SOLUTIONS TO EXAM QUESTIONS

By

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Database System Used:

Oracle 21c Enterprise Edition

Section A

A1 _1

```
Worksheet  Query Builder
show user;


-- Creating a new database user by the name Kigali_Branch in container database
CREATE USER c##Node_A IDENTIFIED BY nodea2025;
GRANT UNLIMITED TABLESPACE TO c##Node_A;
GRANT RESOURCE, DBA, CONNECT TO c##Node_A;

-- Creating another database by the name Bugesera_Branch in container database
CREATE USER c##Node_B IDENTIFIED BY nodeB2025;
GRANT UNLIMITED TABLESPACE TO c##Node_B;
GRANT RESOURCE, DBA, CONNECT TO c##Node_B;
```

Figure 1: Node_A and Node_B creation

A1_2 Refer to A1 SQL code file

A1_3

```
-- ********************************************************************************************
-- Database Link
-- Creating a database link between Node_A and Node_B and test witl SELECT and distributed join
CREATE DATABASE LINK proj_link
CONNECT TO c##Node_B IDENTIFIED BY nodeb2025
USING 'localhost:1521/orcl';

-- ********************************************************************************************
-- Creating Appointment_ALL View
```

```
Script Output x  Query Result x  Query Result 1 x
Task completed in 0.076 seconds

Error starting at line : 120 in command -
CREATE DATABASE LINK proj_link
CONNECT TO c##Node_B IDENTIFIED BY nodeb2025
USING 'localhost:1521/orcl'
Error report -
ORA-02011: duplicate database link name

https://docs.oracle.com/error-help/db/ora-02011/02011. 00000 -  "duplicate database link name"
*Cause:    The database link name specified in a CREATE DATABASE
```

Figure 2: Database Link

A1_4

```
SELECT * FROM Appointment_B@proj_link;

-- A.3.
-- Testing a VIEW on UNION ALL
SELECT * FROM Appointment_A
UNION ALL
SELECT * FROM Appointment_B@proj_link;
```

Script Output | Query Result

SQL | All Rows Fetched: 9 in 0.009 seconds

	APPOINTMENTID	PATIENTID	DOCTORID	VISITDATE	DIAGNOSIS	STATUS
1	5	21	28	20-SEP-25	Gestational Diabetes Mellitus	pending
2	6	19	28	20-SEP-25	Pregnancy-Induced Hypertension	pending
3	8	24	27	29-SEP-25	Epilepsy - generalised tonic-clonic	pending
4	11	17	29	29-JAN-25	Stable angina due to coronary artery disease	pending
5	4	23	25	25-APR-25	Urinary Tract Infection	pending
6	7	22	28	10-AUG-25	Vaginal Candidiasis	pending
7	9	20	27	15-JUL-25	Ischemic stroke - left hemisphere	pending
8	10	16	29	15-MAR-25	Primary hypertension	pending
9	12	18	30	14-JAN-25	Acute appendicitis	pending

Figure 3: View of Appointments

A1_4

```
-- A.4.
Select count(*) from Appointment_A;
select count(*) from Appointment_B@proj_link;
```

Script Output | Query Result

SQL | All Rows Fetched: 1 in 0.009 seconds

	COUNT(*)
1	4

Figure 4: Matching Count(*)

A2_1 refer to the A2 SQL code file

A2_2

```
-- A2.2 REMOTE SELECT
SELECT * FROM Doctor_B@proj_link;
```

Query Result | SQL | All Rows Fetched: 3 in 0.011 seconds

	DOCTORID	FULLNAME	SPECIALTY	DEPTID	PHONE	EMAIL
1	25	Dr. Evelyn Banda	Gynecologist	1	797576277	eviebanda@gmail.com
2	28	Dr. Mercy Phiri	Gynecologist	1	798576209	mercyphiri@gmail.com
3	29	Dr. Issac Merger	Cardiologist	2	799576286	issacmerger99@gmail.com

Figure 5: Database link Already Created

A2_3

```
-- A2.3 DIstributed join from Appointment_A with Patient_B
SELECT a.AppointmentID,
       p.FullName AS Patient_Name,
       p.Gender,
       a.VisitDate,
       a.Diagnosis,
       d.FullName AS Doctor_Name
FROM Appointment_A a
JOIN Patient_B@proj_link p ON a.PatientID = p.PatientID
JOIN Doctor_B@proj_link d ON a.DoctorID = d.DoctorID
WHERE a.VisitDate BETWEEN DATE '2023-01-01' AND DATE '2025-10-30'  -- Date range filter
  AND ROWNUM <= 10                                                 -- Strict row limit
ORDER BY a.VisitDate;
```

Query Result | SQL | All Rows Fetched: 2 in 0.008 seconds

	APPOINTMENTID	PATIENT_NAME	GENDER	VISITDATE	DIAGNOSIS	DOCTOR_NAME
1	11	Moses Peter	Male	29-JAN-25	Stable angina due to coronary artery disease	Dr. Issac Merger
2	6	Eveless Eneya	Female	20-SEP-25	Pregnancy-Induced Hypertension	Dr. Mercy Phiri

Figure 6: Distributed Join

A3_1

```
SELECT
    Status,
    COUNT(*) as Total_Appointments,
    AVG(MONTHS_BETWEEN(SYSDATE, VisitDate)) as Avg_Months_Since_Visit,
    MIN(VisitDate) as Earliest_Visit,
    MAX(VisitDate) as Latest_Visit
FROM Appointment_B@proj_link
GROUP BY Status
ORDER BY Total_Appointments DESC;
```

Script Output | Query Result

SQL | All Rows Fetched: 1 in 0.006 seconds

	STATUS	TOTAL_APPOINTMENTS	AVG_MONTHS_SINCE_VISIT	EARLIEST_VISIT	LATEST_VISIT
1	pending	5	5.821907482078853046594982078853046594982	14-JAN-25	10-AUG-25

Figure 7: Seral Aggregation on Appointments all

A3_2

```
SELECT /*+ PARALLEL(appointment_b@proj_link, 8) */
    Status,
    COUNT(*) as Total_Appointments,
    AVG(MONTHS_BETWEEN(SYSDATE, VisitDate)) as Avg_Months_Since_Visit,
    MIN(VisitDate) as Earliest_Visit,
    MAX(VisitDate) as Latest_Visit
FROM appointment_b@proj_link
GROUP BY Status
ORDER BY Total_Appointments DESC;
-- SET AUTOTRACE OFF;
```

Figure 8: Aggregations on Parallel Hint

A3_3

Script Output | Query Result

SQL | All Rows Fetched: 14 in 0.236 seconds

```
PLAN_TABLE_OUTPUT
Plan hash value: 1534477287

-----------------------------------------------------------------------------------------------
| Id  | Operation             | Name          | Rows  | Bytes | Cost (%CPU)| Time     | Inst   |
-----------------------------------------------------------------------------------------------
|   0 | SELECT STATEMENT REMOTE|              |     1 |    16 |     5  (40)| 00:00:01 |        |
|   1 |  SORT ORDER BY        |               |     1 |    16 |     5  (40)| 00:00:01 |        |
|   2 |   HASH GROUP BY       |               |     1 |    16 |     5  (40)| 00:00:01 |        |
|   3 |    TABLE ACCESS FULL  | APPOINTMENT_B |     5 |    80 |     3   (0)| 00:00:01 |   ORCL |
-----------------------------------------------------------------------------------------------

Note
-----
   - fully remote statement
```

Figure 9: DBMS_XPLAN Output

A3_4

```
-- A3_3 EXECUTION PLAN
-- Capture execution plan for the parallel query
EXPLAIN PLAN FOR
SELECT /*+ PARALLEL(appointment_b@proj_link, 8) */
    Status,
    COUNT(*) as Total_Appointments,
    AVG(MONTHS_BETWEEN(SYSDATE, VisitDate)) as Avg_Months_Since_Visit,
    MIN(VisitDate) as Earliest_Visit,
    MAX(VisitDate) as Latest_Visit
FROM appointment_b@proj_link
GROUP BY Status
ORDER BY Total_Appointments DESC;

-- Display the execution plan
SELECT * FROM TABLE(DBMS_XPLAN.DISPLAY);
```

Script Output | Query Result

SQL | All Rows Fetched: 2 in 0.003 seconds

	EXECUTION_TYPE	PLAN_NOTES	PROCESSING_METHOD	EXPECTED_COST	PERFORMANCE_NOTE
1	Serial	No parallel operations	Single process execution	Higher for large datasets	Slower for large data
2	Parallel (DOP=8)	PX COORDINATOR, PX SEND/RECEIVE operations	8 parallel processes distributed	Lower per-process cost	Faster for large data, overhead for small

Figure 10: Series vs Parallel comparison

A4_1

```
-- ============================================================
-- PL/SQL BLOCK: Distributed Transaction with Two-Phase Commit
-- ============================================================
-- Description: Inserts one local row on Node_A and one remote row via database link
--              Demonstrates atomic distributed transaction with COMMIT
-- ============================================================

SET SERVEROUTPUT ON;

DECLARE
    v_local_appointment_id NUMBER;
    v_remote_prescription_id NUMBER;
BEGIN
    -- Generate unique IDs for the new records
    SELECT COALESCE(MAX(AppointmentID), 0) + 1 INTO v_local_appointment_id FROM Appointment_A;
    SELECT COALESCE(MAX(PrescriptionID), 0) + 1 INTO v_remote_prescription_id FROM Prescription_B@proj_link;

    -- Insert LOCAL row into Appointment_A on Node_A
    INSERT INTO Appointment_A (
        AppointmentID, PatientID, DoctorID, VisitDate, Diagnosis, Status
    ) VALUES (
        v_local_appointment_id,
        1,  -- Existing PatientID
        1,  -- Existing DoctorID
        SYSDATE,
        'Routine checkup distributed transaction test',
        'pending'
    );

    DBMS_OUTPUT.PUT_LINE('Local appointment inserted: ' || v_local_appointment_id);

    -- Insert REMOTE row into Prescription@proj_link on Node_B
    INSERT INTO Prescription_B@proj_link (
        PrescriptionID, AppointmentID, Notes, DateIssued
    ) VALUES (
        v_remote_prescription_id,
        v_local_appointment_id,  -- Links to the local appointment
        'Prescription for distributed transaction test',
        SYSDATE
    );

    -- COMMIT both inserts atomically (Two-Phase Commit)
    COMMIT;

    DBMS_OUTPUT.PUT_LINE('Distributed transaction committed successfully!');

EXCEPTION
    WHEN OTHERS THEN
        DBMS_OUTPUT.PUT_LINE('Error occurred: ' || SQLERRM);
        ROLLBACK;
        DBMS_OUTPUT.PUT_LINE('Transaction rolled back due to error');
END;
/
```

```
Script Output
Task completed in 0.146 seconds

Local appointment inserted: 12
Remote prescription inserted: 11
Distributed transaction committed successfully!


PL/SQL procedure successfully completed.
```

Figure 11: Distributed Transactions with 2 Phase Commit

A4_2

```
-- A2  ============================================================
-- PL/SQL BLOCK: Induce Distributed Transaction Failure by disabling the proj_link through droping it
-- ============================================================

DROP DATABASE LINK proj_link;
```

Script Output | Task completed in 0.08 seconds

```
Error starting at line : 64 in command -
DROP DATABASE LINK proj_link
Error report -
ORA-02018: database link of same name has an open connection
```

Figure 12: Attempt to simulate database link failure to insert data

This result affected A4_4 and 4

A5_1

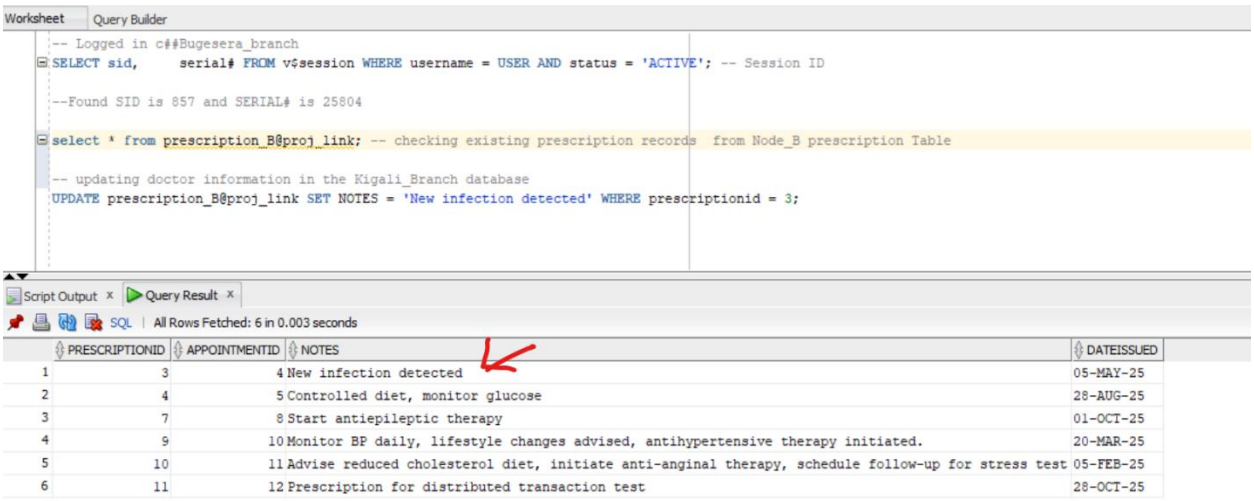
```
-- Logged in c##Bugesera_branch
SELECT sid,     serial# FROM v$session WHERE username = USER AND status = 'ACTIVE'; -- Session ID

--Found SID is 857 and SERIAL# is 25804

select * from prescription_B@proj_link; -- checking existing prescription records  from Node_B prescription Table

-- updating doctor information in the Kigali_Branch database
UPDATE prescription_B@proj_linkk SET NOTES = 'New infection detected' WHERE prescriptionid = 3;
```

Query Result | SQL | All Rows Fetched: 6 in 0.017 seconds

	PRESCRIPTIONID	APPOINTMENTID	NOTES	DATEISSUED
1	3	4	Positive urine culture, hydrate well	05-MAY-25
2	4	5	Controlled diet, monitor glucose	28-AUG-25
3	7	8	Start antiepileptic therapy	01-OCT-25
4	9	10	Monitor BP daily, lifestyle changes advised, antihypertensive therapy initiated.	20-MAR-25
5	10	11	Advise reduced cholesterol diet, initiate anti-anginal therapy, schedule follow-up for stress test	05-FEB-25
6	11	12	Prescription for distributed transaction test	28-OCT-25

Figure 13: Checking all available prescriptions

A5_1 Running update from Node_A in session1



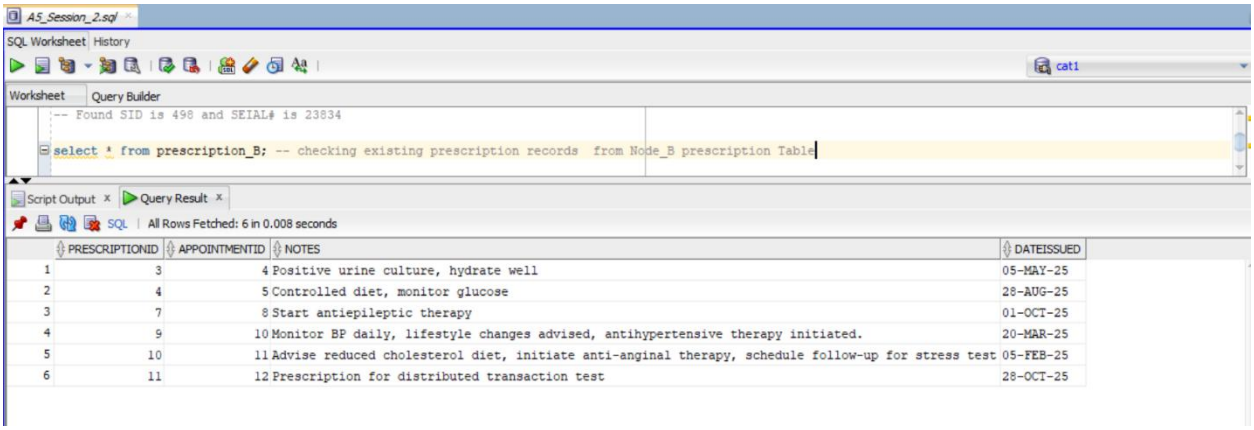
```
-- Logged in c##Bugesera_branch
SELECT sid,     serial# FROM v$session WHERE username = USER AND status = 'ACTIVE'; -- Session ID

--Found SID is 857 and SERIAL# is 25804

select * from prescription_B@proj_link; -- checking existing prescription records  from Node_B prescription Table

-- updating doctor information in the Kigali_Branch database
UPDATE prescription_B@proj_link SET NOTES = 'New infection detected' WHERE prescriptionid = 3;
```

Script Output | Query Result | All Rows Fetched: 6 in 0.003 seconds

	PRESCRIPTIONID	APPOINTMENTID	NOTES	DATEISSUED
1	3	4	New infection detected	05-MAY-25
2	4	5	Controlled diet, monitor glucose	28-AUG-25
3	7	8	Start antiepileptic therapy	01-OCT-25
4	9	10	Monitor BP daily, lifestyle changes advised, antihypertensive therapy initiated.	20-MAR-25
5	10	11	Advise reduced cholesterol diet, initiate anti-anginal therapy, schedule follow-up for stress test	05-FEB-25
6	11	12	Prescription for distributed transaction test	28-OCT-25

Figure 14: Session 1 attempt to update records

A5_2 Opening session two from Node_B



```
-- Found SID is 498 and SEIAL# is 23834

select * from prescription_B; -- checking existing prescription records  from Node_B prescription Table
```

Script Output | Query Result | All Rows Fetched: 6 in 0.008 seconds

	PRESCRIPTIONID	APPOINTMENTID	NOTES	DATEISSUED
1	3	4	Positive urine culture, hydrate well	05-MAY-25
2	4	5	Controlled diet, monitor glucose	28-AUG-25
3	7	8	Start antiepileptic therapy	01-OCT-25
4	9	10	Monitor BP daily, lifestyle changes advised, antihypertensive therapy initiated.	20-MAR-25
5	10	11	Advise reduced cholesterol diet, initiate anti-anginal therapy, schedule follow-up for stress test	05-FEB-25
6	11	12	Prescription for distributed transaction test	28-OCT-25

Figure 15: Before updating records at Node_B in session2

A5_3 Running update from session 2 – result shows task keep running

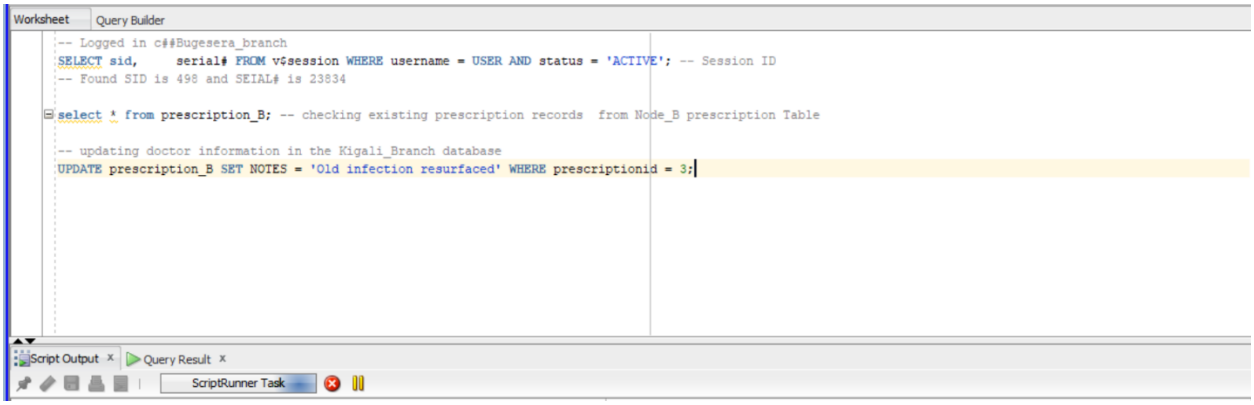
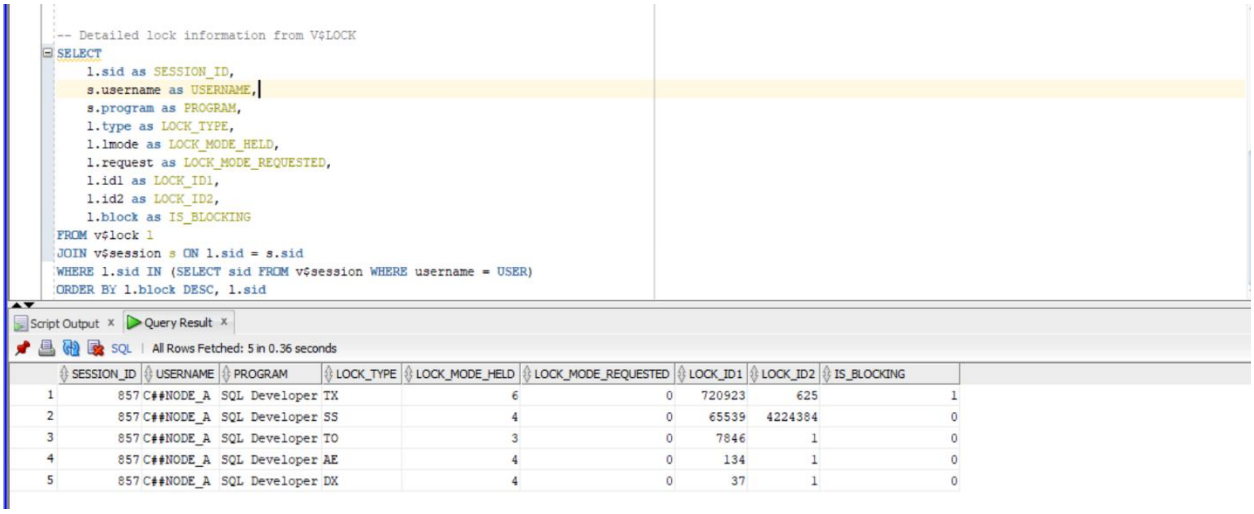


Figure 16: Session 2 attempt to update same records as done in session 1 -task keep running

A5_3 Checking waiting sessions



	SESSION_ID	USERNAME	PROGRAM	LOCK_TYPE	LOCK_MODE_HELD	LOCK_MODE_REQUESTED	LOCK_ID1	LOCK_ID2	IS_BLOCKING
1	857	C##NODE_A	SQL Developer	TX	6	0	720923	625	1
2	857	C##NODE_A	SQL Developer	SS	4	0	65539	4224384	0
3	857	C##NODE_A	SQL Developer	TO	3	0	7846	1	0
4	857	C##NODE_A	SQL Developer	AE	4	0	134	1	0
5	857	C##NODE_A	SQL Developer	DX	4	0	37	1	0

Figure 17: blocked and waiting sessions queried from Node_A session1

A5_4 releasing the lock made at session 1 by committing the update in session 1

Figure 18: Results of releasing session 1 lock

A5_4 session 2 update becomes successful after releasing a lock created in session 1

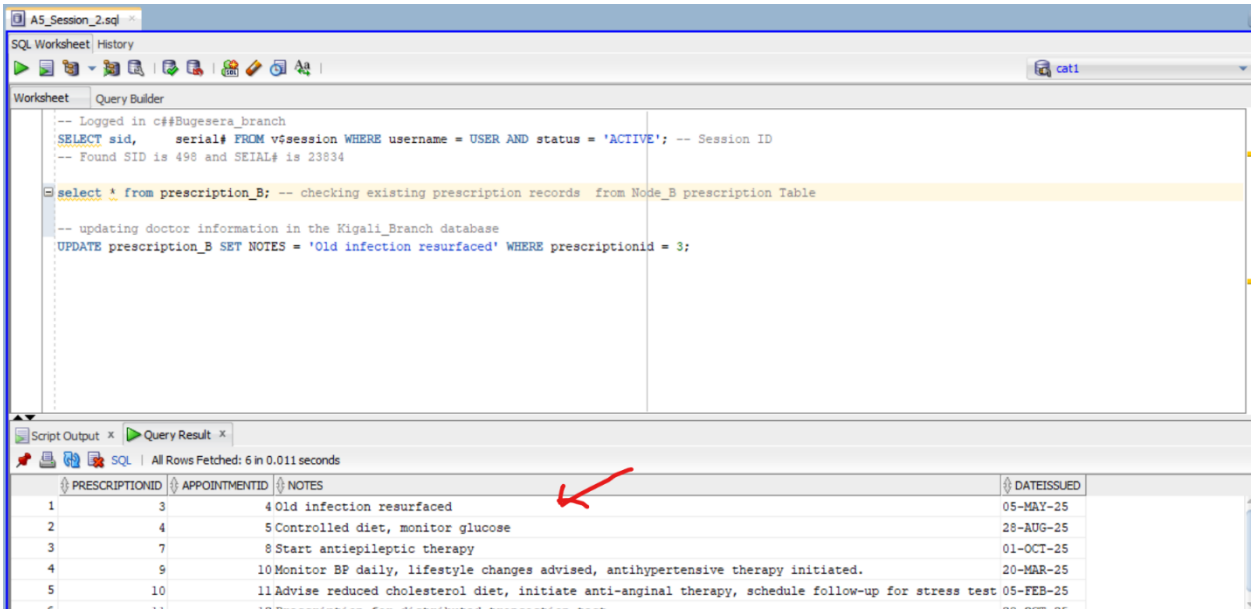
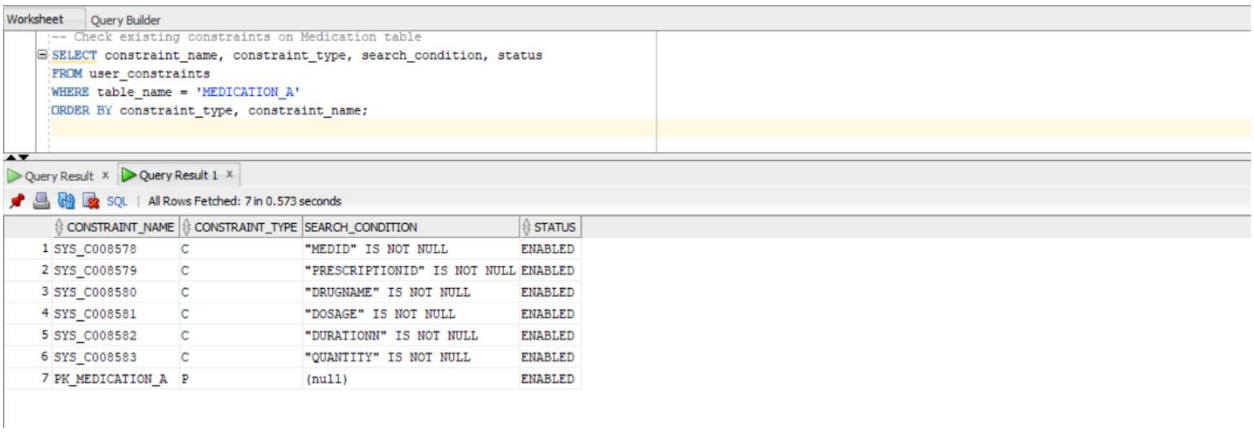


Figure 19: session2 updated successfully after reasing session1

Section B

B6_1 Checking existing null constraints in medication table



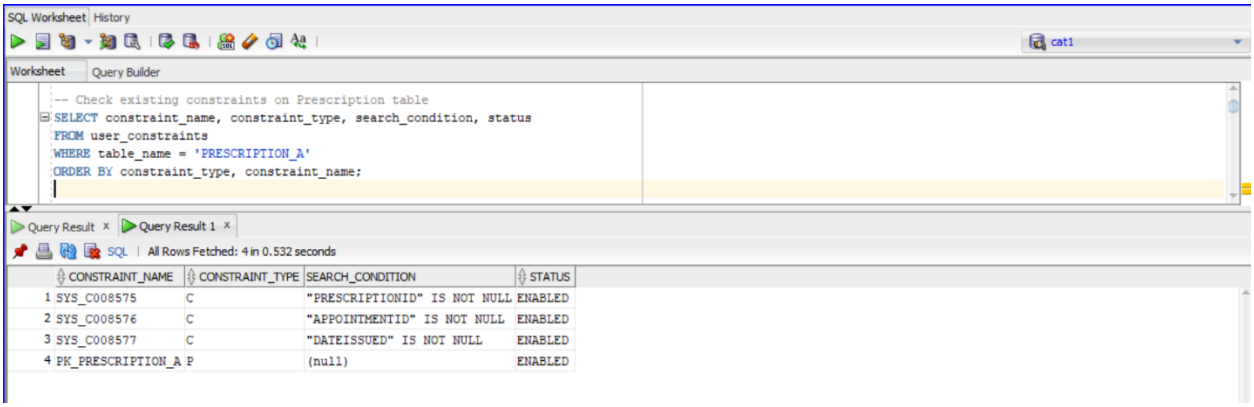
```
-- Check existing constraints on Medication table
SELECT constraint_name, constraint_type, search_condition, status
FROM user_constraints
WHERE table_name = 'MEDICATION_A'
ORDER BY constraint_type, constraint_name;
```

All Rows Fetched: 7 in 0.573 seconds

	CONSTRAINT_NAME	CONSTRAINT_TYPE	SEARCH_CONDITION	STATUS
1	SYS_C008578	C	"MEDID" IS NOT NULL	ENABLED
2	SYS_C008579	C	"PRESCRIPTIONID" IS NOT NULL	ENABLED
3	SYS_C008580	C	"DRUGNAME" IS NOT NULL	ENABLED
4	SYS_C008581	C	"DOSAGE" IS NOT NULL	ENABLED
5	SYS_C008582	C	"DURATIONN" IS NOT NULL	ENABLED
6	SYS_C008583	C	"QUANTITY" IS NOT NULL	ENABLED
7	PK_MEDICATION_A	P	(null)	ENABLED

Figure 20: Checking existing null constraints in medication table

Checking existing null constraints in prescription table



```
-- Check existing constraints on Prescription table
SELECT constraint_name, constraint_type, search_condition, status
FROM user_constraints
WHERE table_name = 'PRESCRIPTION_A'
ORDER BY constraint_type, constraint_name;
```

All Rows Fetched: 4 in 0.532 seconds

	CONSTRAINT_NAME	CONSTRAINT_TYPE	SEARCH_CONDITION	STATUS
1	SYS_C008575	C	"PRESCRIPTIONID" IS NOT NULL	ENABLED
2	SYS_C008576	C	"APPOINTMENTID" IS NOT NULL	ENABLED
3	SYS_C008577	C	"DATEISSUED" IS NOT NULL	ENABLED
4	PK_PRESCRIPTION_A	P	(null)	ENABLED

Figure 21: Checking existing null constraints in prescription table

B6_2 Prepare 2 failing and 2 passing INSERTs per table to validate rules but wrap failing ones in a block and ROLLBACK so committed rows stay within ≤10 total.

2_Passing Insertions on Prescription_A Table

```
-- Test INSERTs for Prescription table using existing constraints
-- PASSING INSERT 1: Valid prescription that should work with current constraints
INSERT INTO Prescription_A (PrescriptionID, AppointmentID, Notes, DateIssued)
VALUES (1001, 1, 'Regular medication for blood pressure', SYSDATE);
select * from prescription_a;
commit;
```

Query Result | SQL | All Rows Fetched: 6 in 0.007 seconds

	PRESCRIPTIONID	APPOINTMENTID	NOTES	DATEISSUED
1	5	6	Reduce salt intake, monitor BP	28-AUG-25
2	6	7	Antifungal therapy	20-AUG-25
3	8	9	Antiplatelet and physiotherapy	30-JUL-25
4	11	12	Patient scheduled for appendectomy. Pre-op antibiotics given, monitor vitals.	05-FEB-25
5	1001	1	Regular medication for blood pressure	28-OCT-25

Figure 22: First passing insert in prescription table

```
-- PASSING INSERT 2: Valid prescription within existing rules
INSERT INTO Prescription_A (PrescriptionID, AppointmentID, Notes, DateIssued)
VALUES (1002, 2, 'Follow-up prescription', SYSDATE - 1);
select * from prescription_a;
commit;
```

Query Result | SQL | All Rows Fetched: 6 in 0.007 seconds

	PRESCRIPTIONID	APPOINTMENTID	NOTES	DATEISSUED
1	5	6	Reduce salt intake, monitor BP	28-AUG-25
2	6	7	Antifungal therapy	20-AUG-25
3	8	9	Antiplatelet and physiotherapy	30-JUL-25
4	11	12	Patient scheduled for appendectomy. Pre-op antibiotics given, monitor vitals.	05-FEB-25
5	1001	1	Regular medication for blood pressure	28-OCT-25
6	1002	2	Follow-up prescription	27-OCT-25

Figure 23: Second passing insert in prescription table

2_failing insertions on prescription table

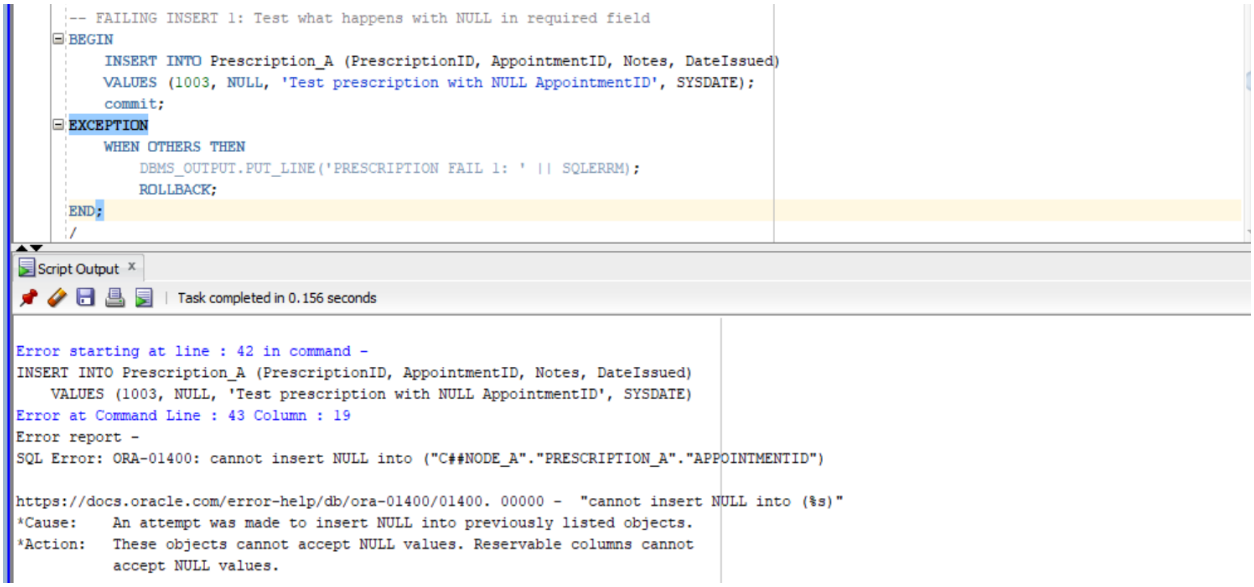


Figure 24: First failing insert operation on prescription table _ AppointmentID not existing

```
-- FAILING INSERT 2: Test invalid data based on existing constraints - unique primary key
BEGIN
    -- This will fail if there are CHECK constraints or foreign key violations
    INSERT INTO Prescription_A (PrescriptionID, AppointmentID, Notes, DateIssued)
    VALUES (1004, 9999, 'Test with non-existent AppointmentID', SYSDATE);
    commit;
EXCEPTION
    WHEN OTHERS THEN
        DBMS_OUTPUT.PUT_LINE('PRESCRIPTION FAIL 2: ' || SQLERRM);
        ROLLBACK;
END;
/
```

Script Output | Task completed in 0.067 seconds

```
Error starting at line : 56 in command -
INSERT INTO Prescription_A (PrescriptionID, AppointmentID, Notes, DateIssued)
    VALUES (1004, 9999, 'Test with non-existent AppointmentID', SYSDATE)
Error report -
ORA-00001: unique constraint (C##NODE_A.PK_PRESCRIPTION_A) violated

https://docs.oracle.com/error-help/db/ora-00001/

More Details :
https://docs.oracle.com/error-help/db/ora-00001/
```

Figure 25: Second failing insert on prescription due to unique constraint of PK

2_passing insertions on medication_A table

Worksheet | Query Builder

```
/

-- Test INSERTs for Medication table using existing constraints
-- PASSING INSERT 1: Valid medication
INSERT INTO Medication_A (MedID, PrescriptionID, DrugName, Dosage, DurationN, Quantity)
VALUES (5001, 1001, 'Paracetamol', '500mg', '7 days', '30 tablets');
select * from medication_a;
```

Query Result | Script Output | Query Result 1 | Query Result 2 | Query Result 3

SQL | All Rows Fetched: 10 in 0.01 seconds

	MEDID	PRESCRIPTIONID	DRUGNAME	DOSAGE	DURATIONN	QUANTITY
1	2	3	Amoxicillin	500 mg	7 days	14
2	5	3	Paracetamol	500 mg	As needed	10
3	6	7	Sodium Valproate	500 mg	long term	60
4	8	8	Aspirin	75 mg	Long term	90
5	11	9	Hydrochlorothiazide 25 mg	1 tab daily morning	Long term	90
6	13	10	Atorvastatin 20 mg	1 tab daily at night	Long term	30
7	18	5	Labetalol	100 mg	Ongoing take with food	15
8	20	6	Clotrimazole	500 mg	7 days	10
9	21	11	Ceftriaxone 1 g IV	Every 12 hours	2 days administer in hospital	2
10	5001	1001	Paracetamol	500mg	7 days	30 tablets

Figure 26: First working query on medication table

```
INSERT INTO Medication_A (MedID, PrescriptionID, DrugName, Dosage, DurationN, Quantity)
VALUES (5002, 1002, 'Amoxicillin', '250mg', '10 days', '20 capsules');
commit;
select * from medication_a;

-- FAILING INSERT 1: Test NULL in required field
```

Script Output | Query Result

SQL | All Rows Fetched: 13 in 0.006 seconds

	MEDID	PRESCRIPTIONID	DRUGNAME	DOSAGE	DURATIONN	QUANTITY
1	2	3	Amoxicillin	500 mg	7 days	14
2	5	3	Paracetamol	500 mg	As needed	10
3	6	7	Sodium Valproate	500 mg	long term	60
4	8	8	Aspirin	75 mg	Long term	90
5	11	9	Hydrochlorothiazide 25 mg	1 tab daily morning	Long term	90
6	13	10	Atorvastatin 20 mg	1 tab daily at night	Long term	30
7	18	5	Labetalol	100 mg	Ongoing take with food	15
8	20	6	Clotrimazole	500 mg	7 days	10
9	21	11	Ceftriaxone 1 g IV	Every 12 hours	2 days administer in hospital	2
10	5001	1001	Paracetamol	500mg	7 days	30 tablets
11	5002	1002	Amoxicillin	250mg	10 days	20 capsules
12	6001	1001	Vitamin C	750mg	30 days	45 tablets
13	7001	1001	Aspirin	100mg	7 days	21 tablets

Figure 27: Second working query on medication_A table

2_failing insertions on medication_A table

```
BEGIN
    INSERT INTO Medication_A (MedID, PrescriptionID, DrugName, Dosage, DurationN, Quantity)
    VALUES (5003, 1001, NULL, '500mg', '7 days', '30 tablets');
EXCEPTION
    WHEN OTHERS THEN
        DBMS_OUTPUT.PUT_LINE('MEDICATION FAIL 1: ' || SQLERRM);
        ROLLBACK;
END;
/
```

Query Result | Script Output | Query Result 1 | Query Result 2 | Query Result 3

Task completed in 0.086 seconds

```
MEDICATION FAIL 1: ORA-01400: cannot insert NULL into ("C##NODE_A"."MEDICATION_A"."DRUGNAME")


PL/SQL procedure successfully completed.
```

Figure 28: First failing query on medication on Null Constraint

```
BEGIN
    INSERT INTO Medication_A (MedID, PrescriptionID, DrugName, Dosage, DurationN, Quantity)
    VALUES (5004, 9999, 'Ibuprofen', '400mg', '5 days', '15 tablets');
EXCEPTION
    WHEN OTHERS THEN
        DBMS_OUTPUT.PUT_LINE('MEDICATION FAIL 2: ' || SQLERRM);
        ROLLBACK;
END;
/
```

Query Result | Script Output | Query Result 1 | Query Result 2 | Query Result 3

Task completed in 0.087 seconds

```
MEDICATION FAIL 2: ORA-00001: unique constraint (C##NODE_A.PK_MEDICATION_A) violated


PL/SQL procedure successfully completed.
```

Figure 29: Second failing query on medication on unique PK constraint

B6_3 Committed rows

```
-- Verify we stay within ≤10 committed rows budget
SELECT
    'Prescription' as Table_Name,
    COUNT(*) as Committed_Rows
FROM Prescription_A
WHERE PrescriptionID IN (1001, 1002)
UNION ALL
SELECT
    'Medication',
    COUNT(*)
FROM Medication_A
WHERE MedID IN (5001, 5002)
UNION ALL
SELECT
    'TOTAL_COMMITTED',
    (SELECT COUNT(*) FROM Prescription_A WHERE PrescriptionID IN (1001, 1002)) +
    (SELECT COUNT(*) FROM Medication_A WHERE MedID IN (5001, 5002))
FROM dual;
```

Query Result | Script Output | Query Result 1 | Query Result 2

SQL | All Rows Fetched: 3 in 0.061 seconds

	TABLE_NAME	COMMITTED_ROWS
1	Prescription	2
2	Medication	2
3	TOTAL_COMMITTED	4

Figure 30: Committed rows

B7_1 Refer to the B7 SQL code file

B7_2 Correct recomputed totals for prescription done by a statement level trigger

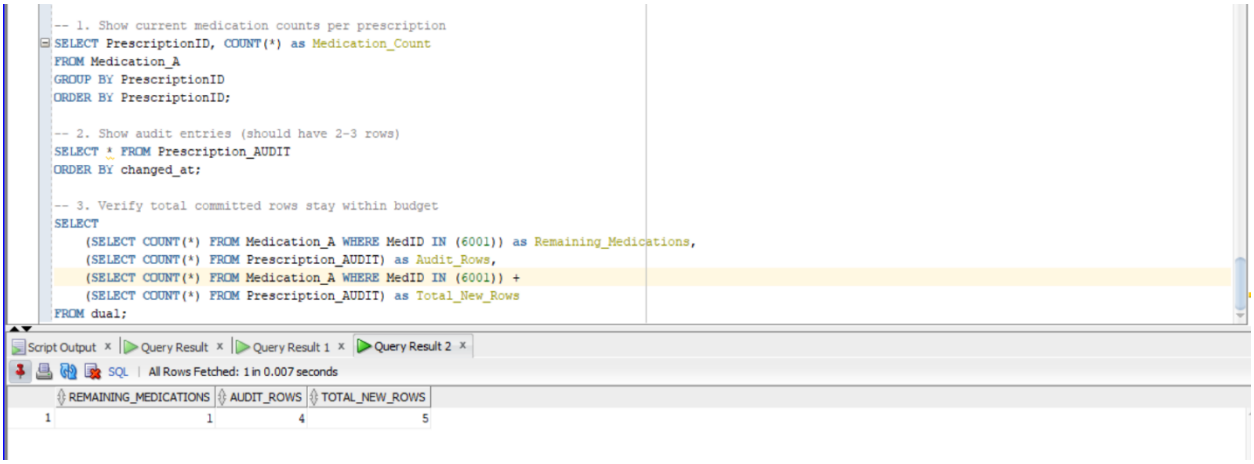


Figure 31: Showing recomputed totals for prescription

B7_3 Audited prescriptions with 3 entries

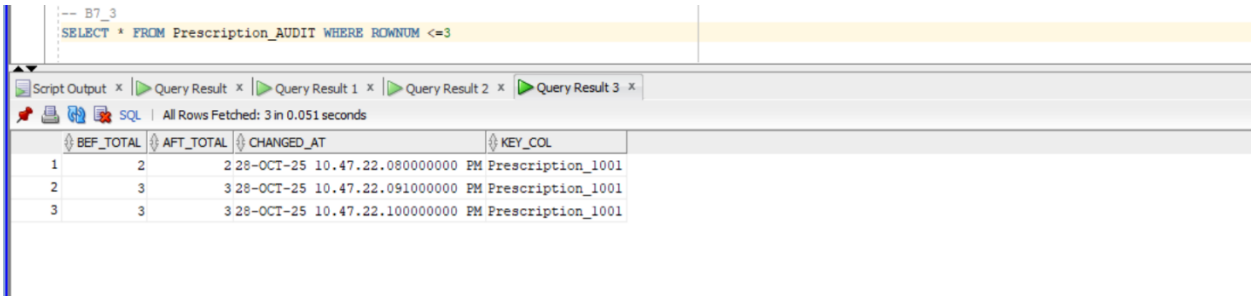


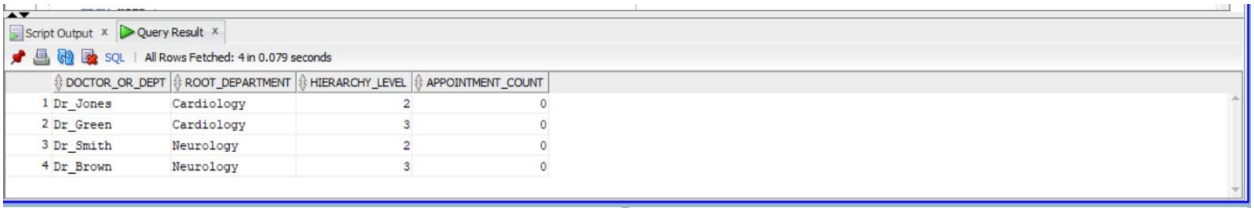
Figure 32: Showing audited prescriptions with 3 entries

B8_1, 2 DDL + INSERTs for HIER (6–10 rows)

	DEPARTMENT	DOCTOR_COUNT	TOTAL_APPOINTMENTS
1	Cardiology	2	0
2	Dr_Brown	1	0
3	Dr_Green	1	0
4	Dr_Jones	2	0
5	Dr_Smith	2	0
6	Neurology	2	0

Figure 33: Showing inserted 6 rows of DDL + INSERTs for HIER table

B8_3 Recursive WITH SQL and sample output (4 rows) shown according to what are available.



	DOCTOR_OR_DEPT	ROOT_DEPARTMENT	HIERARCHY_LEVEL	APPOINTMENT_COUNT
1	Dr_Jones	Cardiology	2	0
2	Dr_Green	Cardiology	3	0
3	Dr_Smith	Neurology	2	0
4	Dr_Brown	Neurology	3	0

Figure 34: Showing 4 rows of recursive sample output

B8_4 Control aggregations validating rollup correctness

	DEPARTMENT	DOCTOR_COUNT	TOTAL_APPOINTMENTS
1	Cardiology	2	0
2	Dr_Brown	1	0
3	Dr_Green	1	0
4	Dr_Jones	2	0
5	Dr_Smith	2	0
6	Neurology	2	0

Figure 35: Control aggregations

B9_1, 2 Created triple table and 8 rows content

```
select * from triple;  -- shwo triple inserted content

-- ============================================================
```

Query Result | SQL | All Rows Fetched: 8 in 0.079 seconds

	S	P	O
1	Influenza	isA	ViralInfection
2	CommonCold	isA	ViralInfection
3	ViralInfection	isA	InfectiousDisease
4	BacterialPneumonia	isA	InfectiousDisease
5	Paracetamol	treats	Fever
6	Antiviral	treats	ViralInfection
7	Antibiotic	treats	BacterialInfection
8	BacterialPneumonia	isA	BacterialInfection

Figure 36: Triple domain facts

B9_3. Recursive inference query implementing transitive isA*

Script Output | Query Result | SQL | All Rows Fetched: 4 in 0.074 seconds

	CONDITION	INFERRED_TYPES
1	BacterialPneumonia	BacterialInfection, BacterialInfection, InfectiousDisease, InfectiousDisease
2	CommonCold	InfectiousDisease, ViralInfection
3	Influenza	InfectiousDisease, ViralInfection
4	ViralInfection	InfectiousDisease

Figure 37: Result of recursive inference query

B9_4 Grouping counts prove inferred labels are consistent.

Script Output | Query Result | Query Result 1 | SQL | All Rows Fetched: 3 in 0.059 seconds

	INFERRED_CATEGORY	CONDITION_COUNT	CONDITIONS
1	InfectiousDisease	4	BacterialPneumonia, CommonCold, Influenza, ViralInfection
2	ViralInfection	2	CommonCold, Influenza
3	BacterialInfection	1	BacterialPneumonia

Figure 38: Grouped inferred labels

B10_1 Business limits and rules

```
INSERT INTO BUSINESS_LIMITS VALUES (
    'MAX_MEDS_PER_PRESCRIPTION',  -- Rule: Maximum medications per prescription
    3,                            -- Threshold: Only 3 medications allowed per prescription
    'Y'                           -- Active: Rule is enabled
);
COMMIT;
select * from business_limits;
```

Script Output | Query Result | SQL | All Rows Fetched: 2 in 0.019 seconds

	RULE_KEY	THRESHOLD	ACTIVE
1	MAX_MEDS_PER_PRESCRIPTION	3	Y

Figure 39: Business limit and one active rule inserted

B10_2 and B10_3 refer to the B10 SQL code file for implementation code

B10_4 Demonstrating passing DML cases

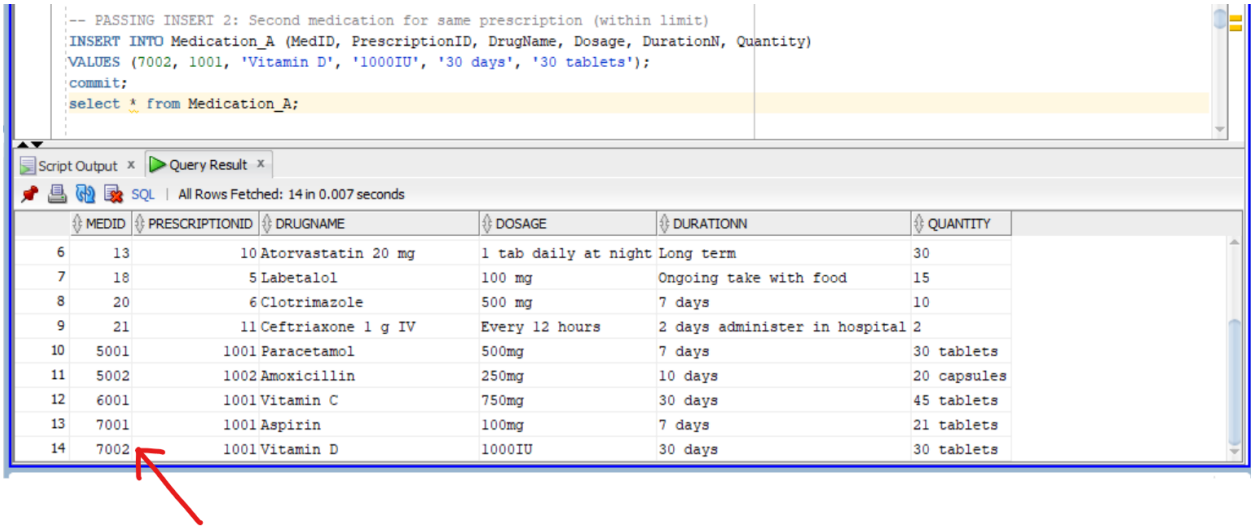
```
-- PASSING INSERT 1: First medication for prescription (within limit)
INSERT INTO Medication_A (MedID, PrescriptionID, DrugName, Dosage, DurationN, Quantity)
VALUES (7001, 1001, 'Aspirin', '100mg', '7 days', '21 tablets');
commit;
select * from Medication_A;
```

Script Output | Query Result | SQL | All Rows Fetched: 13 in 0.006 seconds

	MEDID	PRESCRIPTIONID	DRUGNAME	DOSAGE	DURATIONN	QUANTITY
4	8	8	Aspirin	75 mg	Long term	90
5	11	9	Hydrochlorothiazide 25 mg	1 tab daily morning	Long term	90
6	13	10	Atorvastatin 20 mg	1 tab daily at night	Long term	30
7	18	5	Labetalol	100 mg	Ongoing take with food	15
8	20	6	Clotrimazole	500 mg	7 days	10
9	21	11	Ceftriaxone 1 g IV	Every 12 hours	2 days administer in hospital	2
10	5001	1001	Paracetamol	500mg	7 days	30 tablets
11	5002	1002	Amoxicillin	250mg	10 days	20 capsules
12	6001	1001	Vitamin C	750mg	30 days	45 tablets
13	7001	1001	Aspirin	100mg	7 days	21 tablets

Figure 40: First passing DML case

B10_4 Demonstrating passing DML case



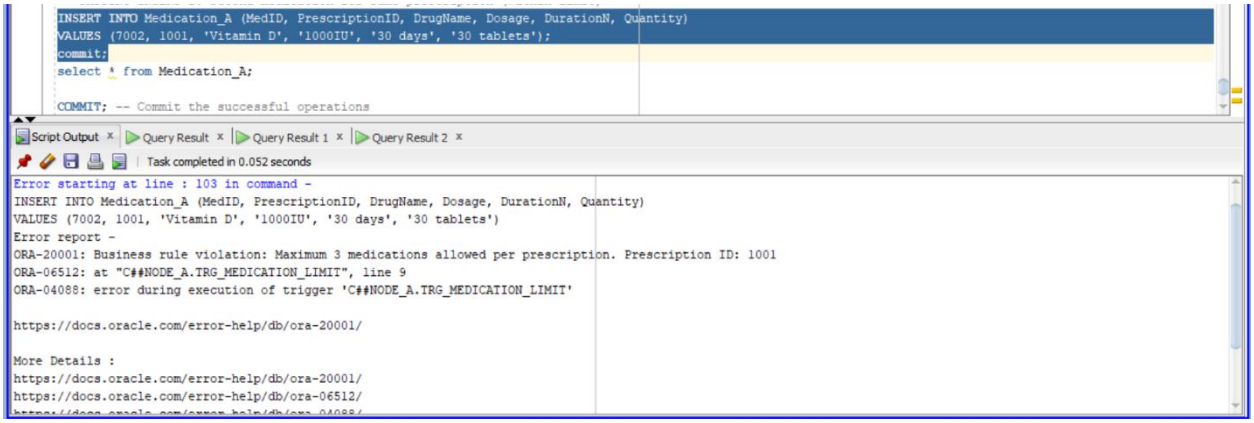
```
-- PASSING INSERT 2: Second medication for same prescription (within limit)
INSERT INTO Medication_A (MedID, PrescriptionID, DrugName, Dosage, DurationN, Quantity)
VALUES (7002, 1001, 'Vitamin D', '1000IU', '30 days', '30 tablets');
commit;
select * from Medication_A;
```

Script Output | Query Result | SQL | All Rows Fetched: 14 in 0.007 seconds

	MEDID	PRESCRIPTIONID	DRUGNAME	DOSAGE	DURATIONN	QUANTITY
6	13	10	Atorvastatin 20 mg	1 tab daily at night	Long term	30
7	18	5	Labetalol	100 mg	Ongoing take with food	15
8	20	6	Clotrimazole	500 mg	7 days	10
9	21	11	Ceftriaxone 1 g IV	Every 12 hours	2 days administer in hospital	2
10	5001	1001	Paracetamol	500mg	7 days	30 tablets
11	5002	1002	Amoxicillin	250mg	10 days	20 capsules
12	6001	1001	Vitamin C	750mg	30 days	45 tablets
13	7001	1001	Aspirin	100mg	7 days	21 tablets
14	7002	1001	Vitamin D	1000IU	30 days	30 tablets

Figure 41: Second passing DML case

B10_4 Demonstrating failing DML case



```
INSERT INTO Medication_A (MedID, PrescriptionID, DrugName, Dosage, DurationN, Quantity)
VALUES (7002, 1001, 'Vitamin D', '1000IU', '30 days', '30 tablets');
commit;
select * from Medication_A;

COMMIT; -- Commit the successful operations
```

Script Output | Query Result | Query Result 1 | Query Result 2

Task completed in 0.052 seconds

```
Error starting at line : 103 in command -
INSERT INTO Medication_A (MedID, PrescriptionID, DrugName, Dosage, DurationN, Quantity)
VALUES (7002, 1001, 'Vitamin D', '1000IU', '30 days', '30 tablets')
Error report -
ORA-20001: Business rule violation: Maximum 3 medications allowed per prescription. Prescription ID: 1001
ORA-06512: at "C##NODE_A.TRG_MEDICATION_LIMIT", line 9
ORA-04088: error during execution of trigger 'C##NODE_A.TRG_MEDICATION_LIMIT'

https://docs.oracle.com/error-help/db/ora-20001/

More Details :
https://docs.oracle.com/error-help/db/ora-20001/
https://docs.oracle.com/error-help/db/ora-06512/
```

Figure 42: First failing DML case - maximum rules reached

B10_4 Demomstrating failing DML case

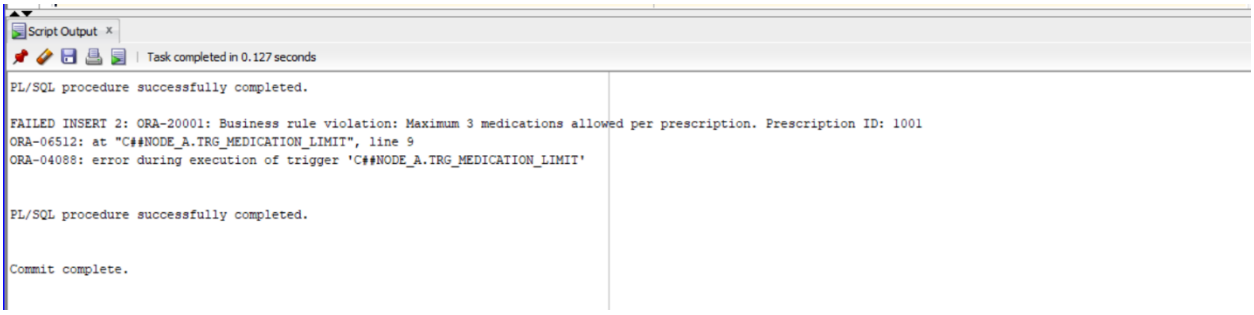


Figure 43: Second failing DML case - maximum rule violation

B10_4 Total committed rows

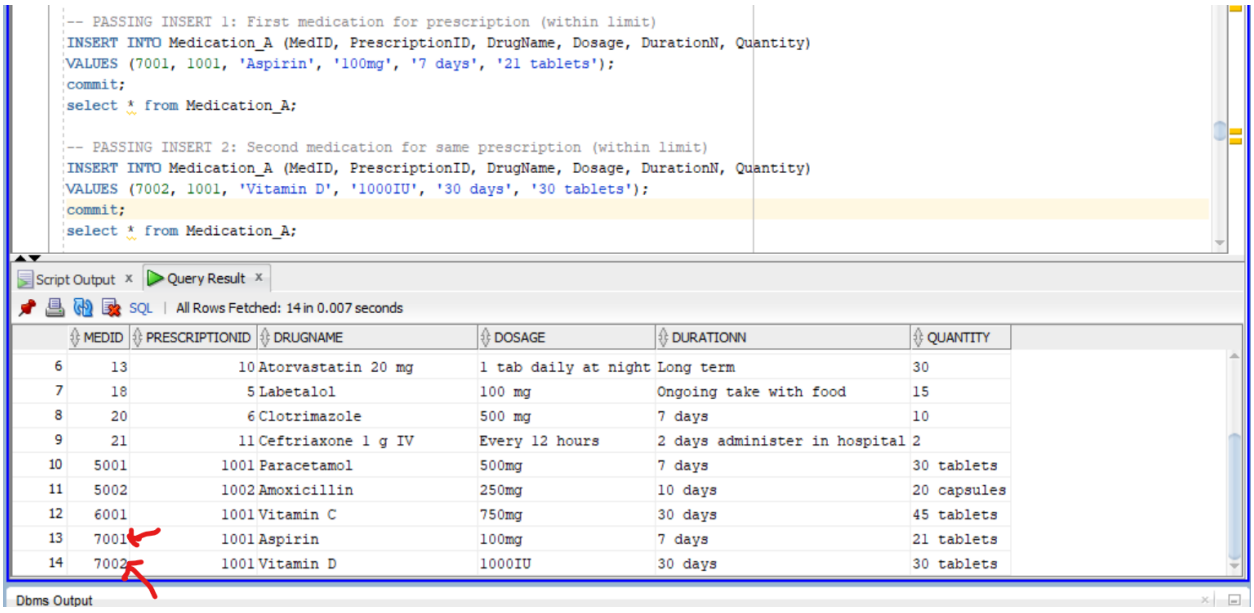


Figure 44: Committed rows

B10 verifying laws enforcement of business limits and rules

```
-- 1. Show current medication counts per prescription
SELECT
    PrescriptionID,
    COUNT(*) as Medication_Count
FROM Medication_A
GROUP BY PrescriptionID
ORDER BY PrescriptionID;

-- 2. Show committed medications (should only have 2 rows from passing inserts)
SELECT
```

Script Output | Query Result

SQL | All Rows Fetched: 10 in 0.007 seconds

	PRESCRIPTIONID	MEDICATION_COUNT
1	3	2
2	5	1
3	6	1
4	7	1
5	8	1
6	9	1
7	10	1
8	11	1
9	1001	3
10	1002	1

THE END