4. Sports Club Memberships (4NF Case)

Table Data:

MemberID | MemberName | Activity | Coach 301 | Alice | Tennis | Coach A

301 | Alice | Badminton | Coach B 301 | Alice | Tennis | Coach C 302 | Bob | Basketball | Coach D

Tasks:

- Identify multi-valued dependencies.
 - Explain if this table violates 4NF.
- Normalize it to 4NF.

Hint:

A member can have multiple activities. A member can have multiple coaches. Activities and coaches are independent.

Step 1: Understanding Multi-Valued Dependencies (MVDs)
A multi-valued dependency (MVD) occurs when one attribute in a table is independent of another but both are dependent on a primary key.

Step 2: Identifying Functional & Multi-Valued Dependencies
Functional Dependencies (FDs)

- MemberID → MemberName (Each MemberID determines the MemberName)

Multi-Valued Dependencies (MVDs)

- MemberID →→ Activity (A member can participate in

multiple activities)

- MemberID →→ Coach (A member can have multiple coaches)

Since **Activity and Coach are independent**, this table has an **MVD**, which can lead to redundancy.

Step 3: Checking for 4NF Violations
The given table is in 4NF because:

- MemberID →→ Activity exists, meaning multiple activities are stored redundantly for each coach.

- MemberID →→ Coach exists, meaning multiple coaches are stored redundantly for each activity.

This causes **data duplication** and **insertion/update anomalies**.

Step 4: Normalization to 4NF
To remove **multi-valued dependencies**, we must **split the table into separate tables**, ensuring activities and coaches are stored independently.

click this link for see -> https://dbdiagram.io/d/practice-question-4-67e639bf4f7afba18487ad66