



LISBON
SCHOOL OF
ECONOMICS &
MANAGEMENT
UNIVERSIDADE DE LISBOA

Carlos J. Costa

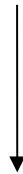
DATABASE NORMALIZATION

1NF (First Normal Form) Rules

- Each table cell should contain a single value.
- Each record needs to be unique.
- <https://youtu.be/K7vzLrGCV50>

1NF (First Normal Form) Rules

studentNu	name	subject
101	John	Programming
102	Maria	Marketing, Strategy
103	Inês	Java, Math



studentNu	name	subject
101	John	Programming
103	Maria	Strategy
103	Maria	Marketing
102	Inês	Math
102	Inês	Java

2NF (Second Normal Form)

Rules

- Rule 1- Be in 1NF
- Rule 2- Single Column Primary Key
- <https://youtu.be/A9sezRxNhWY>

2NF (Second Normal Form) Rules

Book(format, title, author, editor)

Book(idBook, title, author, editor)

Format(idFormat, formatDesc, *idBook*)

3NF (Third Normal Form) Rules

- Rule 1- Be in 2NF
- Rule 2- Has no transitive functional dependencies
- https://youtu.be/GP_RcibUicQ

3NF (Third Normal Form) Rules

Book(idBook,title, authorNamea,pages, editorCode,editorName,editorAddress)

Book(idBook,title, authorNamea,pages, *editorCode*)

Editor (ditorCode,editorName,editorAddress)



BCNF (Boyce-Codd Normal Form)

- Even when a database is in 3rd Normal Form, still there would be anomalies resulted if it has more than one **Candidate Key**.
- Sometimes is BCNF is also referred as **3.5 Normal Form**.

4NF (Fourth Normal Form)

Rules

- If no database table instance contains two or more, independent and multivalued data describing the relevant entity,



- then it is in 4th Normal Form.

5NF (Fifth Normal Form) Rules

- A table is in 5th Normal Form only:
 - if it is in 4NF and
 - it cannot be decomposed into any number of smaller tables without loss of data.

References

Codd, E.F (1969), Derivability, Redundancy, and Consistency of Relations Stored in Large Data Banks, Research Report, IBM.

Codd, E.F (1970). "A Relational Model of Data for Large Shared Data Banks".
Communications of the ACM. Classics. 13 (6): 377–87