



# **What is Normalization and different forms of Normalization ?**

# Why we need Normalization...

- Data Redundancy.
- Waste of disk space.
- Creates maintenance problems.
- Inconsistent dependency.

*orderDetails table*

orderID	orderDate	orderTotal	operatorID	custID	custName	custAddress	custEmail	custPhone
A-231	01/13/2019	300.00	NY-203	2325	Edward	29 Samsung Street, Queens,NY 11859	edward@outlook.com	324-987-3587, 324-897-3582
Z-980	03/05/2020	725.00	LA-3258	9800	Smith	358 Bristol Street,Denbury, MA, 32587	smith123@gmail.com	589-698-8547, 212-396-1380
Y-2432	01/13/2019	72.00	NY-009	2325	Edward	29 Samsung Street, Queens,NY 11859	edwrad@outlook.com	324-987-3587, 324-897-3582
G-2020	02/24/2021	92.78	NY-224	7816	Alex	115-A Alpine Ave,Edison,NJ 32598	alex9898@yahoo.com	214-859-9852



# What is Normalization...

- Normalization is the process of organizing data in a database, in order to reduce data redundancy and improve data integrity
- First proposed by Edgar F. Codd as part of his relational model.
- Systematic approach of decomposing tables to eliminate data redundancy(repetition) and undesirable characteristics like Insertion, Update and Deletion Anomalies.
- It is a multi-step process that puts data into tabular form, removing duplicated data from the relation tables.
- Normalization works in accordance with a series of so-called normal forms.
- 1NF, 2NF, 3NF....
- Although other levels of normalization are possible, third normal form is considered the highest level necessary for most applications.



# 1NF or First Normal Form...

A relation is in 1NF If ...

- It Contains only atomic values, An atomic value is a value that cannot be divided
- There are no Repeating Groups, A repeating group is a series of fields/attributes that are repeated throughout a database table.



orderDetails table

orderID	orderDate	orderTotal	operatorID	custID	custName	custAddress	custEmail	custPhone
A-231	01/13/2019	300.00	NY-203	2325	Edward	29 Samsung Street, Queens,NY 11859	edward@outlook.com	324-987-3587, 324-897-3582
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Tables in 1NF

orderID	orderDate	orderTotal	operatorID	custID	custID	custName	custAddress	custEmail	custPriPhone	custAltPhone
A-231	01/13/2019	300.00	NY-203	2325	2325	Edward	29 Samsung Street, Queens,NY 11859	edward@outlook.com	324-987-3587	324-897-3582
Z-980	03/05/2020	725.00	LA-3258	9800	9800	Smith	358 Bristol Street,Denbury, MA, 32587	smith123@gmail.com	589-698-8547	212-396-1380
Y-2432	01/13/2019	72.00	NY-009	2325	7816	Alex	115-A Alpine Ave,Edison,NJ 32598	alex9898@yahoo.com	214-859-9852	NULL
G-2020	02/24/2021	92.78	NY-224	7816						



## 2NF or 2ND Normal Form...

A relation is in 2NF If ...

- It is in 1NF.
- All partial key dependencies are removed, where an attribute in a table depends on only a part of the primary key and not on the whole key.



*orderDetails table*

orderID	productID	productName
A-231	PR1258	Desk
Z-980	PR2298	Chair
Y-2432	PR7780	Lamp
G-2020	PR1258	Desk

Tables  
in 2NF

orderID	productID
A-231	PR1258
Z-980	PR2298
Y-2432	PR7780
G-2020	PR1258

productID	productName
PR1258	Desk
PR2298	Chair
PR7780	Lamp



# 3NF or 3RD Normal Form...

A relation is in 3NF If ...

- It is in 2NF.
- Non-Primary key columns shouldn't depend on the other non-Primary key columns.
- There is no transitive functional dependency.





Transitively Dependent

Dependent

Dependent

majorCode	majorName	courseCode	courseName
AB45783	Databases	COMP9002	Computing
AB42897	Networking	COMP9002	Computing
AB40892	Operating Systems	COMP9002	Computing
AB44551	Project	BUSS2309	Buss & Computing

Foreign Key

majorCode	majorName	courseCode
AB45783	Databases	COMP9002
AB42897	Networking	COMP9002
AB40892	Operating Systems	COMP9002
AB44551	Project	BUSS2309

Tables in 3NF

courseCode	courseName
COMP9002	Computing
BUSS2309	Buss & Computing

Primary Key