

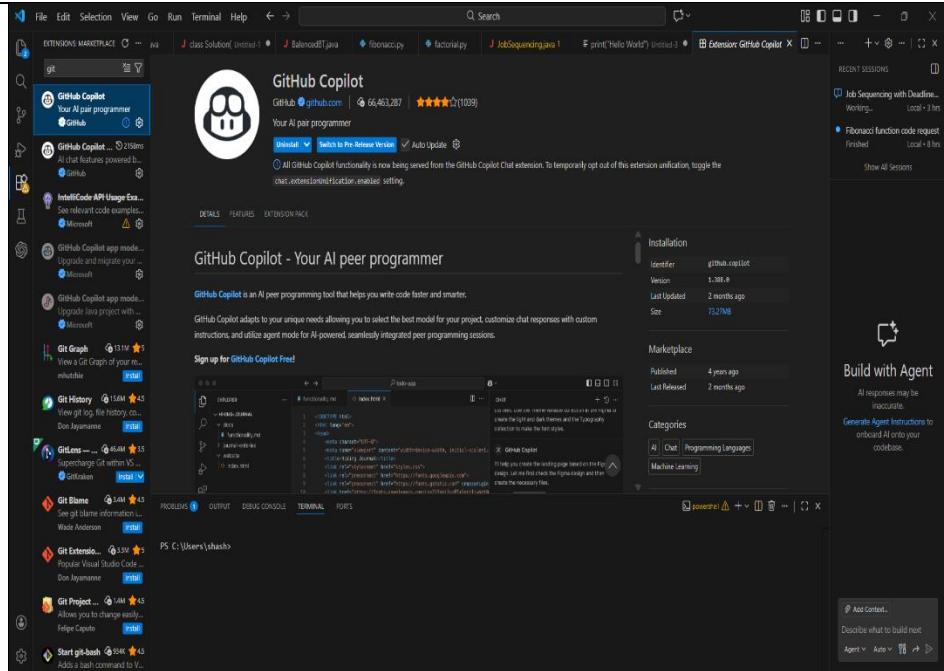
## ASSIGNMENT-1.4

Ht no:2303A51556

SCHOOL OF COMPUTER SCIENCE AND ARTIFICIAL INTELLIGENCE		DEPARTMENT OF COMPUTER SCIENCE ENGINEERING	
Program Name:	B. Tech	Assignment Type:	Lab
Course Coordinator Name	Dr. Rishabh Mittal		
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CourseCode	23CS002PC304	Course Title	AI Assisted Coding
Year/Sem	III/II	Regulation	R23
Date and Day of Assignment	Week1 – Thursday	Time(s)	23CSBTB01 To 23CSBTB52
Duration	2 Hours	Applicable to Batches	All batches
<b>Assignment Number:1.3(Present assignment number)/24(Total number of assignments)</b>			

Q.No.	Question	Expected Time to complete
1	Lab 1: Environment Setup – GitHub Copilot and VS Code Integration + Understanding AI-assisted Coding Workflow	Week1 - Monday

	<p><b>Lab Objectives:</b></p> <ul style="list-style-type: none"><li>● To install and configure GitHub Copilot in Visual Studio Code.</li><li>● To explore AI-assisted code generation using GitHub Copilot.</li><li>● To analyze the accuracy and effectiveness of Copilot's code suggestions.</li><li>● To understand prompt-based programming using comments and code context</li></ul> <p><b>Lab Outcomes (LOs):</b></p> <p>After completing this lab, students will be able to:</p> <ul style="list-style-type: none"><li>● Set up GitHub Copilot in VS Code successfully.</li><li>● Use inline comments and context to generate code with Copilot.</li><li>● Evaluate AI-generated code for correctness and readability.</li><li>● Compare code suggestions based on different prompts and programming styles.</li></ul> <p><b>Task 0</b></p> <ul style="list-style-type: none"><li>● Install and configure GitHub Copilot in VS Code. Take screenshots of each step.</li></ul> <p><b>Expected Output</b></p> <ul style="list-style-type: none"><li>● Install and configure GitHub Copilot in VS Code. Take screenshots of each step.</li></ul>	
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## Task 1: AI-Generated Logic Without Modularization (Prime Number Check Without Functions)

### ❖ Scenario

- You are developing a **basic validation script** for a numerical learning application.

### ❖ Task Description

Use GitHub Copilot to generate a Python program that:

- Checks whether a given number is **prime**
- Accepts user input
- Implements logic **directly in the main code**
- Does **not** use any user-defined functions

### ❖ Expected Output

- Correct prime / non-prime result
- Screenshots showing Copilot-generated code suggestions
- Sample inputs and outputs

The screenshot shows a VS Code interface with the following details:

- File Explorer (Left):** Shows a sidebar with various options like "Open Folder", "Clone Repository", and "Create Java Project".
- Code Editor (Top):** Displays a Python script named `task 2.py` containing code to check if a number is prime.
- Terminal (Bottom):** Shows the script being run in a terminal window. It prompts for a number, checks it, and prints "Prime" or "Not Prime".
- Bottom Navigation:** Includes tabs for PROBLEMS, OUTPUT, DEBUG CONSOLE, TERMINAL (which is selected), and PORTS.

```

C:\> java saves > task 2.py > ...
1 # Import necessary modules (none needed here)
2 number = int(input("Enter a number: "))
3
4 # Check if number is less than 2 (not prime)
5 if number < 2:
6     print("Not Prime")
7 else:
8     is_prime = True # Assume it's prime initially
9
10 # Check divisibility from 2 to number-1
11 for i in range(2, number):
12     if number % i == 0:
13         is_prime = False # Found a divisor, not prime
14         break # Early exit if divisor found
15
16 # Output result
17 if is_prime:
18     print("Prime")
19 else:
20     print("Not Prime")

```

```

PS C:\java saves> & 'c:\Users\shash\anaconda3\envs\Shashidhar\python.exe' 'c:\Users\shash\.vscode\extensions\ms-python.debugpy-2025.18
ed\libs\debugpy\launcher' '54755' '--' 'c:\java saves\task 2.py'
Enter a number: 7
Prime
PS C:\java saves> ^C
PS C:\java saves>
PS C:\java saves> c; cd 'c:\java saves'; & 'c:\Users\shash\anaconda3\envs\Shashidhar\python.exe' 'c:\Users\shash\.vscode\extensions\m
025.18.0-win32-x64\libs\debugpy\launcher' '54816' '--' 'c:\java saves\task 2.py'
Enter a number: 10
Not Prime
PS C:\java saves>

```

## Task 2: Efficiency & Logic Optimization (Cleanup)

### ❖ Scenario

The script must handle larger input values efficiently.

### ❖ Task Description

Review the Copilot-generated code from Task 1 and improve it by:

- Reducing unnecessary iterations
- Optimizing the loop range (e.g., early termination)
- Improving readability
- Use Copilot prompts like:
  - *"Optimize prime number checking logic"*
  - *"Improve efficiency of this code"*

Hint:

Prompt Copilot with phrases like

*"optimize this code"*, *"simplify logic"*, or *"make it more readable"*

### ❖ Expected Output

- Original and optimized code versions
- Explanation of how the improvements reduce time complexity

```

 1 import math # For sqrt function
 2
 3 number = int(input("Enter a number: "))
 4
 5 if number < 2:
 6     print("Not Prime")
 7 else:
 8     is_prime = True
 9
10     # Optimized: Check divisors only up to sqrt(number)
11     for i in range(2, int(math.sqrt(number)) + 1):
12         if number % i == 0:
13             is_prime = False
14             break
15
16         if is_prime:
17             print("Prime")
18         else:
19             print("Not Prime")

```

The screenshot shows a code editor interface with multiple tabs at the top. The active tab contains the Python code for prime number checking. The code uses a for loop to iterate from 2 to the square root of the input number (inclusive). It checks if the number is divisible by any integer in this range. If it finds a divisor, it sets the `is_prime` flag to `False` and breaks out of the loop. If no divisors are found, it prints "Prime". Otherwise, it prints "Not Prime".

### Task 3: Modular Design Using AI Assistance (Prime Number Check Using Functions)

#### ❖ Scenario

The prime-checking logic will be reused across multiple modules.

#### ❖ Task Description

Use GitHub Copilot to generate a function-based Python program that:

- Uses a user-defined function to check primality
- Returns a Boolean value
- Includes meaningful comments (AI-assisted)

#### ❖ Expected Output

- Correctly working prime-checking function
- Screenshots documenting Copilot's function generation
- Sample test cases and outputs

The screenshot shows a code editor interface with a dark theme. At the top, there are several tabs: DArray.java, class Solution (Untitled-1), BalancedBT.java, fibonacci.py, factorial.py, and JobSeq. The main area contains the following Python code:

```

C:\> java saves > task2.py > ...
1 import math
2
3 # Function to check if a number is prime using optimized logic
4 def is_prime(n):
5     """
6         Checks if n is a prime number.
7         Returns True if prime, False otherwise.
8         Optimized by checking divisors up to sqrt(n).
9     """
10    if n < 2:
11        return False # Numbers less than 2 are not prime
12
13    # Check for divisibility up to square root of n
14    for i in range(2, int(math.sqrt(n)) + 1):
15        if n % i == 0:
16            return False # Found a divisor
17
18    return True # No divisors found, it's prime
19
20 # Main program
21 if __name__ == "__main__":
22     number = int(input("Enter a number: "))
23     if is_prime(number):
24         print(f"{number} is Prime")
25     else:
26         print(f"{number} is Not Prime")

```

Below the code editor is a terminal window with the following output:

```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

025.18.0-win32-x64\bundled\libs\debugpy\launcher' '57954' '--' 'c:\java saves\task 2.py'
Enter a number: 7
7 is Prime
PS C:\java saves> 10
10
PS C:\java saves> ^C
PS C:\java saves>
PS C:\java saves> cd 'c:\java saves'; & 'c:\Users\shash\anaconda3\envs\Shashidhar\python.exe'
025.18.0-win32-x64\bundled\libs\debugpy\launcher' '54522' '--' 'c:\java saves\task 2.py'
Enter a number: 10
10 is Not Prime
PS C:\java saves>

```

#### Task 4: Comparative Analysis –With vs Without Functions

##### ❖ Scenario

You are participating in a technical review discussion.

##### ❖ Task Description

Compare the Copilot-generated programs:

- Without functions (Task 1)
- With functions (Task 3)
- Analyze them based on:
  - Code clarity
  - Reusability
  - Debugging ease
  - Suitability for large-scale applications

##### ❖ Expected Output

Comparison table or short analytical report

The screenshot shows a terminal window with the following content:

```
C:\ > java saves > task 2.py > ...
1 import math
2 import time # For timing execution to empirically compare efficiency
3
4 # === TASK 1 APPROACH: INLINE LOGIC (NO FUNCTIONS) ===
5 # This is the non-modular version: All logic in main block.
6 # Pros: Simple for one-off scripts. Cons: Hard to reuse/debug.
7 def run_inline_prime_check():
8     print("\n--- Task 1: Inline Logic (No Functions) ---")
9     number = int(input("Enter a number for inline check: "))
10
11     start_time = time.time()
12
13     if number < 2:
14         print("Not Prime")
15     else:
16         is_prime = True
17         # Basic loop: Checks up to sqrt(n) for efficiency (as optimized in Task 2)
18         for i in range(2, int(math.sqrt(number)) + 1):
19             if number % i == 0:
20                 is_prime = False
21                 break
22             if is_prime:
23                 print("Prime")
24             else:
25                 print("Not Prime")
26
27     end_time = time.time()
28     print(f"Execution time: {end_time - start_time:.6f} seconds")
29
30 # === TASK 3 APPROACH: MODULAR WITH FUNCTIONS ===
31 # This is the reusable version: logic encapsulated in a function.
32 # Pros: Reusable, easier to test/debug. Cons: Slight overhead for tiny scripts.
```

Below the code, there is a navigation bar with tabs: PROBLEMS, OUTPUT, DEBUG CONSOLE, TERMINAL (which is underlined), and PORTS.

```
PS C:\java saves> ^C
PS C:\java saves>
PS C:\java saves> c;; cd 'c:\java saves'; & 'c:\Users\shash\anaconda3\envs\Shashidhar\python.exe' '025.18.0-win32-x64\bundled\libs\debugpy\launcher' '64514' '--' 'c:\java saves\task 2.py'
Task 4: Comparative Analysis Runner
Running both approaches... (Enter same number for fair comparison)

--- Task 1: Inline Logic (No Functions) ---
Enter a number for inline check: 997
Prime
Execution time: 0.000000 seconds
```

The screenshot shows a terminal window with several tabs at the top: DArray.java, Solution (Untitled-1), BalencedBT.java, fibonacci.py, factorial.py, and JobSequence. The main area displays a Python script named task 2.py. The code defines a function `is_prime_modular` that checks if a number is prime by testing divisibility up to the square root of n. It also includes a `run_modular_prime_check` function that prompts the user for a number, performs the check, and prints the result along with the execution time.

```
C:\> java saves > task 2.py > ...
30  # === TASK 3 APPROACH: MODULAR WITH FUNCTIONS ===
31  # This is the reusable version: Logic encapsulated in a function.
32  # Pros: Reusable, easier to test/debug. Cons: Slight overhead for tiny scripts.
33  def is_prime_modular(n):
34      """
35          Checks if n is a prime number.
36          Returns True if prime, False otherwise.
37          Optimized by checking divisors up to sqrt(n).
38      """
39      if n < 2:
40          return False
41      for i in range(2, int(math.sqrt(n)) + 1):
42          if n % i == 0:
43              return False
44      return True
45
46 def run_modular_prime_check():
47     print("\n--- Task 3: Modular with Functions ---")
48     number = int(input("Enter a number for modular check: "))
49
50     start_time = time.time()
51
52     result = is_prime_modular(number)
53     if result:
54         print("Prime")
55     else:
56         print("Not Prime")
57
58     end_time = time.time()
59     print(f"Execution time: {end_time - start_time:.6f} seconds")
60

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

--- Task 1: Inline Logic (No Functions) ---
Enter a number for inline check: 997
Prime
Execution time: 0.000000 seconds

--- Task 3: Modular with Functions ---
Enter a number for modular check: 997
Prime
Execution time: 0.000000 seconds
```

The screenshot shows a terminal window with the following content:

```

Run Terminal Help ← → Search
Array.java J class Solution( Untitled-1 ● J BalencedBT.java fibonaci.py factorial.py J Job
C:\> java saves > task 2.py > ...
46 def run_modular_prime_check():
52     result = is_prime_modular(number)
53     if result:
54         print("Prime")
55     else:
56         print("Not Prime")
57
58     end_time = time.time()
59     print(f"Execution time: {end_time - start_time:.6f} seconds")
60
61 # === MAIN RUNNER: Executes both for comparison ===
62 if __name__ == "__main__":
63     print("Task 4: Comparative Analysis Runner")
64     print("Running both approaches... (Enter same number for fair comparison)")
65
66     run_inline_prime_check()
67     run_modular_prime_check()
68
69     # Simple text-based comparison summary (could be expanded with Copilot)
70     print("\n--- Quick Comparison Summary ---")
71     print("Code Clarity: Modular > Inline (separation of concerns)")
72     print("Reusability: Modular >> Inline (call function anywhere)")
73     print("Debugging Ease: Modular > Inline (test function independently)")
74     print("Suitability for Large-Scale: Modular >> Inline (promotes clean architecture)")

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

--- Task 3: Modular with Functions ---
Enter a number for modular check: 997
Prime
Execution time: 0.000000 seconds

--- Quick Comparison Summary ---
Code Clarity: Modular > Inline (separation of concerns)
Reusability: Modular >> Inline (call function anywhere)
Debugging Ease: Modular > Inline (test function independently)
Suitability for Large-Scale: Modular >> Inline (promotes clean architecture)
PS C:\java saves >

```

## Task 5: AI-Generated Iterative vs Recursive Fibonacci Approaches (Different Algorithmic Approaches to Prime Checking)

### ❖ Scenario

Your mentor wants to evaluate how AI handles **alternative logical strategies**.

### ❖ Task Description

Prompt GitHub Copilot to generate:

- A **basic divisibility check** approach
- An **optimized approach** (e.g., checking up to  $\sqrt{n}$ )

### ❖ Expected Output

- Two correct implementations
- Comparison discussing:
  - Execution flow
  - Time complexity
  - Performance for large inputs
  - When each approach is appropriate

The screenshot shows a terminal window with the following content:

```

C: > java saves > task 2.py >...
1  def is_prime_basic(n):
2      if n < 2:
3          return False
4      for i in range(2, n): # Full range: O(n)
5          if n % i == 0:
6              return False
7      return True
8
9  # Test
10 n = int(input("Enter number: "))
11 print("Prime" if is_prime_basic(n) else "Not Prime")

```

Below the code, the terminal shows the following session:

```

PS C:\java\saves>
PS C:\java\saves> c;; cd 'c:\java\saves'; & 'c:\Users\shash\anaconda3\envs\SH025.18.0-win32-x64\bundled\libs\debugpy\launcher' '54382' '--' 'c:\java\saves\task 2.py'
Enter number: 7
Prime
PS C:\java\saves> ^C
PS C:\java\saves>
PS C:\java\saves> c;; cd 'c:\java\saves'; & 'c:\Users\shash\anaconda3\envs\SH025.18.0-win32-x64\bundled\libs\debugpy\launcher' '58779' '--' 'c:\java\saves\task 2.py'
Enter number: 10
Not Prime
PS C:\java\saves> █

```

The screenshot shows a code editor interface with several tabs at the top: DArray.java, Solution (Untitled-1), BalancedBT.java, and fibonacci.py. The Solution tab contains the following Python code:

```
C:\> java saves > task 2.py > ...
1 import math
2 def is_prime_optimized(n):
3     if n < 2:
4         return False
5     for i in range(2, int(math.sqrt(n)) + 1): # Up to √n: O(√n)
6         if n % i == 0:
7             return False
8     return True
9
10 # Test
11 n = int(input("Enter number: "))
12 print("Prime" if is_prime_optimized(n) else "Not Prime")
```

Below the code editor is a terminal window with the following output:

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

PS C:\java saves>
PS C:\java saves> c:> cd 'c:\java saves'; & 'c:\Users\shash\anaconda3\envs\025.18.0-win32-x64\bundled\libs\debugpy\launcher' '51709' '--' 'c:\java saves>
Enter number: 7
Prime
PS C:\java saves> ^C
PS C:\java saves>
PS C:\java saves> c:> cd 'c:\java saves'; & 'c:\Users\shash\anaconda3\envs\025.18.0-win32-x64\bundled\libs\debugpy\launcher' '51734' '--' 'c:\java saves>
Enter number: 10
Not Prime
PS C:\java saves>
```

**Note: Report should be submitted as a word document for all tasks in a single document with prompts, comments & code explanation, and output and if required, screenshots.**