

First Normal Form

Normalization: 1st Normal Form (1NF)



A table is in first normal form (1NF):

- 1. There are no repeating attributes – every attribute is single valued – each cell in the table contains one value.**
- 2. Each attribute has a unique name – the column names are unique**
- 3. Each Table/Relation has a primary key (PK) which uniquely identifies each row/tuple in the relation.**

Second Normal Form

Normalization: 2nd Normal Form (2NF)



A table is in second normal form (2NF):

- 1. If the relation is in first normal form (1NF)**
- 2. If all non key attributes are fully dependent on the primary key**
- 3. If each relation has a primary key**

Normalization: 3NF



A table is in third normal form (3NF):

1. If the relation is in second normal form (2NF)
2. If all associations where all non-key attributes are not dependent on any other non-key attributes are resolved
3. If each relation has a primary key
4. If all relations are uniquely named

Question 1

3NF: All relations are uniquely named



Customer

CustID (PK)	CustomerFirst Name	CustomerLast Name	AddressLine1	Town	Postcode
WS951	Tom	Smith	5 High Street	Aylesbury	HP20 4YB
AK123	Rebecca	Zane	77 Green Street	High Wycombe	HP14JQ

SubscriptionMembership

CustID (FK)	SubType	SubAmount
WS951	1 Month	£5.00
AK123	12 months	£50.00

Movies

MovieDownloadsID (PK)	MovieDownloadsName	MovieDownloadsType
AV	Avengers Age of Ultron	Sci-Fi
JW	Jurassic World	Sci-Fi
TR	Train	Comedy
IO	Inside Out	Animated
TG	Terminator Genisys	Sci-Fi
MN	Minions	Animated

MovieDownload

CustID (FK)	MovieDownloadsID (FK)	DownloadDate (PK)
WS951	AVU	12/12/2014
WS951	JW	14/12/2014
WS951	TR	16/12/2014
WS951	IO	20/12/2014
AK123	TG	23/05/2012
AK123	IO	05/11/2013
AK123	MN	08/01/2015
AK123	IO	08/01/2015

Why not

Subscription (ID, Type, Cost)

CustomerSubscription (CustomerID, SubscriptionID, DateStarted)

Question 2

1NF: Assigning a Primary Key

Module Code (PK)	Module Title	Student ID (PK)	Course	Tutor	Assignment Title	Date Due	QualityControl	Comments
CO621	Database	21012561	Computing	Wayne	CW2	15/03/13	Not Checked	Blank
CO621	Database	25062041	Computing	Wayne	CW1	15/02/13	Checked	Blank
CO623	E-Business	21012561	Computing	Wayne	CW1	12/05/13	Not Checked	Blank

This relation is now in 1NF

If a student can re-take a module then ModuleCode and StudentID are not unique

Question 3

UNF, 1NF, 2NF & 3NF

UNF	1NF	2NF	3NF
ModuleCode ModuleTitle StudentID Course Tutor AssignmentTitle DateDue QualityControl Comments	ModuleCode (PK) ModuleTitle StudentID (PK) Course Tutor AssignmentTitle DateDue QualityControl Comments	ModuleCode (PK) ModuleTitle ModuleCode (FK) StudentID (FK) Course Tutor AssignmentTitle DateDue QualityControl Comments	MODULE ModuleCode (PK) ModuleTitle STUDENT StudentID (PK) Course SUBMISSION ModuleCode (FK) AssignmentTitle (FK) StudentID (FK) ASSESSMENT ModuleCode (FK) AssignmentTitle (PK) DateDue QualityControl Comments

The AssignmentTitle is not a good primary key as is not unique unless the module code is included in the title.

The Submission only requires the StudentID and the AssignmentTitle. The ModuleCode is dependant on AssignmentTitle

Question 4

UNF	1NF	2NF	3NF	
INVOICENO	InvoiceNo (PK)	CustID (PK)	Customer	Pet
VetBranch	Date	CustTitle	CustID (PK)	Pet_ID (PK)
DATE	BranchName	CustFName	CustTitle	PetName
Name	CustTitle	CustSName	CustFName	CustID (FK)
Address	CustFName	AddressLine1	CustSName	
PetName	CustSName	City	AddressLine1	Pet_Procedure
Procedure	AddressLine1	Town	City	InvoiceNo (FK)
Amount	City	Postcode	Town	Pet_ID (FK)
TotalTax	Town		Postcode	Procedure
AmountOwing	Postcode	InvoiceNo (PK)		Amount
	Total	Date	Customer_Invoice	CustID (FK)
	Tax	BranchName	InvoiceNo (PK)	
	AmountOwing	CustID (FK)	Date	
		Total	Branch	
	Pet_ID (PK)	Tax	CustID (FK)	
	PetName	AmountOwing	Total	
	Procedure		Tax	
	Amount	InvoiceNo (FK)	AmountOwing	
	InvoiceNo (FK)	Pet_ID (PK)		
	CustTitle	PetName		
	CustFName	Procedure		
	CustSName	Amount		
		CustID (FK)		



A Pet may have the same procedure on different dates on the same invoice.

Why not

InvoiceItem (ItemNoPK, InvoiceNoFK, ProcedureNameFK, PetIDFK, AmountCharged)

Procedure (ProcedureNamePK, CurrentCost)

Question 5

Student (StudentID, FirstName, Surname, Address, CourseFK)

Module (ModuleCodePK, Name, Tutor, Day, Room)

CourseModules (CourseNamePK, ModuleCodeFK)

Question 6

What is the best design for Addresses?

- County Name is unique in the UK
- Town Names are not unique in the UK
- Street Names are not unique
- Post Codes are unique in the UK

Address(**AddressNO**, PostCode, TownFK, Street, HouseID)

Town (**TownID**, Name, CountyName)