements the logic directly without using any user-defined function

#### CODE WITH OUTPUT:



```
1 #=====Task1=====
2 #write a python code to generate fibonacci sequence upto n terms that implements the logic directly without using any user-defined function
3 n = int(input("Enter the number of fibonacci numbers to generate: "))
4 if n <= 0:
5     fib_sequence = []
6 elif n == 1:
7     fib_sequence = [0]
8 else:
9     fib_sequence = [0, 1]
10    for i in range(2, n):
11        fib_sequence.append(fib_sequence[i-1] + fib_sequence[i-2])
12    print(f"Fibonacci sequence of {n} numbers: {fib_sequence}")
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```

Enter the number of fibonacci numbers to generate: 5  
Fibonacci sequence of 5 numbers: [0, 1, 1, 2, 3]  
PS C:\Users\Pavani>

#### EXPLANATION:

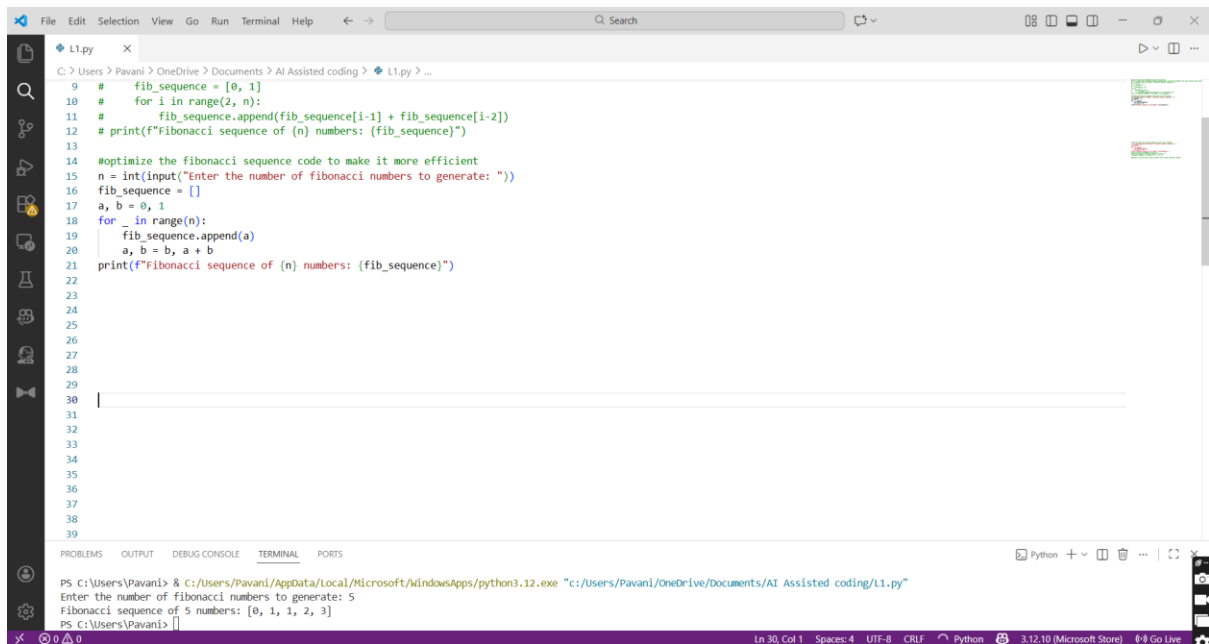
GitHub Copilot generated a Python program to print the Fibonacci sequence by directly writing logic in the main code without using functions. The program takes user input for the number of terms and uses a loop to compute each Fibonacci number. The output correctly displays the Fibonacci sequence, demonstrating procedural coding with AI assistance.

## Task 2: AI Code Optimization & Cleanup (Improving Efficiency)

### PROMPT:

optimize the fibonacci sequence code to make it more efficient

### CODE WITH OUTPUT



The screenshot shows a Python IDE with a file named `L1.py`. The code implements an optimized Fibonacci sequence generator. It starts with a list `fib_sequence = [0, 1]` and a loop that appends the sum of the last two elements. The code is then optimized to use only two variables, `a` and `b`, to generate the sequence iteratively. The output shows the Fibonacci sequence for the input 5: `[0, 1, 1, 2, 3]`.

```
9 # fib_sequence = [0, 1]
10 # for i in range(2, n):
11 #     fib_sequence.append(fib_sequence[i-1] + fib_sequence[i-2])
12 # print(f"Fibonacci sequence of {n} numbers: {fib_sequence}")
13
14 #optimize the fibonacci sequence code to make it more efficient
15 n = int(input("Enter the number of fibonacci numbers to generate: "))
16 fib_sequence = []
17 a, b = 0, 1
18 for i in range(n):
19     fib_sequence.append(a)
20     a, b = b, a + b
21 print(f"Fibonacci sequence of {n} numbers: {fib_sequence}")
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```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

```
PS C:\Users\Pavani> & C:\Users\Pavani\AppData\Local\Microsoft\WindowsApps\python3.12.exe "c:\Users\Pavani\OneDrive\Documents\AI Assisted coding\L1.py"
Enter the number of fibonacci numbers to generate: 5
Fibonacci sequence of 5 numbers: [0, 1, 1, 2, 3]
PS C:\Users\Pavani>
```

### Explanation:

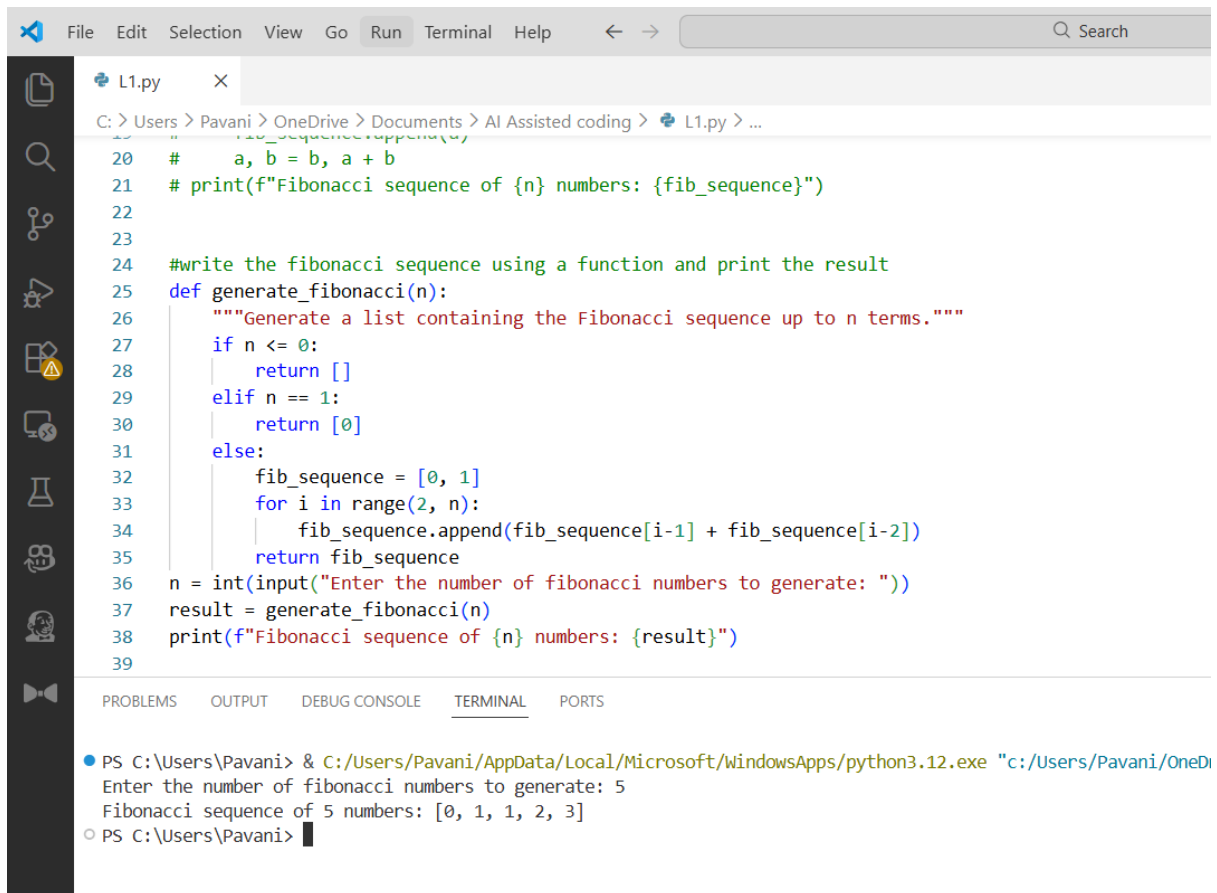
In task2 the initially generated Fibonacci code was optimized to improve efficiency and readability. Redundant variables were removed, and the logic was simplified by using only two variables to generate the sequence iteratively. This reduced unnecessary computations and made the code easier to understand. The optimized program correctly outputs the Fibonacci sequence for the given input.

## Task 3: Modular Design Using AI Assistance (Fibonacci Using Functions)

### PROMPT:

write the fibonacci sequence using a function and print the result

### CODE WITH OUTPUT:



```
File Edit Selection View Go Run Terminal Help
L1.py
C: > Users > Pavani > OneDrive > Documents > AI Assisted coding > L1.py > ...
20 # a, b = b, a + b
21 # print(f"Fibonacci sequence of {n} numbers: {fib_sequence}")
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24 #write the fibonacci sequence using a function and print the result
25 def generate_fibonacci(n):
26     """Generate a list containing the Fibonacci sequence up to n terms."""
27     if n <= 0:
28         return []
29     elif n == 1:
30         return [0]
31     else:
32         fib_sequence = [0, 1]
33         for i in range(2, n):
34             fib_sequence.append(fib_sequence[i-1] + fib_sequence[i-2])
35         return fib_sequence
36 n = int(input("Enter the number of fibonacci numbers to generate: "))
37 result = generate_fibonacci(n)
38 print(f"Fibonacci sequence of {n} numbers: {result}")
39

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS
PS C:\Users\Pavani> & C:/Users/Pavani/AppData/Local/Microsoft/WindowsApps/python3.12.exe "c:/Users/Pavani/OneD
Enter the number of fibonacci numbers to generate: 5
Fibonacci sequence of 5 numbers: [0, 1, 1, 2, 3]
PS C:\Users\Pavani>
```

## EXPLANATION:

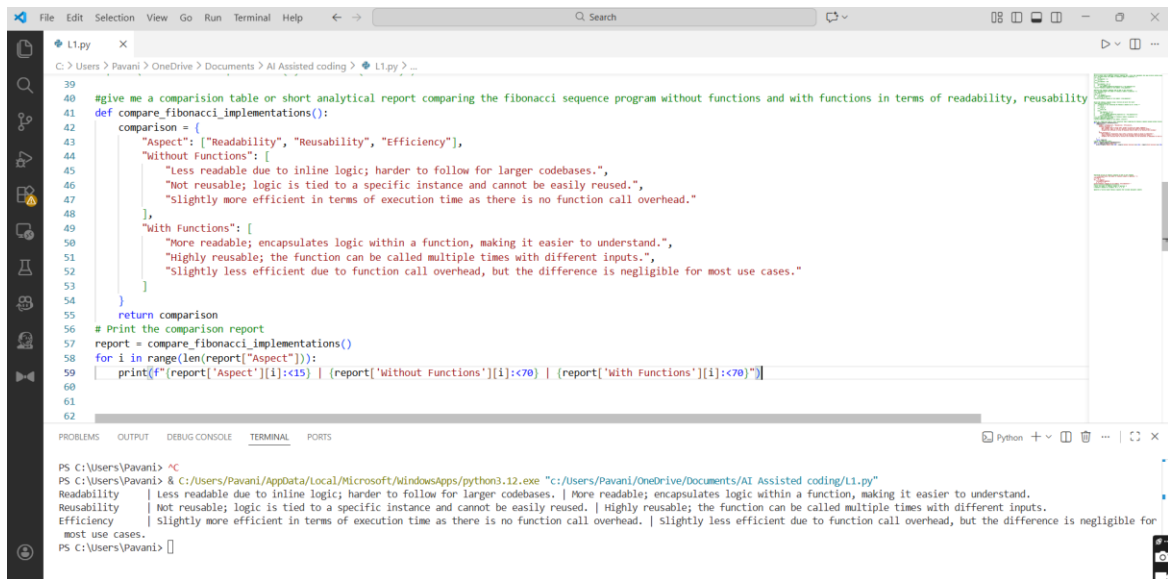
In task 3 GitHub Copilot was used to generate a modular Python program for the Fibonacci sequence using a user-defined function. The Fibonacci logic is encapsulated inside a function, improving code reusability and clarity. The function returns the sequence up to n terms, which is then printed in the main program. This modular approach makes the code easier to test, debug, and reuse in larger applications.

## Task 4: Comparative Analysis – Procedural vs Modular Fibonacci Code

### PROMPT:

give me a comparison table or short analytical report comparing the fibonacci sequence program without functions and with functions in terms of readability, reusability, and efficiency.

### CODE WITH OUTPUT:



The screenshot shows a VS Code editor window with a file named `L1.py`. The code is a Python script that compares the readability, reusability, and efficiency of the Fibonacci sequence implemented without functions versus with functions. The script defines a function `compare_fibonacci_implementations()` that returns a dictionary with these comparisons. The terminal output shows the execution of the script, displaying the comparison results in a table format.

```
39
40 #give me a comparison table or short analytical report comparing the fibonacci sequence program without functions and with functions in terms of readability, reusability
41 def compare_fibonacci_implementations():
42     comparison = {
43         "Aspect": ["Readability", "Reusability", "Efficiency"],
44         "Without Functions": [
45             "Less readable due to inline logic; harder to follow for larger codebases.",
46             "Not reusable; logic is tied to a specific instance and cannot be easily reused.",
47             "Slightly more efficient in terms of execution time as there is no function call overhead."
48         ],
49         "With Functions": [
50             "More readable; encapsulates logic within a function, making it easier to understand.",
51             "Highly reusable; the function can be called multiple times with different inputs.",
52             "Slightly less efficient due to function call overhead, but the difference is negligible for most use cases."
53         ]
54     }
55     return comparison
56 # Print the comparison report
57 report = compare_fibonacci_implementations()
58 for i in range(len(report["Aspect"])):
59     print(f'{report["Aspect"][i]:<15} | {report["Without Functions"][i]:<70} | {report["With Functions"][i]:<70}')
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

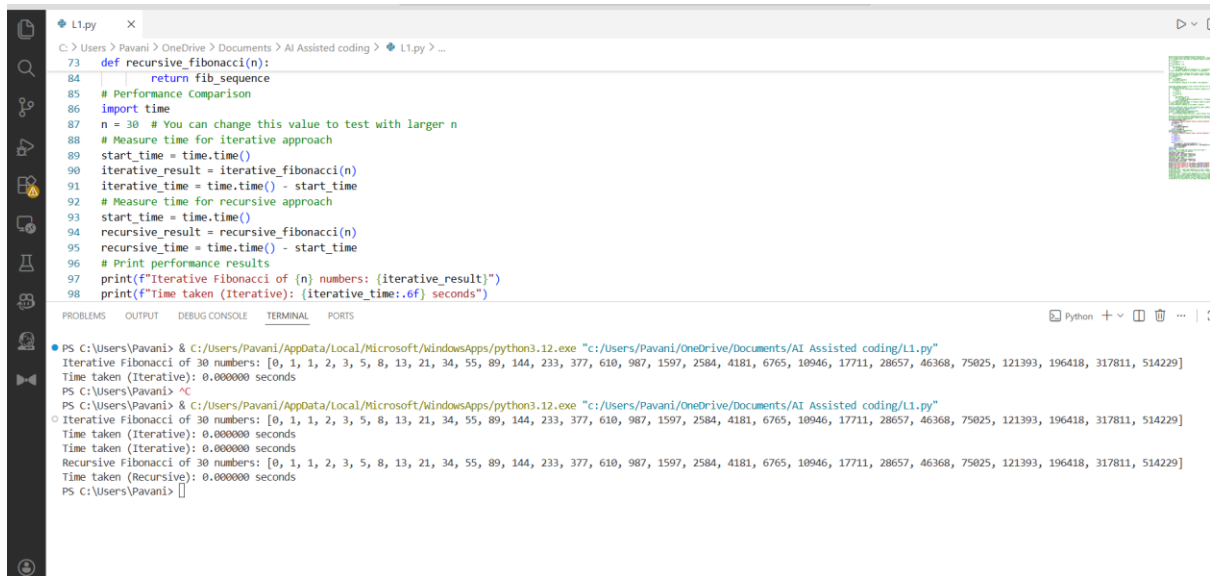
```
PS C:\Users\Pavani> ^C
PS C:\Users\Pavani> & C:/Users/Pavani/AppData/Local/Microsoft/WindowsApps/python3.12.exe "c:/Users/Pavani/OneDrive/Documents/AI Assisted coding/L1.py"
Readability | Less readable due to inline logic; harder to follow for larger codebases. | More readable; encapsulates logic within a function, making it easier to understand.
Reusability | Not reusable; logic is tied to a specific instance and cannot be easily reused. | Highly reusable; the function can be called multiple times with different inputs.
Efficiency  | Slightly more efficient in terms of execution time as there is no function call overhead. | Slightly less efficient due to function call overhead, but the difference is negligible for
most use cases.
PS C:\Users\Pavani> []
```

## EXPLANATION:

In task 4 a comparison was made between the Fibonacci program written without functions and the function-based implementation. The non-modular version is simpler but harder to read and reuse in larger codebases. The function-based version improves readability, reusability, and maintainability by encapsulating logic. This comparison shows that modular code is more suitable for debugging and large-scale applications.

## Task 5: AI-Generated Iterative vs Recursive Fibonacci Approaches (Different Algorithmic Approaches for Fibonacci Series)

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File Edit Selection View Go Run Terminal Help Search
C:\Users\Pavani> OneDrive> Documents> AI Assisted coding> L1.py
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61 #generate an iterative fibonacci implementation and a recursive fibonacci implementation and compare their performance
62 #in terms of time complexity and space complexity and performance for large values of n and explain when recursion is avoided with comments.
63 # Iterative Fibonacci Implementation
64 def iterative_fibonacci(n):
65     """Generate Fibonacci sequence using an iterative approach."""
66     fib_sequence = []
67     a, b = 0, 1
68     for _ in range(n):
69         fib_sequence.append(a)
70         a, b = b, a + b
71     return fib_sequence
72 # Recursive Fibonacci Implementation
73 def recursive_fibonacci(n):
74     """Generate Fibonacci sequence using a recursive approach."""
75     if n <= 0:
76         return []
77     elif n == 1:
78         return [0]
79     elif n == 2:
80         return [0, 1]
81     else:
82         fib_sequence = recursive_fibonacci(n - 1)
83         fib_sequence.append(fib_sequence[-1] + fib_sequence[-2])
84     return fib_sequence
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```
73 def recursive_fibonacci(n):
74     return fib_sequence
75
76 # Performance Comparison
77 import time
78 n = 30 # You can change this value to test with larger n
79 # Measure time for iterative approach
80 start_time = time.time()
81 iterative_result = iterative_fibonacci(n)
82 iterative_time = time.time() - start_time
83 # Measure time for recursive approach
84 start_time = time.time()
85 recursive_result = recursive_fibonacci(n)
86 recursive_time = time.time() - start_time
87 # Print performance results
88 print(f"Iterative Fibonacci of {n} numbers: {iterative_result}")
89 print(f"Time taken (Iterative): {iterative_time:.6f} seconds")
```

```
PS C:\Users\Pavani> & C:/Users/Pavani/AppData/Local/Microsoft/WindowsApps/python3.12.exe "C:/Users/Pavani/OneDrive/Documents/AI Assisted coding/L1.py"
Iterative Fibonacci of 30 numbers: [0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233, 377, 610, 987, 1597, 2584, 4181, 6765, 10946, 17711, 28657, 46368, 75025, 121393, 196418, 317811, 514229]
Time taken (Iterative): 0.000000 seconds
PS C:\Users\Pavani> ^C
PS C:\Users\Pavani> & C:/Users/Pavani/AppData/Local/Microsoft/WindowsApps/python3.12.exe "C:/Users/Pavani/OneDrive/Documents/AI Assisted coding/L1.py"
Iterative Fibonacci of 30 numbers: [0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233, 377, 610, 987, 1597, 2584, 4181, 6765, 10946, 17711, 28657, 46368, 75025, 121393, 196418, 317811, 514229]
Time taken (Iterative): 0.000000 seconds
Recursive Fibonacci of 30 numbers: [0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233, 377, 610, 987, 1597, 2584, 4181, 6765, 10946, 17711, 28657, 46368, 75025, 121393, 196418, 317811, 514229]
Time taken (Recursive): 0.000000 seconds
PS C:\Users\Pavani>
```

## EXPLANATION:

In task 5 GitHub Copilot generated both iterative and recursive implementations of the Fibonacci sequence. The iterative approach uses loops and is efficient in terms of time and memory, making it suitable for large values of  $n$ . The recursive approach follows a self-calling function pattern which is simpler conceptually but consumes more time and stack memory. This comparison shows that recursion should be avoided for large inputs due to performance and space limitations.