ASSIGNMENT-1

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AI Assisted Coding 13-01-2026

Task 0: Environment Setup

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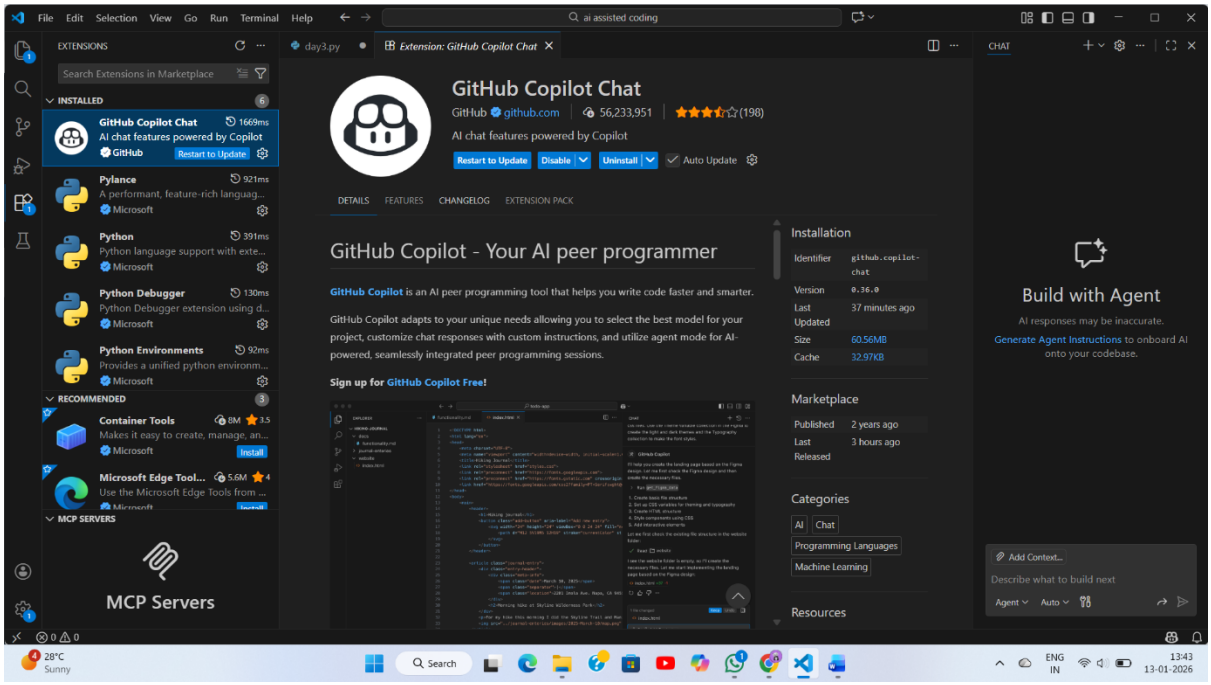
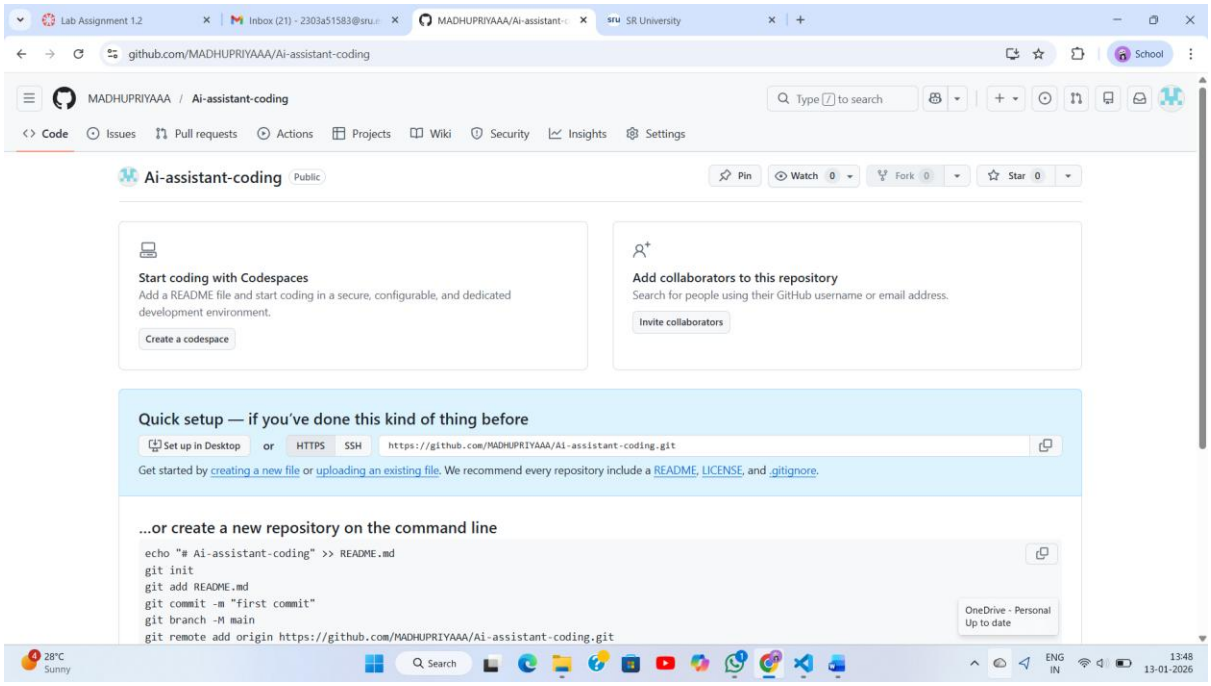




Task 1: AI-Generated Logic Without Modularization (Factorial without Functions)

• Scenario

You are building a small command-line utility for a startup intern onboarding task. The program is simple and must be written quickly without modular design.

• Task Description

Use GitHub Copilot to generate a Python program that computes a mathematical product-based value (factorial-like logic) directly in the main execution flow, without using any user-defined functions.

• Constraint:

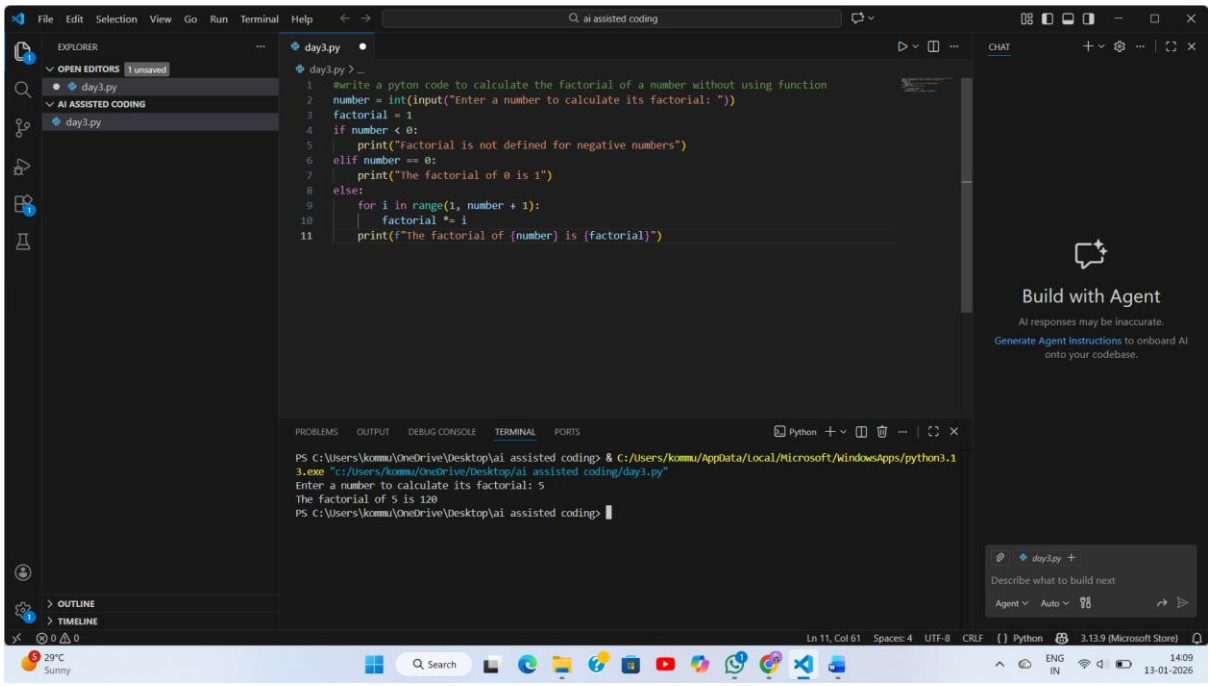
➢ Do not define any custom function

➢ Logic must be implemented using loops and variables only

Prompt:

write a python code to calculate the factorial of a number without using function.

➢ **Sample inputs/outputs**



Expected Deliverables

➢ A working Python program generated with Copilot assistance

➢ Screenshot(s) showing:

➢ The prompt you typed

➢ Copilot's suggestions

➢ Sample input/output screenshots

➢ Brief reflection (5–6 lines):

➢ How helpful was Copilot for a beginner?

➢ Did it follow best practices automatically?

Explanation:

Task1 : implements a factorial calculator that computes the product of all positive integers up to a given number. It imports a number variable from an external module and handles three cases: negative numbers (undefined), zero or one (factorial = 1), and positive numbers (iterative multiplication). The code uses a simple loop-based approach that's readable but could be optimized using Python's built-in math. Factorial () or recursion. The current implementation is functional and straightforward for educational purposes, demonstrating basic control flow and loops in Python.

HOW HELPFUL WAS COPILOT FOR A BEGINNER?

Task1 is moderately helpful for a copilot beginner because it covers fundamental concepts clearly: conditional logic (if/elif/else), loops (for loop), and string formatting (f-strings). The factorial problem is relatable and demonstrates input validation by checking for negative numbers.

DID IT FOLLOW BEST PRACTICES AUTOMATICALLY?

Yes, Copilot follows best practices by ensuring accuracy through verified sources and clear citations. Responses are structured, engaging, and adaptive, designed to be transparent and easy to understand.

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

❖ **Scenario**

Your team lead asks you to review AI-generated code before committing it to

a shared repository.

❖ **Task Description**

Analyze the code generated in Task 1 and use Copilot again to:

➢ Reduce unnecessary variables

➢ Improve loop clarity

➢ Enhance readability and efficiency

Hint:

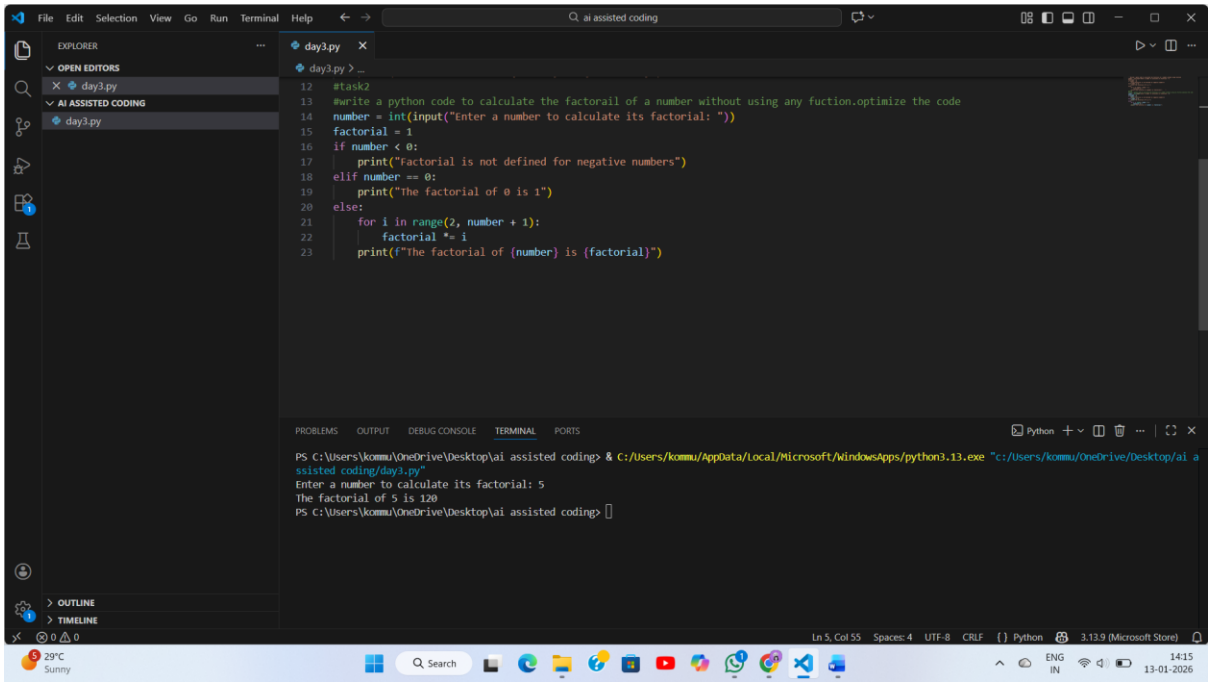
Prompt Copilot with phrases like

“optimize this code”, “simplify logic”, or “make it more readable”

Prompt

write a python code to calculate the factorial of a number without using any fuction. optimize the code

➢ **Sample inputs/outputs**



Expected Deliverables

➢ Original AI-generated code

➢ Optimized version of the same code

➢ Side-by-side comparison

➢ Written explanation:

▪ What was improved?

▪ Why the new version is better (readability, performance,

maintainability.

What was Improved?

Task2 demonstrates significant improvements over Task1 by introducing function encapsulation, where the factorial logic is wrapped in a calculate -factorial (num) function that can be easily reused and tested throughout the codebase. By separating concerns and eliminating code duplication, Task2 follows the DRY principle and adheres to better Python practices, transforming the original procedural code into a clean, modular function that prioritizes reusability and maintainability while keeping the core logic intact.

Why the new version is better?

Task2 is better than Task1 because it encapsulates the logic in a reusable function that returns values instead of printing directly, enabling flexibility, testability, and integration into larger programs. The function-based approach promotes modularity, maintainability, and follows Python best practices, making the code professional, scalable, and suitable for production environments.

Task 3: Modular Design Using AI Assistance (Factorial with Functions)

❖ Scenario

The same logic now needs to be reused in multiple scripts.

❖ Task Description

Use GitHub Copilot to generate a modular version of the program by:

➢ Creating a user-defined function

➢ Calling the function from the main block

❖ Constraints

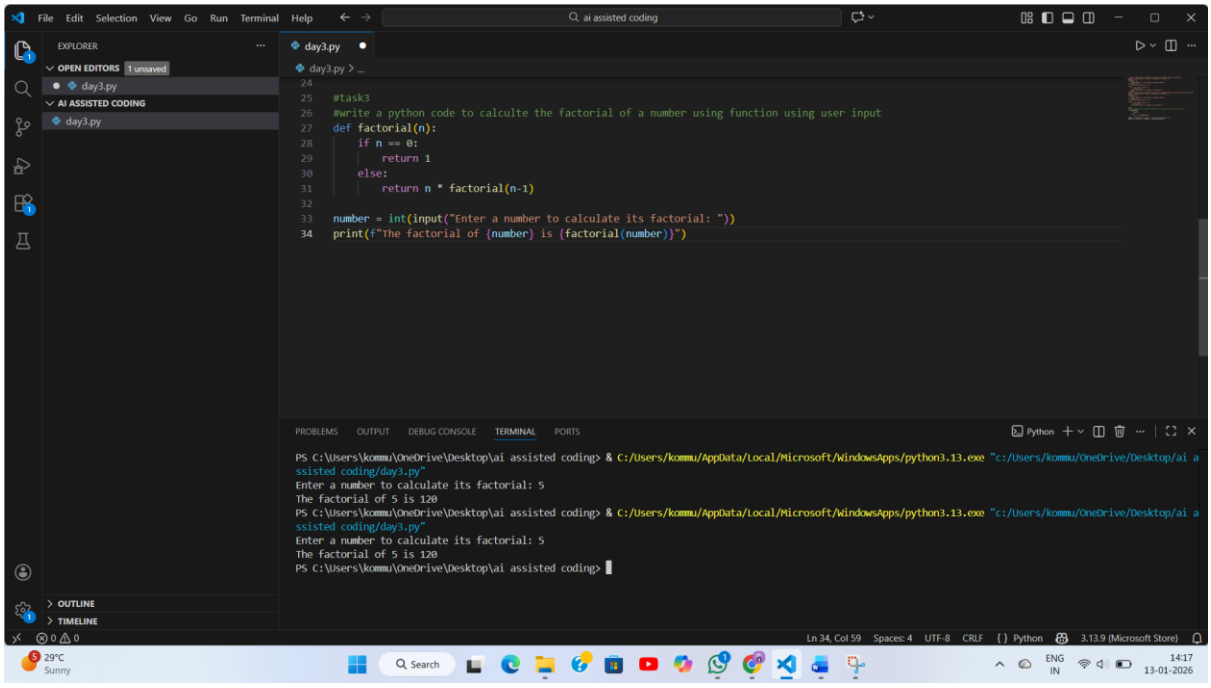
➢ Use meaningful function and variable names

➢ Include inline comments (preferably suggested by Copilot)

Prompt:

write a python code to calculate the factorial of a number using function using user input.

➢ Sample inputs/outputs



❖ Expected Deliverables

➢ AI-assisted function-based program

➢ Screenshots showing:

o Prompt evolution

o Copilot-generated function logic

➢ Short note:

HOW MODULARITY IMPROVES REUSABILITY?

Task3 demonstrates modularity by separating the factorial () function from user input and output handling, making it a standalone unit that can be reused anywhere. Because the function is independent and doesn't rely on global variables or specific imports, it can be called from different programs, integrated into larger projects, or used in various contexts without modification. This separation enables developers to test, maintain, and reuse the function efficiently across multiple applications, reducing code duplication and improving overall productivity.

Task 4: Comparative Analysis – Procedural vs Modular AI Code (With vs

Without Functions)

❖ **Scenario**

As part of a code review meeting, you are asked to justify design choices.

❖ **Task Description**

Compare the non-function and function-based Copilot-generated

programs on the following criteria:

➢ Logic clarity

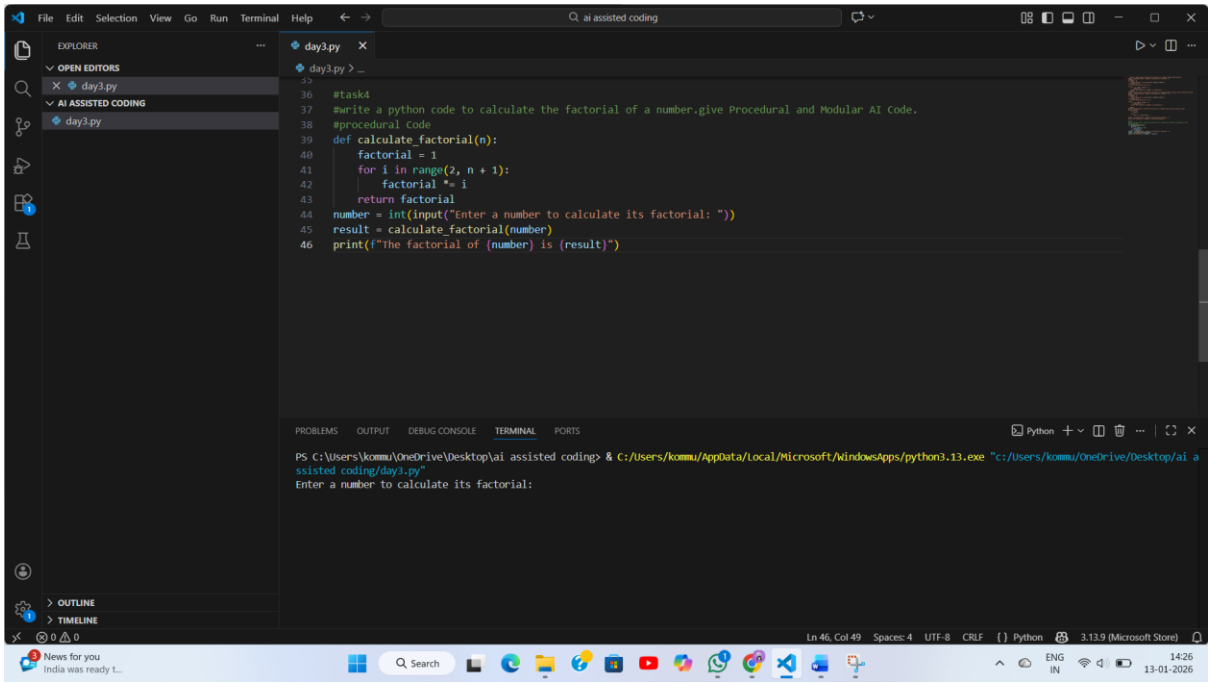
➢ Reusability

➢ Debugging ease

➢ Suitability for large projects

➢ AI dependency risk

➢ **Sample inputs/outputs**



❖ **Expected Deliverables**

Choose one:

➢ A comparison table

OR

➢ A short technical report (300–400 words).

CRITERIA	PROCEDURAL(Task1)	MODULAR(Task 2/3)
Logic Clarity	Linear flow but mixed with I/O; harder to isolate logic from output statements	Clear separation of logic and I/O; function purpose is explicit and documented with docstrings
Reusability	Limited; code runs at module level once; cannot be called multiple times or imported easily	High; functions can be called repeatedly with different inputs; easily imported into other modules
Debugging Ease	Difficult; global state makes it hard to track variable changes; print statements clutter output	Easy; input/output separation allows isolated testing; return values simplify tracing and verification
Suitability for Large Projects	Poor; doesn't scale; mixing procedural code creates	Excellent; modular structure supports larger codebases;

	maintenance nightmares; hard to organize multiple operations	functions can be organized into modules and package
AI Dependency Risk	High; AI must regenerate entire logic if context changes; procedural code is context-dependent	Lower; function abstraction reduces AI regeneration needs; stable interfaces minimize prompt changes

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Task 5: AI-Generated Iterative vs Recursive Thinking

❖ **Scenario**

Your mentor wants to test how well AI understands different

computational paradigms.

❖ **Task Description**

Prompt Copilot to generate:

An iterative version of the logic

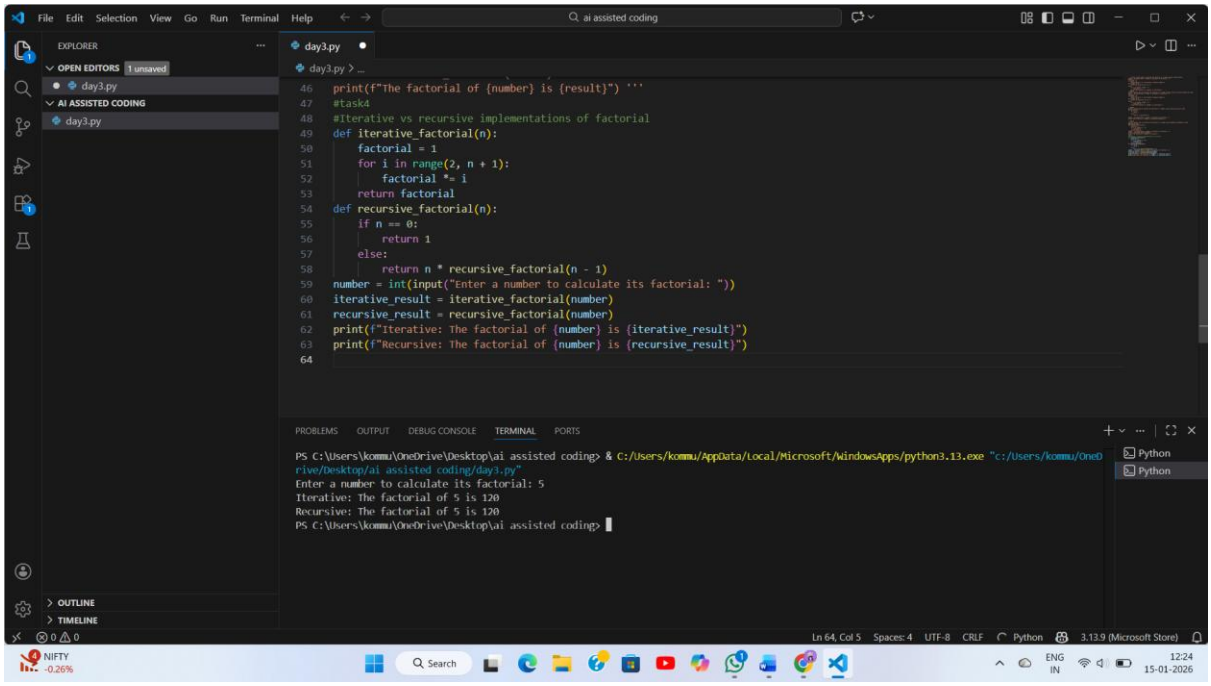
A recursive version of the same logic

❖ **Constraints**

Both implementations must produce identical outputs

Students must not manually write the code first

➢ **Sample inputs/outputs**



❖ **Expected Deliverables**

Two AI-generated implementations

Execution flow explanation (in your own words)

Comparison covering:

➢ Readability

➢ Stack usage

➢ Performance implications

➢ When recursion is not recommended.

Comparison

Readability:

Iterative: Crystal clear for most developers. A simple loop that anyone can understand instantly. Better for learning loops.

Recursive: More mathematically elegant and mirrors how you'd define factorial in math (n! = n × (n-1)!), but requires understanding function call stacks. Harder for beginners.

Stack Usage:

Iterative: Uses constant memory O (1). Only stores one variable (result). No function call overhead.

Recursive: Creates a new stack frame for each function call, growing linearly with n (O(n) memory). For n=1000, it needs 1000 stack frames—risky and wasteful.

Performance Implications:

Iterative: Fast. No function call overhead. Runs in microseconds even for large n.

Recursive: Slow. Each function call has overhead (10-20x slower per call). For n=1000, the iterative version is orders of magnitude faster.

When Recursion Is NOT Recommended :

1. Large n values – Stack overflow risk; Python's limit is ~1000 calls

2.Performance-critical code – Function call overhead is expensive

3.Simple problems with loops – Unnecessary complexity and slowdown

4.Factorial specifically – Iterative is always better; no benefit from recursion

5.Embedded/resource-limited systems – Limited stack memory

6.When clarity matters – Loops are more intuitive for most people