

PRACTICAL - 04

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ROLL NO.: D2 - 32

Aim: Execution of various types of joins operations on multiple tables in a database

SAILOR :

```
SQL> connect aryan/aryan
Connected.
SQL> set linesize 200
SQL> set pagesize
SQL> set pagesize 50
SQL> spool d:\pract4.txt
SQL> CREATE TABLE SAILOR (
  2  SID NUMBER(2) NOT NULL,
  3  SNAME VARCHAR2(15) NOT NULL,
  4  RATING NUMBER(2) DEFAULT 3 NOT NULL, AGE
  5  NUMBER(3,1) DEFAULT 25 NOT NULL,
  6  CONSTRAINT SAILOR_PK_SID PRIMARY KEY (SID)
  7 );
```

Table created.

```
SQL> INSERT INTO SAILOR (SID, SNAME, RATING, AGE) VALUES (22, 'John', 7, 28);
1 row created.

SQL> INSERT INTO SAILOR (SID, SNAME, RATING, AGE) VALUES (29, 'Mike', 5, 32);
1 row created.

SQL> INSERT INTO SAILOR (SID, SNAME, RATING, AGE) VALUES (31, 'Sarah', 9, 35);
1 row created.

SQL> INSERT INTO SAILOR (SID, SNAME, RATING, AGE) VALUES (32, 'Emily', 6, 26);
1 row created.

SQL> INSERT INTO SAILOR (SID, SNAME, RATING, AGE) VALUES (58, 'Alex', 8, 29);
1 row created.

SQL> INSERT INTO SAILOR (SID, SNAME, RATING, AGE) VALUES (95, 'Lisa', 7, 31);
1 row created.

SQL> INSERT INTO SAILOR (SID, SNAME, RATING, AGE) VALUES (64, 'Dustin', 6, 30);
1 row created.

SQL> INSERT INTO SAILOR (SID, SNAME, RATING, AGE) VALUES (71, 'Liam', 4, 27);
1 row created.

SQL> INSERT INTO SAILOR (SID, SNAME, RATING, AGE) VALUES (74, 'Lubber', 8, 45);
1 row created.

SQL> INSERT INTO SAILOR (SID, SNAME, RATING, AGE) VALUES (85, 'Sophia', 7, 33);
1 row created.
```

```
SQL> SELECT * FROM SAILOR;
```

SID	SNAME	RATING	AGE
22	John	7	28
29	Mike	5	32
31	Sarah	9	35
32	Emily	6	26
58	Alex	8	29
95	Lisa	7	31
64	Dustin	6	30
71	Liam	4	27
74	Lubber	8	45
85	Sophia	7	33

```
10 rows selected.
```

BOAT:

```
SQL> CREATE TABLE BOAT (  
 2  BID NUMBER(3) NOT NULL,  
 3  BNAME VARCHAR2(15) NOT NULL,  
 4  COLOR VARCHAR2(10) DEFAULT 'Red' NOT NULL,  
 5  CONSTRAINT BOAT_PK_BID PRIMARY KEY (BID)  
 6  );
```

```
Table created.
```

```
SQL> INSERT INTO BOAT (BID, BNAME, COLOR) VALUES (101, 'Boat1', 'Red');
```

```
1 row created.
```

```
SQL> INSERT INTO BOAT (BID, BNAME, COLOR) VALUES (102, 'Boat2', 'Green');
```

```
1 row created.
```

```
SQL> INSERT INTO BOAT (BID, BNAME, COLOR) VALUES (103, 'Boat3', 'Blue');
```

```
1 row created.
```

```
SQL> INSERT INTO BOAT (BID, BNAME, COLOR) VALUES (104, 'Boat4', 'Red');
```

```
1 row created.
```

```
SQL> INSERT INTO BOAT (BID, BNAME, COLOR) VALUES (105, 'Boat5', 'Yellow');
```

```
1 row created.
```

```
SQL> SELECT * FROM BOAT;
```

BID	BNAME	COLOR
101	Boat1	Red
102	Boat2	Green
103	Boat3	Blue
104	Boat4	Red
105	Boat5	Yellow

RESERVE:

```
SQL> CREATE TABLE RESERVE (  
2  SID NUMBER(2) NOT NULL,  
3  BID NUMBER(3) NOT NULL,  
4  RDAY DATE DEFAULT SYSDATE NOT NULL,  
5  CONSTRAINT RESERVE_PK_SID_BID PRIMARY KEY (SID, BID),  
6  CONSTRAINT RESERVE_FK_SAILOR_SID FOREIGN KEY (SID) REFERENCES SAILOR(SID),  
7  CONSTRAINT RESERVE_FK_BOAT_BID FOREIGN KEY (BID) REFERENCES BOAT(BID)  
8  );
```

Table created.

```
SQL> INSERT INTO RESERVE (SID, BID, RDAY) VALUES (22, 101, SYSDATE);  
1 row created.  
  
SQL> INSERT INTO RESERVE (SID, BID, RDAY) VALUES (64, 101, SYSDATE);  
1 row created.  
  
SQL> INSERT INTO RESERVE (SID, BID, RDAY) VALUES (31, 102, SYSDATE);  
1 row created.  
  
SQL> INSERT INTO RESERVE (SID, BID, RDAY) VALUES (74, 102, SYSDATE);  
1 row created.  
  
SQL> INSERT INTO RESERVE (SID, BID, RDAY) VALUES (95, 103, SYSDATE);  
1 row created.  
  
SQL> INSERT INTO RESERVE (SID, BID, RDAY) VALUES (31, 103, SYSDATE);  
1 row created.  
  
SQL> INSERT INTO RESERVE (SID, BID, RDAY) VALUES (32, 103, SYSDATE);  
1 row created.  
  
SQL> INSERT INTO RESERVE (SID, BID, RDAY) VALUES (58, 104, SYSDATE);  
1 row created.
```

```
SQL> SELECT * FROM RESERVE;
```

SID	BID	RDAY
22	101	10-JUN-23
64	101	10-JUN-23
31	102	10-JUN-23
74	102	10-JUN-23
95	103	10-JUN-23
31	103	10-JUN-23
32	103	10-JUN-23
58	104	10-JUN-23

8 rows selected.

Tasks:

1. CREATE VIEW SAILOR1 with SID [22, 29, 31, 32, 58, 95]

```
SQL> CREATE VIEW SAILOR1 AS
  2 SELECT * FROM Sailor
  3 WHERE SID IN (22, 29, 31, 32, 58, 95);
```

View created.

```
SQL> SELECT * FROM SAILOR1;
```

SID	SNAME	RATING	AGE
22	John	7	28
29	Mike	5	32
31	Sarah	9	35
32	Emily	6	26
58	Alex	8	29
95	Lisa	7	31

6 rows selected.

2. CREATE VIEW SAILOR2 with SID [31, 32, 64, 71, 74]

```
SQL> CREATE VIEW SAILOR2 AS
  2 SELECT * FROM Sailor
  3 WHERE SID IN (31, 32, 64, 71, 74);
```

View created.

```
SQL> SELECT * FROM SAILOR2;
```

SID	SNAME	RATING	AGE
31	Sarah	9	35
32	Emily	6	26
64	Dustin	6	30
71	Liam	4	27
74	Lubber	8	45

3. CREATE VIEW SAILOR3 with SID [22, 32, 85, 74]

```
SQL> CREATE VIEW SAILOR3 AS
  2  SELECT * FROM Sailor
  3  WHERE SID IN (22, 32, 85, 74);

View created.

SQL> SELECT * FROM SAILOR3;
```

SID	SNAME	RATING	AGE
22	John	7	28
32	Emily	6	26
74	Lubber	8	45
85	Sophia	7	33

4. CREATE VIEW RESERVE1 with SID [22,64]

```
SQL> CREATE VIEW RESERVE1 AS
  2  SELECT * FROM Reserve
  3  WHERE SID IN (22, 64);

View created.

SQL> SELECT * FROM RESERVE1;
```

SID	BID	RDAY
22	101	10-JUN-23
64	101	10-JUN-23

5. CREATE VIEW RESERVE1 with SID [31,74]

```
SQL> CREATE VIEW RESERVE2 AS
  2  SELECT * FROM Reserve
  3  WHERE SID IN (31, 74);

View created.

SQL> SELECT * FROM RESERVE2;
```

SID	BID	RDAY
31	102	10-JUN-23
31	103	10-JUN-23
74	102	10-JUN-23

6. Display the content of above views

ALREADY DONE IN THE ABOVE QUERIES.

7. Perform Inner Join Sailor and Reserve table and display all the attributes.

```
SQL> SELECT *
2 FROM Sailor
3 INNER JOIN Reserve ON Sailor.SID = Reserve.SID;
```

SID	SNAME	RATING	AGE	SID	BID	RDAY
22	John	7	28	22	101	10-JUN-23
31	Sarah	9	35	31	103	10-JUN-23
31	Sarah	9	35	31	102	10-JUN-23
32	Emily	6	26	32	103	10-JUN-23
58	Alex	8	29	58	104	10-JUN-23
95	Lisa	7	31	95	103	10-JUN-23
64	Dustin	6	30	64	101	10-JUN-23
74	Lubber	8	45	74	102	10-JUN-23

8. Perform Inner Join Sailor and Reserve table and display only Sid and Sname from sailors table and Bid and Rday from Reserve table.

```
SQL> SELECT Sailor.SID, Sailor.Sname, Reserve.BID, Reserve.Rday
2 FROM Sailor
3 INNER JOIN Reserve ON Sailor.SID = Reserve.SID;
```

SID	SNAME	BID	RDAY
22	John	101	10-JUN-23
31	Sarah	103	10-JUN-23
31	Sarah	102	10-JUN-23
32	Emily	103	10-JUN-23
58	Alex	104	10-JUN-23
95	Lisa	103	10-JUN-23
64	Dustin	101	10-JUN-23
74	Lubber	102	10-JUN-23

8 rows selected.

9. Perform Equi Join Sailor and Reserve table and display only Sid and Sname from sailors table and Bid and Rday from Reserve table. The reservation month should be November and SID should be 74.

```
SQL> SELECT Sailor.SID, Sailor.SNAME, Reserve.BID, Reserve.RDAY
2 FROM Sailor
3 INNER JOIN Reserve ON Sailor.SID = Reserve.SID
4 WHERE TO_CHAR(Reserve.RDAY, 'MM') = '11' AND Sailor.SID = 74;
```

no rows selected

10. Perform Theta join Sailor, Reserve and Boat. The reservation month should be August and BID should not be 101.

```
SQL> SELECT Sailor.SID, Sailor.SNAME, Reserve.BID, Reserve.RDAY
  2 FROM Sailor
  3 JOIN Reserve ON Sailor.SID = Reserve.SID
  4 JOIN Boat ON Reserve.BID = Boat.BID
  5 WHERE TO_CHAR(Reserve.RDAY, 'MM') = '08' AND Boat.BID <> 101;

no rows selected
```

11. Perform Left Outer Join on Sailor1 and Sailor2 and tuples to be ordered by SID of sailor1 and sailor2.

```
SQL> SELECT *
  2 FROM SAILOR1
  3 LEFT OUTER JOIN SAILOR2 ON SAILOR1.SID = SAILOR2.SID
  4 ORDER BY SAILOR1.SID, SAILOR2.SID;
```

SID	SNAME	RATING	AGE	SID	SNAME	RATING	AGE
22	John	7	28				
29	Mike	5	32				
31	Sarah	9	35	31	Sarah	9	35
32	Emily	6	26	32	Emily	6	26
58	Alex	8	29				
95	Lisa	7	31				

6 rows selected.

12. Perform Right Outer Join on Sailor1 and Sailor2 and tuples to be ordered by SID of sailor1 and sailor2.

```
SQL> SELECT *
  2 FROM SAILOR1
  3 RIGHT OUTER JOIN SAILOR2 ON SAILOR1.SID = SAILOR2.SID
  4 ORDER BY SAILOR1.SID, SAILOR2.SID;
```

SID	SNAME	RATING	AGE	SID	SNAME	RATING	AGE
31	Sarah	9	35	31	Sarah	9	35
32	Emily	6	26	32	Emily	6	26
				64	Dustin	6	30
				71	Liam	4	27
				74	Lubber	8	45

13. Perform Full Outer Join on Sailor1 and Sailor2 and tuples to be ordered by SID of sailor1 and sailor2.

```
SQL> SELECT *
  2 FROM SAILOR1
  3 FULL OUTER JOIN SAILOR2 ON SAILOR1.SID = SAILOR2.SID
  4 ORDER BY SAILOR1.SID, SAILOR2.SID;
```

SID	SNAME	RATING	AGE	SID	SNAME	RATING	AGE
22	John	7	28				
29	Mike	5	32				
31	Sarah	9	35	31	Sarah	9	35
32	Emily	6	26	32	Emily	6	26
58	Alex	8	29				
95	Lisa	7	31				
				64	Dustin	6	30
				71	Liam	4	27
				74	Lubber	8	45

9 rows selected.

14. Execute Natural Join on Sailor and Reserve

```
SQL> SELECT *
  2  FROM Sailor
  3  NATURAL JOIN Reserve;
```

SID	SNAME	RATING	AGE	BID	RDAY
22	John	7	28	101	10-JUN-23
31	Sarah	9	35	103	10-JUN-23
31	Sarah	9	35	102	10-JUN-23
32	Emily	6	26	103	10-JUN-23
58	Alex	8	29	104	10-JUN-23
95	Lisa	7	31	103	10-JUN-23
64	Dustin	6	30	101	10-JUN-23
74	Lubber	8	45	102	10-JUN-23

8 rows selected.

15. Perform Cross Join on Sailor3 and Reserve2

```
SQL> SELECT *
  2  FROM SAILOR3
  3  CROSS JOIN RESERVE2;
```

SID	SNAME	RATING	AGE	SID	BID	RDAY
22	John	7	28	31	102	10-JUN-23
32	Emily	6	26	31	102	10-JUN-23
74	Lubber	8	45	31	102	10-JUN-23
85	Sophia	7	33	31	102	10-JUN-23
22	John	7	28	31	103	10-JUN-23
32	Emily	6	26	31	103	10-JUN-23
74	Lubber	8	45	31	103	10-JUN-23
85	Sophia	7	33	31	103	10-JUN-23
22	John	7	28	74	102	10-JUN-23
32	Emily	6	26	74	102	10-JUN-23
74	Lubber	8	45	74	102	10-JUN-23
85	Sophia	7	33	74	102	10-JUN-23

12 rows selected.

16. Find the names of sailors who have reserved boat 103. [Perform using Natural Join and Inner Join]

NATURAL JOIN:

```
SQL> SELECT Sname
  2  FROM Sailor
  3  NATURAL JOIN Reserve
  4  WHERE BID = 103;
```

SNAME
Sarah
Emily
Lisa

INNER JOIN:

```
SQL> SELECT Sailor.Sname
2  FROM Sailor
3  INNER JOIN Reserve ON Sailor.SID = Reserve.SID
4  WHERE Reserve.BID = 103;

SNAME
-----
Sarah
Emily
Lisa
```

17. Find the names of sailors who have reserved a red boat. [Perform using Natural Join and Inner Join]

NATURAL JOIN:

```
SQL> SELECT DISTINCT Sname
2  FROM Sailor
3  NATURAL JOIN Reserve
4  NATURAL JOIN Boat
5  WHERE Color = 'red';

no rows selected
```

INNER JOIN:

```
SQL> SELECT DISTINCT Sailor.Sname
2  FROM Sailor
3  INNER JOIN Reserve ON Sailor.SID = Reserve.SID
4  INNER JOIN Boat ON Reserve.BID = Boat.BID
5  WHERE Boat.Color = 'red';

no rows selected
```

18. Find the colors of boats reserved by Lubber

```
SQL> SELECT DISTINCT Boat.Color
2  FROM Sailor
3  INNER JOIN Reserve ON Sailor.SID = Reserve.SID
4  INNER JOIN Boat ON Reserve.BID = Boat.BID
5  WHERE Sailor.Sname = 'Lubber';

COLOR
-----
Green
```

19. Find the colors of boats reserved by Dustin

```
SQL> SELECT DISTINCT Boat.Color
  2   FROM Sailor
  3   INNER JOIN Reserve ON Sailor.SID = Reserve.SID
  4   INNER JOIN Boat ON Reserve.BID = Boat.BID
  5   WHERE Sailor.Sname = 'Dustin';

COLOR
-----
Red
```

20. Find the names of sailors who have reserved at least one boat.

```
SQL> SELECT DISTINCT Sailor.Sname
  2   FROM Sailor
  3   INNER JOIN Reserve ON Sailor.SID = Reserve.SID;

SNAME
-----
John
Lubber
Sarah
Emily
Alex
Lisa
Dustin

7 rows selected.
```

21. Find the names of sailors who have reserved either a red or a green boat.

```
SQL> SELECT DISTINCT Sailor.Sname
  2   FROM Sailor
  3   INNER JOIN Reserve ON Sailor.SID = Reserve.SID
  4   INNER JOIN Boat ON Reserve.BID = Boat.BID
  5   WHERE Boat.Color IN ('red', 'green');

no rows selected
```

22. Find the names of sailors who have reserved a red and a green boat.

```
SQL> SELECT SNAME
  2   FROM SAILOR
  3   WHERE SID IN (
  4       SELECT SID
  5       FROM RESERVE
  6       WHERE BID IN (
  7           SELECT BID
  8           FROM BOAT
  9           WHERE COLOR = 'Red'
 10       )
 11 ) AND SID IN (
 12     SELECT SID
 13     FROM RESERVE
 14     WHERE BID IN (
 15         SELECT BID
 16         FROM BOAT
 17         WHERE COLOR = 'Green'
 18     )
 19 );

no rows selected
```

23. Find all sailor id's of sailors who have a rating of at least 8 or reserved boat 103.

```
SQL> SELECT DISTINCT Sailor.SID
  2  FROM Sailor
  3  LEFT JOIN Reserve ON Sailor.SID = Reserve.SID
  4  WHERE Sailor.Rating >= 8 OR Reserve.BID = 103;

      SID
  -----
      31
      95
      32
      74
      58
```

24. Find the names of sailors who have reserved a boat whose name contains 'U' and Order the names in ascending order.

```
SQL> SELECT DISTINCT Sailor.Sname
  2  FROM Sailor
  3  INNER JOIN Reserve ON Sailor.SID = Reserve.SID
  4  INNER JOIN Boat ON Reserve.BID = Boat.BID
  5  WHERE Boat.Bname LIKE '%U%'
  6  ORDER BY Sailor.Sname ASC;

no rows selected
```

25. Find the sailor id's and name of sailors with age over 20 who have reserved a boat whose name includes the string "lake".

```
SQL> SELECT DISTINCT Sailor.SID, Sailor.Sname
  2  FROM Sailor
  3  INNER JOIN Reserve ON Sailor.SID = Reserve.SID
  4  INNER JOIN Boat ON Reserve.BID = Boat.BID
  5  WHERE Sailor.Age > 20 AND Boat.Bname LIKE '%lake%';

no rows selected
```

26. Find the sailor id's of sailors whose rating is better than some sailor called Bob

```
SQL> SELECT DISTINCT SID
  2  FROM SAILOR
  3  WHERE RATING > (
  4      SELECT RATING
  5      FROM SAILOR
  6      WHERE SNAME = 'Bob'
  7  );

no rows selected
```

27. For each boat which was reserved by at least 5 sailors with age ≥ 40 , find the boat id and the average age of such sailors.

```
SQL> SELECT RESERVE.BID, AVG(SAILOR.AGE) AS AVERAGE_AGE
2  FROM RESERVE
3  JOIN SAILOR ON RESERVE.SID = SAILOR.SID
4  WHERE SAILOR.AGE  $\geq$  40
5  GROUP BY RESERVE.BID
6  HAVING COUNT(DISTINCT RESERVE.SID)  $\geq$  5;

no rows selected
```