WEEK-2

PL/SQL,JUnit_Basic Testing,Mockito exercises & SL4 Logging

PL-SQL

Exercise 1: Control Structures

Scenario 1: The bank wants to apply a discount to loan interest rates for customers above 60 years old.

- **Question:** Write a PL/SQL block that loops through all customers, checks their age, and if they are above 60, apply a 1% discount to their current loan interest rates.

Scenario 2: A customer can be promoted to VIP status based on their balance.

- **Question:** Write a PL/SQL block that iterates through all customers and sets a flag IsVIP to TRUE for those with a balance over $10,000.

Scenario 3: The bank wants to send reminders to customers whose loans are due within the next 30 days.

- **Question:** Write a PL/SQL block that fetches all loans due in the next 30 days and prints a reminder message for each customer.

CODE:

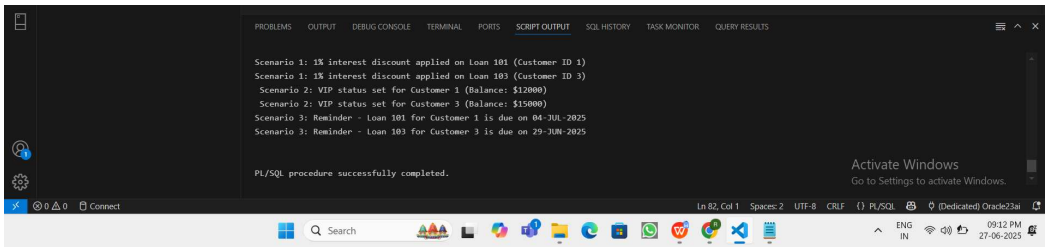
```
SET SERVEROUTPUT ON;
BEGIN
  EXECUTE IMMEDIATE 'DROP TABLE loans';
EXCEPTION WHEN OTHERS THEN NULL;
END;
/
BEGIN
```

```
  EXECUTE IMMEDIATE 'DROP TABLE customers';
EXCEPTION WHEN OTHERS THEN NULL;
END;
/
CREATE TABLE customers (
  cust_id   NUMBER PRIMARY KEY,
  age       NUMBER,
  balance   NUMBER,
  vip_flag  VARCHAR2(5)
);
CREATE TABLE loans (
  loan_id   NUMBER PRIMARY KEY,
  cust_id   NUMBER,
  int_rate  NUMBER,
  due_on    DATE,
  FOREIGN KEY (cust_id) REFERENCES customers(cust_id)
);
INSERT INTO customers VALUES (1, 65, 12000, 'FALSE');
INSERT INTO customers VALUES (2, 45, 8000, 'FALSE');
INSERT INTO customers VALUES (3, 70, 15000, 'FALSE');

INSERT INTO loans VALUES (101, 1, 10, TO_DATE('04-JUL-2025','DD-MON-YYYY'));
INSERT INTO loans VALUES (102, 2, 9,  TO_DATE('01-SEP-2025','DD-MON-YYYY'));
INSERT INTO loans VALUES (103, 3, 8,  TO_DATE('29-JUN-2025','DD-MON-YYYY'));
COMMIT;

-- Changed block with renamed variables
DECLARE
  CURSOR discount_cursor IS
    SELECT l.loan_id AS lid, l.cust_id AS cid, l.int_rate AS rate
    FROM loans l
    JOIN customers c ON l.cust_id = c.cust_id
```

```
    WHERE c.age > 60;

  CURSOR vip_cursor IS
    SELECT cust_id AS vip_cid, balance AS vip_bal
    FROM customers
    WHERE balance > 10000;

  CURSOR reminder_cursor IS
    SELECT loan_id AS rem_loan_id, cust_id AS rem_cust_id, due_on AS rem_due
    FROM loans
    WHERE due_on BETWEEN SYSDATE AND SYSDATE + 30;
BEGIN

  -- Scenario 1: Discount for seniors
  FOR d_rec IN discount_cursor LOOP
    UPDATE loans
    SET int_rate = int_rate - 1
    WHERE loan_id = d_rec.lid;

    DBMS_OUTPUT.PUT_LINE(
      'Scenario 1: 1% interest discount applied on Loan ' || d_rec.lid ||
      ' (Customer ID ' || d_rec.cid || ')'
    );
  END LOOP;

  -- Scenario 2: VIP customers
  FOR v_rec IN vip_cursor LOOP
    UPDATE customers
    SET vip_flag = 'TRUE'
    WHERE cust_id = v_rec.vip_cid;

    DBMS_OUTPUT.PUT_LINE(
```

```
    ' Scenario 2: VIP status set for Customer ' || v_rec.vip_cid ||
    ' (Balance: $' || v_rec.vip_bal || ')'
  );
 END LOOP;

 -- Scenario 3: Upcoming loan due
 FOR r_rec IN reminder_cursor LOOP
  DBMS_OUTPUT.PUT_LINE(
    'Scenario 3: Reminder - Loan ' || r_rec.rem_loan_id ||
    ' for Customer ' || r_rec.rem_cust_id ||
    ' is due on ' || TO_CHAR(r_rec.rem_due, 'DD-MON-YYYY')
  );
 END LOOP;

 COMMIT;
END;
/
```

OUTPUT:



Scenario 1: 1% interest discount applied on Loan 101 (Customer ID 1)

Scenario 1: 1% interest discount applied on Loan 103 (Customer ID 3)

Scenario 2: VIP status set for Customer 1 (Balance: $12000)

Scenario 2: VIP status set for Customer 3 (Balance: $15000)

Scenario 3: Reminder - Loan 101 for Customer 1 is due on 04-JUL-2025
Scenario 3: Reminder - Loan 103 for Customer 3 is due on 29-JUN-2025

PL/SQL procedure successfully completed.

Exercise 3: Stored Procedures

Scenario 1: The bank needs to process monthly interest for all savings accounts.

- **Question:** Write a stored procedure **ProcessMonthlyInterest** that calculates and updates the balance of all savings accounts by applying an interest rate of 1% to the current balance.

Scenario 2: The bank wants to implement a bonus scheme for employees based on their performance.

- **Question:** Write a stored procedure **UpdateEmployeeBonus** that updates the salary of employees in a given department by adding a bonus percentage passed as a parameter.

Scenario 3: Customers should be able to transfer funds between their accounts.

- **Question:** Write a stored procedure **TransferFunds** that transfers a specified amount from one account to another, checking that the source account has sufficient balance before making the transfer.

CODE:

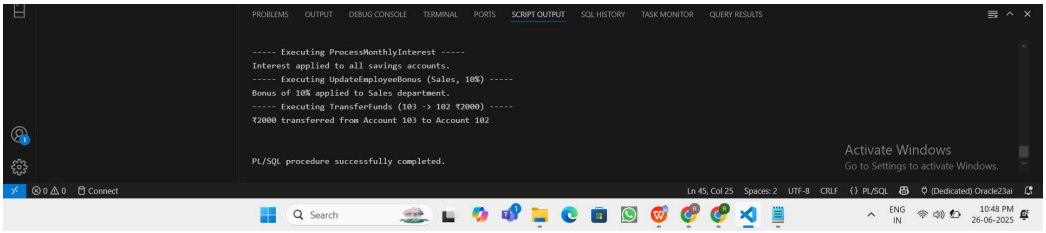
```
SET SERVEROUTPUT ON;

BEGIN
  EXECUTE IMMEDIATE 'DROP TABLE bank_accounts';
EXCEPTION WHEN OTHERS THEN NULL;
END;
/

BEGIN
  EXECUTE IMMEDIATE 'DROP TABLE staff_members';
EXCEPTION WHEN OTHERS THEN NULL;
END;
/

CREATE TABLE bank_accounts (
  account_id    NUMBER PRIMARY KEY,
  customer_id   NUMBER,
  balance       NUMBER,
  account_type  VARCHAR2(20)
);

CREATE TABLE staff_members (
  emp_id     NUMBER PRIMARY KEY,
  name       VARCHAR2(50),
  department VARCHAR2(50),
  salary     NUMBER
);

INSERT INTO bank_accounts VALUES (101, 1, 10000, 'SAVINGS');
INSERT INTO bank_accounts VALUES (102, 2, 15000, 'CURRENT');
INSERT INTO bank_accounts VALUES (103, 3, 20000, 'SAVINGS');
```

```
INSERT INTO staff_members VALUES (1, 'Ravi',   'Sales',    40000);
INSERT INTO staff_members VALUES (2, 'Sneha',  'Finance',  45000);
INSERT INTO staff_members VALUES (3, 'Ajith',  'Sales',    42000);

COMMIT;

CREATE OR REPLACE PROCEDURE ApplyInterestToSavings IS
BEGIN
  UPDATE bank_accounts
  SET balance = balance + (balance * 0.01)
  WHERE UPPER(account_type) = 'SAVINGS';

  DBMS_OUTPUT.PUT_LINE('Interest applied to all savings accounts.');
  COMMIT;
END;
/

CREATE OR REPLACE PROCEDURE AddDepartmentBonus (
  v_dept       IN VARCHAR2,
  v_bonus_pct  IN NUMBER
) IS
BEGIN
  UPDATE staff_members
  SET salary = salary + (salary * v_bonus_pct / 100)
  WHERE LOWER(department) = LOWER(v_dept);

  DBMS_OUTPUT.PUT_LINE('Bonus of ' || v_bonus_pct || '% applied to ' || v_dept
|| ' department.');
  COMMIT;
END;
/
```

```
CREATE OR REPLACE PROCEDURE ExecuteFundTransfer (
  v_source_acc IN NUMBER,
  v_dest_acc   IN NUMBER,
  v_amount     IN NUMBER
) IS
  v_balance NUMBER;
BEGIN
  SELECT balance INTO v_balance
  FROM bank_accounts
  WHERE account_id = v_source_acc;

  IF v_balance < v_amount THEN
    RAISE_APPLICATION_ERROR(-20001, 'Not enough balance in source account.');
  END IF;

  UPDATE bank_accounts
  SET balance = balance - v_amount
  WHERE account_id = v_source_acc;

  UPDATE bank_accounts
  SET balance = balance + v_amount
  WHERE account_id = v_dest_acc;

  DBMS_OUTPUT.PUT_LINE('₹' || v_amount || ' transferred from Account ' ||
v_source_acc || ' to Account ' || v_dest_acc);
  COMMIT;
END;
/

BEGIN
  DBMS_OUTPUT.PUT_LINE('----- Executing ApplyInterestToSavings -----');
```

```
  ApplyInterestToSavings;

  DBMS_OUTPUT.PUT_LINE('----- Executing AddDepartmentBonus (Sales, 10%) -----');
  AddDepartmentBonus('Sales', 10);

  DBMS_OUTPUT.PUT_LINE('----- Executing ExecuteFundTransfer (103 -> 102 ₹2000) -
----');
  ExecuteFundTransfer(103, 102, 2000);
END;
/
```

OUTPUT



JUnit Basic Testing

Exercise 1: Setting Up JUnit

Scenario:

You need to set up JUnit in your Java project to start writing unit tests.

Steps:

1. Create a new Java project in your IDE (e.g., IntelliJ IDEA, Eclipse).

2. Add JUnit dependency to your project. If you are using Maven, add the following to your

pom.xml:

<dependency>

```
<groupId>junit</groupId>
<artifactId>junit</artifactId>
<version>4.13.2</version>
<scope>test</scope>
</dependency>
```

3. Create a new test class in your project

CODE:

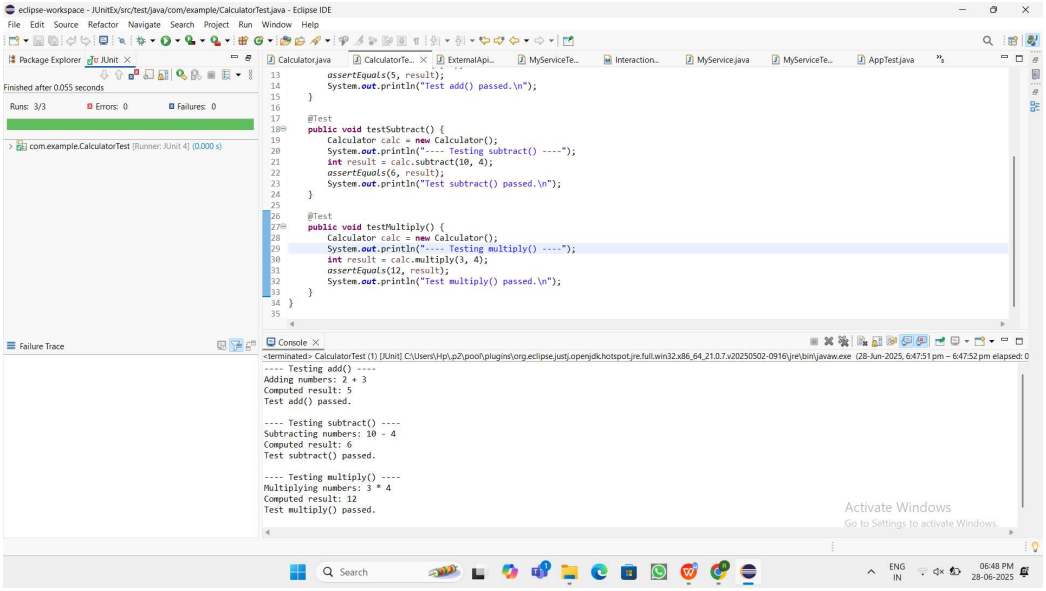
Calculator.java

```
package com.example;
public class Calculator {
    public int add(int num1, int num2) {
        System.out.println("Adding numbers: " + num1 + " + " + num2);
        int sum = num1 + num2;
        System.out.println("Computed result: " + sum);
        return sum;
    }
    public int subtract(int minuend, int subtrahend) {
        System.out.println("Subtracting numbers: " + minuend + " - " + subtrahend);
        int difference = minuend - subtrahend;
        System.out.println("Computed result: " + difference);
        return difference;
    }
    public int multiply(int factor1, int factor2) {
        System.out.println("Multiplying numbers: " + factor1 + " * " + factor2);
        int product = factor1 * factor2;
        System.out.println("Computed result: " + product);
        return product;
    }
}
```

CalculatorTest.java

```
package com.example;
import org.junit.Test;
import static org.junit.Assert.*;
public class CalcOpsTest {
   @Test
   public void testAdd() {
      Calculator calculatorInstance = new Calculator();
      System.out.println("---- Testing add() ----");
      int result = calculatorInstance.add(2, 3);
      assertEquals(5, result);
      System.out.println("Test add() passed.\n");
   }
   @Test
   public void testSubtract() {
      Calculator calculatorInstance = new Calculator();
      System.out.println("---- Testing subtract() ----");
      int result = calculatorInstance.subtract(10, 4);
      assertEquals(6, result);
      System.out.println("Test subtract() passed.\n");
   }
   @Test
   public void testMultiply() {
      Calculator calculatorInstance = new Calculator();
      System.out.println("---- Testing multiply() ----");
      int result = calculatorInstance.multiply(3, 4);
      assertEquals(12, result);
      System.out.println("Test multiply() passed.\n");
   }
}
```

OUTPUT:



Exercise 3: Assertions in JUnit

Scenario:

You need to use different assertions in JUnit to validate your test results.

Steps: 1. Write tests using various JUnit assertions.

Solution Code:

```
public class AssertionsTest {
@Test
public void testAssertions() {
// Assert equals
assertEquals(5, 2 + 3);
// Assert true
assertTrue(5 > 3);
// Assert false
assertFalse(5 < 3);
// Assert null
assertNull(null);
```

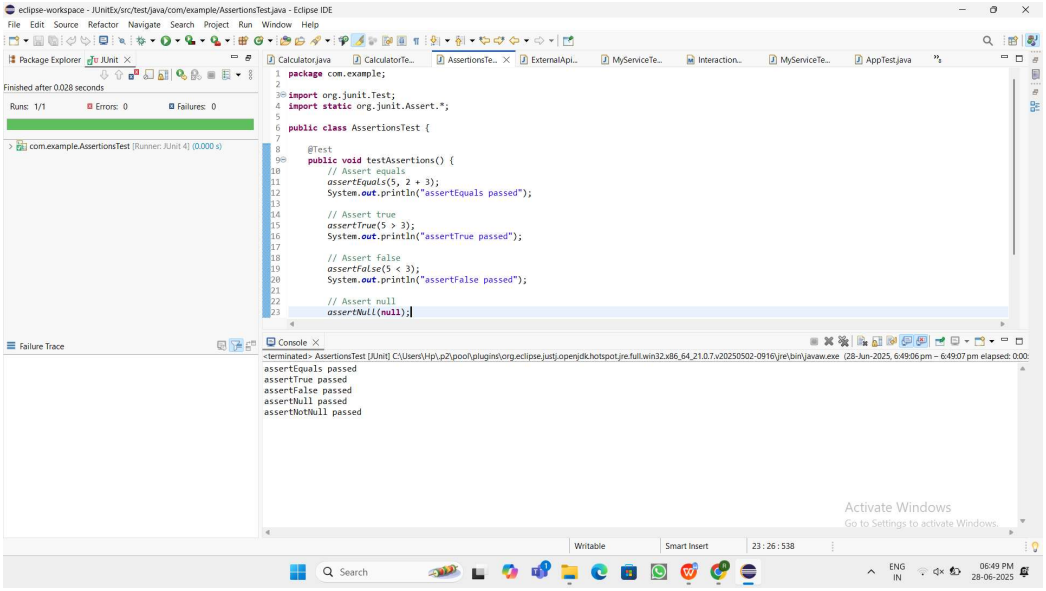
```
// Assert not null
assertNotNull(new Object());
}
}
```

CODE:

AssertionsTest.java

```
package com.example;
import org.junit.Test;
import static org.junit.Assert.*;
public class BasicAssertionsDemo {
   @Test
   public void runBasicAssertions() {
      assertEquals(5, 2 + 3);
      System.out.println("assertEquals passed");
      assertTrue(5 > 3);
      System.out.println("assertTrue passed");
      assertFalse(5 < 3);
      System.out.println("assertFalse passed");
      assertNull(null);
      System.out.println("assertNull passed");
      assertNotNull(new Object());
      System.out.println("assertNotNull passed");
   }
}
```

OUTPUT:



Exercise 4: Arrange-Act-Assert (AAA) Pattern, Test Fixtures, Setup and Teardown Methods in JUnit

Scenario:

You need to organize your tests using the Arrange-Act-Assert (AAA) pattern and use setup

and teardown methods.

Steps:

1. Write tests using the AAA pattern.
2. Use @Before and @After annotations for setup and teardown methods.

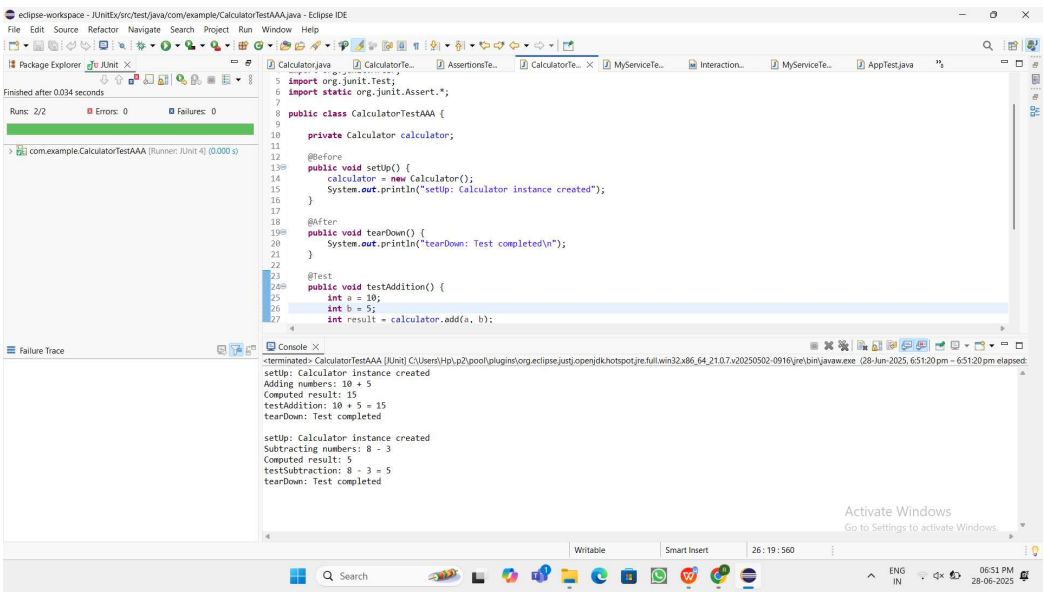
CODE:

CalculatorTestAAA.java

```
package com.example;

import org.junit.Before;
import org.junit.After;
import org.junit.Test;
import static org.junit.Assert.*;

public class CalculatorUnitTest {

    private Calculator calcInstance;

    @Before
    public void setUp() {
        calcInstance = new Calculator();
        System.out.println("setUp: Calculator instance created");
    }

    @After
    public void tearDown() {
        System.out.println("tearDown: Test completed\n");
    }

    @Test
    public void testAddition() {
        int a = 10;
        int b = 5;
        int result = calcInstance.add(a, b);
        assertEquals(15, result);
        System.out.println("testAddition: " + a + " + " + b + " = " + result);
```

```
    }

    @Test
    public void testSubtraction() {
        int a = 8;
        int b = 3;
        int result = calcInstance.subtract(a, b);
        assertEquals(5, result);
        System.out.println("testSubtraction: " + a + " - " + b + " = " + result);
    }
}
```

OUTPUT:



Mockito Hands-On Exercises

Exercise 1: Mocking and Stubbing

Scenario:

You need to test a service that depends on an external API. Use Mockito to mock the external API and stub its methods.

Steps:

1. Create a mock object for the external API.
2. Stub the methods to return predefined values.
3. Write a test case that uses the mock object.

Solution Code:

```
import static org.mockito.Mockito.*;
import org.junit.jupiter.api.Test;
import org.mockito.Mockito;
public class MyServiceTest {
@Test
public void testExternalApi() {
ExternalApi mockApi = Mockito.mock(ExternalApi.class);
when(mockApi.getData()).thenReturn("Mock Data");
MyService service = new MyService(mockApi);
String result = service.fetchData();
assertEquals("Mock Data", result);
}
```

CODE:

ExternalApi.java

```
package com.example.MockDemo;
public interface ExternalApi {
String getData();
}
```

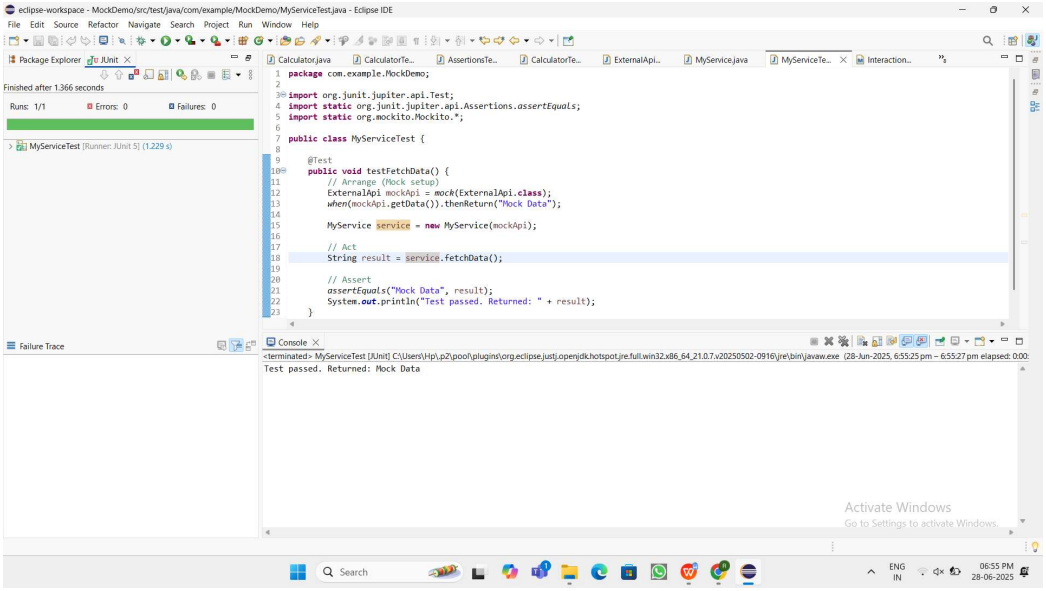
Myservice.java

```
package com.example.MockDemo;
public class MyService {
private final ExternalApi externalApi;
public MyService(ExternalApi externalApi) {
this.externalApi = externalApi;
}
public String fetchData() {
return externalApi.getData();
}
}
```

MyServiceTest.java

```
package com.example.MockDemo;
import org.junit.jupiter.api.Test;
import static org.junit.jupiter.api.Assertions.assertEquals;
import static org.mockito.Mockito.*;
public class MyServiceTest {
@Test
public void testFetchData() {
// Arrange (Mock setup)
ExternalApi mockApi = mock(ExternalApi.class);
when(mockApi.getData()).thenReturn("Mock Data");
MyService service = new MyService(mockApi);
String result = service.fetchData();
assertEquals("Mock Data", result);
System.out.println("Test passed. Returned: " + result);
}
}
```

OUTPUT:



Exercise 2: Verifying Interactions

Scenario:

You need to ensure that a method is called with specific arguments.

Steps:

1. Create a mock object.

2. Call the method with specific arguments.

3. Verify the interaction.

Solution Code:

import static org.mockito.Mockito.*; import org.junit.jupiter.api.Test;

import org.mockito.Mockito;

public class MyServiceTest {

@Test

public void testVerifyInteraction() {

ExternalApi mockApi = Mockito.mock(ExternalApi.class);

MyService service = new MyService(mockApi);

service.fetchData();

verify(mockApi).getData();

CODE:

ExternalApi.java

```
package com.example.InteractionVerifier;
public interface ExternalApi {
String getData();
}
```

MyService.java

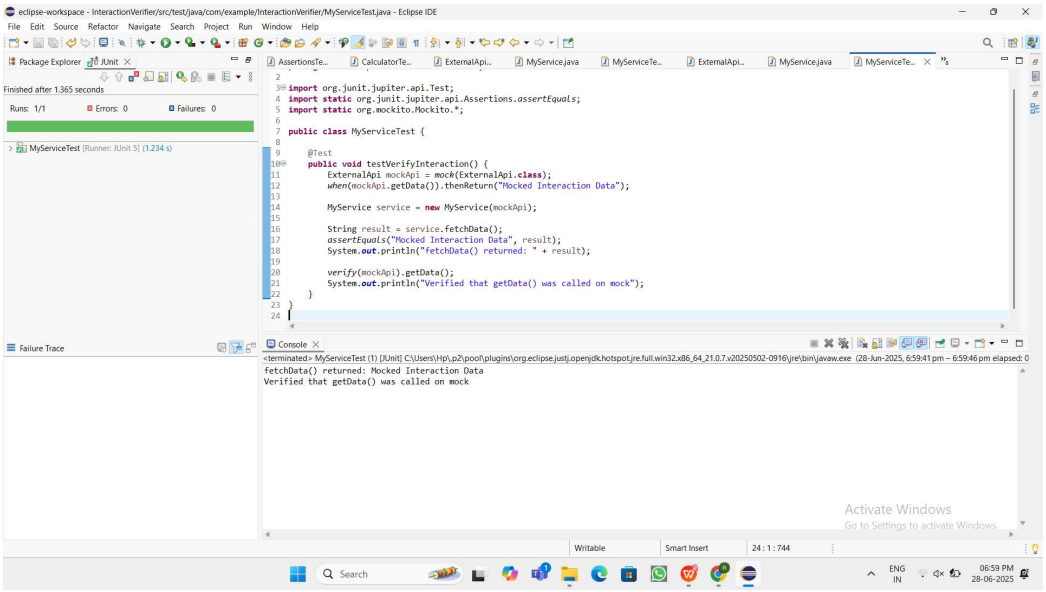
```
package com.example.InteractionVerifier;
public class MyService {
private ExternalApi externalApi;
public MyService(ExternalApi externalApi) {
this.externalApi = externalApi;
}
public String fetchData() {
return externalApi.getData();
}
}
```

MyServiceTest.java

```
package com.example.InteractionVerifier;
import org.junit.jupiter.api.Test;
import static org.junit.jupiter.api.Assertions.assertEquals;
import static org.mockito.Mockito.*;
public class MyServiceTest {
@Test
public void testVerifyInteraction() {
ExternalApi mockApi = mock(ExternalApi.class);
```

```
when(mockApi.getData()).thenReturn("Mocked Interaction Data");
MyService service = new MyService(mockApi);
String result = service.fetchData();
assertEquals("Mocked Interaction Data", result);
System.out.println("fetchData() returned: " + result);
verify(mockApi).getData();
System.out.println("Verified that getData() was called on mock");
}
}
```

OUTPUT:



Logging using SLF4J

Exercise 1: Logging Error Messages and Warning Levels

Task: Write a Java application that demonstrates logging error messages and warning levels using SLF4J.

Step-by-Step Solution:

1. Add SLF4J and Logback dependencies to your `pom.xml` file:

```
<dependency>
<groupId>org.slf4j</groupId>
<artifactId>slf4j-api</artifactId>
<version>1.7.30</version>
</dependency>
<dependency>
<groupId>ch.qos.logback</groupId>
<artifactId>logback-classic</artifactId>
<version>1.2.3</version>
</dependency>
```

2. Create a Java class that uses SLF4J for logging:

```
import org.slf4j.Logger;
import org.slf4j.LoggerFactory;
public class LoggingExample {
private static final Logger logger = LoggerFactory.getLogger(LoggingExample.class);
public static void main(String[] args) {
logger.error("This is an error message");
logger.warn("This is a warning message");
}
}
```

CODE:

LoggingExample.java

```
package com.example.loggingdemo;
import org.slf4j.Logger;
import org.slf4j.LoggerFactory;
public class AppLoggerDemo {
   private static final Logger appLogger =
LoggerFactory.getLogger(AppLoggerDemo.class);
   public static void main(String[] args) {
      appLogger.error("This is an ERROR message");
      appLogger.warn("This is a WARNING message");
      appLogger.info("This is an INFO message");
      appLogger.debug("This is a DEBUG message");
   }
}
```

OUTPUT: