

Assignment-1.4

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Program Name: B. Tech		Assignment Type: Lab	
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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
Assignment Number: 1.3(Present assignment number)/ 24 (Total number of assignments)			
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>Lab Objectives:</p> <ul style="list-style-type: none"> • To install and configure GitHub Copilot in Visual Studio Code. • To explore AI-assisted code generation using GitHub Copilot. • To analyze the accuracy and effectiveness of Copilot's code suggestions. • To understand prompt-based programming using comments and code context <p>Lab Outcomes (LOs):</p> <p>After completing this lab, students will be able to:</p> <ul style="list-style-type: none"> • Set up GitHub Copilot in VS Code successfully. • Use inline comments and context to generate code with Copilot. • Evaluate AI-generated code for correctness and readability. • Compare code suggestions based on different prompts and programming styles. 	
	<p>Task 0</p> <ul style="list-style-type: none"> • Install and configure GitHub Copilot in VS Code. Take screenshots of each step. <p>Expected Output</p> <ul style="list-style-type: none"> • Install and configure GitHub Copilot in VS Code. Take screenshots of each step. 	
	Task 1: AI-Generated Logic Without Modularization (Prime Number Check Without Functions)	

The screenshot shows a code editor interface with a dark theme. At the top, there are three tabs: 'fibonacci.py', 'factorial.py', and 'prime num.py X'. Below the tabs, the file content is displayed:

```
C: > Users > prade > OneDrive > Pradeep > prime num.py > ...
1 # AI-Generated Prime Number Check Without Functions
2 # This script checks if a given number is prime without using any functions
3
4 # Get input from user
5 num = int(input("Enter a number to check if it's prime: "))
6
7 # Initialize flag
8 is_prime = True
9
10 # Check if number is less than or equal to 1
11 if num <= 1:
12     is_prime = False
13 else:
14     # Check for factors from 2 to sqrt(num)
15     for i in range(2, int(num**0.5) + 1):
16         if num % i == 0:
17             is_prime = False
18             break
19
20 # Output the result
21 if is_prime:
22     print(f"{num} is a prime number.")
23 else:
24     print(f"{num} is not a prime number.")
25
```

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

In the terminal window, the command `C:\Users\prade>C:/Users/prade/AppData/Local/Microsoft/WindowsApps/python3.12.exe "c:/Users/prade/OneDrive/Pradeep/prime num.py"` is entered, followed by the prompt `Enter a number to check if it's prime: 2`. The output shows `2 is a prime number.`

Text below the terminal window states: "Here we are checking whether the given number is prime or not."

❖ 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

Task 2: Efficiency & Logic Optimization (Cleanup)

```
fibonacci.py factorial.py prime_num.py optimize_prime_no_checking.py
l> Users>prade>OneDrive>Pradeep>optimize_prime_no_checking.py >-
1 def is_prime_optimized(n):
2     """
3         Optimized prime number checking using 6k+1 rule.
4         Checks divisibility only by numbers of the form 6k+1 up to sqrt(n).
5     """
6     if n < 2:
7         return False
8     if n == 3:
9         return True
10    if n % 2 == 0 or n % 3 == 0:
11        return False
12
13    # Check for factors of the form 6k+1
14    i = 5
15    while i * i <= n:
16        if n % i == 0 or n % (i + 2) == 0:
17            return False
18        i += 6
19    return True
20
21 # Example usage
22 if __name__ == "__main__":
23     import time
24
25     # Test with some numbers
26     test_numbers = [2, 3, 4, 5, 17, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97, 100, 101, 103, 107, 109, 113, 127, 131, 137, 139, 149, 151, 157, 163, 167, 173, 179, 181, 191, 193, 197, 199]
27
28     print("Checking prime numbers with optimized logic:")
29     start_time = time.time()
30     for num in test_numbers:
31         result = is_prime_optimized(num)
32         print(f"{num} is {'prime' if result else 'not prime'}")
33     end_time = time.time()
34     print(f"\nTime taken: {(end_time - start_time):.4f} seconds")
35
36     # Interactive check
37     while True:
38         try:
39             user_input = int(input("\nEnter a number to check (or 0 to exit): "))
40             if user_input == 0:
41                 break
42             result = is_prime_optimized(user_input)
43             print(f"{user_input} is {'prime' if result else 'not prime'}")
44         except ValueError:
45             print("Please enter a valid integer.")
46
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS SPELL CHECKER
```

Enter a number to check (or 0 to exit): 556
556 is not prime
Enter a number to check (or 0 to exit): 4899
4899 is not prime

❖ 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

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

```

fibonacci.py factorial.py prime_num.py optimize_prime_no_checking.py prime_check_in_functions.py •
C:\Users\prade> OneDrive > Pradeep > prime_check_in_functions.py > ...
1
2 # AI-assisted Python program for prime number checking using functions
3 # This program defines a function to check if a number is prime and returns a Boolean value
4
5 def is_prime(number):
6     """
7         Check if a given number is prime.
8
9     Args:
10        number (int): The number to check for primality.
11
12     Returns:
13        bool: True if the number is prime, False otherwise.
14    """
15    # Numbers less than or equal to 1 are not prime
16    if number <= 1:
17        return False
18
19    # 2 and 3 are prime numbers
20    if number <= 3:
21        return True
22
23    # Check if the number is divisible by 2 or 3
24    if number % 2 == 0 or number % 3 == 0:
25        return False
26
27    # Check for factors from 5 to sqrt(number), skipping even numbers and multiples of 3
28    i = 5
29    while i * i <= number:
30        if number % i == 0 or number % (i + 2) == 0:
31            return False
32        i += 6
33
34    # If no factors found, the number is prime
35    return True
36

37 # Main function to test the is_prime function
38 def main():
39     """
40         Main function to demonstrate the prime checking functionality.
41     """
42
43     # Test cases
44     test_numbers = [2, 3, 4, 5, 17, 23, 29, 31, 37, 41, 43, 47]
45
46     print("Prime number checker (AI-assisted):")
47     for num in test_numbers:
48         result = is_prime(num)
49         status = "is prime" if result else "is not prime"
50         print(f"{num} {status}")
51
52     # Interactive input
53     while True:
54         try:
55             user_input = int(input("\nEnter a number to check (or 0 to exit): "))
56             if user_input == 0:
57                 break
58             result = is_prime(user_input)
59             status = "is prime" if result else "is not prime"
60             print(f"{user_input} {status}")
61         except ValueError:
62             print("Please enter a valid integer.")
63
64     # Run the main function if the script is executed directly
65     if __name__ == "__main__":
66         main()

```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS SPELL CHECKER ⓘ

Enter a number to check (or 0 to exit): 3
3 is prime

Enter a number to check (or 0 to exit): 1
1 is not prime

Enter a number to check (or 0 to exit):

Here we find prime numbers 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

Task 4: Comparative Analysis –With vs Without Functions

The screenshot shows a code editor with two tabs open: 'comparative.py' and 'is_prime_function.py'. Both tabs contain the same prime-checking logic, demonstrating the efficiency of inline vs. function-based implementations.

```
1  # Comparative Analysis: Prime Number Checking With vs Without Functions
2  # This program compares the efficiency of prime checking logic implemented with and without user-defined functions
3  # AI-generated code
4
5  import time
6
7  # Function-based implementation
8  def is_prime_function(n):
9      """
10         Check if a number is prime using a function.
11         Returns True if prime, False otherwise.
12     """
13
14     if n <= 1:
15         return False
16     if n <= 3:
17         return True
18     if n % 2 == 0 or n % 3 == 0:
19         return False
20     i = 5
21     while i * i <= n:
22         if n % i == 0 or n % (i + 2) == 0:
23             return False
24         i += 6
25
26     return True
27
28 # Non-function implementation (inline logic)
29 def check_primes_without_function(numbers):
30     """
31         Check a list of numbers for primality without using a separate function.
32         Returns a list of results.
33     """
34     results = []
35     for num in numbers:
36         # Inline prime checking logic
37         is_prime = True
38         if num <= 1:
39             is_prime = False
40         elif num > 3:
41             if num % 2 == 0 or num % 3 == 0:
42                 is_prime = False
43             else:
44                 i = 5
45                 while i * i <= num:
46                     if num % i == 0 or num % (i + 2) == 0:
47                         is_prime = False
48                         break
49                     i += 6
50             results.append(is_prime)
51
52 # Test data
53 test_numbers = [2, 3, 4, 5, 17, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97, 101, 103, 107, 109, 113, 127, 131, 137, 139, 149, 151, 157, 163]
54
55 print("Comparative Analysis: Prime Checking With vs Without Functions")
56 print("-" * 60)
57
58 # Test with functions
59 print("\nTesting with function-based approach:")
60 start_time = time.time()
61 function_results = [is_prime_function(num) for num in test_numbers]
62 function_time = time.time() - start_time
63 print(f"Time taken: {function_time:.6f} seconds")
64
65 # Test without functions
66 print("\nTesting without function-based approach:")
67 start_time = time.time()
68 inline_results = check_primes_without_function(test_numbers)
69 inline_time = time.time() - start_time
70 print(f"Time taken: {inline_time:.6f} seconds")
```

```
72 # Verify results are the same
73 if function_results == inline_results:
74     print("\n✓ Results are identical - both approaches produce the same output")
75 else:
76     print("\n✗ Results differ - there might be an error in implementation")
77
78 # Performance comparison
79 print("Performance Comparison:")
80 print(f"Function-based time: {function_time:.6f} seconds")
81 print(f"Inline time: {inline_time:.6f} seconds")
82 if function_time < inline_time:
83     print("Function-based approach is faster")
84 elif inline_time < function_time:
85     print("Inline approach is faster")
86 else:
87     print("Both approaches have similar performance")
88
89 # Display some results
90 print("Sample Results:")
91 for i in range(min(10, len(test_numbers))):
92     num = test_numbers[i]
93     print(f"{num}: {'Prime' if function_results[i] else 'Not Prime'}")
94
95 print("\nNote: Function-based code is more modular, reusable, and easier to maintain.")
96 print("While inline code might have slight performance advantages for simple cases.")
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS SPELL CHECKER 2

Enter a number to check (or 0 to exit): 5
5 is prime

Enter a number to check (or 0 to exit): 1
1 is not prime

❖ 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

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

```
fibonacci.py factorial.py prime_numpy.py optimize_prime_no_checking.py prime_check_in_functions.py algorithm.py.py

C:\> Users > prade > OneDrive > Pradeep > algorithmpypy > ...
1 #generates a python on Iterative vs Recursive Fibonacci Approaches (Different Algorithmic Approaches to Prime Checking)
2 def fibonacci_iterative(n):
3     """
4         Calculate Fibonacci number using an iterative approach.
5     """
6     Args:
7         n (int): The position in the Fibonacci sequence.
8
9     Returns:
10        int: The Fibonacci number at position n.
11        """
12        if n <= 0:
13            return 0
14        elif n == 1:
15            return 1
16
17        a, b = 0, 1
18        for _ in range(2, n + 1):
19            a, b = b, a + b
20        return b
21
22 def fibonacci_recursive(n):
23     """
24         Calculate Fibonacci number using a recursive approach.
25     """
26     Args:
27         n (int): The position in the Fibonacci sequence.
28
29     Returns:
30        int: The Fibonacci number at position n.
31        """
32        if n <= 0:
33            return 0
34        elif n == 1:
35            return 1
36        else:
37            return fibonacci_recursive(n - 1) + fibonacci_recursive(n - 2)
38
39 # Example usage
40 if __name__ == "__main__":
41     n = 10 # Change this value to compute a different Fibonacci number
42
43     print(f"Fibonacci number at position {n} (Iterative): {fibonacci_iterative(n)}")
44     print(f"Fibonacci number at position {n} (Recursive): {fibonacci_recursive(n)}")
45     print("Please enter a valid integer.")
46
47     # Performance comparison
48     import time
49     n_large = 30 # Larger value for performance comparison
50     start_time = time.time()
51     print(f"Fibonacci number at position {n_large} (Iterative): {fibonacci_iterative(n_large)}")
52     end_time = time.time()
53     print(f"Iterative approach took {end_time - start_time:.6f} seconds")
54     start_time = time.time()
55     print(f"Fibonacci number at position {n_large} (Recursive): {fibonacci_recursive(n_large)}")
56     end_time = time.time()
57     print(f"Recursive approach took {end_time - start_time:.6f} seconds")

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS SPELL CHECKER 1

Enter a number to check (or 0 to exit): 2
2 is prime

Enter a number to check (or 0 to exit): 3
3 is prime

Enter a number to check (or 0 to exit): 55
55 is not prime
```

❖ 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

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.