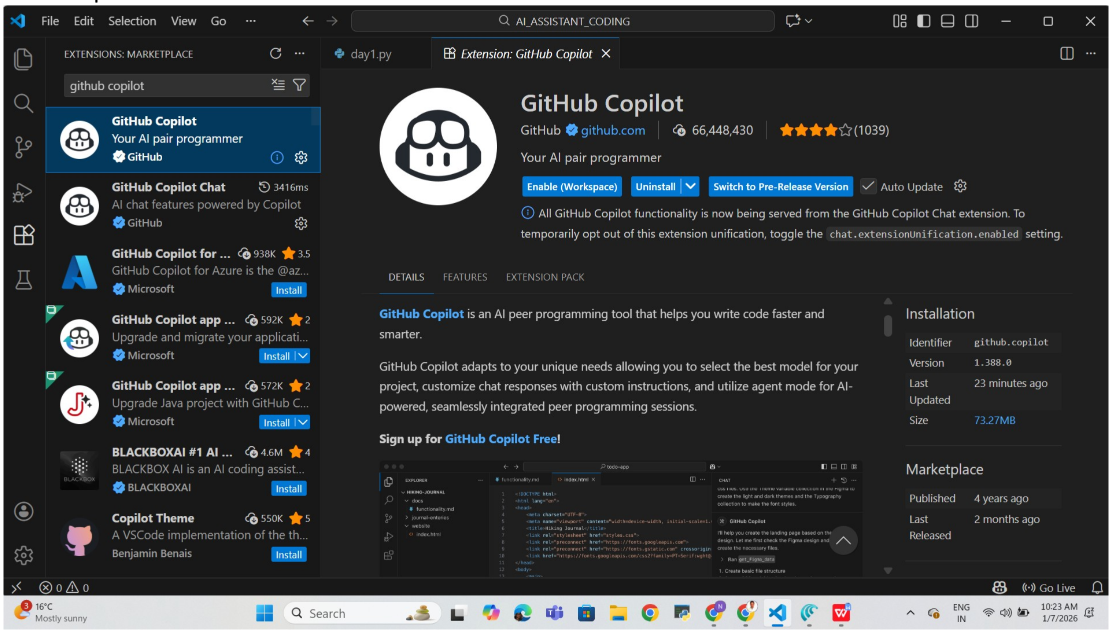
Lab assignment - 1.4 2303A51744
8-1-26

TASK - 0

Install and configure GitHub Copilot in VS Code. Take screenshots of each step.



github copilot

GitHub Copilot	Your AI pair programmer — GitHub
GitHub Copilot Chat 3416ms	AI chat features powered by Copilot — GitHub
GitHub Copilot for ... 938K ★3.5	GitHub Copilot for Azure is the @az... — Microsoft — Install
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Copilot Theme 550K ★5	A VSCode implementation of the th... — Benjamin Benais — Install

GitHub Copilot

GitHub github.com | 66,448,430 | ★★★★☆(1039)

Your AI pair programmer

Enable (Workspace) | Uninstall | Switch to Pre-Release Version | ✓ Auto Update

All GitHub Copilot functionality is now being served from the GitHub Copilot Chat extension. To temporarily opt out of this extension unification, toggle the `chat.extensionUnification.enabled` setting.

DETAILS FEATURES EXTENSION PACK

GitHub Copilot is an AI peer programming tool that helps you write code faster and smarter.

GitHub Copilot adapts to your unique needs allowing you to select the best model for your project, customize chat responses with custom instructions, and utilize agent mode for AI-powered, seamlessly integrated peer programming sessions.

Sign up for GitHub Copilot Free!

Installation

Identifier	github.copilot
Version	1.388.0
Last Updated	23 minutes ago
Size	73.27MB

Marketplace

Published	4 years ago
Last Released	2 months ago

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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

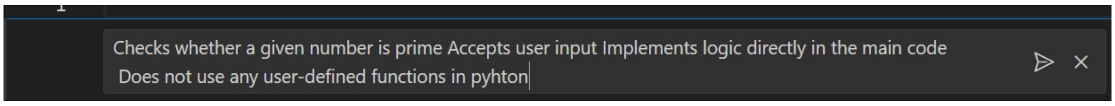
➢ Does not use any user-defined functions

❖ Expected Output

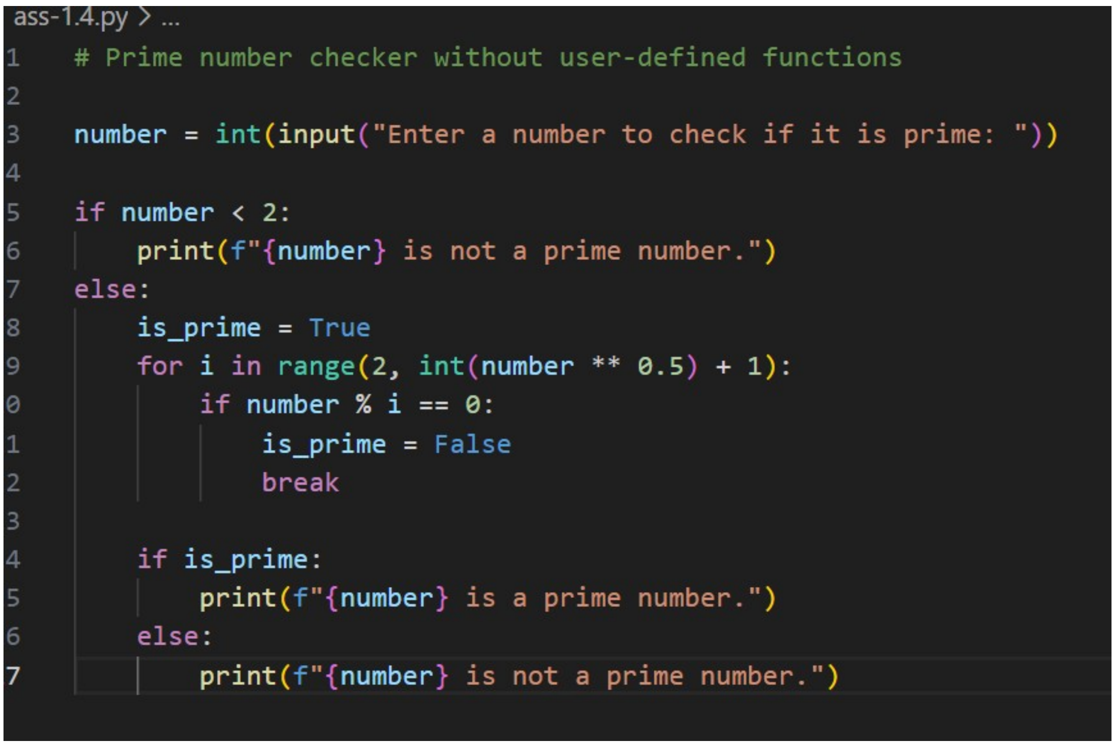
➢ Correct prime / non-prime result

➢ Screenshots showing Copilot-generated code suggestions

➢ Sample inputs and outputs

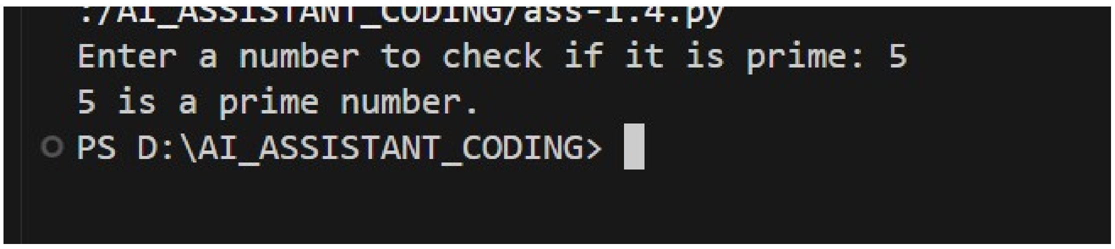


Checks whether a given number is prime Accepts user input Implements logic directly in the main code Does not use any user-defined functions in pyhton



ass-1.4.py > ...

```python
# Prime number checker without user-defined functions

number = int(input("Enter a number to check if it is prime: "))

if number < 2:
    print(f"{number} is not a prime number.")
else:
    is_prime = True
    for i in range(2, int(number ** 0.5) + 1):
        if number % i == 0:
            is_prime = False
            break

    if is_prime:
        print(f"{number} is a prime number.")
    else:
        print(f"{number} is not a prime number.")
```



```
:/AI_ASSISTANT_CODING/ass-1.4.py
Enter a number to check if it is prime: 5
5 is a prime number.
PS D:\AI_ASSISTANT_CODING>
```

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:

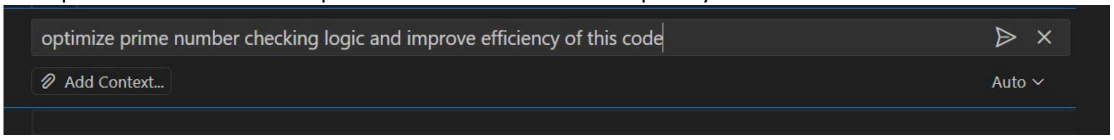
Prompt Copilot with phrases like

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

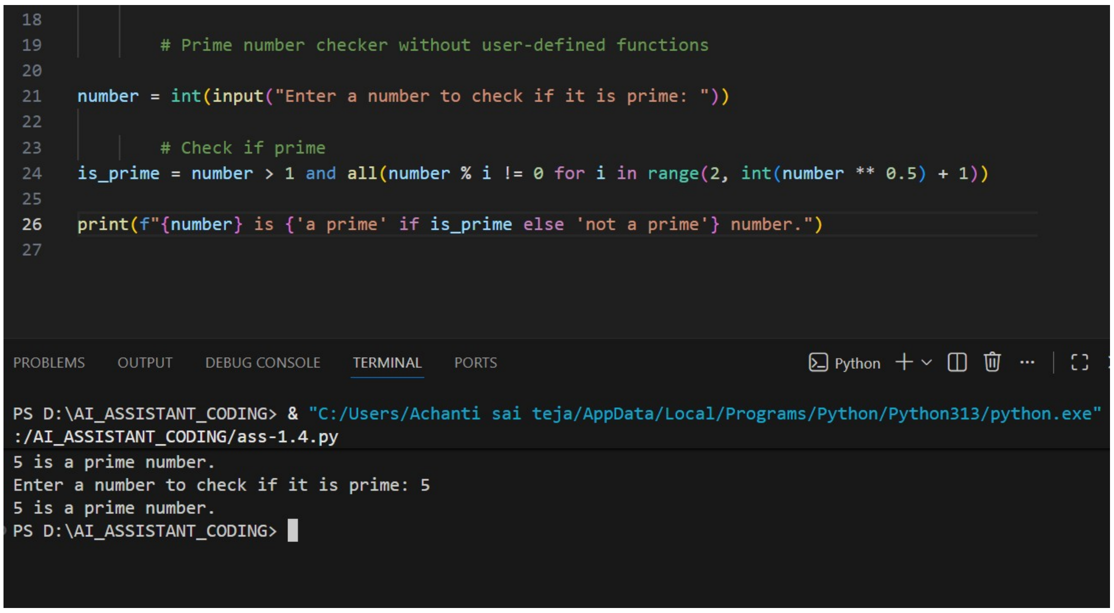
❖ Expected Output

➢ Original and optimized code versions

➢ Explanation of how the improvements reduce time complexity



optimize prime number checking logic and improve efficiency of this code



```python

        # Prime number checker without user-defined functions

number = int(input("Enter a number to check if it is prime: "))

        # Check if prime
is_prime = number > 1 and all(number % i != 0 for i in range(2, int(number ** 0.5) + 1))

print(f"{number} is {'a prime' if is_prime else 'not a prime'} number.")

```

```
PS D:\AI_ASSISTANT_CODING> & "C:/Users/Achanti sai teja/AppData/Local/Programs/Python/Python313/python.exe"
:/AI_ASSISTANT_CODING/ass-1.4.py
5 is a prime number.
Enter a number to check if it is prime: 5
5 is a prime number.
PS D:\AI_ASSISTANT_CODING>
```

The optimization checks divisibility only up to √n instead of n, reducing unnecessary iterations.
This works because any composite number must have a factor less than or equal to √n.
Early termination using break or all() stops execution as soon as a divisor is found.
Thus, time complexity improves from O(n) to O(√n), with best case O(1).

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

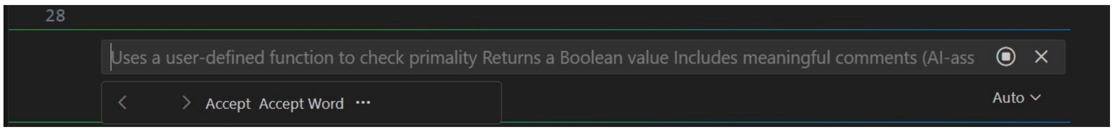
➢ Includes meaningful comments (AI-assisted)

❖ Expected Output

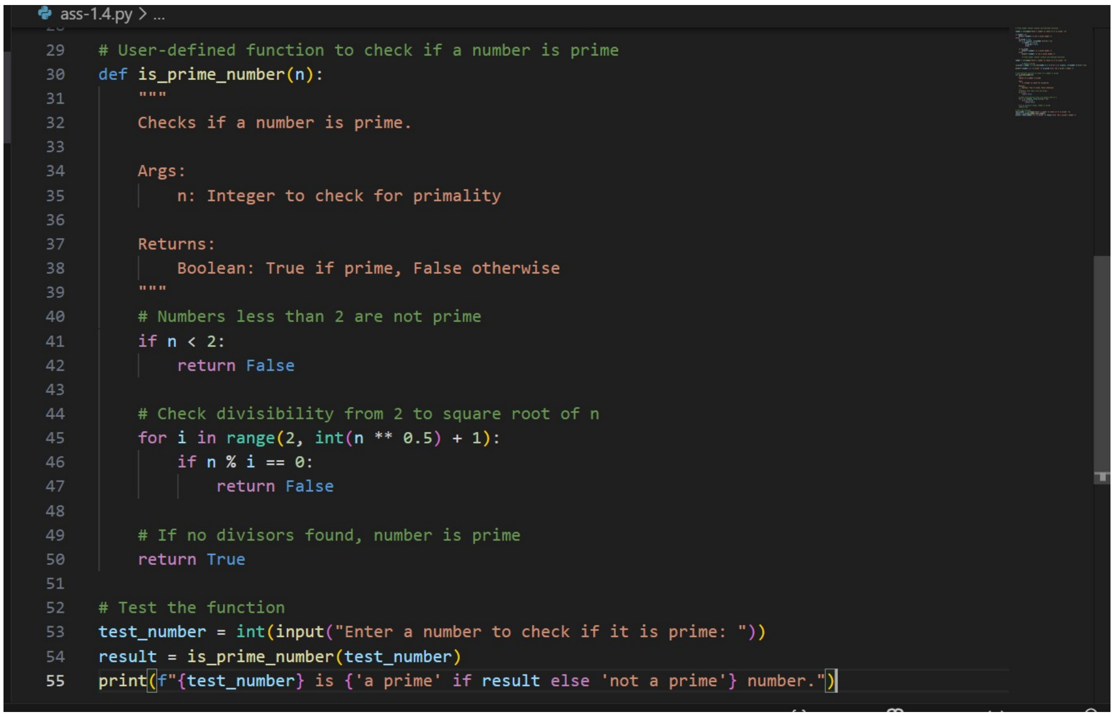
➢ Correctly working prime-checking function

➢ Screenshots documenting Copilot's function generation

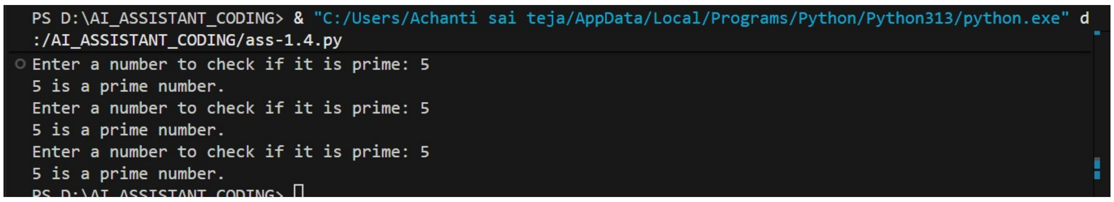
➢ Sample test cases and outputs



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



```python
# User-defined function to check if a number is prime
def is_prime_number(n):
    """
    Checks if a number is prime.

    Args:
        n: Integer to check for primality

    Returns:
        Boolean: True if prime, False otherwise
    """
    # Numbers less than 2 are not prime
    if n < 2:
        return False

    # Check divisibility from 2 to square root of n
    for i in range(2, int(n ** 0.5) + 1):
        if n % i == 0:
            return False

    # If no divisors found, number is prime
    return True

# Test the function
test_number = int(input("Enter a number to check if it is prime: "))
result = is_prime_number(test_number)
print(f"{test_number} is {'a prime' if result else 'not a prime'} number.")
```



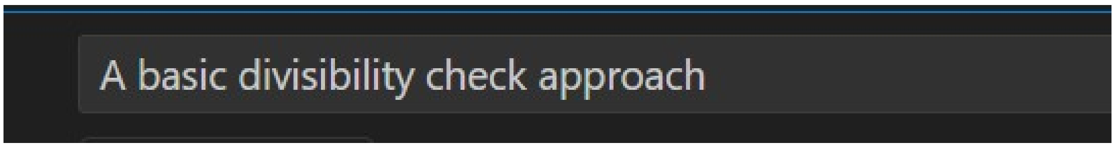
```
PS D:\AI_ASSISTANT_CODING> & "C:/Users/Achanti sai teja/AppData/Local/Programs/Python/Python313/python.exe" d
:/AI_ASSISTANT_CODING/ass-1.4.py
Enter a number to check if it is prime: 5
5 is a prime number.
Enter a number to check if it is prime: 5
5 is a prime number.
Enter a number to check if it is prime: 5
5 is a prime number.
PS D:\AI_ASSISTANT_CODING> 
```

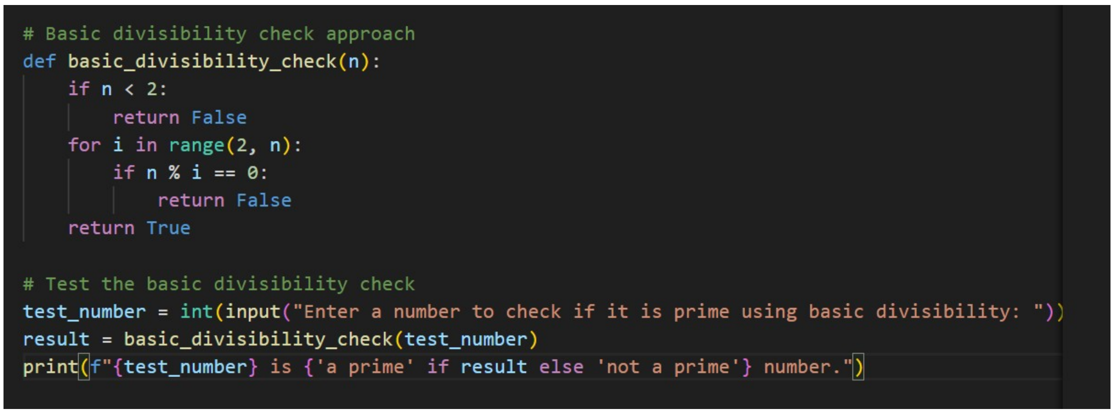
Task 4: Comparative Analysis –With vs Without Functions
❖ Scenario
You are participating in a technical review discussion.
❖ Task Description
Compare the Copilot-generated programs:
➢ Without functions (Task 1)
➢ With functions (Task 3)
➢ Analyze them based on:
➢ Code clarity
➢ Reusability
➢ Debugging ease
➢ Suitability for large-scale applications
❖ Expected Output
Comparison table or short analytical report

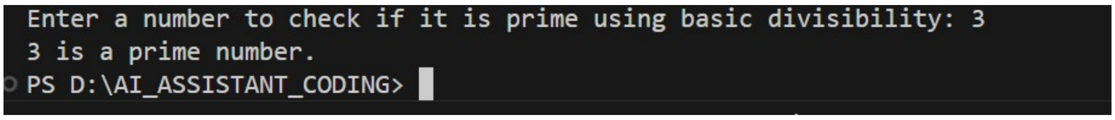
Comparison Report of the 3 Prime Number Checker Codes
Code 1 – Loop with flag and break:
Uses a loop up to √n and stops early when a divisor is found. Efficient and easy to understand. Time complexity is O(√n).
Code 2 – all() with generator expression:
Also checks up to √n but uses Python's built-in all() with short-circuiting. More concise and Pythonic, same O(√n) time complexity, slightly better readability.
Code 3 – User-defined function (is_prime_number)
Encapsulates logic in a function, improving reusability and modularity. Performance is the same (O(√n)), best suited for larger programs or repeated checks.

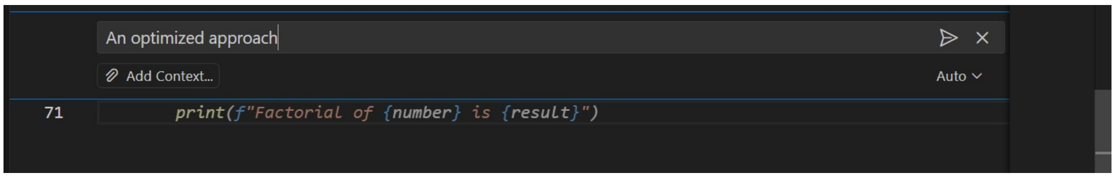
Overall Conclusion:
All three have the same time complexity (O(√n)). Code 2 is the most concise, Code 1 is beginner-friendly, and Code 3 is best for structured and reusable code.

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 √n)
❖ Expected Output
➢ Two correct implementations
➢ Comparison discussing:
▪ Execution flow
▪ Time complexity
▪ Performance for large inputs
▪ When each approach is appropriate

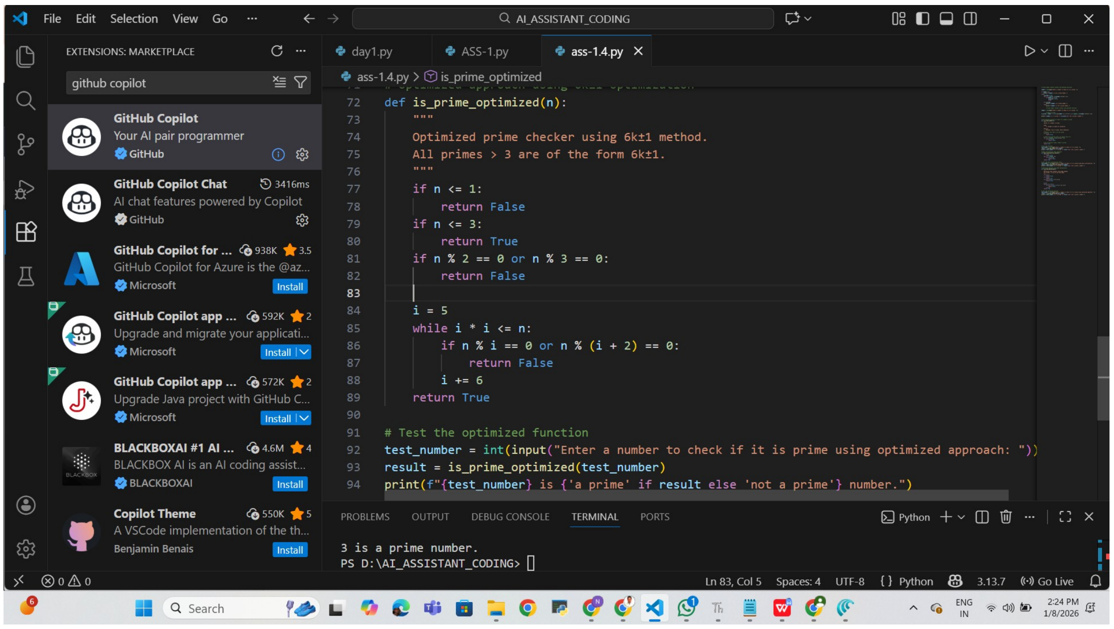

A basic divisibility check approach


```python
# Basic divisibility check approach
def basic_divisibility_check(n):
    if n < 2:
        return False
    for i in range(2, n):
        if n % i == 0:
            return False
    return True

# Test the basic divisibility check
test_number = int(input("Enter a number to check if it is prime using basic divisibility: "))
result = basic_divisibility_check(test_number)
print(f"{test_number} is {'a prime' if result else 'not a prime'} number.")
```

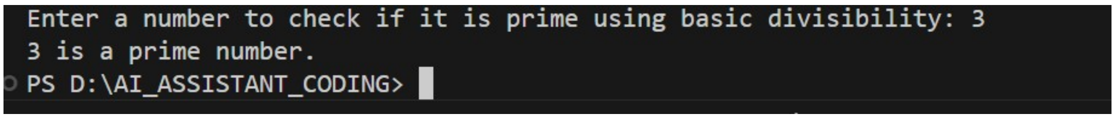

```
Enter a number to check if it is prime using basic divisibility: 3
3 is a prime number.
PS D:\AI_ASSISTANT_CODING>
```


An optimized approach

```python
        print(f"Factorial of {number} is {result}")
```


```python
def is_prime_optimized(n):
    """
    Optimized prime checker using 6k±1 method.
    All primes > 3 are of the form 6k±1.
    """
    if n <= 1:
        return False
    if n <= 3:
        return True
    if n % 2 == 0 or n % 3 == 0:
        return False

    i = 5
    while i * i <= n:
        if n % i == 0 or n % (i + 2) == 0:
            return False
        i += 6
    return True

# Test the optimized function
test_number = int(input("Enter a number to check if it is prime using optimized approach: "))
result = is_prime_optimized(test_number)
print(f"{test_number} is {'a prime' if result else 'not a prime'} number.")
```

```
3 is a prime number.
PS D:\AI_ASSISTANT_CODING>
```


```
Enter a number to check if it is prime using basic divisibility: 3
3 is a prime number.
PS D:\AI_ASSISTANT_CODING>
```

Comparison (Short Notes)
Execution Flow:
Basic divisibility: Checks all numbers from 2 to n−1 sequentially.
Optimized (√n): Checks divisors only up to √n and stops early if a factor is found.
Function-based: Same optimized flow but wrapped in a reusable function.
Time Complexity:
Basic divisibility: O(n)
Optimized (√n): O(√n)
Function-based optimized: O(√n)
Performance for Large Inputs:
Basic approach is slow and inefficient for large numbers.
Optimized approaches are much faster and suitable for large inputs.
Function-based version performs the same but is cleaner for repeated use.
When Each Approach Is Appropriate
Basic approach: For learning and very small inputs.
Optimized approach: For efficient single checks.
Function-based approach: For structured programs and multiple prime checks.