First Normal Form(1NF)

- A relation will be 1NF if it contains an atomic value.
- Each record must be unique.
- It states that an attribute of a table cannot hold multiple values. It must hold only single-valued attribute.

Each entry must have only one single value for each cell and each record must be unique.

Second Normal Form (2NF)

- In the 2NF, relational must be in 1NF.
- In the second normal form, all non-prime attributes are fully functional dependent on the primary key. NOT partially dependent on the primary key.

No partial dependency.

Third Normal Form (3NF)

- A relation must be in 2NF and no transitive dependency for no-key attributes,
- 3NF has to reduce the data duplication.

No transitive dependency

Example1:

UNF	1NF	2NF	3NF
Project code	Project Code	Project Code	Project Code
Project title	Project Title	Project title	Employee No.
Project Managers	Project Managers	Project Managers	Hourly Rate
Project Budget	Project Budget	Project Budget	
Employee No.			Employee No.
Employee Name	Project Code	Project Code	Employee Name
	Employee No.	Employee No.	Department No.

Department No. Department Name Hourly Rate	Employee Name Department No. Department Name Hourly Rate	Hourly Rate Employee No. Employee Name Department No. Department Name	Department No. Department Name Project Code Project title Project Managers Project Budget

Example2:

UNF	1NF	2NF	3NF
Patient No. Patient Surname Patient Forename Ward No. Ward Name Prescription Date Drug Code Drug Name Dosage Length of Treatment	Patient No. Patient Surname Patient Forename Ward No. Ward Name Patient No. Prescription Date Drug Code Drug Name Dosage Length of Treatment	Patient No. Patient Surname Patient Forename Ward No. Ward Name Patient No. Prescription Date Drug Code Dosage Length of Treatment Drug Code Drug Name	Patient No. Patient Surname Patient Forename Ward No. Ward No. Ward Name Patient No. Prescription Date Drug Code Dosage Length of Treatment Drug Code Drug Name

Example3:

UNF	1NF	2NF	3NF
orderNo customerNo customerName customerAddres s telno depotNo depotName *productNo* *productName* *productQty* *productPrice*	orderNo customerNo customerName customerAddres s telno depotNo depotName orderNo productNo productName productQty productPrice	orderNo customerNo customerName customerAddres s telno depotNo depotName orderNo productNo productQty productNo productName productPrice	orderNo customerNo depotNo customerNo customerName customerAddres s telno deoptNo depotName orderNo productNo productQty productNo productName productPrice

Example4:

UNF → Attributes
1NF → Eliminate Repository Groups
2NF → Eliminate Partial Key Dependency.
3NF → Eliminate Transitive Dependency

UNF	1NF	2NF	3NF
BranchID	BranchID	BranchID	BranchID
BranchName	BranchName	BranchName	BranchName
BranchAddress	BranchAddress	BranchAddress	BranchManager
PostCode	PostCode	PostCode	_EmployeeID
Town	Town	Town	BranchManager
Country	Country	Country	_Surname
BranchManager	BranchManager	BranchManager	FranchiseOwner
_EmployeeID	_EmployeeID	_EmployeeID	Name
BranchManager	BranchManager	BranchManager	FranchiseOwner
_Surname	_Surname	_Surname	ID
FranchiseOwner	FranchiseOwner	FranchiseOwner	FranchiseOwner
Name	Name	Name	_Tel.No
FranchiseOwner	FranchiseOwner	FranchiseOwner	FranchiseOwner
ID	ID	ID	_StartDate
FranchiseOwner	FranchiseOwner	FranchiseOwner	PostCode*
_Tel.No	_Tel.No	_Tel.No	
FranchiseOwner	FranchiseOwner	FranchiseOwner	
_StartDate	_StartDate	_StartDate	PostCode
EmployeeID			BranchAddress
EmployeeFirstN			Town
ame	BranchID	EmployeeID	Country
EmployeeSurna	EmployeeID	EmployeeFirstN	
me	EmployeeFirstN	ame	
EmployeeNI_N	ame	EmployeeSurna	EmployeeID
o.	EmployeeSurna	me	EmployeeFirstN
ItemID	me	EmployeeNI_N	ame
ItemName	EmployeeNI_N	o.	EmployeeSurna
ItemDescription	o.		me
UnitPrice	ItemID		EmployeeNI_N
No_in_Stock	ItemName	ItemID	o.
CategoryCode	ItemDescription	ItemName	
	UnitPrice	ItemDescription	ItemID
	Price+VAT	UnitPrice	ItemName
		No_in_Stock	ItemDescription

CategoryDescription	No_in_Stock	CategoryCode	UnitPrice
SupplierID	CategoryCode	CategoryDescription	No_in_Stock
SupplierName	CategoryDescription		CategoryCode*
	SupplierID	SupplierID	
	SupplierName	SupplierName	CategoryCode
			CategoryDescription
		BranchID	
		EmployeeID	SupplierID
		ItemID	SupplierName
		SupplierID	
		Price+VAT	BranchID
			EmployeeID
			ItemID
			SupplierID
			Price+VAT

Example5:

UNF	1NF	2NF	3NF
OrderNo	OrderNo	OrderNo	OrderNo
OrderDate	OrderDate	OrderDate	OrderDate
CustomerID	CustomerID	CustomerID	CustomerID*
Title	Title	Title	
FirstName	FirstName	FirstName	CustomerID
LastName	LastName	LastName	Title
Address	Address	Address	FirstName
Town	Town	Town	LastName
Country	Country	Country	Telephone
PostCode	PostCode	PostCode	PostCode*
Telephone	Telephone	Telephone	
BookID			PostCode
ISBM	OrderNo	BookID	Address
BookTitle	BookID	ISBM	Town
Author	ISBM	BookTitle	Country

Publisher Price Qty	BookTitle Author Publisher Price Qty	Author Publisher Price <u>OrderNo</u> <u>BookID</u> Qty	<u>BookID</u> ISBM BookTitle Author Publisher Price <u>OrderNo</u> <u>BookID</u> Qty

Example 6:

UNF	1NF	2NF	3NF
<u>Customer_AccountNo.</u> CustomerName CustomerAddress CustomerTelNo HolidayReferenceNo BookingDate HotelName HolidayResort FlightNo DepartureAirport ArrivalAirport DepatureDate ReturnDate	<u>Customer_AccountNo.</u> CustomerName CustomerAddress CustomerTelNo <u>Customer_AccountNo</u> <u>HolidayReferenceNo</u> BookingDate HotelName HolidayResort FlightNo DepartureAirport ArrivalAirport DepatureDate ReturnDate	<u>Customer_AccountNo.</u> CustomerName CustomerAddress CustomerTelNo <u>HolidayReferenceNo</u> HotelName HolidayResort FlightNo DepartureAirport ArrivalAirport DepatureDate ReturnDate <u>Customer_AccountNo</u>	<u>Customer_AccountNo.</u> CustomerName CustomerAddress CustomerTelNo <u>Customer_AccountNo</u> <u>HolidayReferenceNo</u> BookingDate <u>HolidayReferenceNo</u> HotelName HolidayResort FlightNo* <u>FlightNo</u>

		HolidayReferenceNo BookingDate	DepartureAirport ArrivalAirport DepartureDate ReturnDate

Skeleton Table
Customer (Customer Account No., Customer Name, Customer Address, Customer Tel No.)
Booking (Customer Account No.*, Holiday Reference No., Booking date)
Holiday (H Holiday Reference No.*,Hotel Name, Holiday Resort, Flight No.*)
Flight (Flight No., Departure Airport, Arrival Airport, Departure Date, Return Date

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┌─────────────────────────┐
│        Customer         │
└─────────────────────────┘
             │
┌─────────────────────────┐
│        Booking          │
└─────────────────────────┘
             │
┌─────────────────────────┐
│        Holiday          │
└─────────────────────────┘
             │
┌─────────────────────────┐
│        Flight           │
└─────────────────────────┘
```