PL/SQL programming

Mandatory Exercises:

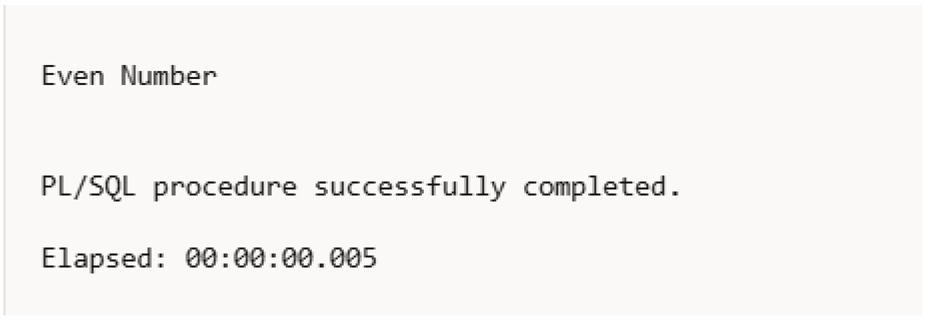
Exercise 1: Control Structures

1.IF-ELSE Statement

Code:

```
DECLARE
  num NUMBER := 8;
BEGIN
  IF MOD(num, 2) = 0 THEN
    DBMS_OUTPUT.PUT_LINE('Even Number');
  ELSE
    DBMS_OUTPUT.PUT_LINE('Odd Number');
  END IF;
END;
/
```

Output:



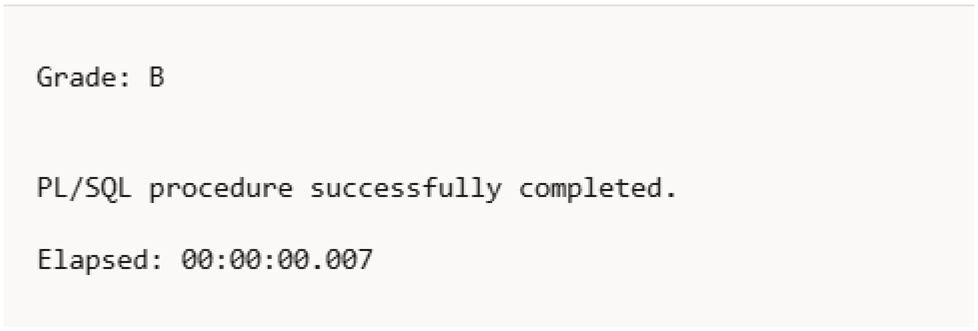
```
Even Number


PL/SQL procedure successfully completed.

Elapsed: 00:00:00.005
```

2.CASE Statement

Code:

```
DECLARE
  marks NUMBER := 85;
  grade CHAR(1);
BEGIN
```

```
  CASE
    WHEN marks >= 90 THEN grade := 'A';
    WHEN marks >= 80 THEN grade := 'B';
    WHEN marks >= 70 THEN grade := 'C';
    WHEN marks >= 60 THEN grade := 'D';
    ELSE grade := 'F';
  END CASE;
  DBMS_OUTPUT.PUT_LINE('Grade: ' || grade);
END;
/
```

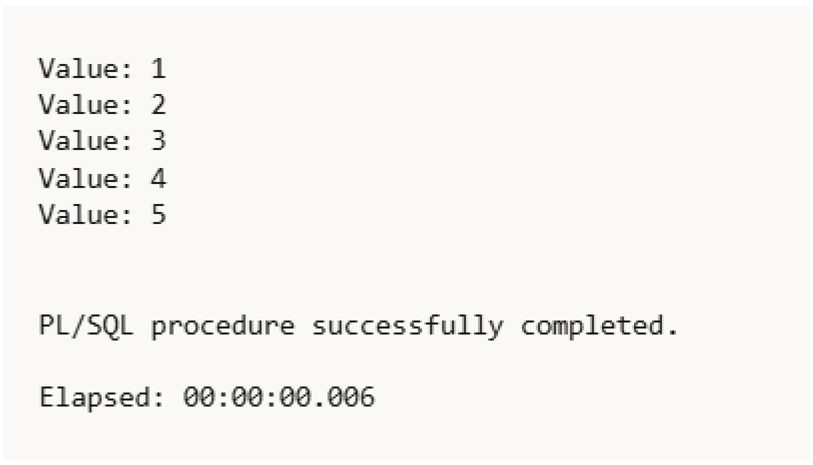


```
Grade: B


PL/SQL procedure successfully completed.

Elapsed: 00:00:00.007
```

3. Simple LOOP

```
DECLARE
  i NUMBER := 1;
BEGIN
  LOOP
    EXIT WHEN i > 5;
    DBMS_OUTPUT.PUT_LINE('Value: ' || i);
    i := i + 1;
  END LOOP;
END;
/
```

Output:



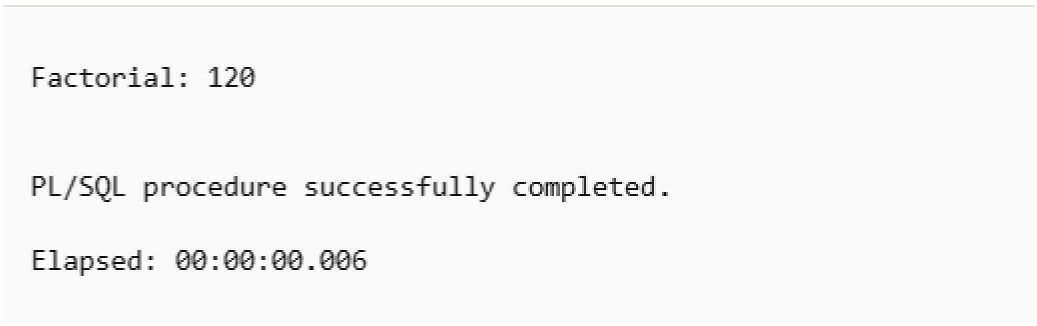
```
Value: 1
Value: 2
Value: 3
Value: 4
Value: 5


PL/SQL procedure successfully completed.

Elapsed: 00:00:00.006
```

4. WHILE LOOP

Code:

```
DECLARE
  num NUMBER := 5;
  result NUMBER := 1;
BEGIN
  WHILE num > 0 LOOP
    result := result * num;
    num := num - 1;
  END LOOP;
  DBMS_OUTPUT.PUT_LINE('Factorial: ' || result);
END;
/
```

Output:



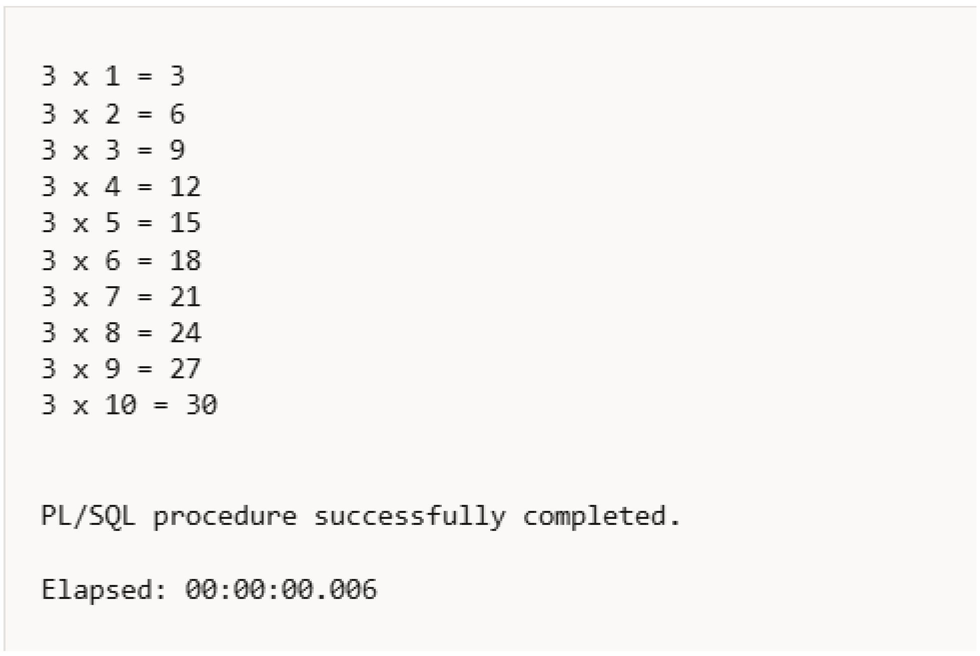
```
Factorial: 120


PL/SQL procedure successfully completed.

Elapsed: 00:00:00.006
```

5. FOR LOOP

Code:

```
DECLARE
  i NUMBER;
BEGIN
  FOR i IN 1..10 LOOP
    DBMS_OUTPUT.PUT_LINE('3 x ' || i || ' = ' || (3 * i));
  END LOOP;
END;
/
```

Output:



```
3 x 1 = 3
3 x 2 = 6
3 x 3 = 9
3 x 4 = 12
3 x 5 = 15
3 x 6 = 18
3 x 7 = 21
3 x 8 = 24
3 x 9 = 27
3 x 10 = 30


PL/SQL procedure successfully completed.

Elapsed: 00:00:00.006
```

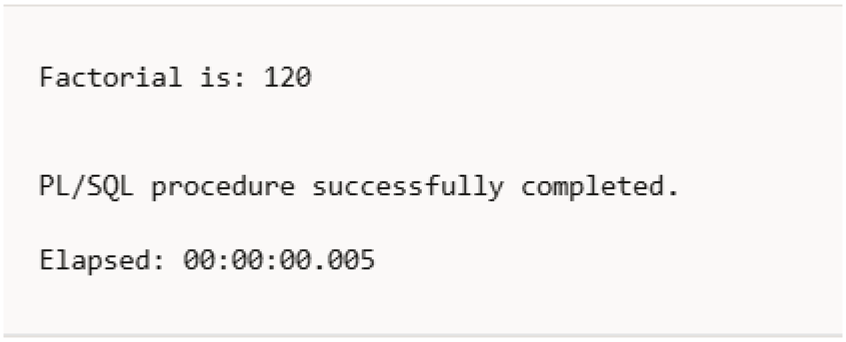
Exercise 3: Stored Procedures

1.Procedure with IN and OUT Parameters

Code:

```
-- Create procedure
CREATE OR REPLACE PROCEDURE get_factorial (
  num IN NUMBER,
  fact OUT NUMBER
)
IS
  i NUMBER := 1;
BEGIN
  fact := 1;
  WHILE i <= num LOOP
    fact := fact * i;
    i := i + 1;
  END LOOP;
END;
/
-- Call the procedure
DECLARE
  result NUMBER;
BEGIN
  get_factorial(5, result);
  DBMS_OUTPUT.PUT_LINE('Factorial is: ' || result);
END;
/
```

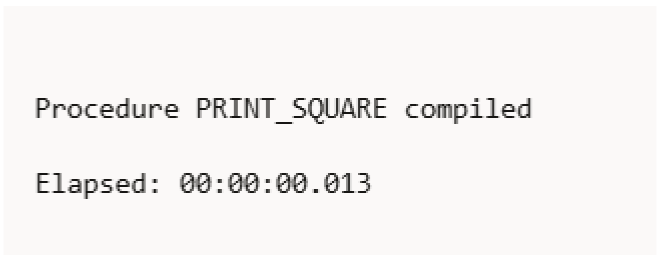
Output:



```
Factorial is: 120


PL/SQL procedure successfully completed.

Elapsed: 00:00:00.005
```

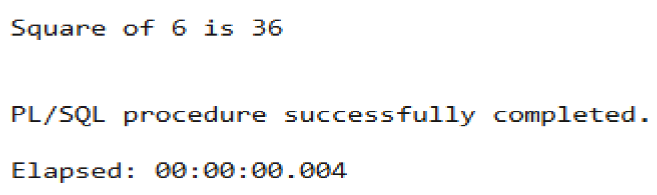
2. Stored Procedure with IN Parameter

```
-- Create procedure
CREATE OR REPLACE PROCEDURE print_square (
   num IN NUMBER
)
IS
   result NUMBER;
BEGIN
   result := num * num;
   DBMS_OUTPUT.PUT_LINE('Square of ' || num || ' is ' || result);
END;
/
```



```
Procedure PRINT_SQUARE compiled

Elapsed: 00:00:00.013
```

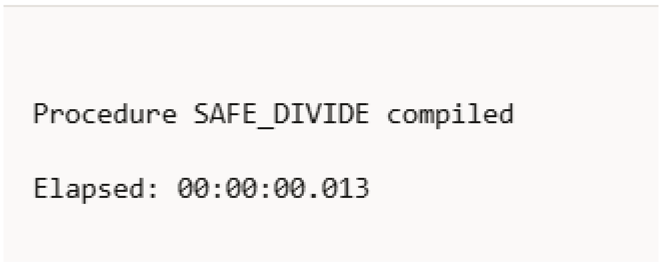
```
-- Call the procedure
BEGIN
   print_square(6);
END;
/
```



```
Square of 6 is 36

PL/SQL procedure successfully completed.

Elapsed: 00:00:00.004
```

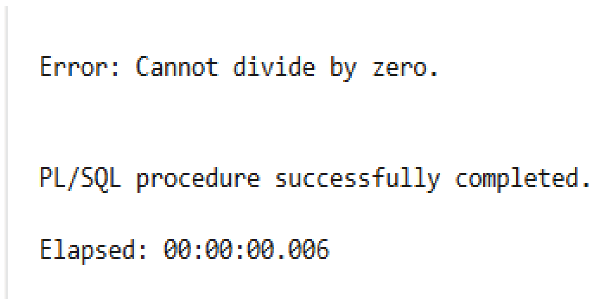
3. Procedure with Exception Handling

```
-- Create procedure
CREATE OR REPLACE PROCEDURE safe_divide (
   a IN NUMBER,
   b IN NUMBER
)
IS
   result NUMBER;
BEGIN
   result := a / b;
   DBMS_OUTPUT.PUT_LINE('Result: ' || result);
EXCEPTION
   WHEN ZERO_DIVIDE THEN
      DBMS_OUTPUT.PUT_LINE('Error: Cannot divide by zero.');
END;
/
```



```
Procedure SAFE_DIVIDE compiled

Elapsed: 00:00:00.013
```

```
-- Call the procedure
BEGIN
   safe_divide(10, 0);
END;
/
```



```
Error: Cannot divide by zero.


PL/SQL procedure successfully completed.

Elapsed: 00:00:00.006
```

Additional Exercises:

Schema

Step 1: Tables Creation

```
BEGIN
  EXECUTE IMMEDIATE 'DROP TABLE Transactions CASCADE CONSTRAINTS';
  EXECUTE IMMEDIATE 'DROP TABLE Accounts CASCADE CONSTRAINTS';
  EXECUTE IMMEDIATE 'DROP TABLE Loans CASCADE CONSTRAINTS';
  EXECUTE IMMEDIATE 'DROP TABLE Employees CASCADE CONSTRAINTS';
  EXECUTE IMMEDIATE 'DROP TABLE Customers CASCADE CONSTRAINTS';
EXCEPTION WHEN OTHERS THEN NULL;
END;
/
-- Create tables
CREATE TABLE Customers (
    CustomerID NUMBER PRIMARY KEY,
    Name VARCHAR2(100),
    DOB DATE,
    Balance NUMBER,
    LastModified DATE
);
CREATE TABLE Accounts (
    AccountID NUMBER PRIMARY KEY,
    CustomerID NUMBER,
    AccountType VARCHAR2(20),
    Balance NUMBER,
    LastModified DATE,
    FOREIGN KEY (CustomerID) REFERENCES Customers(CustomerID)
);

CREATE TABLE Transactions (
    TransactionID NUMBER PRIMARY KEY,
    AccountID NUMBER,
    TransactionDate DATE,
    Amount NUMBER,
    TransactionType VARCHAR2(10),
    FOREIGN KEY (AccountID) REFERENCES Accounts(AccountID)
);

CREATE TABLE Loans (
    LoanID NUMBER PRIMARY KEY,
    CustomerID NUMBER,
    LoanAmount NUMBER,
    InterestRate NUMBER,
    StartDate DATE,
    EndDate DATE,
    FOREIGN KEY (CustomerID) REFERENCES Customers(CustomerID)
);

CREATE TABLE Employees (
    EmployeeID NUMBER PRIMARY KEY,
    Name VARCHAR2(100),
    Position VARCHAR2(50),
    Salary NUMBER,
    Department VARCHAR2(50),
    HireDate DATE
);
```

Step 2: Insert Sample Data

```
-- Insert sample data
INSERT INTO Customers VALUES (1, 'John Doe', TO_DATE('1960-05-15', 'YYYY-MM-DD'),
12000, SYSDATE);
INSERT INTO Customers VALUES (2, 'Jane Smith', TO_DATE('1990-07-20', 'YYYY-MM-
DD'), 8000, SYSDATE);

INSERT INTO Accounts VALUES (1, 1, 'Savings', 1000, SYSDATE);
INSERT INTO Accounts VALUES (2, 2, 'Checking', 1500, SYSDATE);

INSERT INTO Transactions VALUES (1, 1, SYSDATE, 200, 'Deposit');
INSERT INTO Transactions VALUES (2, 2, SYSDATE, 300, 'Withdrawal');

INSERT INTO Loans VALUES (1, 1, 5000, 5, SYSDATE, ADD_MONTHS(SYSDATE, 60));
INSERT INTO Employees VALUES (1, 'Alice Johnson', 'Manager', 70000, 'HR',
TO_DATE('2015-06-15', 'YYYY-MM-DD'));
INSERT INTO Employees VALUES (2, 'Bob Brown', 'Developer', 60000, 'IT',
TO_DATE('2017-03-20', 'YYYY-MM-DD'));
```

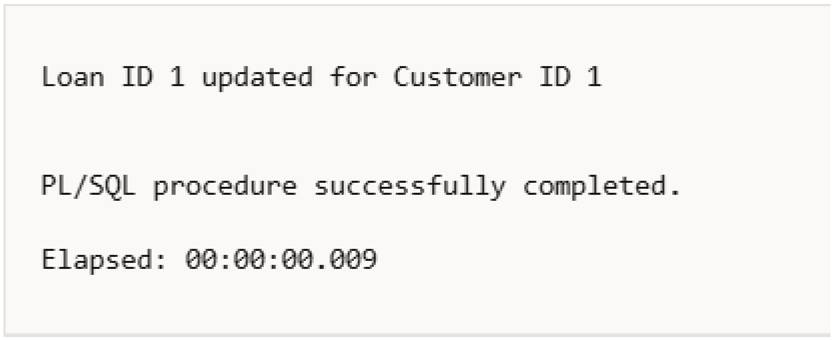
Exercise 1: Control Structures

Scenario 1:Apply Discount to Senior Citizens' Loan

Code:

```
BEGIN
 FOR loan_rec IN (
  SELECT
   l.LoanID AS loan_id,
   l.InterestRate,
   c.CustomerID AS cust_id,
   c.DOB
  FROM Loans l
  JOIN Customers c ON l.CustomerID = c.CustomerID
 )
 LOOP
  IF MONTHS_BETWEEN(SYSDATE, loan_rec.DOB)/12 > 60 THEN
   UPDATE Loans
   SET InterestRate = InterestRate - 1
   WHERE LoanID = loan_rec.loan_id;

   DBMS_OUTPUT.PUT_LINE('Loan ID ' || loan_rec.loan_id ||
             ' updated for Customer ID ' || loan_rec.cust_id);
  END IF;
 END LOOP;
END;
/
```

Output:



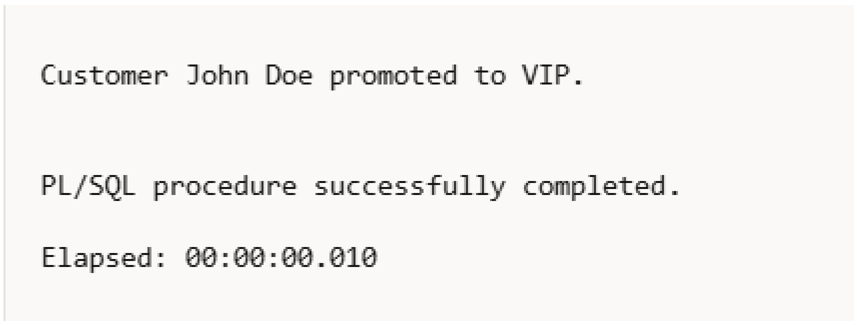
```
Loan ID 1 updated for Customer ID 1


PL/SQL procedure successfully completed.

Elapsed: 00:00:00.009
```

Scenario 2 Promote VIP Customers

Code:

```
BEGIN
 FOR cust IN (SELECT * FROM Customers) LOOP
  IF cust.Balance > 10000 THEN
   DBMS_OUTPUT.PUT_LINE('Customer ' || cust.Name || ' promoted to VIP.');
  END IF;
 END LOOP;
END;
/
```

Output:



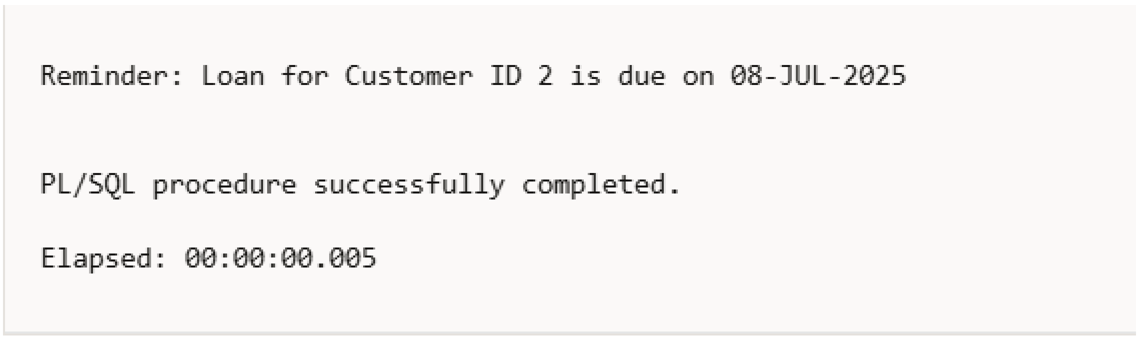
```
Customer John Doe promoted to VIP.


PL/SQL procedure successfully completed.

Elapsed: 00:00:00.010
```

Scenario 3: Reminders for Upcoming Loan Dues

Code:

```
BEGIN
 FOR rec IN (
  SELECT * FROM Loans WHERE EndDate <= SYSDATE + 30
 ) LOOP
  DBMS_OUTPUT.PUT_LINE('Reminder: Loan for Customer ID ' || rec.CustomerID ||
           ' is due on ' || TO_CHAR(rec.EndDate, 'DD-MON-YYYY'));
 END LOOP;
END;
/
```

Output:


```
Reminder: Loan for Customer ID 2 is due on 08-JUL-2025


PL/SQL procedure successfully completed.

Elapsed: 00:00:00.005
```

Exercise 2: Error Handling

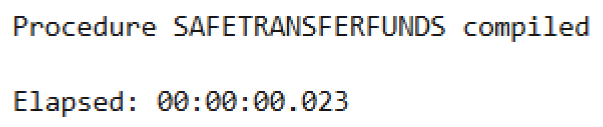
Scenario 1: Safe Transfer Funds with Output

Code:

```
CREATE OR REPLACE PROCEDURE SafeTransferFunds (
  fromAcc NUMBER,
  toAcc NUMBER,
  amount NUMBER
) IS
  v_balance NUMBER;
BEGIN
  SELECT Balance INTO v_balance FROM Accounts WHERE AccountID = fromAcc;
  IF v_balance < amount THEN
    RAISE_APPLICATION_ERROR(-20001, 'Insufficient funds');
  END IF;
  UPDATE Accounts SET Balance = Balance - amount WHERE AccountID = fromAcc;
  UPDATE Accounts SET Balance = Balance + amount WHERE AccountID = toAcc;
  COMMIT;
  DBMS_OUTPUT.PUT_LINE('Transfer successful.');
EXCEPTION
  WHEN OTHERS THEN
```

```
    ROLLBACK;
    DBMS_OUTPUT.PUT_LINE('Error: ' || SQLERRM);
END;
/
```

Output:

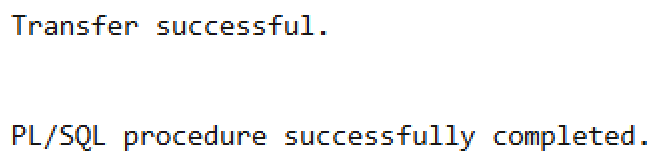


```
Procedure SAFETRANSFERFUNDS compiled

Elapsed: 00:00:00.023
```

Code:

```
BEGIN
  SafeTransferFunds(1, 2, 100);  -- Example: Transfer 100 from AccountID 1 to AccountID
2
END;
/
```

Output:



```
Transfer successful.


PL/SQL procedure successfully completed.
```

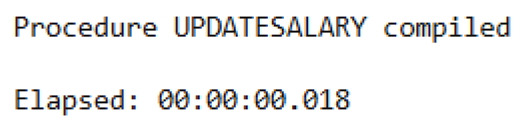
Scenario 2: Update Salary with Output

Code:

```
CREATE OR REPLACE PROCEDURE UpdateSalary (
  empId NUMBER,
  percent IN NUMBER
) IS
BEGIN
  UPDATE Employees SET Salary = Salary + (Salary * percent / 100) WHERE EmployeeID
= empId;
  IF SQL%ROWCOUNT = 0 THEN
    DBMS_OUTPUT.PUT_LINE('Error: Employee ID not found.');
```

```
 ELSE
  COMMIT;
  DBMS_OUTPUT.PUT_LINE('Salary updated successfully.');
 END IF;
END;
/
```

Output:

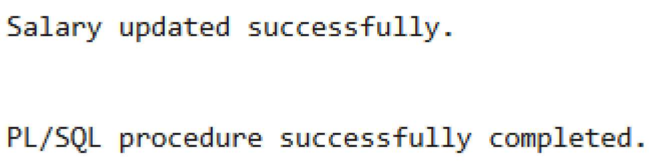


```
Procedure UPDATESALARY compiled

Elapsed: 00:00:00.018
```

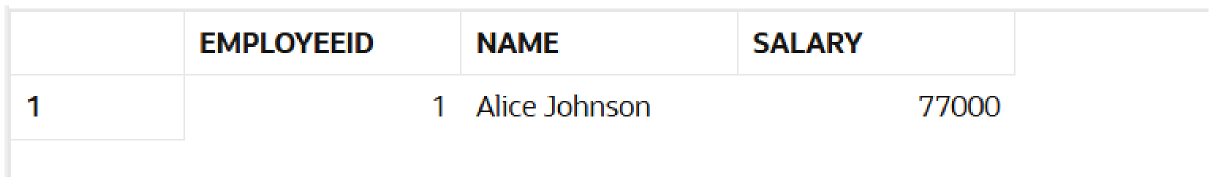
Code:

```
BEGIN
 UpdateSalary(1, 10);  -- Updates salary of employee with ID 1 by 10%
END;
/
```

Output:



```
Salary updated successfully.


PL/SQL procedure successfully completed.
```



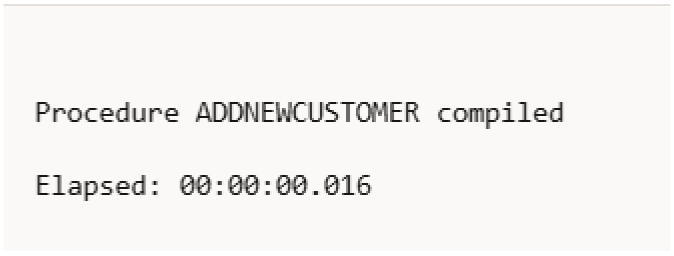
	EMPLOYEEID	NAME	SALARY
1	1	Alice Johnson	77000

Scenario 3: Add New Customer with Error Handling

Code:

```
CREATE OR REPLACE PROCEDURE AddNewCustomer (
 p_id NUMBER,
 p_name VARCHAR2,
 p_dob DATE,
  p_balance NUMBER
) IS
BEGIN
  INSERT INTO Customers VALUES (p_id, p_name, p_dob, p_balance, SYSDATE);
  COMMIT;
  DBMS_OUTPUT.PUT_LINE('Customer added successfully.');
EXCEPTION
  WHEN DUP_VAL_ON_INDEX THEN
    DBMS_OUTPUT.PUT_LINE('Error: Customer ID already exists.');
END;
/
```

Output:



```
Procedure ADDNEWCUSTOMER compiled

Elapsed: 00:00:00.016
```

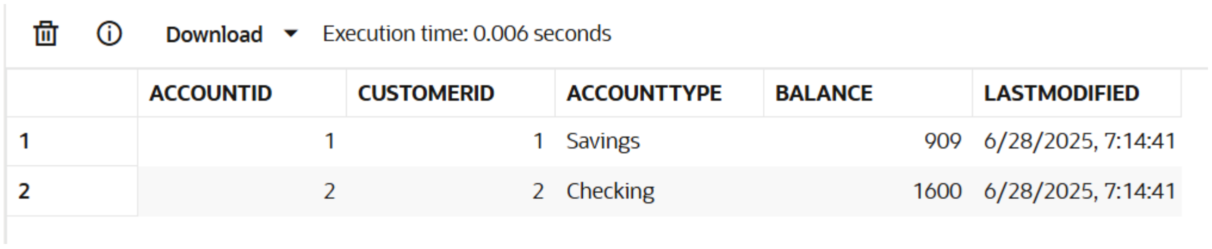
Exercise 3: Stored Procedures

Scenario 1: Process Monthly Interest

Code:

```
CREATE OR REPLACE PROCEDURE ProcessMonthlyInterest IS
BEGIN
    UPDATE Accounts
    SET Balance = Balance + (Balance * 0.01)
    WHERE AccountType = 'Savings';
END;
/
-- Test
EXEC ProcessMonthlyInterest;
```

SELECT * FROM Accounts;



Download Execution time: 0.006 seconds

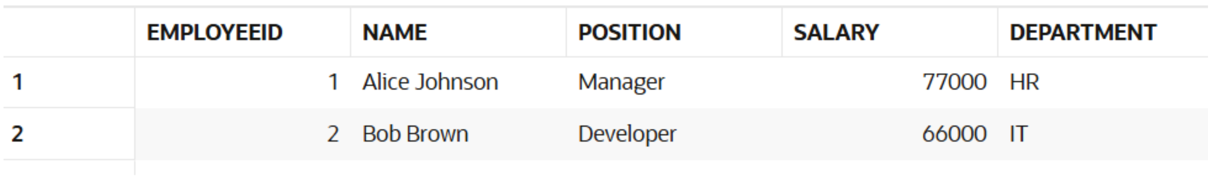
	ACCOUNTID	CUSTOMERID	ACCOUNTTYPE	BALANCE	LASTMODIFIED
1	1	1	Savings	909	6/28/2025, 7:14:41
2	2	2	Checking	1600	6/28/2025, 7:14:41

Scenario 2: Update Employee Bonus

Code:

```
CREATE OR REPLACE PROCEDURE UpdateEmployeeBonus(
   dept IN VARCHAR2,
   bonus_percent IN NUMBER
) IS
BEGIN
   UPDATE Employees
   SET Salary = Salary + (Salary * bonus_percent / 100)
   WHERE Department = dept;
END;
/
-- Test
EXEC UpdateEmployeeBonus('IT', 10);
SELECT * FROM Employees;
```

Output:



	EMPLOYEEID	NAME	POSITION	SALARY	DEPARTMENT
1	1	Alice Johnson	Manager	77000	HR
2	2	Bob Brown	Developer	66000	IT

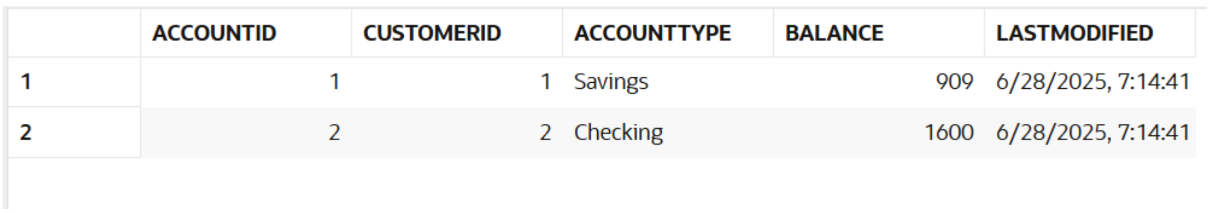
Scenario 3: Transfer Funds

Code:

```
CREATE OR REPLACE PROCEDURE TransferFunds(
  from_acc IN NUMBER,
  to_acc IN NUMBER,
  amount IN NUMBER
) IS
  insufficient_balance EXCEPTION;
BEGIN
  DECLARE
    from_balance NUMBER;
  BEGIN
    SELECT Balance INTO from_balance FROM Accounts WHERE AccountID =
from_acc FOR UPDATE;

    IF from_balance < amount THEN
      RAISE insufficient_balance;
    END IF;

    UPDATE Accounts SET Balance = Balance - amount WHERE AccountID = from_acc;
    UPDATE Accounts SET Balance = Balance + amount WHERE AccountID = to_acc;

    INSERT INTO Transactions VALUES (
      Transactions_seq.NEXTVAL, from_acc, SYSDATE, amount, 'Transfer'
    );
    INSERT INTO Transactions VALUES (
      Transactions_seq.NEXTVAL, to_acc, SYSDATE, amount, 'Transfer'
    );
  END;
EXCEPTION
```

```
  WHEN insufficient_balance THEN
    DBMS_OUTPUT.PUT_LINE('Insufficient funds.');
END;
/


-- Test
EXEC TransferFunds(1, 2, 200);
SELECT * FROM Accounts;
SELECT * FROM Transactions;
```

Output:



	ACCOUNTID	CUSTOMERID	ACCOUNTTYPE	BALANCE	LASTMODIFIED
1	1	1	Savings	909	6/28/2025, 7:14:41
2	2	2	Checking	1600	6/28/2025, 7:14:41

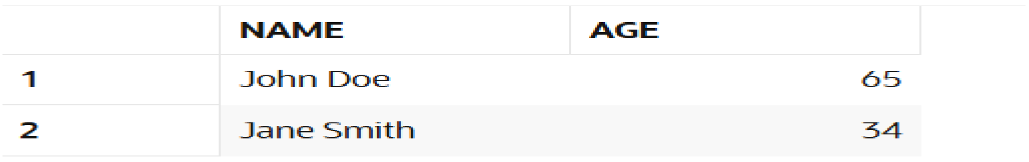
Exercise 4: Functions

Scenario 1: Calculate Age

Code:

```
CREATE OR REPLACE FUNCTION CalculateAge(dob DATE) RETURN NUMBER IS
BEGIN
  RETURN FLOOR(MONTHS_BETWEEN(SYSDATE, dob)/12);
END;
/
-- Test
SELECT Name, CalculateAge(DOB) AS Age FROM Customers;
```

Output:



	NAME	AGE
1	John Doe	65
2	Jane Smith	34

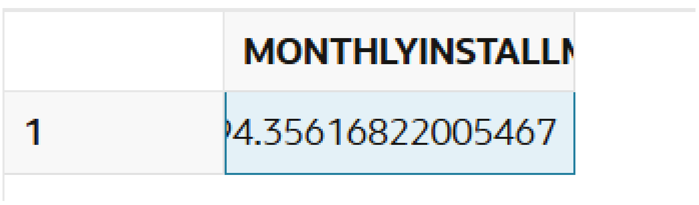
Scenario 2: Calculate Monthly Installment

Code:

```
CREATE OR REPLACE FUNCTION CalculateMonthlyInstallment(
   loan_amount IN NUMBER,
   annual_rate IN NUMBER,
   years IN NUMBER
) RETURN NUMBER IS
   monthly_rate NUMBER;
   n NUMBER;
BEGIN
   monthly_rate := annual_rate / (12 * 100);
   n := years * 12;
   RETURN loan_amount * monthly_rate / (1 - POWER(1 + monthly_rate, -n));
END;
/
-- Test
SELECT CalculateMonthlyInstallment(5000, 5, 5) AS MonthlyInstallment FROM DUAL;
```

Output:

```
Function CALCULATEMONTHLYINSTALLMENT compiled

Elapsed: 00:00:00.003
```



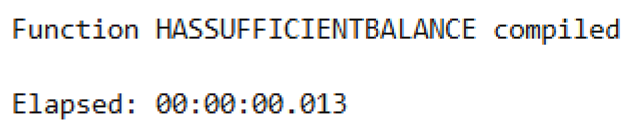
	MONTHLYINSTALL
1	4.35616822005467

Scenario 3: Has Sufficient Balance

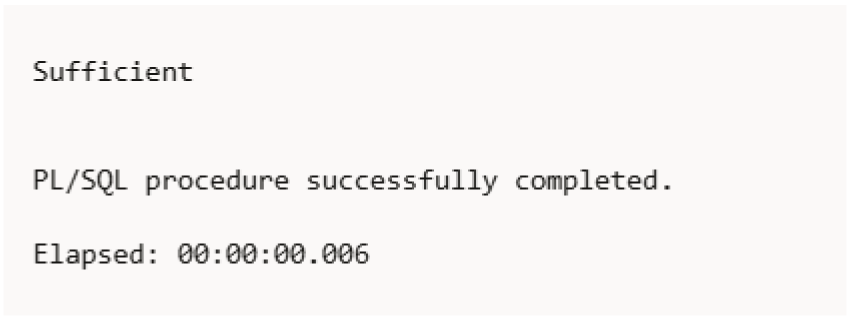
Code:

```
CREATE OR REPLACE FUNCTION HasSufficientBalance(
  acc_id IN NUMBER,
  amt IN NUMBER
) RETURN BOOLEAN IS
  bal NUMBER;
BEGIN
  SELECT Balance INTO bal FROM Accounts WHERE AccountID = acc_id;
  RETURN bal >= amt;
END;
/
-- Test
DECLARE
  result BOOLEAN;
BEGIN
  result := HasSufficientBalance(1, 500);
  IF result THEN
    DBMS_OUTPUT.PUT_LINE('Sufficient');
  ELSE
    DBMS_OUTPUT.PUT_LINE('Insufficient');
  END IF;
END;
/
```

Output:



```
Function HASSUFFICIENTBALANCE compiled

Elapsed: 00:00:00.013
```



```
Sufficient


PL/SQL procedure successfully completed.

Elapsed: 00:00:00.006
```

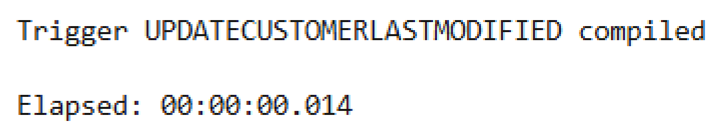
Exercise 5: Triggers

Scenario 1: Update Last Modified

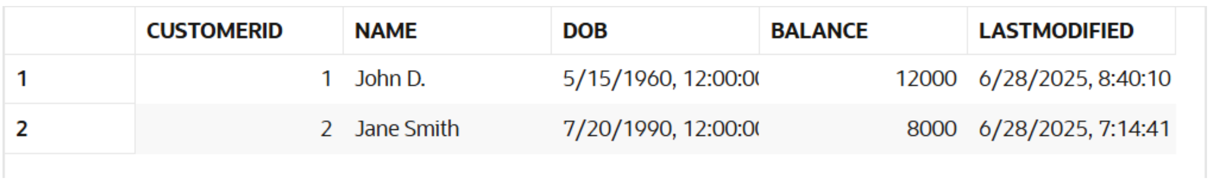
Code:

```
CREATE OR REPLACE TRIGGER UpdateCustomerLastModified

BEFORE UPDATE ON Customers

FOR EACH ROW

BEGIN

  :NEW.LastModified := SYSDATE;

END;

/

-- Test

UPDATE Customers SET Name = 'John D.' WHERE CustomerID = 1;

SELECT * FROM Customers;
```

Output:



```
Trigger UPDATECUSTOMERLASTMODIFIED compiled

Elapsed: 00:00:00.014
```



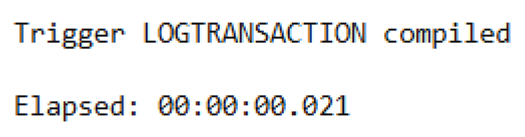
	CUSTOMERID	NAME	DOB	BALANCE	LASTMODIFIED
1	1	John D.	5/15/1960, 12:00:0	12000	6/28/2025, 8:40:10
2	2	Jane Smith	7/20/1990, 12:00:0	8000	6/28/2025, 7:14:41

Scenario 2: Audit Log

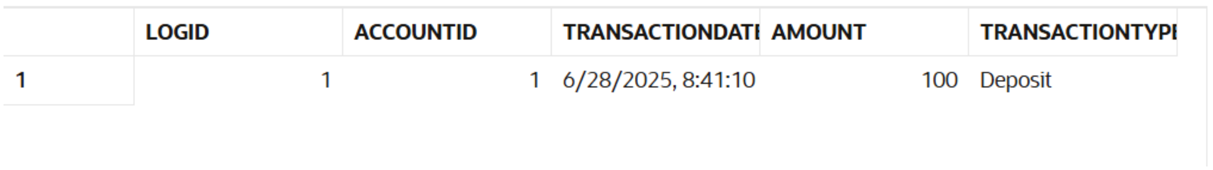
Code:

```
CREATE TABLE AuditLog (
  LogID NUMBER GENERATED ALWAYS AS IDENTITY,
  AccountID NUMBER,
  TransactionDate DATE,
  Amount NUMBER,
  TransactionType VARCHAR2(10)
);
CREATE OR REPLACE TRIGGER LogTransaction
AFTER INSERT ON Transactions
FOR EACH ROW
BEGIN
  INSERT INTO AuditLog(AccountID, TransactionDate, Amount, TransactionType)
  VALUES (:NEW.AccountID, :NEW.TransactionDate, :NEW.Amount,
:NEW.TransactionType);
END;
/
-- Test
INSERT INTO Transactions VALUES (3, 1, SYSDATE, 100, 'Deposit');
SELECT * FROM AuditLog;
```

Output:



```
Trigger LOGTRANSACTION compiled

Elapsed: 00:00:00.021
```



	LOGID	ACCOUNTID	TRANSACTIONDATI	AMOUNT	TRANSACTIONTYPI
1	1	1	6/28/2025, 8:41:10	100	Deposit

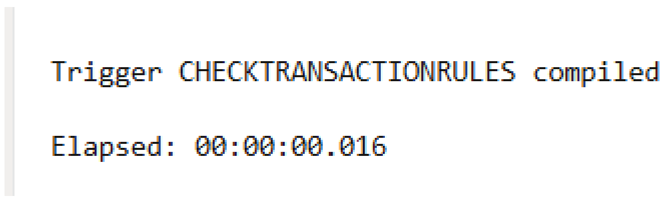
Scenario 3: Transaction Rules

Code:

```
CREATE OR REPLACE TRIGGER CheckTransactionRules
```

```
BEFORE INSERT ON Transactions
FOR EACH ROW
DECLARE
  bal NUMBER;
BEGIN
  IF :NEW.TransactionType = 'Withdrawal' THEN
    SELECT Balance INTO bal FROM Accounts WHERE AccountID = :NEW.AccountID;
    IF :NEW.Amount > bal THEN
      RAISE_APPLICATION_ERROR(-20001, 'Insufficient balance for withdrawal');
    END IF;
  ELSIF :NEW.TransactionType = 'Deposit' THEN
    IF :NEW.Amount <= 0 THEN
      RAISE_APPLICATION_ERROR(-20002, 'Deposit amount must be positive');
    END IF;
  END IF;
END;
/
-- Test (this will raise error if rules break)
-- INSERT INTO Transactions VALUES (4, 1, SYSDATE, 50000, 'Withdrawal');
```

Output:



```
Trigger CHECKTRANSACTIONRULES compiled

Elapsed: 00:00:00.016
```

Exercise 6: Cursors

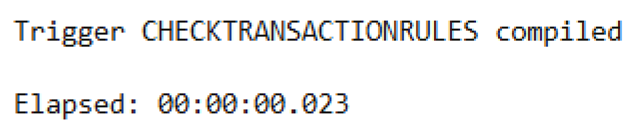
Scenario 1: Generate Monthly Statements

Code:

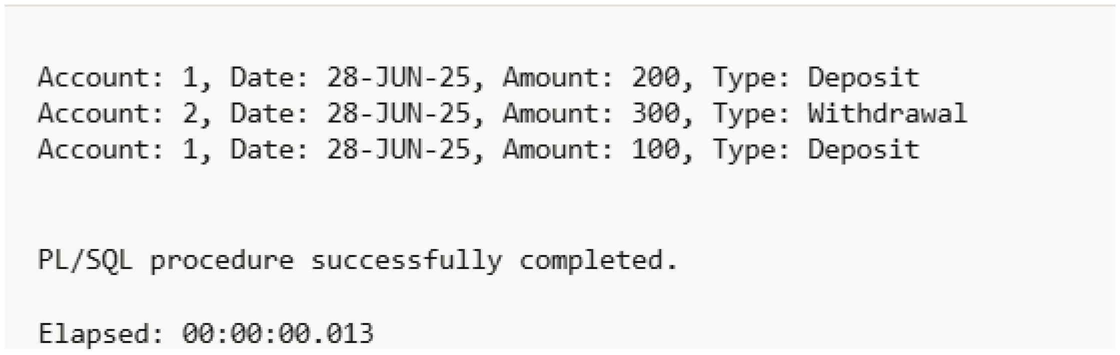
```
DECLARE
```

```
  CURSOR cur IS
    SELECT AccountID, TransactionDate, Amount, TransactionType
    FROM Transactions
    WHERE TRUNC(TransactionDate, 'MM') = TRUNC(SYSDATE, 'MM');
BEGIN
  FOR rec IN cur LOOP
    DBMS_OUTPUT.PUT_LINE('Account: ' || rec.AccountID ||
                         ', Date: ' || rec.TransactionDate ||
                         ', Amount: ' || rec.Amount ||
                         ', Type: ' || rec.TransactionType);
  END LOOP;
END;
/
```

Output:



```
Trigger CHECKTRANSACTIONRULES compiled

Elapsed: 00:00:00.023
```



```
Account: 1, Date: 28-JUN-25, Amount: 200, Type: Deposit
Account: 2, Date: 28-JUN-25, Amount: 300, Type: Withdrawal
Account: 1, Date: 28-JUN-25, Amount: 100, Type: Deposit


PL/SQL procedure successfully completed.

Elapsed: 00:00:00.013
```

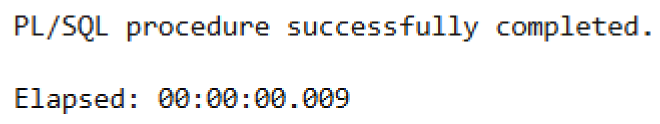
Scenario 2: Apply Annual Fee

Code:

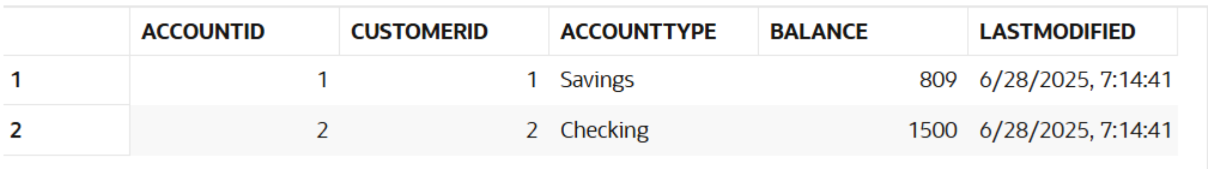
```
DECLARE
  CURSOR c IS SELECT AccountID, Balance FROM Accounts FOR UPDATE;
  fee NUMBER := 100;
```

```
BEGIN
  FOR r IN c LOOP
    UPDATE Accounts SET Balance = Balance - fee WHERE AccountID = r.AccountID;
  END LOOP;
END;
/
-- Test
SELECT * FROM Accounts;
```

Output:



```
PL/SQL procedure successfully completed.

Elapsed: 00:00:00.009
```



	ACCOUNTID	CUSTOMERID	ACCOUNTTYPE	BALANCE	LASTMODIFIED
1	1	1	Savings	809	6/28/2025, 7:14:41
2	2	2	Checking	1500	6/28/2025, 7:14:41

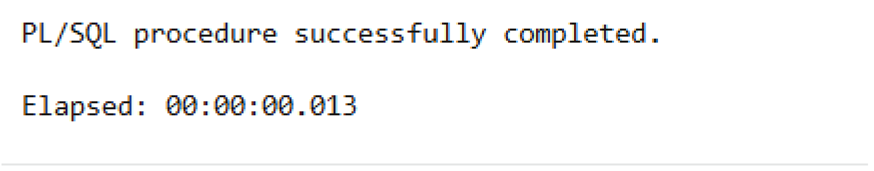
Scenario 3: Update Loan Interest

Code:

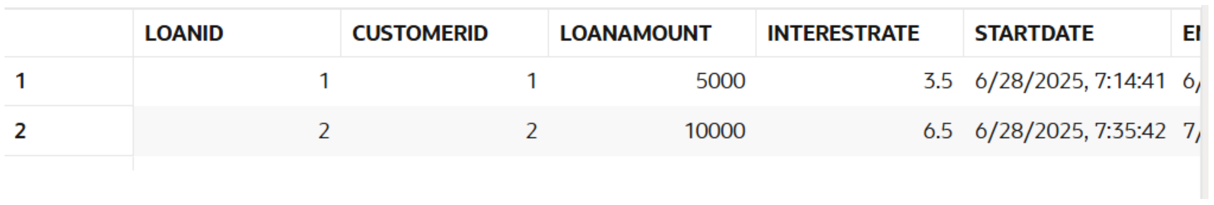
```
DECLARE
  CURSOR c IS SELECT LoanID, InterestRate FROM Loans FOR UPDATE;
BEGIN
  FOR r IN c LOOP
    UPDATE Loans
    SET InterestRate = r.InterestRate + 0.5
    WHERE LoanID = r.LoanID;
  END LOOP;
END;
/
-- Test
```

SELECT * FROM Loans;

Output:



```
PL/SQL procedure successfully completed.

Elapsed: 00:00:00.013
```



	LOANID	CUSTOMERID	LOANAMOUNT	INTERESTRATE	STARTDATE	EI
1	1	1	5000	3.5	6/28/2025, 7:14:41	6/
2	2	2	10000	6.5	6/28/2025, 7:35:42	7/

Exercise 7: Packages

Scenario 1: CustomerManagement

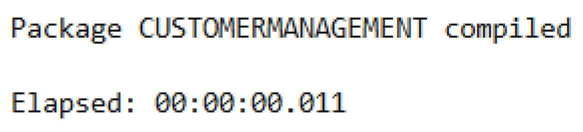
Code:

```
CREATE OR REPLACE PACKAGE CustomerManagement AS
  PROCEDURE AddCustomer(
    id NUMBER,
    name VARCHAR2,
    dob DATE,
    balance NUMBER
  );

  PROCEDURE UpdateCustomer(
    id NUMBER,
    name VARCHAR2
  );

  FUNCTION GetBalance(
    id NUMBER
  ) RETURN NUMBER;
```

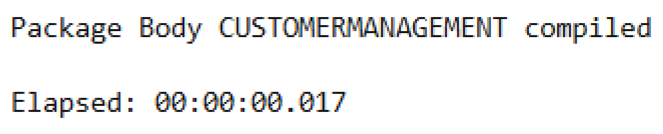
```
END CustomerManagement;
/
CREATE OR REPLACE PACKAGE BODY CustomerManagement AS
  PROCEDURE AddCustomer(id NUMBER, name VARCHAR2, dob DATE, balance
NUMBER) IS
  BEGIN
    INSERT INTO Customers (CustomerID, Name, DOB, Balance, LastModified)
    VALUES(id, name, dob, balance, SYSDATE);
  END;

  PROCEDURE UpdateCustomer(id NUMBER, name VARCHAR2) IS
  BEGIN
    UPDATE Customers
    SET Name = name,
      LastModified = SYSDATE
    WHERE CustomerID = id;
  END;

  FUNCTION GetBalance(id NUMBER) RETURN NUMBER IS
    bal NUMBER;
  BEGIN
    SELECT Balance INTO bal FROM Customers WHERE CustomerID = id;
    RETURN bal;
  END;
END CustomerManagement;
/
SET SERVEROUTPUT ON;
BEGIN
```

```
  -- Add a new customer
  CustomerManagement.AddCustomer(3, 'Sam Wilson', TO_DATE('1992-12-12', 'YYYY-
MM-DD'), 1200);

  -- Update customer name
  CustomerManagement.UpdateCustomer(3, 'Samuel Wilson');

  -- Fetch and display balance
  DECLARE
    bal NUMBER;
  BEGIN
    bal := CustomerManagement.GetBalance(3);
    DBMS_OUTPUT.PUT_LINE('Balance for Customer 3: ' || bal);
  END;
END;
/
```

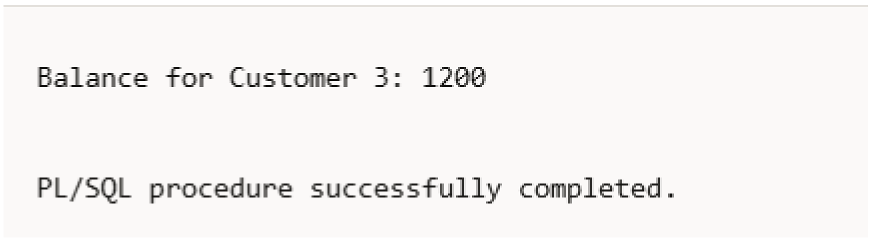
Output:



```
Package CUSTOMERMANAGEMENT compiled

Elapsed: 00:00:00.011
```



```
Package Body CUSTOMERMANAGEMENT compiled

Elapsed: 00:00:00.017
```



```
Balance for Customer 3: 1200


PL/SQL procedure successfully completed.
```

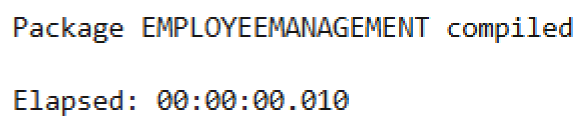
Scenario 2: EmployeeManagement

Code:

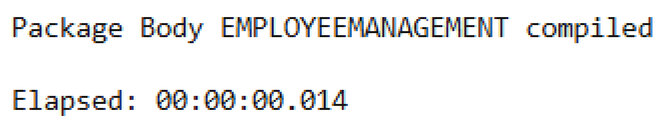
```
CREATE OR REPLACE PACKAGE EmployeeManagement AS
   PROCEDURE HireEmployee(
      id NUMBER,
      name VARCHAR2,
      pos VARCHAR2,
      sal NUMBER,
      dept VARCHAR2,
      hiredate DATE
   );

   PROCEDURE UpdateEmployee(
      id NUMBER,
      name VARCHAR2
   );

   FUNCTION GetAnnualSalary(
      id NUMBER
   ) RETURN NUMBER;
END EmployeeManagement;
/
CREATE OR REPLACE PACKAGE BODY EmployeeManagement AS
   PROCEDURE HireEmployee(id NUMBER, name VARCHAR2, pos VARCHAR2, sal
NUMBER, dept VARCHAR2, hiredate DATE) IS
   BEGIN
      INSERT INTO Employees (EmployeeID, Name, Position, Salary, Department,
HireDate)
```

```
        VALUES(id, name, pos, sal, dept, hiredate);
    END;

    PROCEDURE UpdateEmployee(id NUMBER, name VARCHAR2) IS
    BEGIN
        UPDATE Employees
        SET Name = name
        WHERE EmployeeID = id;
    END;

    FUNCTION GetAnnualSalary(id NUMBER) RETURN NUMBER IS
        sal NUMBER;
    BEGIN
        SELECT Salary INTO sal FROM Employees WHERE EmployeeID = id;
        RETURN sal * 12;
    END;
END EmployeeManagement;
/
SET SERVEROUTPUT ON;

BEGIN
    -- Step 1: Add a new employee
    EmployeeManagement.HireEmployee(
        3,
        'Charlie Stark',
        'Analyst',
        50000,
        'Finance',
        TO_DATE('2020-01-10', 'YYYY-MM-DD')
    );

    -- Step 2: Update employee name
    EmployeeManagement.UpdateEmployee(3, 'Charles Stark');

    -- Step 3: Fetch and print annual salary
    DECLARE
        annual_salary NUMBER;
    BEGIN
        annual_salary := EmployeeManagement.GetAnnualSalary(3);
        DBMS_OUTPUT.PUT_LINE('Annual Salary for Employee 3: ' || annual_salary);
    END;
END;
/
```

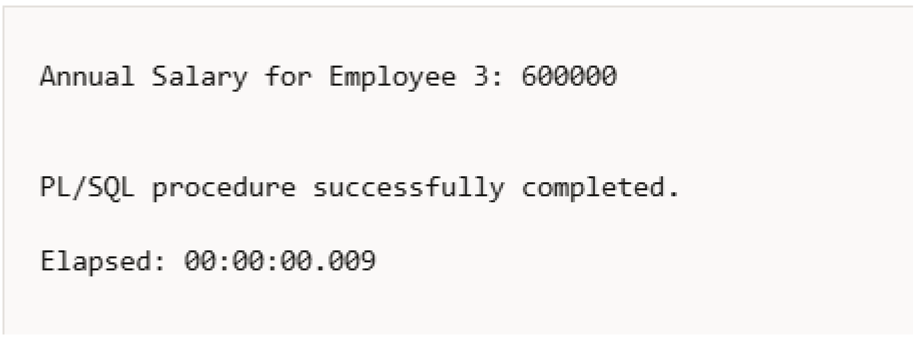
Output:



```
Package EMPLOYEEMANAGEMENT compiled

Elapsed: 00:00:00.010
```



```
Package Body EMPLOYEEMANAGEMENT compiled

Elapsed: 00:00:00.014
```



```
Annual Salary for Employee 3: 600000


PL/SQL procedure successfully completed.

Elapsed: 00:00:00.009
```

Scenario 3: AccountOperations

Code:

```
CREATE OR REPLACE PACKAGE AccountOperations AS
  PROCEDURE OpenAccount(
    accid NUMBER,
    cid NUMBER,
    type VARCHAR2,
    balance NUMBER
  );
 PROCEDURE CloseAccount(
    accid NUMBER
  );
FUNCTION GetTotalBalance(
    cid NUMBER
  ) RETURN NUMBER;
END AccountOperations;
/
CREATE OR REPLACE PACKAGE BODY AccountOperations AS
  PROCEDURE OpenAccount(accid NUMBER, cid NUMBER, type VARCHAR2, balance NUMBER) IS
  BEGIN
    INSERT INTO Accounts (AccountID, CustomerID, AccountType, Balance, LastModified)
    VALUES(accid, cid, type, balance, SYSDATE);
  END;
PROCEDURE CloseAccount(accid NUMBER) IS
  BEGIN
    DELETE FROM Accounts WHERE AccountID = accid;
  END;
```

```
FUNCTION GetTotalBalance(cid NUMBER) RETURN NUMBER IS
    total NUMBER;
  BEGIN
    SELECT SUM(Balance) INTO total FROM Accounts WHERE CustomerID = cid;
    RETURN total;
  END;
END AccountOperations;
/
SET SERVEROUTPUT ON;

BEGIN
  -- Open a new account
  AccountOperations.OpenAccount(3, 1, 'Savings', 2000);

  -- Get and display total balance
  DECLARE
    total_bal NUMBER;
  BEGIN
    total_bal := AccountOperations.GetTotalBalance(1);
    DBMS_OUTPUT.PUT_LINE('Total Balance for Customer 1: ' || total_bal);
  END;
END;
/
```

Output:

```
Package ACCOUNTOPERATIONS compiled

Elapsed: 00:00:00.013


Package Body ACCOUNTOPERATIONS compiled

Elapsed: 00:00:00.013
```

```
Total Balance for Customer 1: 2809


PL/SQL procedure successfully completed.

Elapsed: 00:00:00.014
```