**EXERCISE 4:**

**Arrange-Act-Assert Pattern, Test Fixtures, Setup and Teardown Methods in JUnit**

**ARRANGE-ACT-ASSERT (AAA) PATTERN IN JUNIT:**

The **AAA pattern** is a popular and structured way to write unit tests. It breaks the test method into three clear stages:

1. **Arrange**

* Prepare objects and inputs required for testing.
* Example: Instantiate objects, set values.

1. **Act**

* Perform the action you want to test.
* Example: Call the target method.

1. **Assert**

* Check if the outcome is as expected.
* Example: Use assertEquals(), assertTrue(), etc.

**TEARDOWN METHODS IN JUNIT:**

Teardown methods are executed **after each test** to reset or clean up the test environment, ensuring tests run independently.

| **Method Type** | **Annotation** | **Purpose** |
| --- | --- | --- |
| Setup | @Before (JUnit 4) | Runs before each test method |
| Teardown | @After (JUnit 4) | Runs after each test method |

**MAIN CLASS — MathTool.java**

package com.assignment;

public class MathTool {

public int increment(int x) {

return x + 1;

}

public int decrement(int x) {

return x - 1;

}

}

**TEST CLASS — MathToolTest.java**

package com.assignment;

import org.junit.Before;

import org.junit.After;

import org.junit.Test;

import static org.junit.Assert.\*;

public class MathToolTest {

private MathTool tool;

@Before

public void setUp() {

tool = new MathTool();

System.out.println("Setup: MathTool instance initialized");

}

@After

public void tearDown() {

tool = null;

System.out.println("Teardown: MathTool instance destroyed");

}

@Test

public void testIncrement() {

// Arrange

int input = 10;

// Act

int result = tool.increment(input);

// Assert

assertEquals(11, result);

System.out.println("Test Increment Passed");

}

@Test

public void testDecrement() {

// Arrange

int input = 5;

// Act

int result = tool.decrement(input);

// Assert

assertEquals(4, result);

System.out.println("Test Decrement Passed");

}

}

**SAMPLE OUTPUT**

Setup: MathTool instance initialized

Test Increment Passed

Teardown: MathTool instance destroyed

Setup: MathTool instance initialized

Test Decrement Passed

Teardown: MathTool instance destroyed

Tests run: 2, Failures: 0, Errors: 0, Skipped: 0

BUILD SUCCESSFUL