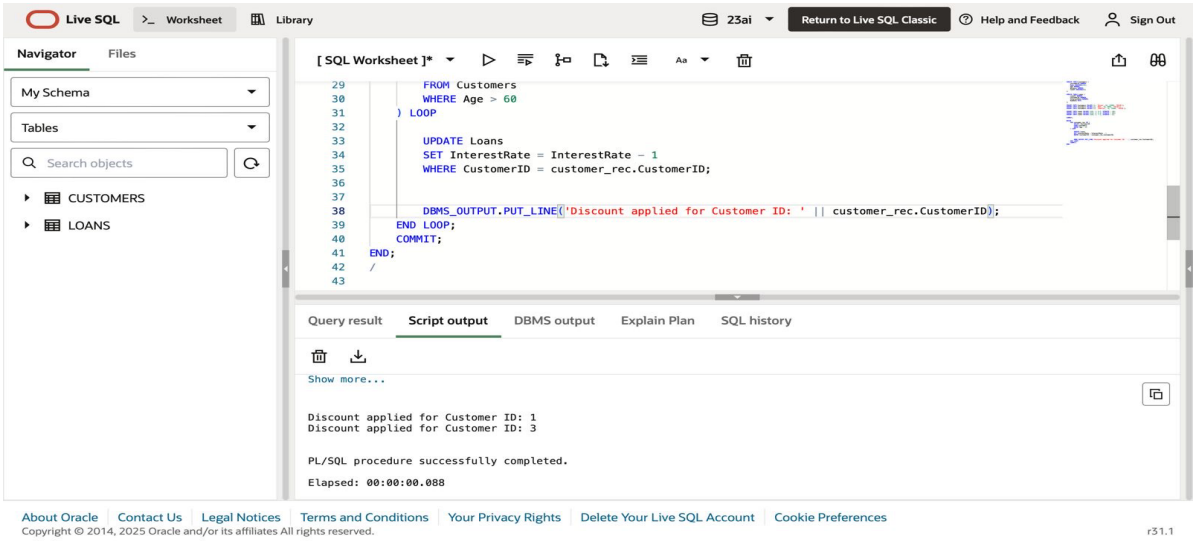
WEEK 2:
PLSQL_Exercises

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.

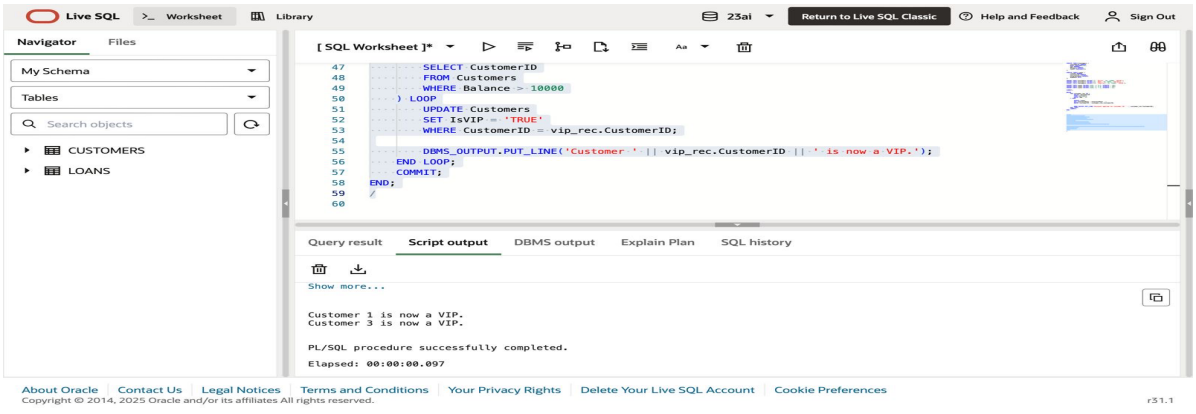
SOLUTION:

```
CREATE TABLE Customers (
   CustomerID NUMBER,
   Name VARCHAR2(50),
   Age NUMBER,
   Balance NUMBER,
   IsVIP VARCHAR2(5)
);

CREATE TABLE Loans (
   LoanID NUMBER,
   CustomerID NUMBER,
   InterestRate NUMBER,
   DueDate DATE
);


INSERT INTO Customers VALUES (1, 'Alice', 65, 12000, 'FALSE');
INSERT INTO Customers VALUES (2, 'Bob', 58, 9000, 'FALSE');
INSERT INTO Customers VALUES (3, 'Charlie', 70, 15000, 'FALSE');

INSERT INTO Loans VALUES (101, 1, 8.5, SYSDATE + 10);
INSERT INTO Loans VALUES (102, 2, 9.0, SYSDATE + 40);
INSERT INTO Loans VALUES (103, 3, 7.5, SYSDATE + 5);

COMMIT;

BEGIN
   FOR customer_rec IN (
      SELECT CustomerID
      FROM Customers
      WHERE Age > 60
   ) LOOP

      UPDATE Loans
      SET InterestRate = InterestRate - 1
      WHERE CustomerID = customer_rec.CustomerID;


      DBMS_OUTPUT.PUT_LINE('Discount applied for Customer ID: ' || customer_rec.CustomerID);
   END LOOP;
   COMMIT;
END;
```



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.

```
BEGIN
   FOR vip_rec IN (
      SELECT CustomerID
      FROM Customers
      WHERE Balance > 10000
   ) LOOP
      UPDATE Customers
      SET IsVIP = 'TRUE'
      WHERE CustomerID = vip_rec.CustomerID;

      DBMS_OUTPUT.PUT_LINE('Customer ' || vip_rec.CustomerID || ' is now a VIP.');
   END LOOP;
   COMMIT;
END;
```

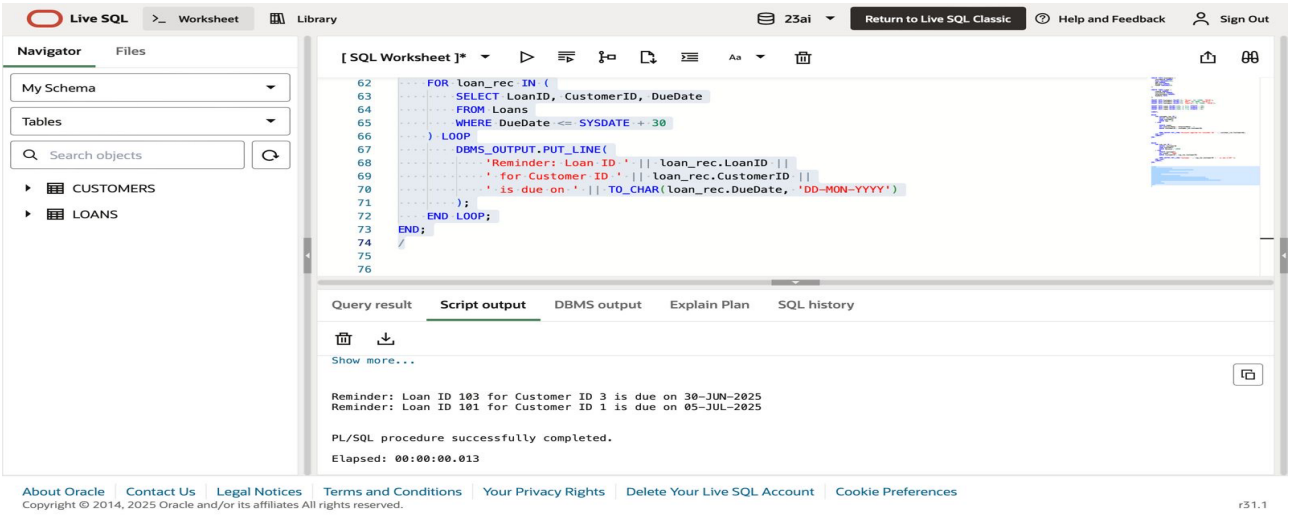


- **Scenario 3:** The bank wants to send reminders to customers whose loans are due within the next 30 days.

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

```
BEGIN
   FOR loan_rec IN (
      SELECT LoanID, CustomerID, DueDate
      FROM Loans
```

```
    WHERE DueDate <= SYSDATE + 30
  ) LOOP
    DBMS_OUTPUT.PUT_LINE(
      'Reminder: Loan ID ' || loan_rec.LoanID ||
      ' for Customer ID ' || loan_rec.CustomerID ||
      ' is due on ' || TO_CHAR(loan_rec.DueDate, 'DD-MON-YYYY')
    );
  END LOOP;
END;
```



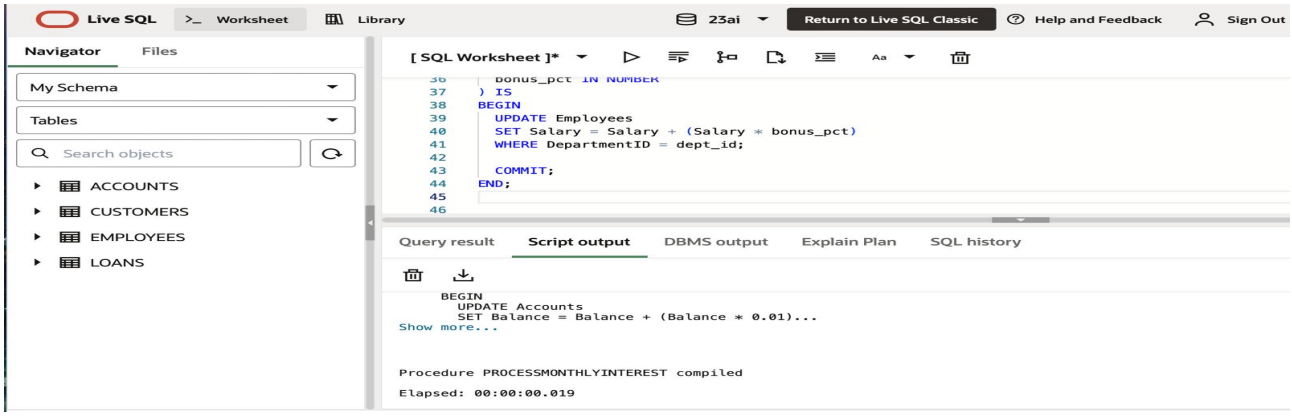
Exercise 3: Stored Procedures

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.

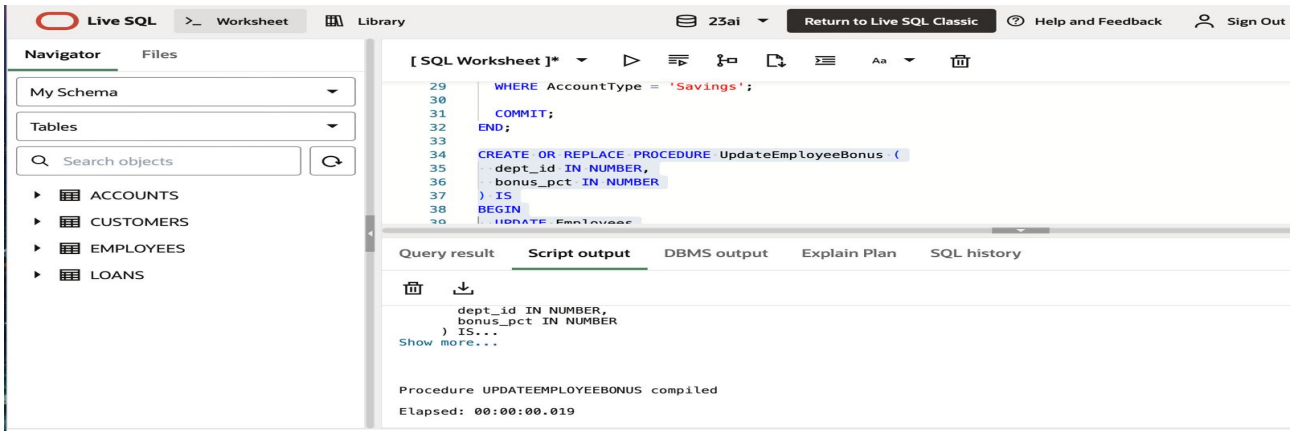
```
CREATE TABLE Accounts (
AccountID NUMBER PRIMARY KEY,
AccountHolder VARCHAR2(100),
AccountType VARCHAR2(20), -- e.g., 'Savings', 'Current'
Balance NUMBER(15, 2)
);

CREATE TABLE Employees (
EmployeeID NUMBER PRIMARY KEY,
Name VARCHAR2(100),
DepartmentID NUMBER,
Salary NUMBER(10, 2)
);

INSERT INTO Accounts VALUES (101, 'A', 'Savings', 10000);
INSERT INTO Accounts VALUES (102, 'B', 'Current', 8000);
INSERT INTO Accounts VALUES (103, 'C', 'Savings', 15000);

INSERT INTO Employees VALUES (1, 'June', 10, 50000);
INSERT INTO Employees VALUES (2, 'July', 20, 60000);
INSERT INTO Employees VALUES (3, 'Jan', 10, 55000);

CREATE OR REPLACE PROCEDURE ProcessMonthlyInterest IS
BEGIN
UPDATE Accounts
```

```
SET Balance = Balance + (Balance * 0.01)
WHERE AccountType = 'Savings';

COMMIT;
END;
```



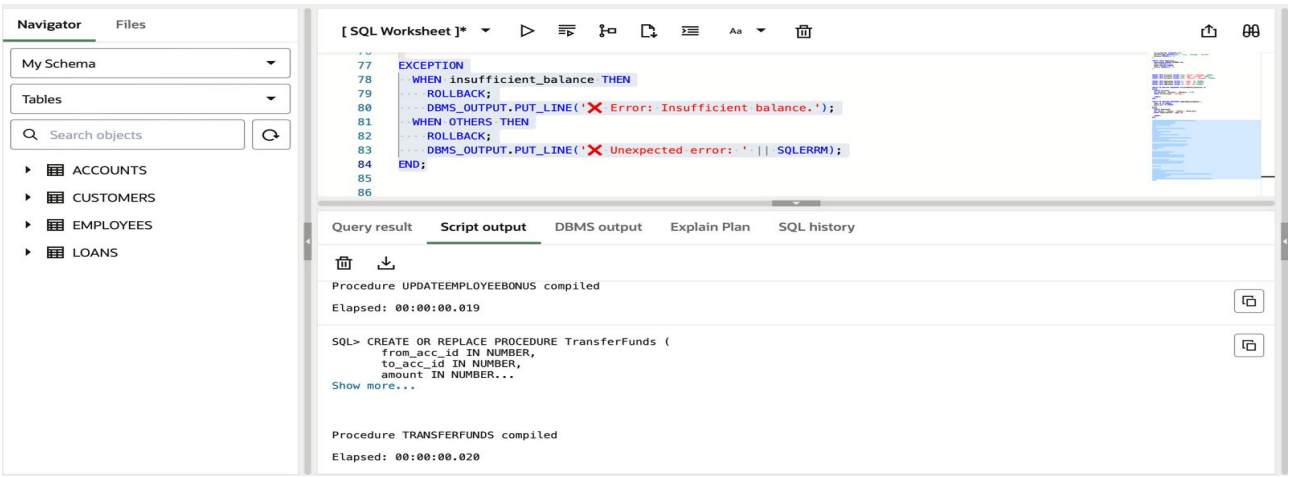
Scenario 2: The bank wants to implement a bonus scheme for employees based on their performance.
Question: Write a stored procedure **UpdateEmployeeBonus** that updates the salary of employees in a given department by adding a bonus percentage passed as a parameter.

```
CREATE OR REPLACE PROCEDURE UpdateEmployeeBonus (
dept_id IN NUMBER,
bonus_pct IN NUMBER
) IS
BEGIN
UPDATE Employees
SET Salary = Salary + (Salary * bonus_pct)
WHERE DepartmentID = dept_id;

COMMIT;
END;
```



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.

```
CREATE OR REPLACE PROCEDURE TransferFunds (
from_acc_id IN NUMBER,
to_acc_id IN NUMBER,
amount IN NUMBER
) IS
insufficient_balance EXCEPTION;
BEGIN
-- Check balance
DECLARE
current_balance NUMBER;
BEGIN
SELECT Balance INTO current_balance
FROM Accounts
WHERE AccountID = from_acc_id;

IF current_balance < amount THEN
RAISE insufficient_balance;
END IF;
END;

-- Perform transfer
UPDATE Accounts
SET Balance = Balance - amount
WHERE AccountID = from_acc_id;

UPDATE Accounts
SET Balance = Balance + amount
WHERE AccountID = to_acc_id;

COMMIT;

EXCEPTION
WHEN insufficient_balance THEN
ROLLBACK;
DBMS_OUTPUT.PUT_LINE('❌ Error: Insufficient balance.');
WHEN OTHERS THEN
ROLLBACK;
DBMS_OUTPUT.PUT_LINE('❌ Unexpected error: ' || SQLERRM);
END;
```



JUnit Testing Exercises :

Exercise 1: Setting Up JUnit

Scenario:

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

Steps:

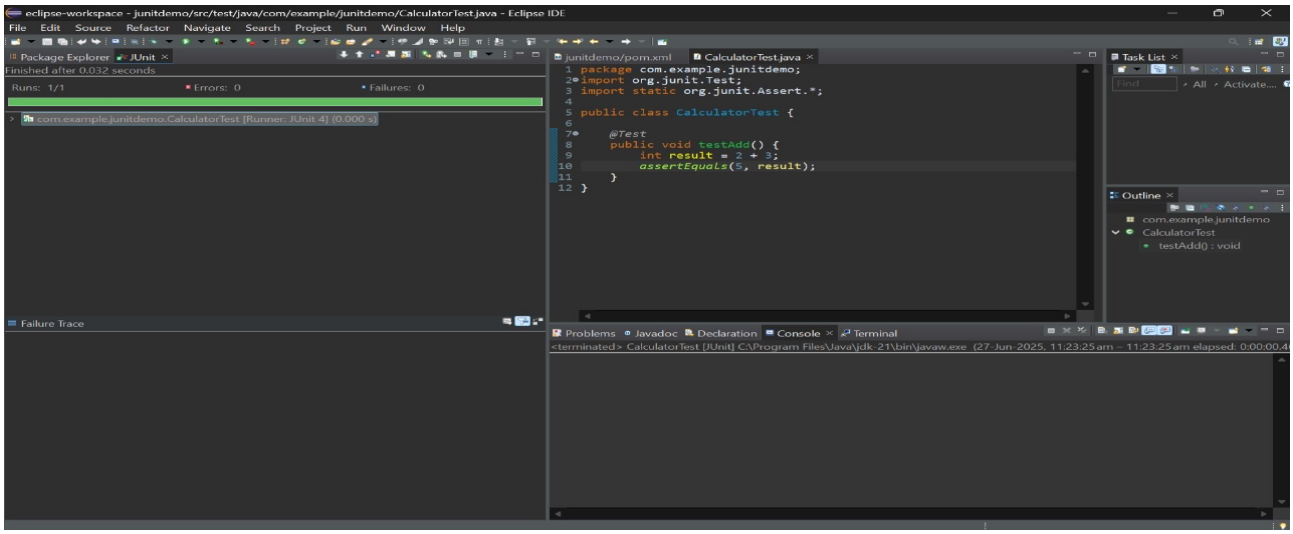
1. Create a new Java project in your IDE (e.g., IntelliJ IDEA, Eclipse).

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.



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);

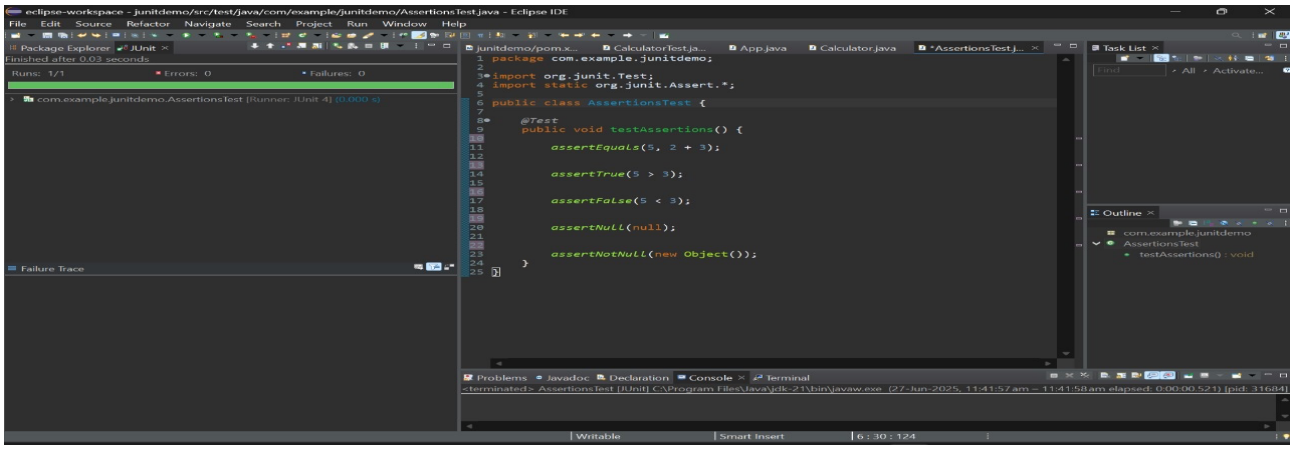
// Assert false assertFalse(5 < 3);

// Assert null assertNull(null);

// Assert not null

assertNotNull(new Object()); }

}



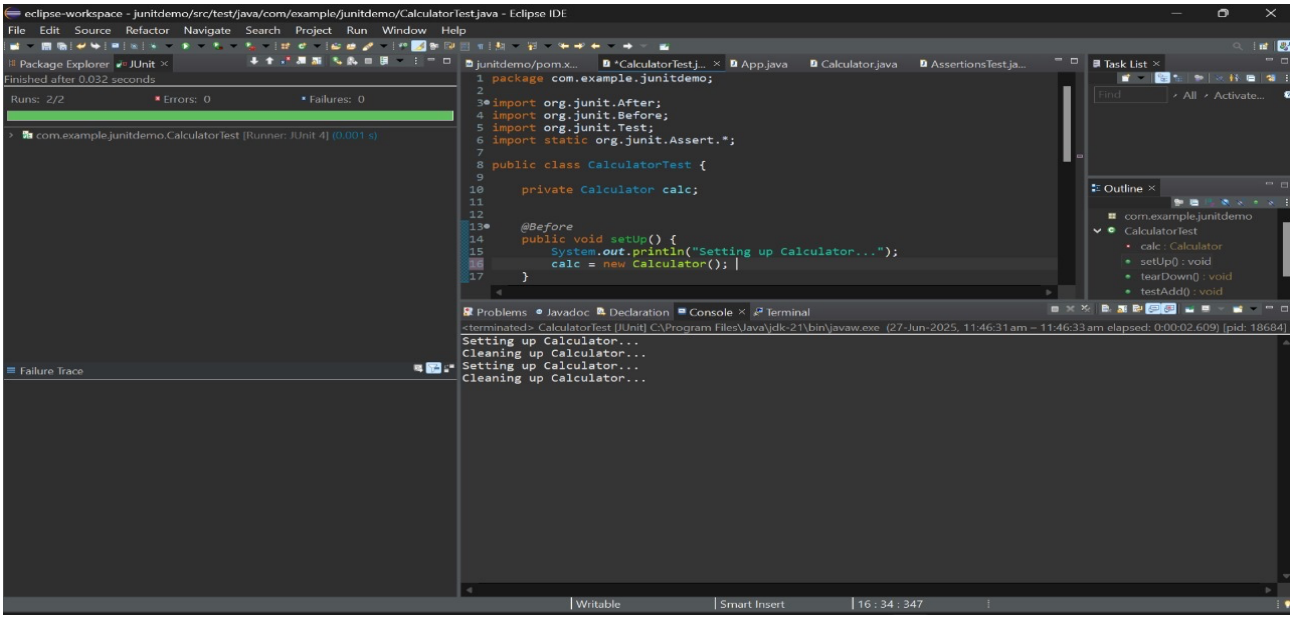
Exercise 4: Arrange-Act-Assert (AAA) Pattern, Test Fixtures, Setup and Teardown Methods in JUnit

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.



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.

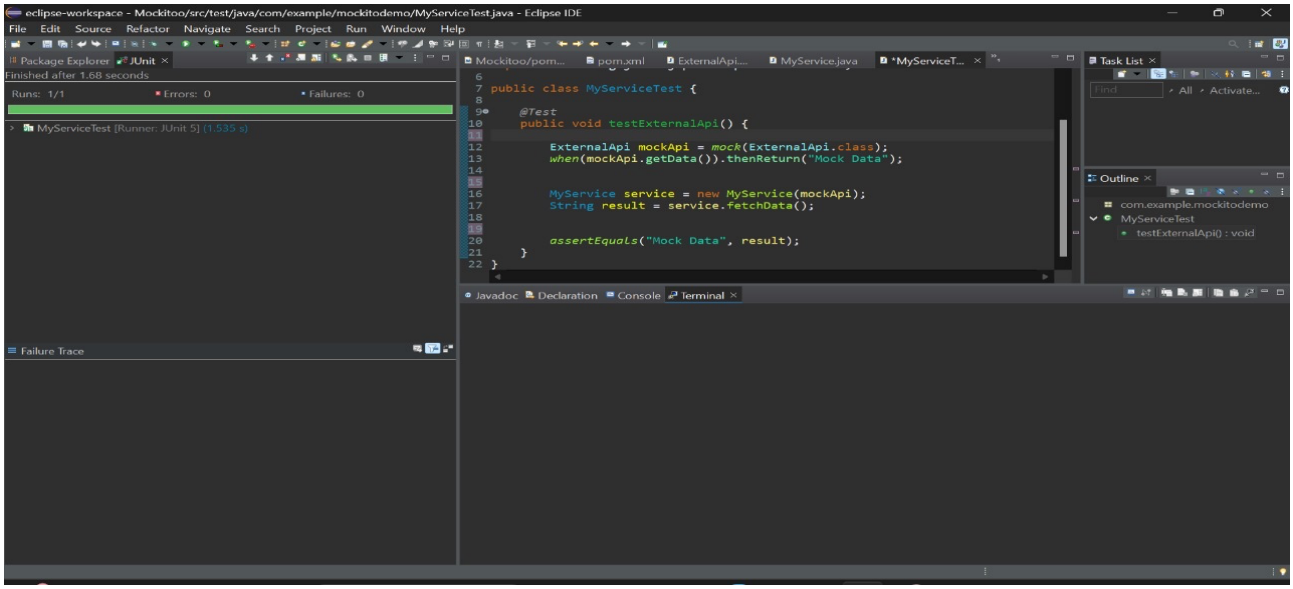
Steps:
1. Create a mock object for the external API.
2. Stub the methods to return predefined values. 3. Write a test case that uses the mock object.

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);

} }



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.

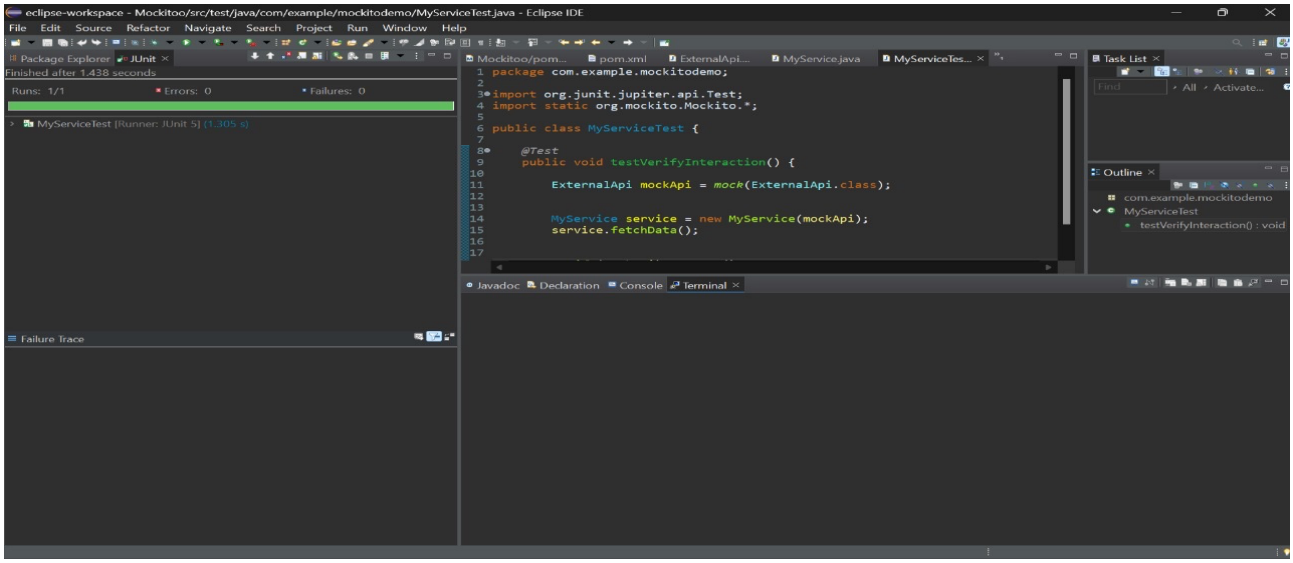
Solution Code:
import static org.mockito.Mockito.*;

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();

} }



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");

} }