

ASSIGNMENT-10.4

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Batch-13

Task 1: AI-Assisted Syntax and Code Quality Review

Scenario

You join a development team and are asked to review a junior developer's Python script that fails to run correctly due to basic coding mistakes. Before deployment, the code must be corrected and standardized.

Task Description

You are given a Python script containing:

- Syntax errors
- Indentation issues
- Incorrect variable names
- Faulty function calls

Use an AI tool (GitHub Copilot / Cursor AI) to:

- Identify all syntactic and structural errors
- Correct them systematically
- Generate an explanation of each fix made

Expected Outcome

- Fully corrected and executable Python code
- AI-generated explanation describing:
 - Syntax fixes
 - Naming corrections
 - Structural improvements
- Clean, readable version of the script

#ERROR CODE

```
assss.py > ...
1  def factorial(num)
2  if num < 0
3  |   print("Negative number not allowed")
4  else
5  |   fact = 1
6  |   for i in range(1, num+1)
7  |       fact = fact * i
8  return fact
9
10 Number = 5
11 → result = Factorial(Number)
12 print("Fa ↴ factorial result")
13
14
15
```

```
syntaxError: expected ':'
PS C:\Users\neera\OneDrive\Desktop\assignments> & C:\Users\neera\AppData\Local\Python\pythoncore-3.14-64\python.exe c:/Users/neera/OneDrive/Desktop/assignments/assss.py
File "c:/Users/neera/OneDrive/Desktop/assignments/assss.py", line 1
    def factorial(num)
               ^
syntaxError: expected ':'
PS C:\Users\neera\OneDrive\Desktop\assignments>
```

#CORRECTED CODE:

```
assss.py > factorial
1  def factorial(num):
2  |   if num < 0:
3  |   |   print("Negative number not allowed")
4  |   |   return None
5  |   else:
6  |   |   fact = 1
7  |   |   for i in range(1, num + 1):
8  |   |   |   fact = fact * i
9  |   |   return fact
10
11 number = (function) def factorial(num: Any) -> (int | None)
12 result = factorial(number)
13
14 if result is not None:
15 |   print("Factorial is", result)
16
17
18
19
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS POSTMAN CONSOLE

FACTORIZATION

```
PS C:\Users\neera\OneDrive\Desktop\assignments> & C:\Users\neera\AppData\Local\Python\pythoncore-3.14-64\python.exe c:/Users/neera/OneDrive/Desktop/assignments/assss.py
Factorial is 120
PS C:\Users\neera\OneDrive\Desktop\assignments> []
```

#PREVIEW OF AI

The screenshot shows a code editor interface with a dark theme. On the left, there is a code editor window titled 'assss.py' containing Python code for calculating factorials. The code includes handling for negative numbers and uses a for loop. A terminal window below shows the script being run and a syntax error. On the right, a sidebar titled 'PREVIEW OF ASSSS.PY CODE FUNCTIONALITY' lists 7 numbered suggestions with detailed explanations. At the bottom right, there is a preview of the output 'Factorial is 120'.

PREVIEW OF ASSSS.PY CODE FUNCTIONALITY

1. **Function definition colon**
Added a colon after `def factorial(num)` to start the function body.
2. **If / else colons**
Each control statement (`if`, `else`) now ends with a colon as required by Python syntax.
3. **Indentation of block statements**
The body of the function, loop, and return statements were indented correctly to reflect Python's block structure.
4. **Return value on negative input**
Added `return None` inside the negative-case branch so the function exits predictably.
5. **Loop syntax corrected**
Included a colon at the end of the `for` line and adjusted spacing around `num + 1`.
6. **Function call casing**
Changed `Factorial(Number)` to `factorial(Number)` – Python is case-sensitive.
7. **General formatting**
Ensured consistent spacing and alignment for readability.

With these fixes, running the script will now print:

```
Factorial is 120
```

Feel free to test or expand the function further!

Task 2: Performance-Oriented Code Review

Scenario

A data processing function works correctly but is inefficient and slows down the system when large datasets are used.

Task Description

You are provided with a function that identifies duplicate values in a list using inefficient nested loops.

Using AI-assisted code review:

- Analyze the logic for performance bottlenecks
- Refactor the code for better time complexity
- Preserve the correctness of the output

Ask the AI to explain:

- Why the original approach was inefficient
- How the optimized version improves performance

Expected Outcome

- Optimized duplicate-detection logic (e.g., using sets or hash-based structures)
- Improved time complexity

- AI explanation of performance improvement
- Clean, readable implementation

#ORIGINAL CODE

```
fact.py > ...
1 def fibonacci(n):
2     if n <= 1:
3         return n
4     else:
5         return fibonacci(n - 1) + fibonacci(n - 2)
6
7
8 number = 35
9 result = fibonacci(number)
10 print("Fibonacci number is:", result)
11
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS POSTMAN CONSOLE

ct.py
ct.py
Fibonacci number is: 9227465
PS C:\Users\neera\OneDrive\Desktop\assignments>

#OPTIMIZED VERSION

```
fact.py > fibonacci
1 def fibonacci(n):
2     if n <= 1:
3         return n
4     prev = 0
5     curr = 1
6     for _ in range(2, n + 1):
7         prev, curr = curr, prev + curr
8     return curr
9 number = 35
10 result = fibonacci(number)
11 print("Fibonacci number is:", result)
12
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS POSTMAN CONSOLE

PS C:\Users\neera\OneDrive\Desktop\assignments> & C:\Users\neera\AppData\Local\Python\pythoncore-3.14-64\python.exe c:/Users/neera/OneDrive/Desktop/assignments/fact.py

^C

Fibonacci number is: 9227465

#PREVIEW OF AI

The screenshot shows a Python script named `fact.py` in the editor. The code defines a recursive `fibonacci` function and then uses it to calculate the 35th Fibonacci number. The output is displayed in the terminal at the bottom.

```
fact.py > ...
1 def fibonacci(n):
2     if n <= 1:
3         return n
4     else:
5         return fibonacci(n - 1) + fibonacci(n - 2)
6
7     prev = 0
8     curr = 1
9
10    for _ in range(2, n + 1):
11        prev, curr = curr, prev + curr
12
13    return curr
14
15 number = 35
16 result = fibonacci(number)
17 print("Fibonacci number is:", result)
```

Output when run:

```
Fibonacci number is: 9227465
```

This implementation runs in $O(n)$ time and is efficient for moderate values of n . If you ever decide you need something faster ($O(\log n)$), I can show you an optimized version again—just let me know!

Task 3: Readability and Maintainability Refactoring

Scenario

A working script exists in a project, but it is difficult to understand due to poor naming, formatting, and structure. The team wants it rewritten for long-term maintainability.

Task Description

You are given a poorly structured Python function with:

- Cryptic function names
 - Poor indentation
 - Unclear variable naming
 - No documentation

Use AI-assisted review to:

- Refactor the code for clarity

- Apply PEP 8 formatting standards
- Improve naming conventions
- Add meaningful documentation

Expected Outcome

- Clean, well-structured code
- Descriptive function and variable names
- Proper indentation and formatting
- Docstrings explaining the function purpose
- AI explanation of readability improvements

#ORIGINAL CODE

The screenshot shows a code editor interface with a dark theme. At the top, there's a tab for 'prime.py'. Below it, the code is displayed:

```

prime.py > ...
1 def p(n):
2     c=0
3     for i in range(1,n+1):
4         if n%i==0:
5             c=c+1
6         if c==2:
7             print("P")
8         else:
9             print("NP")
10
11 x=7
12 p(x)
13

```

Below the code editor, there's a navigation bar with tabs: PROBLEMS, OUTPUT, DEBUG CONSOLE, TERMINAL, PORTS, and POSTMAN CONSOLE. The TERMINAL tab is currently selected.

The terminal window below shows the command-line interface:

```

PS C:\Users\neera\OneDrive\Desktop\assignments> & C:\Users\neera\AppData\Local\Python\pythoncore-3.14-64\python.exe
c:/Users/neera/OneDrive/Desktop/assignments/prime.py
P
PS C:\Users\neera\OneDrive\Desktop\assignments>

```

This screenshot is similar to the previous one, showing the same code editor and terminal interface. The terminal output has been updated to reflect the changes made to the code:

```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS POSTMAN CONSOLE

PS C:\Users\neera\OneDrive\Desktop\assignments> & C:\Users\neera\AppData\Local\Python\pythoncore-3.14-64\python.exe
c:/Users/neera/OneDrive/Desktop/assignments/prime.py
P
PS C:\Users\neera\OneDrive\Desktop\assignments>

```

#OPTIMIZED CODE

```
prime.py X
prime.py > is_prime
1 def is_prime(number):
4
5     A prime number is a number greater than 1 that
6     has exactly two positive divisors: 1 and itself.
7
8     Parameters:
9         number (int): The number to check.
10
11    Returns:
12        bool: True if the number is prime, otherwise False.
13        """
14    if number <= 1:
15        return False
16
17    for divisor in range(2, int(number ** 0.5) + 1):
18        if number % divisor == 0:
19            return False
20    return True
21 input_number = 7
22 if is_prime(input_number):
23     print("The number is Prime.")
24 else:
25     print("The number is Not Prime.")

9         number (int): The number to check.
10
11    Returns:
12        bool: True if the number is prime, otherwise False.
13        """
14    if number <= 1:
15        return False
16
17    for divisor in range(2, int(number ** 0.5) + 1):
18        if number % divisor == 0:
19            return False
20    return True
21 input_number = 7
22 if is_prime(input_number):
23     print("the number is Prime.")
24 else:
25     print("The number is Not Prime.")

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS POSTMAN CONSOLE +
```

PS C:\Users\neera\OneDrive\Desktop\assignments> & C:\Users\neera\AppData\Local\Python\pythoncore-3.14-64\python.exe

...

The number is Prime.

PS C:\Users\neera\OneDrive\Desktop\assignments> & C:\Users\neera\AppData\Local\Python\pythoncore-3.14-64\python.exe

c:/Users/neera/OneDrive/Desktop/assignments/prime.py

The number is Prime.

The number is Prime.

Ln 17, Col 53 Spaces: 4 UTF-8 CRLF {} Python Python 3.14.2

#PREVIEW OF AI

The screenshot shows the Visual Studio Code interface with two open files: `prime.py` and `fact.py`.

prime.py:

```
def p(n):
    c=0
    for i in range(1,n+1):
        if n%i==0:
            c=c+1
    if c==2:
        print("P")
    else:
        print("NP")
```

fact.py:

```
def is_prime(number):
    """
    Check whether a given number is a prime number.

    A prime number is a number greater than 1 that has exactly two positive divisors: 1 and itself.

    Parameters:
    number (int): The number to check.

    Returns:
    bool: True if the number is prime, otherwise False
    """
    if number <= 1:
        return False
```

Terminal Output:

```
PS C:\Users\neera\OneDrive\Desktop\assignments> & C:\Users\neera\AppData\Local\Python\pythoncore-3.14-64\python.exe ..\neera\AppData\Local\Python\pythoncore-3.14-64\python.exe c:/Users/neera/OneDrive/Desktop/assignments/prime.py
The number is Prime.
```

Preview Request:

bool: True if the number is prime, otherwise False

```
if number <= 1:
    return False

for divisor in range(2, int(number ** 0.5)):
    if number % divisor == 0:
        return False

return True
```

input_number = 7

```
if is_prime(input_number):
    print("The number is Prime.")
else:
    print("The number is Not Prime.")
```

Preview output:

```
The number is Prime.
```

The function now correctly identifies primes and runs in $O(\sqrt{n})$ time.

Let me know if you'd like to test other values or extend it further!

1 file changed +29 -12

Task 4: Secure Coding and Reliability Review

Scenario

A backend function retrieves user data from a database but has security vulnerabilities and poor error handling, making it unsafe for production deployment.

Task Description

You are given a Python script that:

- Uses unsafe SQL query construction
 - Has no input validation
 - Lacks exception handling

Use AI tools to:

- Identify security vulnerabilities

- Refactor the code using safe coding practices
 - Add proper exception handling
 - Improve robustness and reliability

Expected Outcome

- Secure SQL queries using parameterized statements
 - Input validation logic
 - Try-except blocks for runtime safety
 - AI-generated explanation of security improvements
 - Production-ready code structure

#ERROR CODE

```
SQL.py  X
SQLPy > ...
1 import sqlite3
2
3 def get_user(username):
4     conn = sqlite3.connect("users.db")
5     cursor = conn.cursor()
6
7     query = "SELECT * FROM users WHERE username = '" + username + "'"
8     cursor.execute(query)
9
10    result = cursor.fetchall()
11    conn.close()
12
13    return result
14
15
16 user_input = input("Enter username: ")
17 data = get_user(user_input)
18 print(data)
19
```

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS POSTMAN CONSOLE

PS C:\Users\neera\OneDrive\Desktop\assignments> & c:\Users\neera\AppData\Local\Python\pythoncore-3.14-64\python.exe
Enter username: Soumya
Traceback (most recent call last):
  File "c:\Users\neera\OneDrive\Desktop\assignments\SQL.py", line 17, in <module>
    data = get_user(user_input)
           ^^^^^^^^^^
  File "c:\Users\neera\OneDrive\Desktop\assignments\SQL.py", line 8, in get_user
    cursor.execute(query)
                     ^^^^^^
sqlite3.OperationalError: no such table: users
PS C:\Users\neera\OneDrive\Desktop\assignments>
```

#OPTIMIZED CODE:

```
SQL.py > ...
1  import re
2  import sqlite3
3  from typing import Any, List, Tuple
4
5
6  USERNAME_RE = re.compile(r"^[A-Za-z0-9_]{1,32}$") # policy can be adjusted
7
8
9  class DatabaseError(Exception):
10     """Generic exception for database-related failures."""
11
12
13     def validate_username(name: str) -> None:
14         """Raise `ValueError` if `name` does not meet policy."""
15         if not USERNAME_RE.match(name):
16             raise ValueError("invalid username format")
17
18
19     def get_user(username: str) -> List[tuple[Any, ...]]:
20         """Fetch rows from `users` table matching `username`.
21
22         - Uses a parameterized query to prevent SQL injection.
23         - Wraps connection in a context manager so it's closed automatically.
24         - Converts SQLite errors to `DatabaseError` for the caller.
25
26
27     def main() -> None:
28         user_input = input("Enter username: ").strip()
29         try:
30             data = get_user(user_input)
31         except ValueError as err:
32             print(f"input error: {err}")
33         except DatabaseError as err:
34             print(f"database error: {err}")
35         else:
36             if data:
37                 for row in data:
38                     print(row)
39             else:
40                 print("no such user")
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56     if __name__ == "__main__":
57         main()
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS POSTMAN CONSOLE

```
The number is Prime.
PS C:\Users\neera\OneDrive\Desktop\assignments> python SQL.py
Enter username: soumya
database error: database query failed
PS C:\Users\neera\OneDrive\Desktop\assignments> []
```

#PREVIEW OF AI

The screenshot shows the Visual Studio Code interface with several windows open. On the left, there's a code editor window for a file named 'SQL.py' containing Python code for a database query. Below it is a terminal window showing command-line interactions with Python scripts like 'fact.py', 'prime.py', and 'SQL.py'. To the right, there's a 'CHAT' window titled 'FACT.PY PREVIEW REQUEST' displaying AI-generated code snippets for error handling. A 'Preview' section shows a user input 'Enter username: soumya' and the resulting output 'database error: database query failed'. A message at the bottom of the preview window says, 'This demonstrates the added error handling and predictable output.' At the bottom right, there's a 'Raptor mini (Preview)' window showing build status.

```
SQL.py
1 cursor.execute(query)
2
3 result = cursor.fetchall()
4 conn.close()
5
6 return result
7
8
9 user_input = input("Enter username: ")
10 data = get_user(user_input)
11 print(data)
12 from typing import Any, List, Tuple
13
14 USERNAME_RE = re.compile(r"^[A-Za-z0-9_]{1,32}$") # pol
15
16 class DatabaseError(Exception):
17     """Generic exception for database errors"""
18
19     def __init__(self, message="Database error occurred."):
20         self.message = message
21         super().__init__(self.message)
22
23     def __str__(self):
24         return self.message
25
26
27 def get_user(username):
28     query = "SELECT * FROM users WHERE username = %s"
29
30     try:
31         conn = psycopg2.connect("dbname=users")
32         cursor = conn.cursor()
33
34         cursor.execute(query, (username,))
35
36         result = cursor.fetchall()
37
38         if result:
39             return result[0]
40         else:
41             return None
42
43     except psycopg2.Error as e:
44         raise DatabaseError(str(e))
45
46     finally:
47         cursor.close()
48         conn.close()
49
50
51 if __name__ == "__main__":
52     main()

CHAT
← FACT.PY PREVIEW REQUEST
else:
    if data:
        for row in data:
            print(row)
    else:
        print("no such user")

if __name__ == "__main__":
    main()

Preview
When run without a properly initialized users.db, it gracefully reports:
Enter username: soumya
database error: database query failed

This demonstrates the added error handling and predictable output.

You're now working with a safe, maintainable backend! Let me know if you want to add logging, configuration, or migration support next.

Raptor mini (Preview) • 1x
> 1 file changed +56 -17
Keep Undo
Describe what to build next
Auto ▾
```

Task 5: AI-Based Automated Code Review Report

Scenario

Your team uses AI tools to perform automated preliminary code reviews before human review, to improve code quality and consistency across projects.

Task Description

You are provided with a poorly written Python script.

Using AI-assisted review:

- Generate a structured code review report that evaluates:
 - Code readability
 - Naming conventions
 - Formatting and style consistency
 - Error handling
 - Documentation quality

- o Maintainability

The task is not just to fix the code, but to analyze and report on quality issues.

Expected Outcome

- AI-generated review report including:

- o Identified quality issues

- o Risk areas

- o Code smell detection

- o Improvement suggestions

- Optional improved version of the code

- Demonstration of AI as a code reviewer, not just a code generator

#OPTIMIZED CODE

```
task.py > ...
1 def f(a,b):
2     c=a+b
3     print(c)
4
5 x=10
6 y=0
7 f(x,y)
8

PROBLEMS    OUTPUT    DEBUG CONSOLE    TERMINAL    PORTS    POSTMAN CONSOLE
-----<
sqlite3.OperationalError: no such table: users
PS C:\Users\neera\OneDrive\Desktop\assignments>
PS C:\Users\neera\OneDrive\Desktop\assignments> & C:\Users\neera\AppData\Local\Python\pythoncore-3.14-64\python.exe
c:/Users/neera/OneDrive/Desktop/assignments/task.py
10
PS C:\Users\neera\OneDrive\Desktop\assignments>
```

#ORIGINAL CODE:

```
task.py > add_numbers
1 def add_numbers(first_number, second_number):
2     """
3         Add two numeric values and return the result.
4     Parameters:
5         first_number (int or float): The first value.
6         second_number (int or float): The second value.
7     Returns:
8         int or float: Sum of the two numbers.
9     """
10    if not isinstance(first_number, (int, float)) or not isinstance(second_number, (int, float)):
11        raise ValueError("Both inputs must be numeric.")
12    return first_number + second_number
13 if __name__ == "__main__":
14     try:
15         num1 = 10
16         num2 = 0
```

```

13     if __name__ == "__main__":
14         try:
15             num1 = 10
16             num2 = 0
17             result = add_numbers(num1, num2)
18             print("Result:", result)
19         except ValueError as error:
20             print("Input Error:", error)
21

```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS POSTMAN CONSOLE

```

S C:\Users\neera\OneDrive\Desktop\assignments> & C:\Users\neera\AppData\Local\Python\pythoncore-3.14-64\python.exe ./Users/neera/OneDrive/Desktop/assignments/task.py
result: 10
S C:\Users\neera\OneDrive\Desktop\assignments>

```

#PREVIEW OF AI

task.py > ...

```

def f(a,b):
    c=a+b
    print(c)

x=10
y=0
f(x,y)
"""
Simple example illustrating addition.

This module defines a reusable `add` function and exercise
command-line driven `main`. It follows common style and d
practices to make it easy to read, test, and extend.
"""

def add(num1: float, num2: float) -> float:
    """Return the sum of ``num1`` and ``num2``.

    Args:
        num1: first addend.

```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS ... + × ⌂ | [] X

```

PS C:\Users\neera\OneDrive\Desktop\assignments> ^C
PS C:\Users\neera\OneDrive\Desktop\assignments> & C:\Users\neera\AppData\Local\Python\pythoncore-3.14-64\python.exe ./Users/neera/OneDrive/Desktop/assignments/task.py
10 ...
PS C:\Users\neera\OneDrive\Desktop\assignments>

```

Keep Undo ⌂ | 1 of 1 ↑ ↓

Python Python Python Python Python powershell powershell powershell

◀ FACT.PY PREVIEW REQUEST

- Time-complexity vs. algorithm choice**
 - The naïve recursive `fib(n)=fib(n-1)+fib(n-2)` runs in $\Theta(2^n)$ because it repeatedly recomputes the same values.
 - A simple loop is $\Theta(n)$; each step does a constant amount of work.
 - Fast-doubling/bit-wise iteration exploits mathematical identities to cut the number of steps to $\Theta(\log n)$. The theory here is "divide and conquer"/"binary exponentiation" applied to the Fibonacci Q-matrix.
- Security and input validation**
 - SQL injection is possible when untrusted data is interpolated into a query string; the theory is that the DB engine parses the combined string, so user input becomes part of the syntax. Parameterisation separates data from code, preventing that mis-parsing.
 - Input validation (e.g. regex for usernames) is a form of **defensive programming**: you define a formal language for acceptable inputs and reject anything outside it to avoid undefined behaviour, buffer overflow, or injection.
- Error handling and resource management**
 - Exceptions are a structured way to propagate failures; catching them lets you maintain invariants and release resources.
 - Context managers (`with ...`) are an application of the RALL idiom – acquire resource, run block, release even on error.
- Code quality principles**

> 1 file changed +33 -7

Keep Undo ⌂