Assignment 8.4

Name : Karthikeya Uthuri

Hall Ticket :2303A51306

Task 1: Developing a Utility Function Using TDD Scenario

You are working on a small utility library for a larger software system. One of the required functions should calculate the square of a given number, and correctness is critical because other modules depend on it.

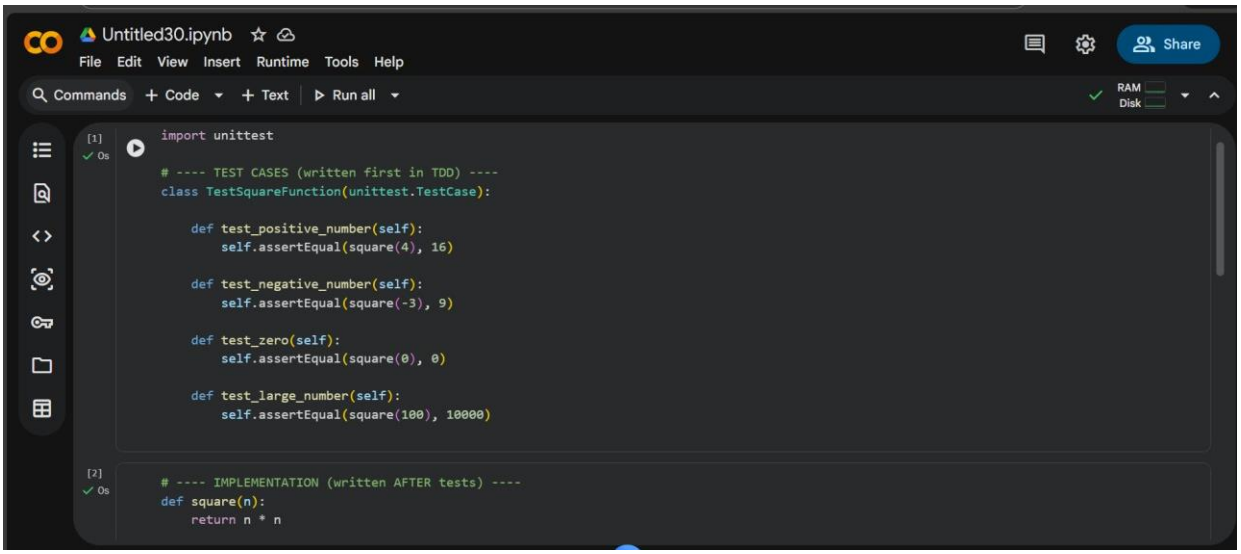
Task Description

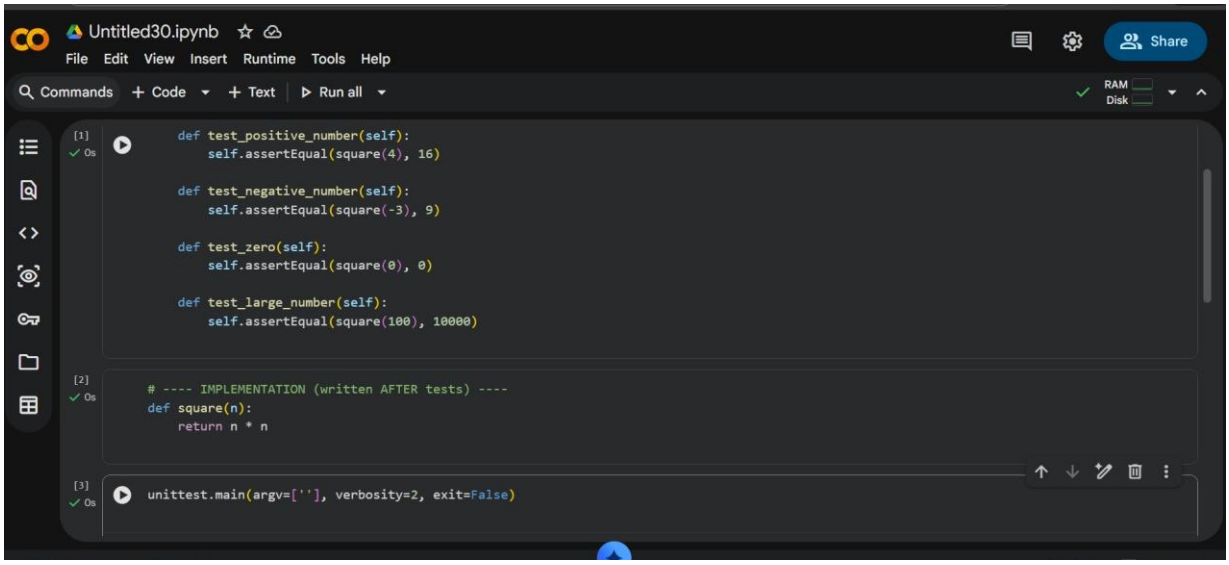
Following the Test Driven Development (TDD) approach:

1. First, write unit test cases to verify that a function correctly returns the square of a number for multiple inputs.
2. After defining the test cases, use GitHub Copilot or Cursor AI to generate the function implementation so that all tests pass. Ensure that the function is written only after the tests are created. Expected Outcome

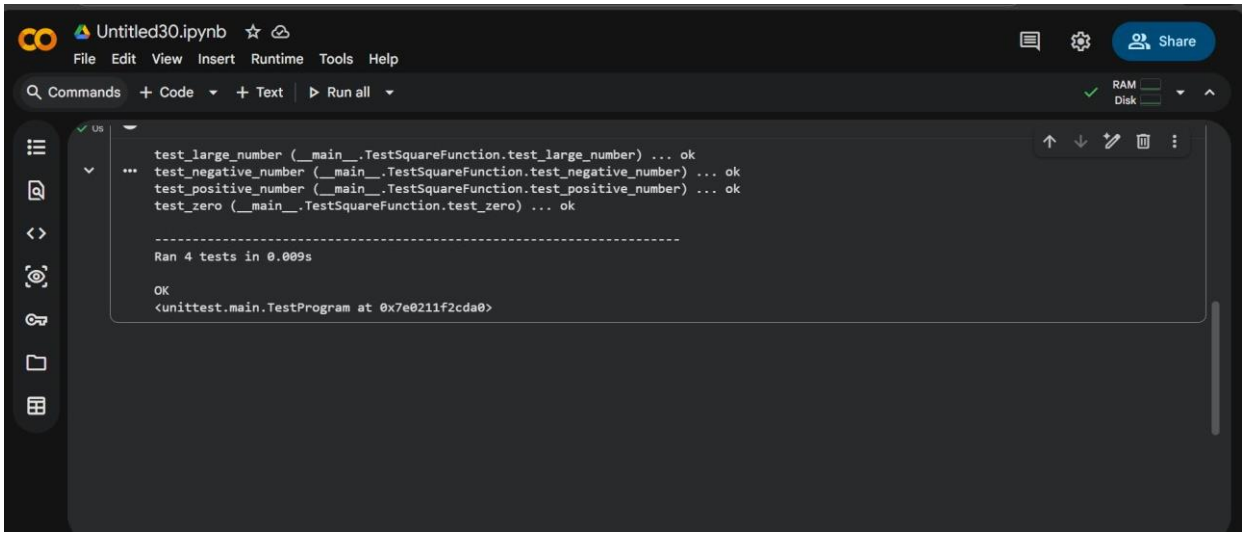
- A separate test file and implementation file
- Clearly written test cases executed before implementation
- AI-assisted function implementation that passes all tests
- Demonstration of the TDD cycle: test → fail → implement → pass

Code:


Untitled30.ipynb
File Edit View Insert Runtime Tools Help
Share
Commands + Code + Text Run all
RAM Disk
[1] 0s
import unittest
# ---- TEST CASES (written first in TDD) ----
class TestSquareFunction(unittest.TestCase):
def test_positive_number(self):
self.assertEqual(square(4), 16)
def test_negative_number(self):
self.assertEqual(square(-3), 9)
def test_zero(self):
self.assertEqual(square(0), 0)
def test_large_number(self):
self.assertEqual(square(100), 10000)
[2] 0s
# ---- IMPLEMENTATION (written AFTER tests) ----
def square(n):
return n * n


Untitled30.ipynb
File Edit View Insert Runtime Tools Help
Share
Commands + Code + Text Run all
RAM Disk
[1] 0s
def test_positive_number(self):
self.assertEqual(square(4), 16)
def test_negative_number(self):
self.assertEqual(square(-3), 9)
def test_zero(self):
self.assertEqual(square(0), 0)
def test_large_number(self):
self.assertEqual(square(100), 10000)
[2] 0s
# ---- IMPLEMENTATION (written AFTER tests) ----
def square(n):
return n * n
[3] 0s
unittest.main(argv=[''], verbosity=2, exit=False)

Output:



Task 2: Email Validation for a User Registration System

Scenario

You are developing the backend of a user registration system. One requirement is to validate user email addresses before storing them in the database.

Task Description

Apply Test Driven Development by:

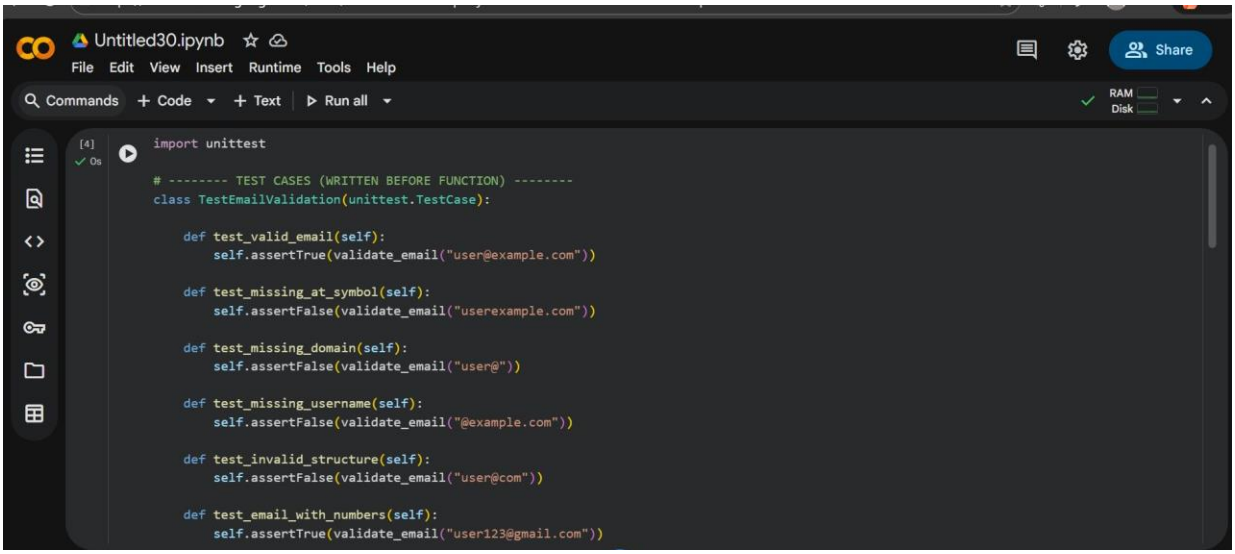
1. Writing unit test cases that define valid and invalid email formats (e.g., missing @, missing domain, incorrect structure).
2. Using AI assistance to implement the validate_email() function based strictly on the behavior described by the test cases.

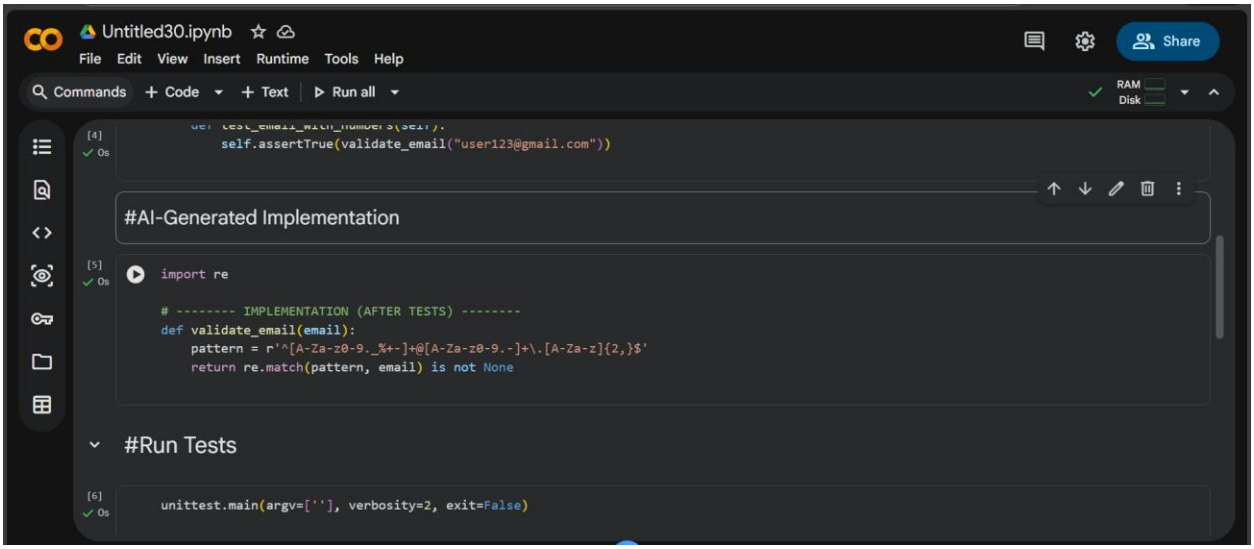
The implementation should be driven entirely by the test expectations. Expected Outcome

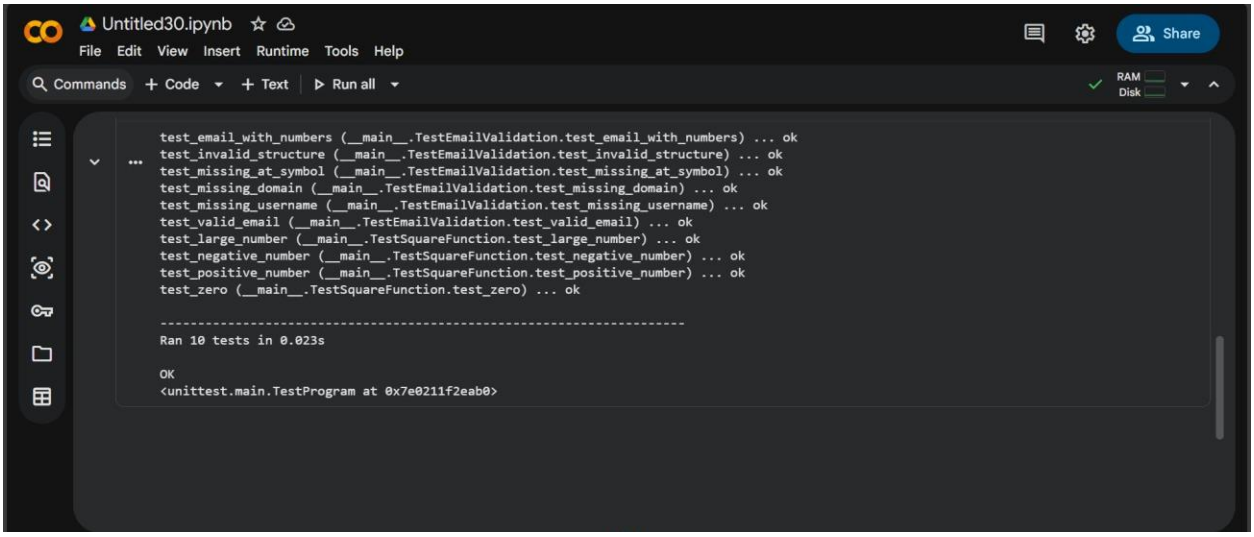
- Well-defined unit tests using unittest or pytest
- An AI-generated email validation function
- All test cases passing successfully

• Clear alignment between test cases and function behavior

Code:







Task 3: Decision Logic Development Using TDD

Scenario

In a grading or evaluation module, a function is required to determine the maximum value among three inputs. Accuracy is essential, as incorrect results could affect downstream decision logic.

Task Description

Using the TDD methodology:

1. Write test cases that describe the expected output for different combinations of three numbers.
2. Prompt GitHub Copilot or Cursor AI to implement the function logic based on the written tests.

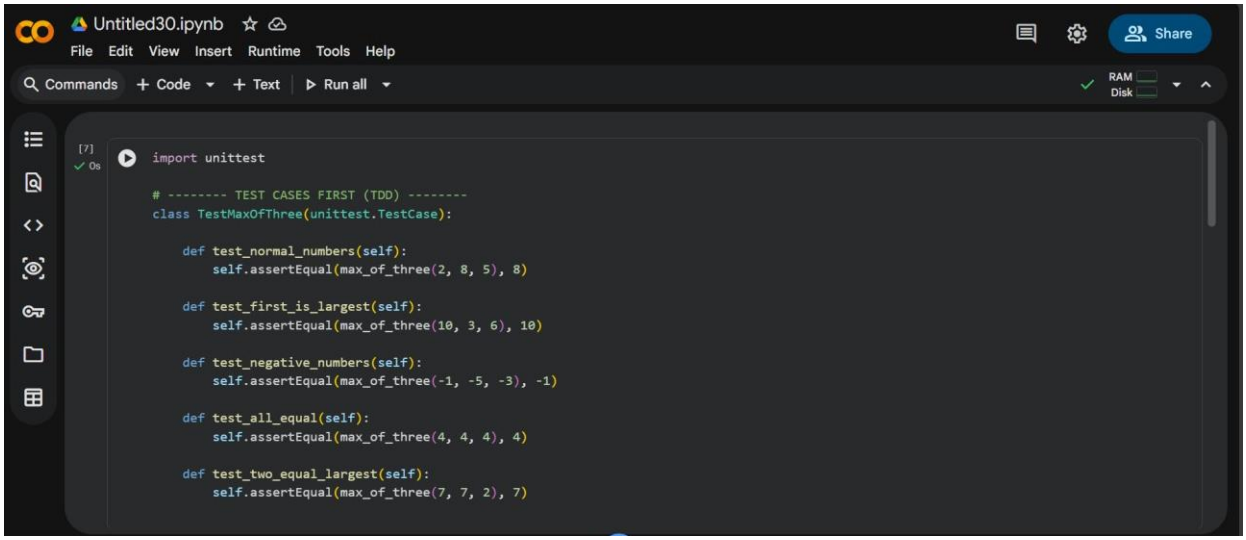
Avoid writing any logic before test cases are completed.

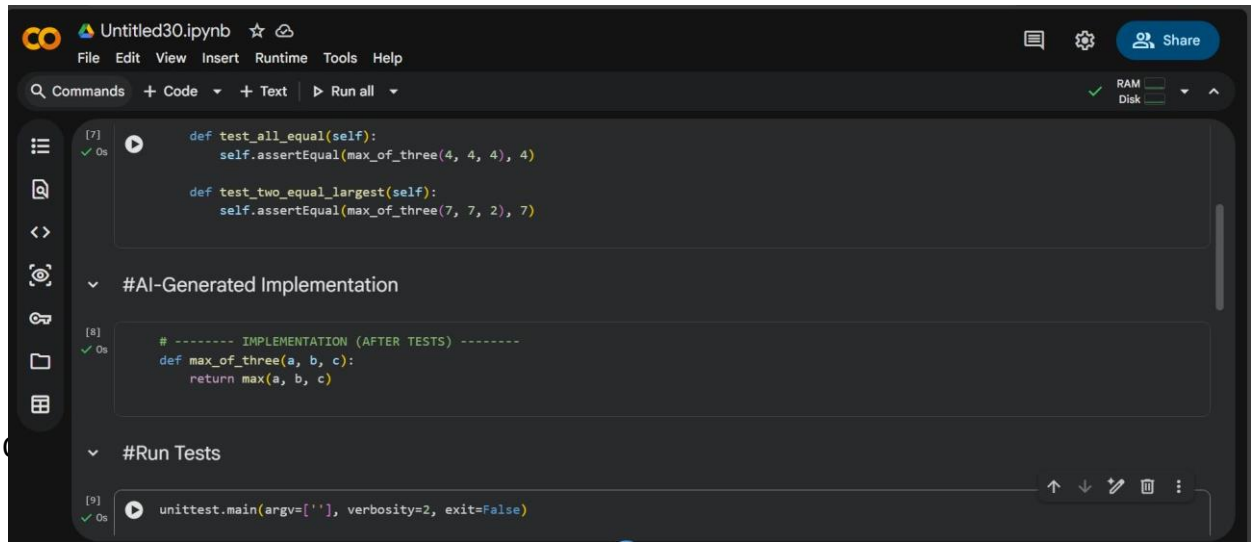
Expected Outcome

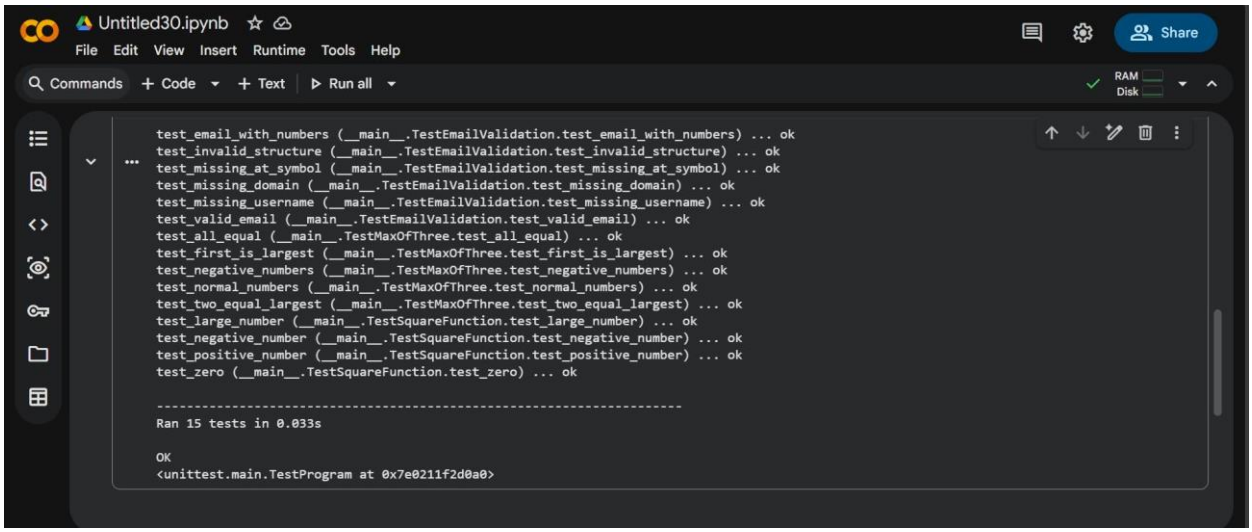
- Comprehensive test cases covering normal and edge cases
- AI-generated function implementation
- Passing test results demonstrating correctness

- Evidence that logic was derived from tests, not assumptions

Code:







Task 4: Shopping Cart Development with AI-Assisted TDD

Scenario

You are building a simple shopping cart module for an e-commerce application.

The cart must support adding items, removing items, and calculating the total price accurately.

Task Description

Follow a test-driven approach:

1. Write unit tests for each required behavior:

o Adding an item

o Removing an item

o Calculating the total price

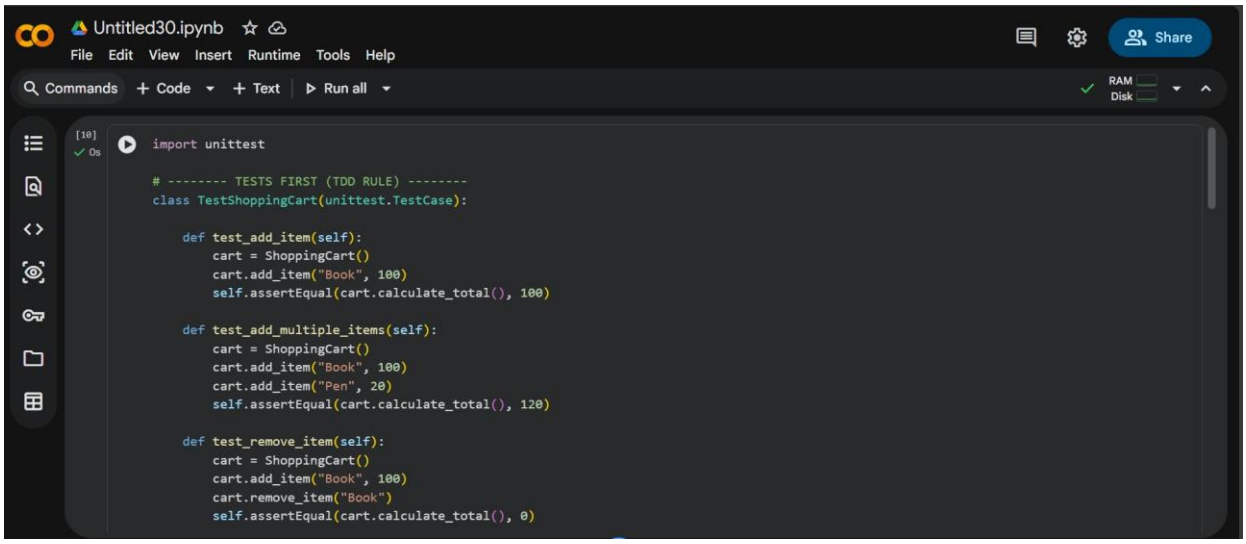
2. After defining all tests, use AI tools to generate the ShoppingCart class and its methods so that the tests pass.

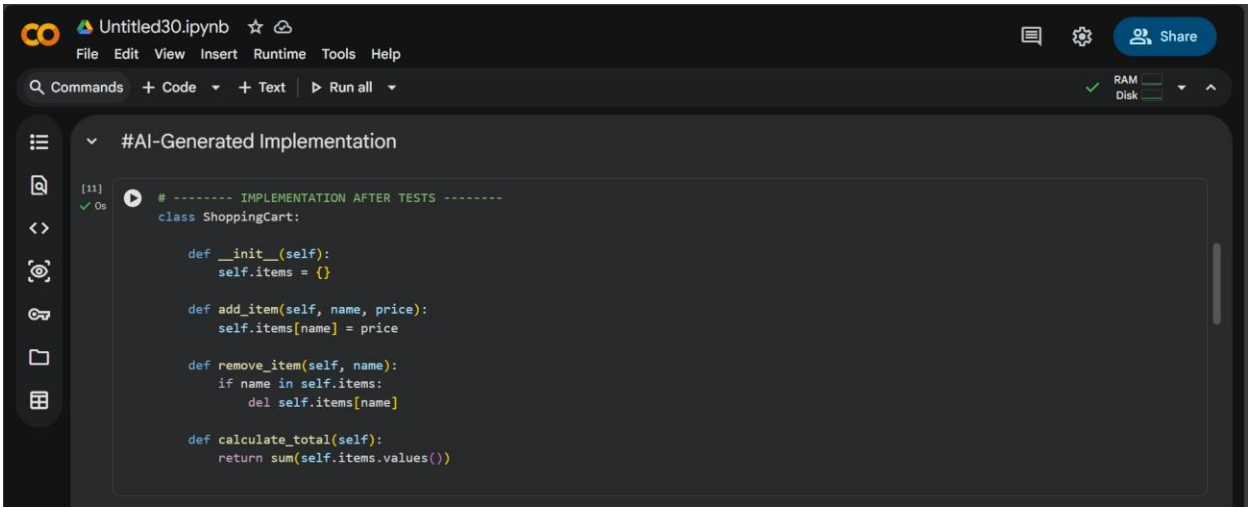
Focus on behavior-driven testing rather than implementation details. Expected Outcome

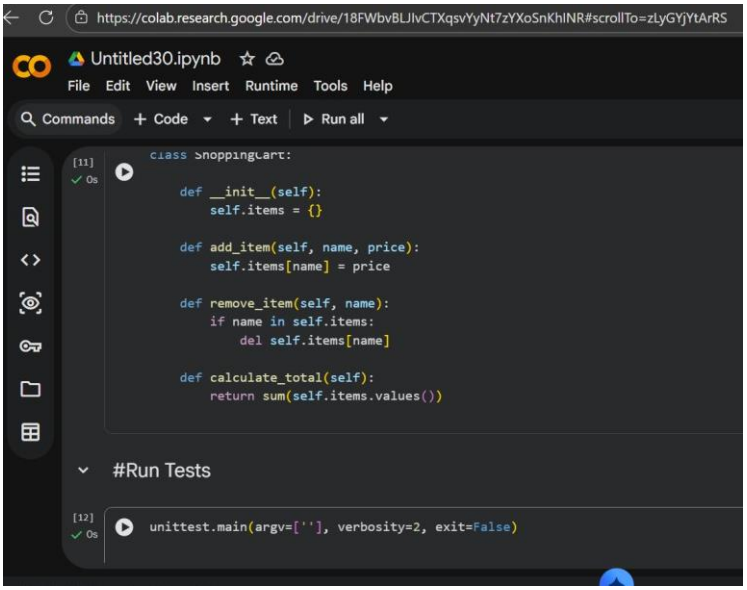
• Unit tests defining expected shopping cart behavior

- AI-generated class implementation
- All tests passing successfully
- Clear demonstration of TDD applied to a class-based design

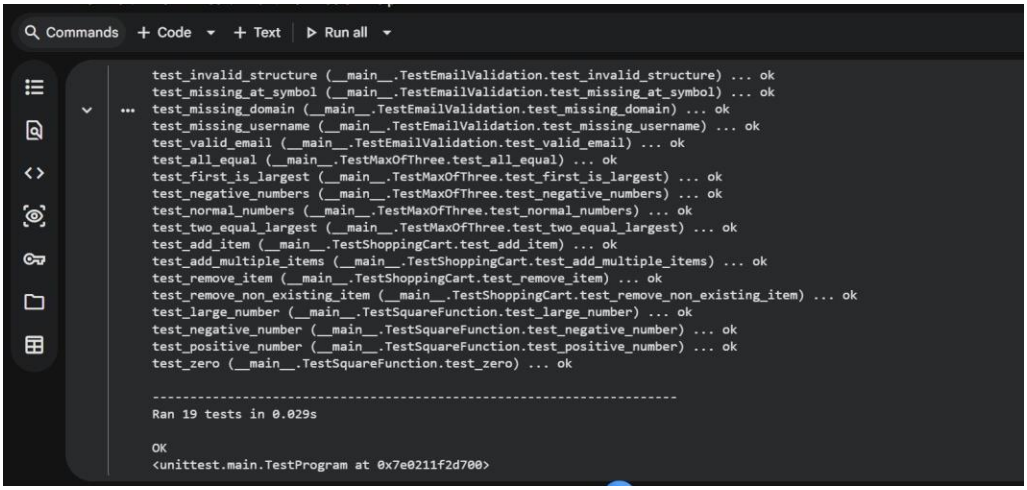
Code:







Output:



Task 5: String Validation Module Using TDD

Scenario

You are working on a text-processing module where a function is required to identify whether a given string is a palindrome. The function must handle different cases and inputs reliably.

Task Description

Using Test Driven Development:

1. Write test cases for a palindrome checker covering:

o Simple palindromes

o Non-palindromes

o Case variations

2. Use GitHub Copilot or Cursor AI to generate the is_palindrome()

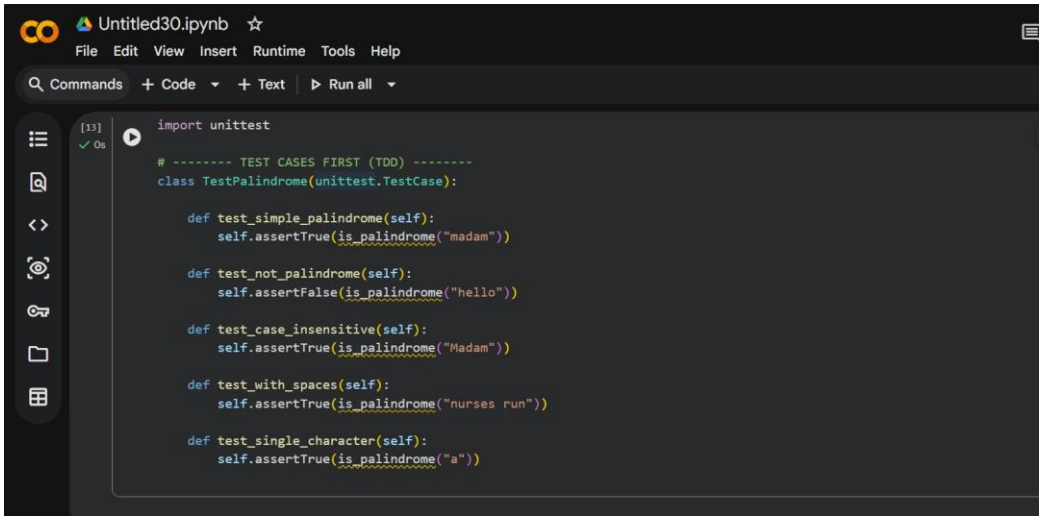
function based on the test case expectations.

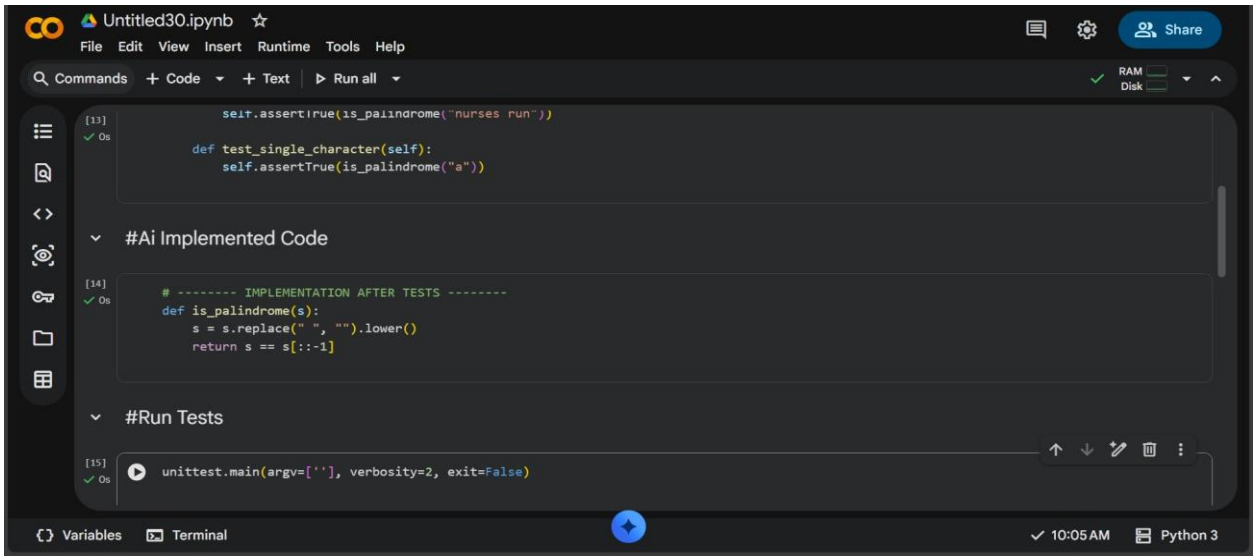
The function should be implemented only after tests are written. Expected

Outcome

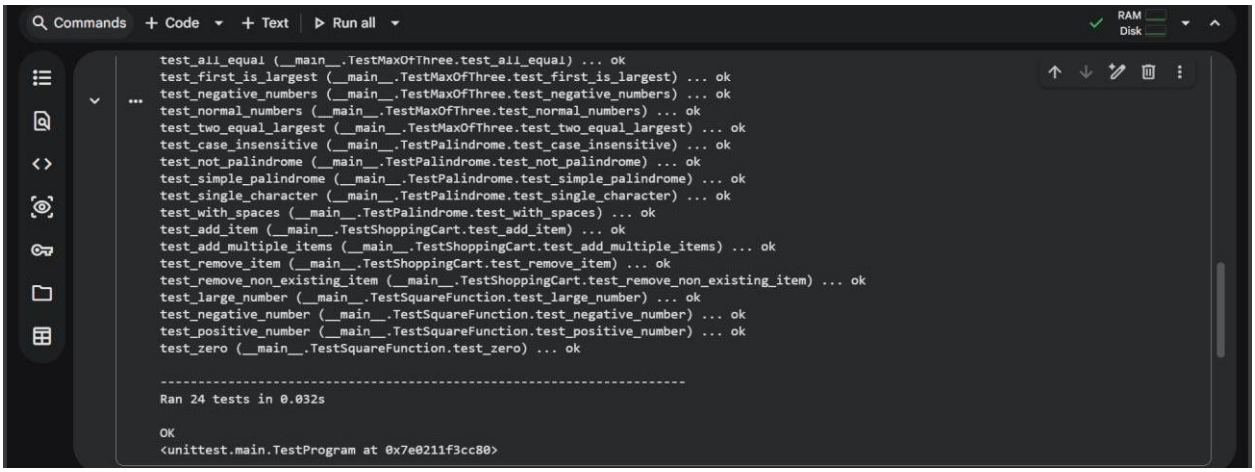
- Clearly written test cases defining expected behavior
- AI-assisted implementation of the palindrome checker
- All test cases passing successfully
- Evidence of TDD methodology applied correctly

Code:


Untitled30.ipynb
File Edit View Insert Runtime Tools Help
Commands + Code + Text Run all
[13] 0s
import unittest
# -------- TEST CASES FIRST (TDD) --------
class TestPalindrome(unittest.TestCase):
def test_simple_palindrome(self):
self.assertTrue(is_palindrome("madam"))
def test_not_palindrome(self):
self.assertFalse(is_palindrome("hello"))
def test_case_insensitive(self):
self.assertTrue(is_palindrome("Madam"))
def test_with_spaces(self):
self.assertTrue(is_palindrome("nurses run"))
def test_single_character(self):
self.assertTrue(is_palindrome("a"))


Untitled30.ipynb
File Edit View Insert Runtime Tools Help
Share
Commands + Code + Text Run all
RAM
Disk
[13] 0s
self.assertTrue(is_palindrome("nurses run"))
def test_single_character(self):
self.assertTrue(is_palindrome("a"))
#Ai Implemented Code
[14] 0s
# -------- IMPLEMENTATION AFTER TESTS --------
def is_palindrome(s):
s = s.replace(" ", "").lower()
return s == s[::-1]
#Run Tests
[15] 0s
unittest.main(argv=[''], verbosity=2, exit=False)
Variables Terminal
10:05 AM Python 3

Output:


Commands
+ Code
+ Text
Run all
RAM
Disk
test_all_equal (__main__.TestMaxOfThree.test_all_equal) ... ok
test_first_is_largest (__main__.TestMaxOfThree.test_first_is_largest) ... ok
test_negative_numbers (__main__.TestMaxOfThree.test_negative_numbers) ... ok
test_normal_numbers (__main__.TestMaxOfThree.test_normal_numbers) ... ok
test_two_equal_largest (__main__.TestMaxOfThree.test_two_equal_largest) ... ok
test_case_insensitive (__main__.TestPalindrome.test_case_insensitive) ... ok
test_not_palindrome (__main__.TestPalindrome.test_not_palindrome) ... ok
test_simple_palindrome (__main__.TestPalindrome.test_simple_palindrome) ... ok
test_single_character (__main__.TestPalindrome.test_single_character) ... ok
test_with_spaces (__main__.TestPalindrome.test_with_spaces) ... ok
test_add_item (__main__.TestShoppingCart.test_add_item) ... ok
test_add_multiple_items (__main__.TestShoppingCart.test_add_multiple_items) ... ok
test_remove_item (__main__.TestShoppingCart.test_remove_item) ... ok
test_remove_non_existing_item (__main__.TestShoppingCart.test_remove_non_existing_item) ... ok
test_large_number (__main__.TestSquareFunction.test_large_number) ... ok
test_negative_number (__main__.TestSquareFunction.test_negative_number) ... ok
test_positive_number (__main__.TestSquareFunction.test_positive_number) ... ok
test_zero (__main__.TestSquareFunction.test_zero) ... ok
Ran 24 tests in 0.032s
OK
<unittest.main.TestProgram at 0x7e0211f3cc80>