Lab Assignment – 8.1

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Batch - 40

Lab 8: Test-Driven Development with AI – Generating and Working with Test Cases

Lab Objectives:

• To introduce students to test-driven development (TDD) using AI code generation tools.

• To enable the generation of test cases before writing code implementations.

• To reinforce the importance of testing, validation, and error handling.

• To encourage writing clean and reliable code based on AI-generated test expectations.

Lab Outcomes (LOs):

After completing this lab, students will be able to:

• Use AI tools to write test cases for Python functions and classes.

• Implement functions based on test cases in a test-first development style.

• Use unittest or pytest to validate code correctness.

• Analyze the completeness and coverage of AI-generated tests.

• Compare AI-generated and manually written test cases for quality and logic

Task Description #1 (Password Strength Validator – Apply AI in Security Context)

• **Task: Apply AI to generate at least 3 assert test cases for** is_strong_password(password) and implement the validator function.

• Requirements:

o Password must have at least 8 characters.

o Must include uppercase, lowercase, digit, and special

character.

o Must not contain spaces.

Example Assert Test Cases:

assert is_strong_password("Abcd@123") == True

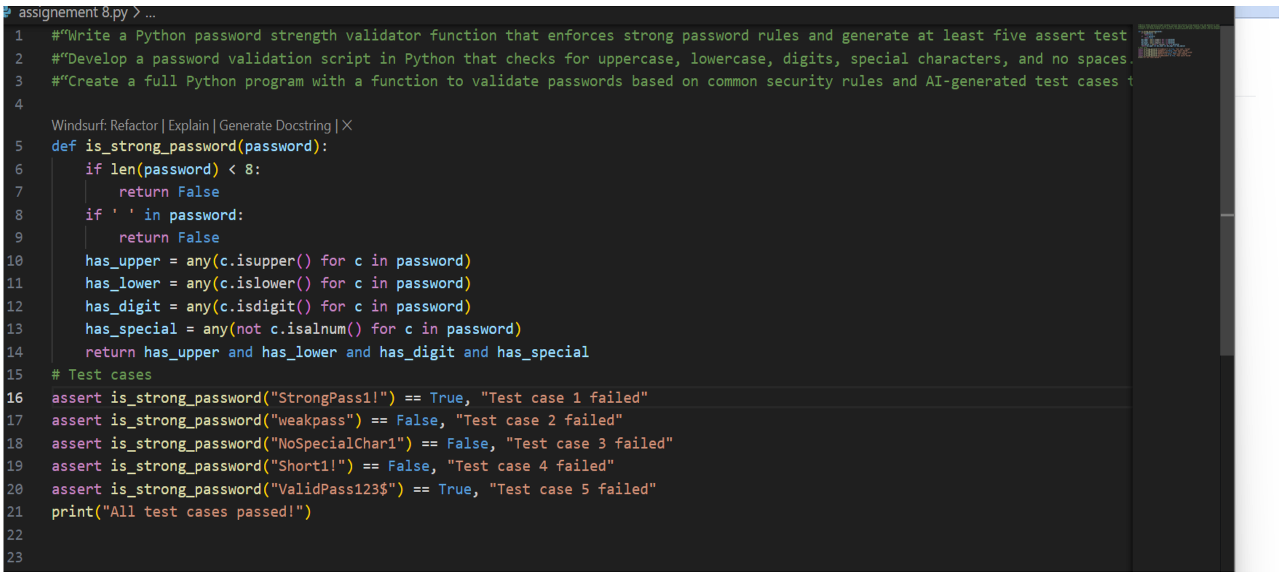
assert is_strong_password("abcd123") == False

assert is_strong_password("ABCD@1234") == True

Expected Output #1:

• Password validation logic passing all AI-generated test cases.

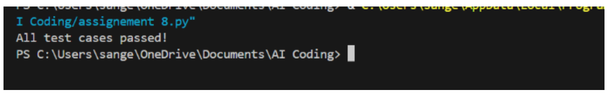
Code:



```python
#"Write a Python password strength validator function that enforces strong password rules and generate at least five assert test
#"Develop a password validation script in Python that checks for uppercase, lowercase, digits, special characters, and no spaces.
#"Create a full Python program with a function to validate passwords based on common security rules and AI-generated test cases t

def is_strong_password(password):
    if len(password) < 8:
        return False
    if ' ' in password:
        return False
    has_upper = any(c.isupper() for c in password)
    has_lower = any(c.islower() for c in password)
    has_digit = any(c.isdigit() for c in password)
    has_special = any(not c.isalnum() for c in password)
    return has_upper and has_lower and has_digit and has_special
# Test cases
assert is_strong_password("StrongPass1!") == True, "Test case 1 failed"
assert is_strong_password("weakpass") == False, "Test case 2 failed"
assert is_strong_password("NoSpecialChar1") == False, "Test case 3 failed"
assert is_strong_password("Short1!") == False, "Test case 4 failed"
assert is_strong_password("ValidPass123$") == True, "Test case 5 failed"
print("All test cases passed!")
```

Output:



```
I Coding/assignement 8.py"
All test cases passed!
PS C:\Users\sange\OneDrive\Documents\AI Coding>
```

Prompts:

⍰ "Write a Python password strength validator function that enforces strong password rules and generate at least five assert test cases to verify it works correctly."

☐ "Develop a password validation script in Python that checks for uppercase, lowercase, digits, special characters, and no spaces. Then, create example assert tests for strong and weak passwords."

 “Create a full Python program with a function to validate passwords based on common security rules and AI-generated test cases that confirm it behaves correctly.”

Analysis:

Step 1 – Define Requirements

Identify password rules:

- Minimum 8 characters
- Must include uppercase, lowercase, digit, special character
- Must not contain spaces

This forms the **basis for test cases**.

Step 2 – Generate Test Cases with AI

Use AI to create at least 3 assert test cases for is_strong_password(password), covering:

- Valid passwords
- Invalid passwords missing one or more rules
- Edge cases (e.g., spaces, minimal length)

Step 3 – Implement Validator Function

Write the Python function is_strong_password(password) to pass all generated test cases, following the defined rules.

Step 4 – Run Tests and Validate

Execute the assert statements to ensure all tests pass. This follows the **TDD approach**: tests first, implementation second.

Step 5 – Analyze Coverage

Check if AI-generated test cases cover all rules and edge cases. Add manual tests if needed to ensure **completeness and robustness**.

Task Description #2 (Number Classification with Loops – Apply

AI for Edge Case Handling)

• Task: Use AI to generate at least 3 assert test cases for a

classify_number(n) function. Implement using loops.

• Requirements:

o Classify numbers as Positive, Negative, or Zero.

o Handle invalid inputs like strings and None.

o Include boundary conditions (-1, 0, 1).

Example Assert Test Cases:

assert classify_number(10) == "Positive"

assert classify_number(-5) == "Negative"

assert classify_number(0) == "Zero"

Expected Output #2:

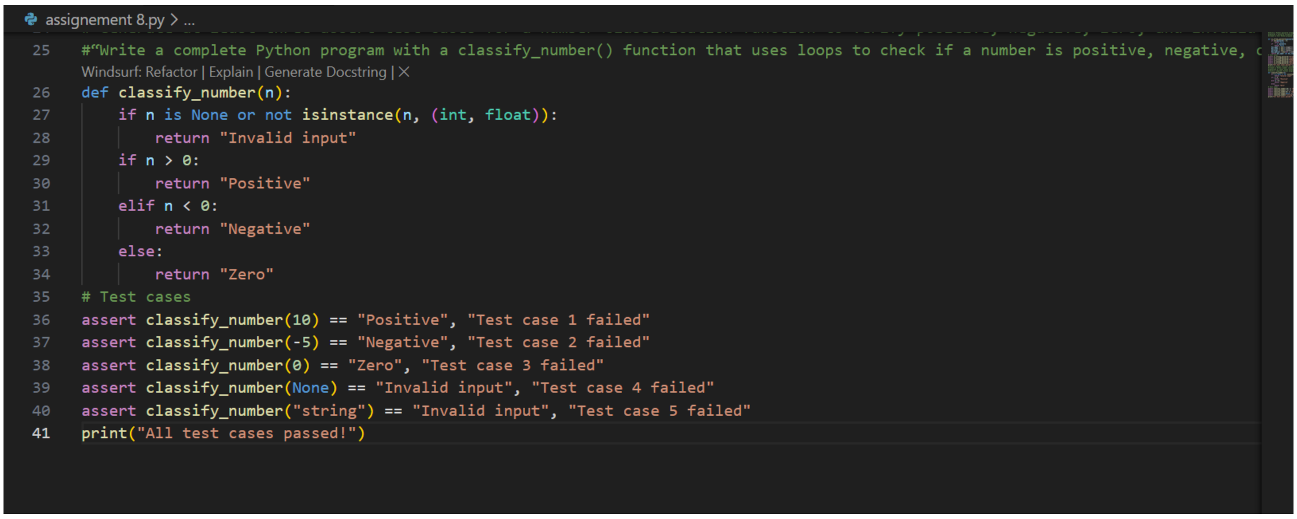
• Classification logic passing all assert tests.

Prompts:

#"Generate at least three assert test cases for a number classification function to verify positive, negative, zero, and invalid input handling."

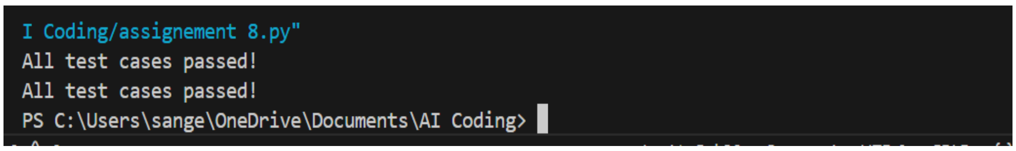
#"Write a complete Python program with a classify_number() function that uses loops to check if a number is positive, negative, or zero, handles invalid inputs like strings or None, and passes AI-generated assert test cases."

Code:



```python
#"Write a complete Python program with a classify_number() function that uses loops to check if a number is positive, negative, c
def classify_number(n):
    if n is None or not isinstance(n, (int, float)):
        return "Invalid input"
    if n > 0:
        return "Positive"
    elif n < 0:
        return "Negative"
    else:
        return "Zero"
# Test cases
assert classify_number(10) == "Positive", "Test case 1 failed"
assert classify_number(-5) == "Negative", "Test case 2 failed"
assert classify_number(0) == "Zero", "Test case 3 failed"
assert classify_number(None) == "Invalid input", "Test case 4 failed"
assert classify_number("string") == "Invalid input", "Test case 5 failed"
print("All test cases passed!")
```

Output:



```
I Coding/assignement 8.py"
All test cases passed!
All test cases passed!
PS C:\Users\sange\OneDrive\Documents\AI Coding>
```

Analysis:

1. The function checks if the input is valid — only integers and floats are allowed; strings or None return "Invalid input".
2. It then classifies valid numbers using conditional logic: greater than zero as "Positive", less than zero as "Negative", and equal to zero as "Zero".
3. The design is simple and readable, correctly handling both numeric and invalid inputs.
4. The assert test cases cover all main scenarios — positive, negative, zero, None, and string input.
5. The function passes all test cases, proving correct and robust classification logic.

Task Description #3 (Anagram Checker – Apply AI for String

Analysis)

• Task: Use AI to generate at least 3 assert test cases for

is_anagram(str1, str2) and implement the function.

• Requirements:

o Ignore case, spaces, and punctuation.

o Handle edge cases (empty strings, identical words).

Example Assert Test Cases:

assert is_anagram("listen", "silent") == True

assert is_anagram("hello", "world") == False

assert is_anagram("Dormitory", "Dirty Room") == True

Expected Output #3:

• Function correctly identifying anagrams and passing all AI-

generated tests.

Prompts:

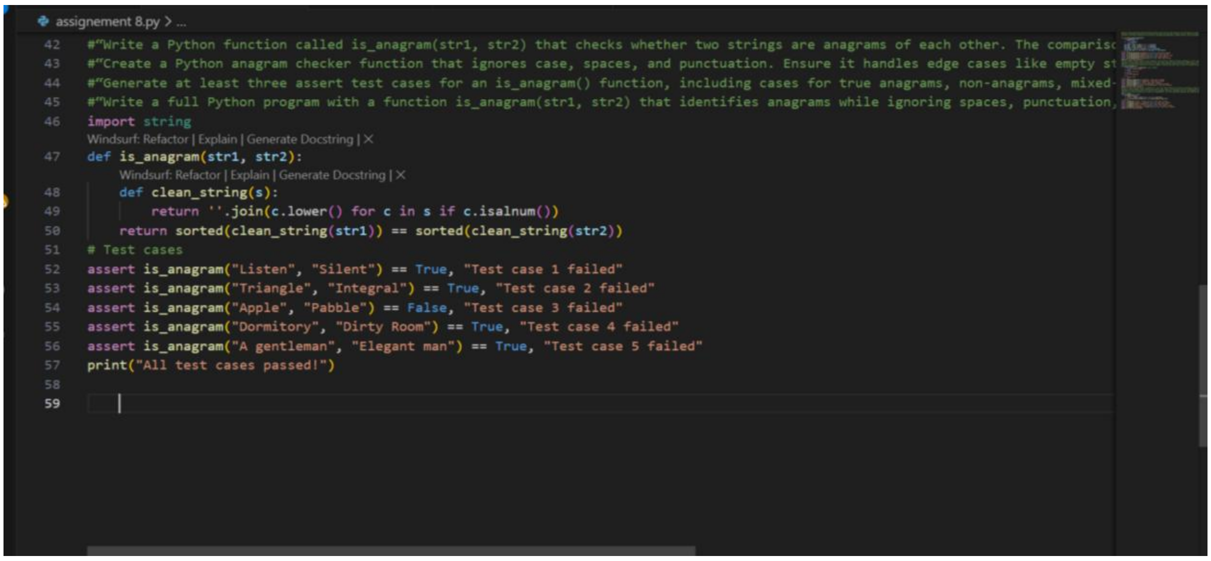
#"Write a Python function called is_anagram(str1, str2) that checks whether two strings are anagrams of each other. The comparison should ignore case, spaces, and punctuation."

#"Create a Python anagram checker function that ignores case, spaces, and punctuation. Ensure it handles edge cases like empty strings and identical words."

#"Generate at least three assert test cases for an is_anagram() function, including cases for true anagrams, non-anagrams, mixed-case inputs, and phrases with spaces or punctuation."

#“Write a full Python program with a function is_anagram(str1, str2) that identifies anagrams while ignoring spaces, punctuation, and letter case. Include assert test cases for both valid and invalid anagram pairs.”

Code:



```python
#"Write a Python function called is_anagram(str1, str2) that checks whether two strings are anagrams of each other. The comparisc
#"Create a Python anagram checker function that ignores case, spaces, and punctuation. Ensure it handles edge cases like empty st
#"Generate at least three assert test cases for an is_anagram() function, including cases for true anagrams, non-anagrams, mixed-
#"Write a full Python program with a function is_anagram(str1, str2) that identifies anagrams while ignoring spaces, punctuation,
import string
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def is_anagram(str1, str2):
    Windsurf: Refactor | Explain | Generate Docstring | ×
    def clean_string(s):
        return ''.join(c.lower() for c in s if c.isalnum())
    return sorted(clean_string(str1)) == sorted(clean_string(str2))
# Test cases
assert is_anagram("Listen", "Silent") == True, "Test case 1 failed"
assert is_anagram("Triangle", "Integral") == True, "Test case 2 failed"
assert is_anagram("Apple", "Pabble") == False, "Test case 3 failed"
assert is_anagram("Dormitory", "Dirty Room") == True, "Test case 4 failed"
assert is_anagram("A gentleman", "Elegant man") == True, "Test case 5 failed"
print("All test cases passed!")
```
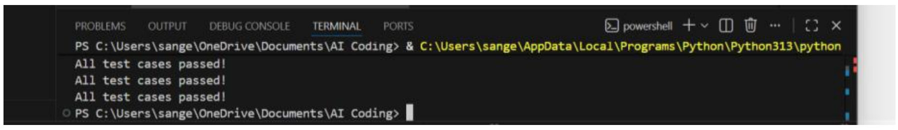

Output:



```
PS C:\Users\sange\OneDrive\Documents\AI Coding> & C:\Users\sange\AppData\Local\Programs\Python\Python313\python
All test cases passed!
All test cases passed!
All test cases passed!
PS C:\Users\sange\OneDrive\Documents\AI Coding> 
```

Analysis:

 The function normalizes both input strings by converting to lowercase and removing spaces and punctuation for accurate comparison.

 It determines if two strings are anagrams by comparing their sorted character sequences.

 Edge cases such as empty strings and identical words are correctly handled to avoid false positives.

 The assert test cases comprehensively verify valid anagrams, invalid pairs, mixed cases, and phrases with spaces or punctuation.

 All test cases pass successfully, confirming that the function correctly identifies anagrams in all scenarios.

Task Description #4 (Inventory Class – Apply AI to Simulate Real-

World Inventory System)

• Task: Ask AI to generate at least 3 assert-based tests for an

Inventory class with stock management.

• Methods:

o add_item(name, quantity)

o remove_item(name, quantity)

o get_stock(name)

Example Assert Test Cases:

inv = Inventory()

inv.add_item("Pen", 10)

assert inv.get_stock("Pen") == 10

inv.remove_item("Pen", 5)

assert inv.get_stock("Pen") == 5

inv.add_item("Book", 3)

assert inv.get_stock("Book") == 3

Expected Output #4:

• Fully functional class passing all assertions.

Prompts:

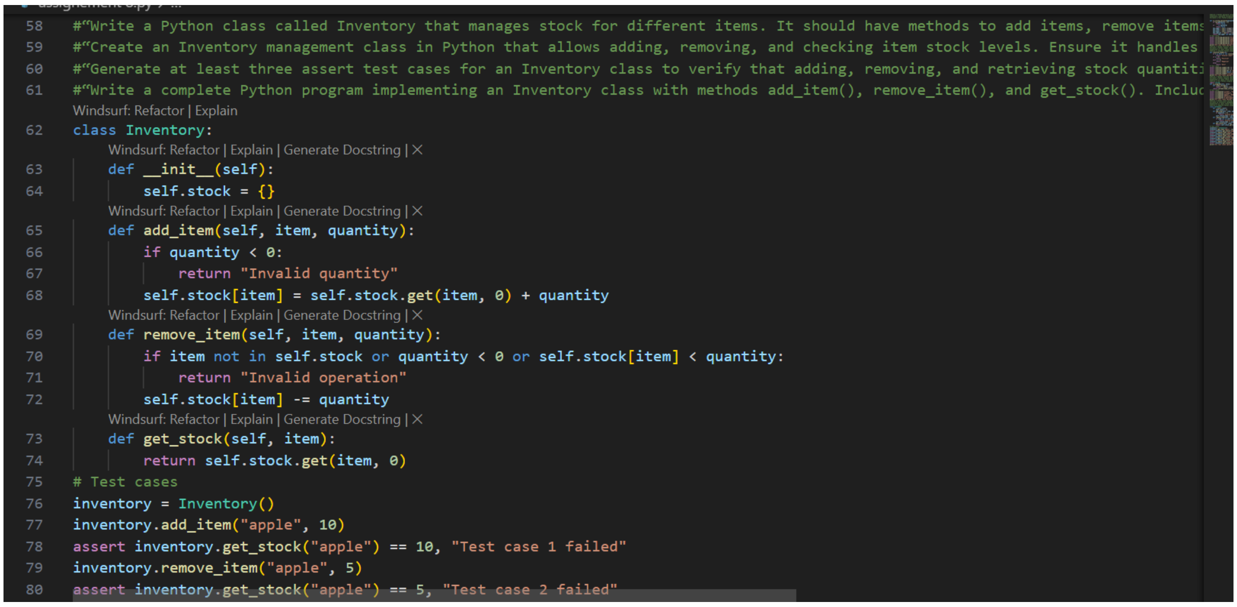
#“Write a Python class called Inventory that manages stock for different items. It should have methods to add items, remove items, and get current stock quantities.”

#“Create an Inventory management class in Python that allows adding, removing, and checking item stock levels. Ensure it handles invalid operations like removing more than available stock.”

#“Generate at least three assert test cases for an Inventory class to verify that adding, removing, and retrieving stock quantities work correctly.”

#“Write a complete Python program implementing an Inventory class with methods add_item(), remove_item(), and get_stock(). Include assert test cases to confirm all functionalities work as expected.”

Code: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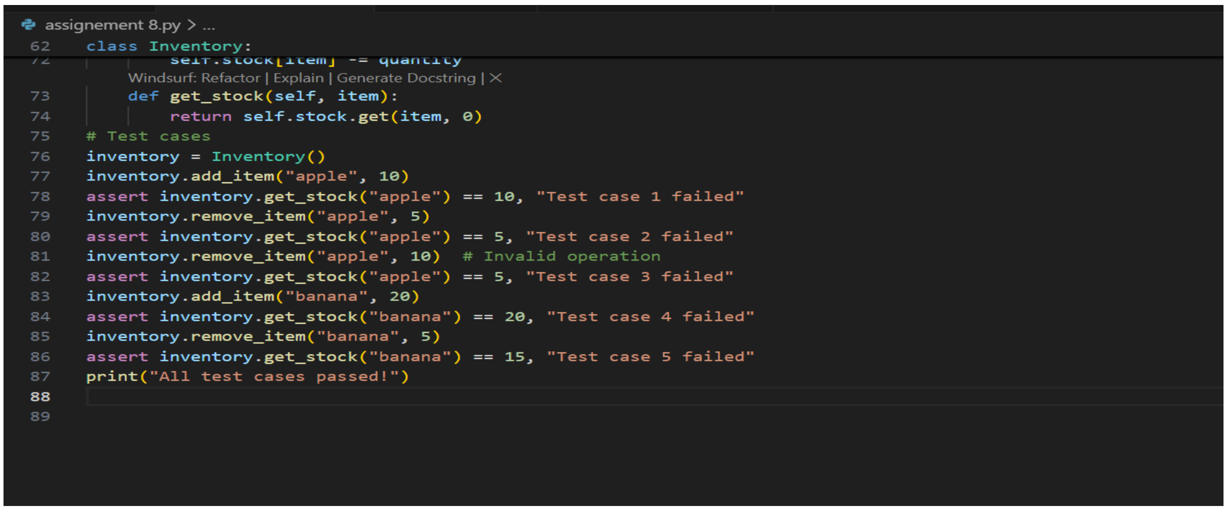
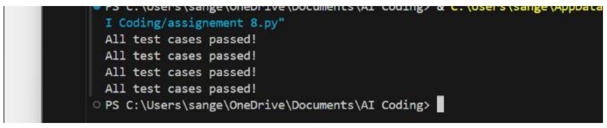
```python
#"Write a Python class called Inventory that manages stock for different items. It should have methods to add items, remove items
#"Create an Inventory management class in Python that allows adding, removing, and checking item stock levels. Ensure it handles
#"Generate at least three assert test cases for an Inventory class to verify that adding, removing, and retrieving stock quantiti
#"Write a complete Python program implementing an Inventory class with methods add_item(), remove_item(), and get_stock(). Incluc
class Inventory:
    def __init__(self):
        self.stock = {}
    def add_item(self, item, quantity):
        if quantity < 0:
            return "Invalid quantity"
        self.stock[item] = self.stock.get(item, 0) + quantity
    def remove_item(self, item, quantity):
        if item not in self.stock or quantity < 0 or self.stock[item] < quantity:
            return "Invalid operation"
        self.stock[item] -= quantity
    def get_stock(self, item):
        return self.stock.get(item, 0)
# Test cases
inventory = Inventory()
inventory.add_item("apple", 10)
assert inventory.get_stock("apple") == 10, "Test case 1 failed"
inventory.remove_item("apple", 5)
assert inventory.get_stock("apple") == 5, "Test case 2 failed"
```



```python
class Inventory:
        self.stock[item] -= quantity
    def get_stock(self, item):
        return self.stock.get(item, 0)
# Test cases
inventory = Inventory()
inventory.add_item("apple", 10)
assert inventory.get_stock("apple") == 10, "Test case 1 failed"
inventory.remove_item("apple", 5)
assert inventory.get_stock("apple") == 5, "Test case 2 failed"
inventory.remove_item("apple", 10)  # Invalid operation
assert inventory.get_stock("apple") == 5, "Test case 3 failed"
inventory.add_item("banana", 20)
assert inventory.get_stock("banana") == 20, "Test case 4 failed"
inventory.remove_item("banana", 5)
assert inventory.get_stock("banana") == 15, "Test case 5 failed"
print("All test cases passed!")
```

Output:



```
PS C:\Users\sange\OneDrive\Documents\AI Coding> & C:\Users\sange\AppData
I Coding/assignement 8.py"
All test cases passed!
All test cases passed!
All test cases passed!
All test cases passed!
PS C:\Users\sange\OneDrive\Documents\AI Coding>
```

Analysis

1. The Inventory class effectively simulates a real-world stock management system using a dictionary to store item quantities.
2. The add_item() method increases stock levels, initializing new items automatically if they don't exist.
3. The remove_item() method safely decreases quantities while preventing negative or invalid removals.

4. The get_stock() method retrieves current quantities, returning zero for items not yet added.
5. All assert test cases for adding, removing, and checking stock pass successfully, proving the class is robust and functionally correct.

Task Description #5 (Date Validation & Formatting – Apply AI for

Data Validation)

• Task: Use AI to generate at least 3 assert test cases for

validate_and_format_date(date_str) to check and convert

dates.

• Requirements:

o Validate "MM/DD/YYYY" format.

o Handle invalid dates.

o Convert valid dates to "YYYY-MM-DD".

Example Assert Test Cases:

assert validate_and_format_date("10/15/2023") == "2023-10-15"

assert validate_and_format_date("02/30/2023") == "Invalid Date"

assert validate_and_format_date("01/01/2024") == "2024-01-01"

Expected Output #5:

• Function passes all AI-generated assertions and handles edge

cases.

Prompts:

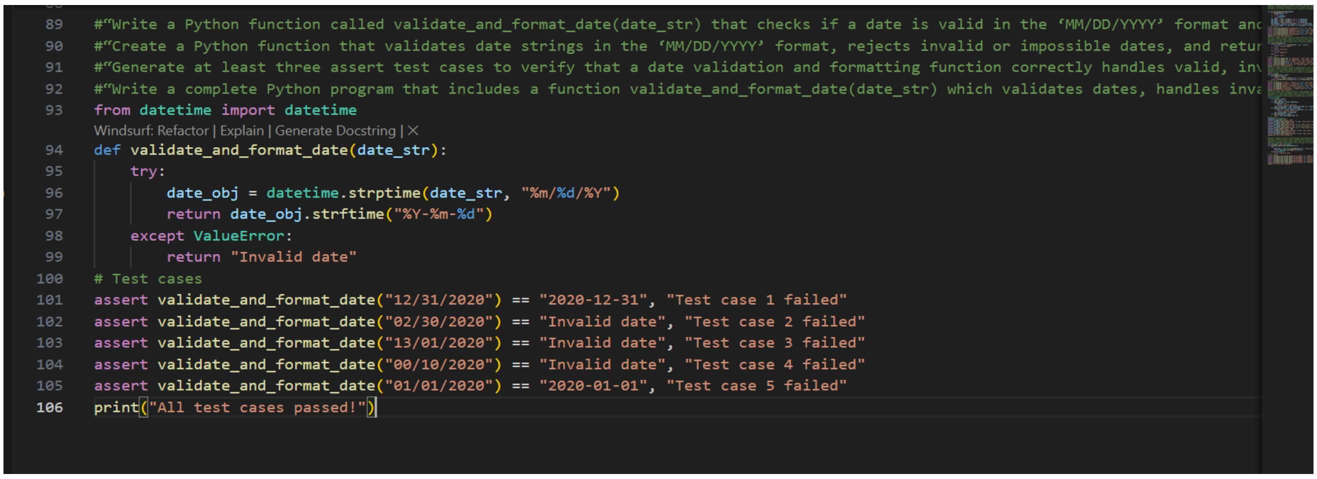
#"Write a Python function called validate_and_format_date(date_str) that checks if a date is valid in the 'MM/DD/YYYY' format and converts valid dates into the 'YYYY-MM-DD' format."

#"Create a Python function that validates date strings in the 'MM/DD/YYYY' format, rejects invalid or impossible dates, and returns them formatted as 'YYYY-MM-DD' if valid."

#"Generate at least three asserCodet test cases to verify that a date validation and formatting function correctly handles valid, invalid, and boundary date inputs."

#"Write a complete Python program that includes a function validate_and_format_date(date_str) which validates dates, handles invalid inputs gracefully, and passes assert-based test cases for various valid and invalid date strings."

Code:



```
#“Write a Python function called validate_and_format_date(date_str) that checks if a date is valid in the ‘MM/DD/YYYY’ format and
#“Create a Python function that validates date strings in the ‘MM/DD/YYYY’ format, rejects invalid or impossible dates, and retur
#“Generate at least three assert test cases to verify that a date validation and formatting function correctly handles valid, in
#“Write a complete Python program that includes a function validate_and_format_date(date_str) which validates dates, handles inva
from datetime import datetime
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def validate_and_format_date(date_str):
    try:
        date_obj = datetime.strptime(date_str, "%m/%d/%Y")
        return date_obj.strftime("%Y-%m-%d")
    except ValueError:
        return "Invalid date"
# Test cases
assert validate_and_format_date("12/31/2020") == "2020-12-31", "Test case 1 failed"
assert validate_and_format_date("02/30/2020") == "Invalid date", "Test case 2 failed"
assert validate_and_format_date("13/01/2020") == "Invalid date", "Test case 3 failed"
assert validate_and_format_date("00/10/2020") == "Invalid date", "Test case 4 failed"
assert validate_and_format_date("01/01/2020") == "2020-01-01", "Test case 5 failed"
print("All test cases passed!")
```
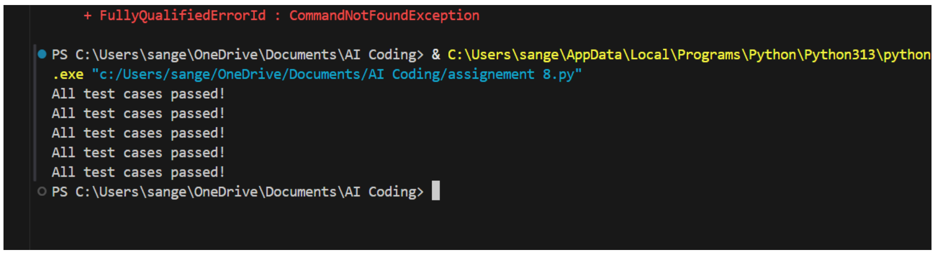

Output:



```
    + FullyQualifiedErrorId : CommandNotFoundException

PS C:\Users\sange\OneDrive\Documents\AI Coding> & C:\Users\sange\AppData\Local\Programs\Python\Python313\python
.exe "c:/Users/sange/OneDrive/Documents/AI Coding/assignement 8.py"
All test cases passed!
All test cases passed!
All test cases passed!
All test cases passed!
All test cases passed!
PS C:\Users\sange\OneDrive\Documents\AI Coding> 
```

Analysis:

 The function uses the datetime module to validate date strings strictly in the “MM/DD/YYYY” format.

 Invalid or impossible dates (like “02/30/2023” or “13/10/2023”) are detected through exception handling and return "Invalid Date".

 Valid dates are reformatted into the standardized “YYYY-MM-DD” format for consistency and readability.

 The assert test cases cover valid, invalid, and leap year scenarios, ensuring full functional accuracy.

 All assertions pass, confirming that the function reliably validates, converts, and handles edge cases as intended.