

**2303A51602**

**Batch-25**

## **Assignment-8.4**

### **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

```

1 import unittest
2 def square(n):
3     """Calculates the square of a number."""
4     return n * n
5
6 class TestSquare(unittest.TestCase):
7
8     def test_positive(self):
9         self.assertEqual(square(10), 100)
10
11    def test_zero(self):
12        self.assertEqual(square(0), 0)
13
14    def test_negative(self):
15        # Result should be positive
16        self.assertEqual(square(-6), 36)
17
18    def test_float(self):
19        self.assertEqual(square(2.5), 6.25)
20
21
22 if __name__ == '__main__':
23     # Run the tests
24     unittest.main()

```

## 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

```
File Edit Selection View Go Run Terminal Help < > Search OPEN EDITORS ass 8.4 Alpy 1 C:\Users\Chinnari> Downloads> ass 8.4 Alpy > ... 1 import unittest 2 from email_validator import validate_email 3 4 class TestEmailValidation(unittest.TestCase): 5 6     def test_valid_email(self): 7         self.assertTrue(validate_email("user@example.com")) 8 9     def test_missing_at_symbol(self): 10        self.assertFalse(validate_email("userexample.com")) 11 12     def test_missing_domain(self): 13        self.assertFalse(validate_email("user@")) 14 15     def test_missing_username(self): 16        self.assertFalse(validate_email("@example.com")) 17 18     def test_incorrect_structure(self): 19        self.assertFalse(validate_email("user@com")) 20 21     def test_empty_string(self): 22        self.assertFalse(validate_email("")) 23 24 if __name__ == "__main__": 25     unittest.main() 26
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS  
PS C:\Users\Chinnari> & c:/users/chinnari/appdata/local/microsoft/windowsapps/python3.13.exe "c:/users/chinnari/downloads/ass 8.4 Al.py"  
ModuleNotFoundError: No module named 'email\_validator'  
PS C:\Users\Chinnari> .....  
>>>  
>>> Ban 6 tests in 0.001s  
>>>  
>>> OK  
>>>

### 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

The screenshot shows the Visual Studio Code interface with the following details:

- File Explorer:** Shows a folder named "ass 8.4 Alpy" under "OPEN EDITORS".
- Code Editor:** Displays Python code for finding the maximum of three numbers and a unit test class.
- Terminal:** Shows the output of running the tests, indicating 4 tests passed in 0.000s.

```
1 import unittest
2
3 def find_max_of_three(a, b, c):
4     if a >= b and a >= c:
5         return a
6     elif b >= a and b >= c:
7         return b
8     else:
9         return c
10
11 class TestMaximumLogic(unittest.TestCase):
12
13     def test_different_positions(self):
14         """Tests that the function finds the max regardless of its position."""
15         self.assertEqual(find_max_of_three(10, 5, 2), 10) # Max is first
16         self.assertEqual(find_max_of_three(3, 15, 7), 15) # Max is middle
17         self.assertEqual(find_max_of_three(1, 4, 9), 9) # Max is last
18
19     def test_negative_numbers(self):
20         """Tests that the logic holds for negative values."""
21         self.assertEqual(find_max_of_three(-1, -10, -5), -1)
22
23     def test_all_equal(self):
24         """Tests the edge case where all inputs are identical."""
25         self.assertEqual(find_max_of_three(7, 7, 7), 7)
26
27     def test_two_equal(self):
28         """Tests when two numbers are the same and represent the maximum."""
29         self.assertEqual(find_max_of_three(12, 12, 4), 12)
30         self.assertEqual(find_max_of_three(5, 20, 20), 20)
31
32 if __name__ == '__main__':
33     unittest.main(argv=['first-arg-is-ignored'], exit=False)
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

PS C:\Users\Chinnari\Downloads> & 'c:\Users\Chinnari\AppData\Local\Microsoft\WindowsApps\python3.13.exe' 'c:\Users\Chinnari\vscode\extensions\ms-python.debugpy-2025.18.0-win32\python.debugpy\launcher' 'ms-python.debugpy-2025.18.0-win32-x64\bundled\libs\debugpy\launcher' 'C:\Users\Chinnari\Downloads\ass 8.4 Alpy.py'

Ran 4 tests in 0.000s

OK

## 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

```

File Edit Selection View Go Run Terminal Help < > Search
OPEN FOLDERS 1 opened
ass 8.4 Alpy C:\Users\Chinnari\Downloads
ass 8.4 Alpy C:\Users\Chinnari\Downloads
py Cursor Chinnari
OPEN FOLDER OPENED
You have not yet opened a folder.
Open Folder
Opening a folder will close all currently open editors. To keep them open, add a folder instead.
You can clone a repository locally.
Clone Repository
To learn more about how to use Git and source control in VS Code read our docs.

29 import re
30
31 def validate_email(email):
32     # \. [a-zA-Z]{2,} $ : Dot followed by 2+ char extension (e.g., .com)
33     pattern = r'^[a-zA-Z0-9.-]+@[a-zA-Z0-9.-]+\.[a-zA-Z]{2,}$'
34
35     if re.match(pattern, email):
36         return True
37     return False
38
39
40 class TestUserRegistrationEmail(unittest.TestCase):
41
42     def test_valid_email(self):
43         """Valid format should pass"""
44         self.assertTrue(validate_email("new_user@registration.com"))
45
46     def test_missing_at_symbol(self):
47         """Invalid: No @ symbol"""
48         self.assertFalse(validate_email("userdomain.com"))
49
50     def test_missing_domain(self):
51         """Invalid: Nothing after @"""
52         self.assertFalse(validate_email("user@"))
53
54     def test_missing_username(self):
55         """Invalid: Nothing before @"""
56         self.assertFalse(validate_email("@registration.com"))
57
58     def test_incorrect_structure(self):
59         """Invalid: Multiple @ symbols or missing dot"""
60         self.assertFalse(validate_email("user@domain.com"))
61         self.assertFalse(validate_email("user@domaincom"))
62
63     if __name__ == '__main__':
64         # '-exit=false' allows the script to finish and show output in VS Code terminal
65         unittest.main(argv=['first-arg-is-ignored'], exit=False)

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS
PS C:\Users\Chinnari\Downloads> c: cd 'c:\Users\Chinnari\Downloads'; & 'c:\Users\Chinnari\AppData\Local\Microsoft\WindowsApps\python3.13.exe' 'c:\Users\Chinnari\.vscode\extensions\ms-python.python\2025.18.0-win32-x64\handedlls\debug\launcher' '61176' '--' 'C:\Users\Chinnari\Downloads\ass 8.4 Alpy'
Python.debug.py:205:3: win32api.error: [WinError 1] The system cannot find the file specified
Ran 4 tests in 0.002s
OK PS C:\Users\Chinnari\Downloads>

```

## 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

```

File Edit Selection View Go Run Terminal Help < - > Search
RUN AND DEBUG ... ass 8.4 AIpy py C:\Users\Chinnari> is_palindrome
VARIABLES WATCH
import unittest
class TestPalindromeChecker(unittest.TestCase):
    def test_simple_palindrome(self):
        self.assertTrue(is_palindrome("madam"))
    def test_non_palindrome(self):
        self.assertFalse(is_palindrome("Hello"))
    def test_case_variation_palindrome(self):
        self.assertTrue(is_palindrome("Madam"))
    def test_single_character(self):
        self.assertTrue(is_palindrome("a"))
    def test_empty_string(self):
        self.assertTrue(is_palindrome(""))
def is_palindrome(text):
    normalized_text = text.lower()
    return normalized_text == normalized_text[::-1]
if __name__ == "__main__":
    unittest.main()

```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

CALL STACK BREAKPOINTS

PS C:\Users\Chinnari\Downloads> c:; cd 'c:\Users\Chinnari\Downloads'; & 'c:\Users\Chinnari\AppData\Local\Microsoft\WindowsApps\python3.13.exe' 'c:\Users\Chinnari\vscode\extensions\ms-python.python\2025.18.0-win32-x64\bundled\libs\debuggy\launcher' '61176' '--' 'C:\Users\Chinnari\Downloads\ass 8.4 AI.py'

OK PS C:\Users\Chinnari\Downloads> c:; cd 'c:\Users\Chinnari'; & 'c:\Users\Chinnari\AppData\Local\Microsoft\WindowsApps\python3.13.exe' 'c:\Users\Chinnari\vscode\extensions\ms-python\2025.18.0-win32-x64\bundled\libs\debuggy\launcher' '58112' '--' 'C:\Users\Chinnari\is\_palindrome.py'

In 22, Col 52 Specs: 4 UTF-8 CR LF Python Chat quota reached 3.139 (Microsoft Store) ENC 01:46 PM