Let’s create a flawed (unnormalized) table filled with anomalies and then walk through **1NF**, **2NF**, and **3NF** normalization processes.

⚠ Unnormalized Table: `StudentCourseScores`

StudentID	StudentName	Courses	Scores	AdvisorName	AdvisorPhone
101	Alice Brown	Math, English, Physics	85, 78, 92	Mr. John	08011223344
102	Bob Smith	Chemistry, Math	88, 90	Ms. Rita	08022334455
103	Clara Jones	Biology, Chemistry, Physics, Math	75, 80, 89, 95	Mr. John	08011223344

⊘ Problems (Anomalies):

- **Repeating groups** (Courses & Scores): Violates atomicity (1NF).
- **Partial dependencies**: If StudentID is the key, then `AdvisorName` and `AdvisorPhone` depend only on a portion of the data, not each course.
- **Transitive dependency**: AdvisorPhone depends on AdvisorName which depends on StudentID (via relation).

✓ First Normal Form (1NF)

Goal:

- No repeating groups.

- Atomic values in all fields.
- Primary key identified.

✅ Table: `StudentCourses` (Flattened, Atomic)

StudentID	StudentName	Course	Score	AdvisorName	AdvisorPhone
101	Alice Brown	Math	85	Mr. John	08011223344
101	Alice Brown	English	78	Mr. John	08011223344
101	Alice Brown	Physics	92	Mr. John	08011223344
102	Bob Smith	Chemistry	88	Ms. Rita	08022334455
102	Bob Smith	Math	90	Ms. Rita	08022334455
103	Clara Jones	Biology	75	Mr. John	08011223344
103	Clara Jones	Chemistry	80	Mr. John	08011223344
103	Clara Jones	Physics	89	Mr. John	08011223344
103	Clara Jones	Math	95	Mr. John	08011223344

- Primary Key: (`StudentID`, `Course`)

✅ Second Normal Form (2NF)

Goal:

- Remove partial dependencies.
- Every non-key column depends on the *whole* primary key.

Solution: Split into multiple related tables.

Table 1: `Students`

StudentID	StudentName	AdvisorID
101	Alice Brown	1
102	Bob Smith	2
103	Clara Jones	1

Table 2: `Advisors`

AdvisorID	AdvisorName	AdvisorPhone
1	Mr. John	08011223344
2	Ms. Rita	08022334455

Table 3: `Courses`

CourseID	CourseName
1	Math
2	English
3	Physics
4	Chemistry
5	Biology

Table 4: `StudentScores`

StudentID	CourseName	Score
101	Math	85
101	English	78
101	Physics	92
102	Chemistry	88
102	Math	90
103	Biology	75
103	Chemistry	80
103	Physics	89
103	Math	95

✅ Third Normal Form (3NF)

Goal:

- Eliminate **transitive dependencies**.
- All non-key columns must depend *only* on the key, and *nothing but the key*.

Let's revise:

- In `Students`, `AdvisorName` and `AdvisorPhone` have been removed and placed in the `Advisors` table.
- In `StudentScores`, course details are not repeated—only referenced via `CourseName` or `CourseID`.

✅ Final Tables Summary:

`Students`

StudentID	StudentName	AdvisorID
101	Alice Brown	1
102	Bob Smith	2
103	Clara Jones	1

`Advisors`

AdvisorID	AdvisorName	AdvisorPhone
1	Mr. John	08011223344
2	Ms. Rita	08022334455

`Courses`

CourseID	CourseName
1	Math
2	English
3	Physics
4	Chemistry
5	Biology

`StudentScores`

StudentID	CourseID	Score
101	1	85
101	2	78

StudentID	CourseID	Score
101	3	92
102	4	88
102	1	90
103	5	75
103	4	80
103	3	89
103	1	95