Normalisation (unnormalised to 3NF)

Watch video: https://youtu.be/rFMEZG3UZM8?t=5m08s

Normalisation (unnormalised to 3NF)

Revenue(invoiceNum, transDate,
{services(serviceNum, serviceName, hours,
hourlyRate, amount, customerNo, customerName)})
Primary key invoiceNum

REVENUE TRANSACTIONS								
Invoice #	Transaction Date	Service Type #	Service Name	Hours	Hourly Rate	Amount	Customer #	Customer Name
101	1/5/2003	1	Bookkeeping	6	25	150	251	Stinson & Assoc.
		3	Partnership	25	50	1,250	251	Stinson & Assoc.
102	1/28/2003	4	Personal	6	40	240	136	Jack Randall
103	2/10/2003	4	Personal	4	40	160	200	Judy and June
104	2/18/2003	1	Bookkeeping	20	25	500	257	Warren Cleaning
		3	Partnership	35	50	1,750	257	Warren Cleaning
105	2/25/2003	1	Bookkeeping	8	25	200	102	Bernie Contrell
		4	Personal	16	40	640	102	Bernie Contrell
		5	Tax Planning	5	75	375	102	Bernie Contrell
106	3/5/2003	1	Bookkeeping	151	25	3,775	385	Kirk Company
107	3/9/2003	4	Personal	6	40	240	154	Amy Holt

Normalisation (unnormalised to 3NF)

- The table is clearly unnormalised as there is a repeating group of attributes. Not all of the non key attributes are functionally dependent on invoiceNum.

- Although attributes customerNo and customerName are part of the repeating group of attributes, you will see from the data that for each invoiceNum there is only one customerNo and customerName value.

- invoiceNum → transDate, customerNo, customerName

Normalisation (unnormalised to 3NF)

- **UNF to 1NF:**

  Revenue(invoiceNum, transDate, customerNo, customerName)
  Primary key invoiceNum

  Services(invoiceNum, serviceNum, serviceName, hours,
  hourlyRate, amount)
  Primary key invoiceNum, serviceNum
  Foreign key invoiceNum references Revenue(invoiceNum)

Normalisation (unnormalised to 3NF)

- **1NF to 2NF:**

- Table Revenue is in 2NF (no partial key dependencies) and it is a single attribute primary key.

- Table Services is not in 2NF as there is a partial key dependency on serviceNum
  i.e. serviceNum → serviceName, hourlyRate

Normalisation (unnormalised to 3NF)

- **1NF to 2NF:**

  ServiceDetails(serviceNum, serviceName, hourlyRate)
  Primary key serviceNum

  Services(invoiceNum, serviceNum, hours, amount)
  Primary key invoiceNum, serviceNum
  Foreign key invoiceNum references
  Revenue(invoiceNum)
  Foreign key serviceNum references
  ServiceDetails(serviceNum)

Normalisation (unnormalised to 3NF)

- **2NF to 3NF:**

- Tables Services and ServiceDetails are in 3NF (no transitive key dependencies)

- Table Revenue is not in 3NF as there is a transitive key dependency on invoiceNum

  i.e. invoiceNum → customerNo and
  customerNo → customerName =>
  invoiceNum → customerName through customerNo

Normalisation (unnormalised to 3NF)

- **2NF to 3NF:**

  Customer(customerNo, customerName)
  Primary key customerNo

  Revenue(invoiceNum, transDate, customerNo)
  Primary key invoiceNum
  Foreign key customerNo references Customer(customerNo)

Normalisation (unnormalised to 3NF)

- **Full set of Relations:**

ServiceDetails(serviceNum, serviceName, hourlyRate)
Primary key serviceNum

Customer(customerNo, customerName)
Primary key customerNo

Revenue(invoiceNum, transDate, customerNo)
Primary key invoiceNum
Foreign key customerNo references Customer(customerNo)

Services(invoiceNum, serviceNum, hours, amount)
Primary key invoiceNum, serviceNum
Foreign key invoiceNum references
Revenue(invoiceNum)
Foreign key serviceNum references
ServiceDetails(serviceNum)

Normalisation (unnormalised to 3NF)

- **Full set of Relations:**

Services(invoiceNum, serviceNum, hours, amount)
Primary key invoiceNum, serviceNum
Foreign key invoiceNum references
Revenue(invoiceNum)
Foreign key serviceNum references
ServiceDetails(serviceNum)

The attribute amount can be removed from the table as it can be calculated/derived from attribute *hours* in this table (Services) and *hourlyRate* (ServiceDetails).

Normalisation (unnormalised to 3NF)

- **Full set of Relations:**

Services(invoiceNum, serviceNum, hours)
Primary key invoiceNum, serviceNum
Foreign key invoiceNum references
Revenue(invoiceNum)
Foreign key serviceNum references
ServiceDetails(serviceNum)

All non key attributes are functionally dependent on the primary key, the entire primary key, and nothing but the primary key.

Which Normal Form?

- Is this table in UNF, 1NF, 2NF, or 3NF? 3NF

  Project(projCode, projTitle, projManager, projBudget)
  Primary key projCode

Project Code	Project Title	Project Manager	Project Budget
PC010	Pensions System	M Phillips	24500
PC045	Salaries System	H Martin	17400
PC064	HR System	K Lewis	12250

Which Normal Form?

- Is this table in UNF, 1NF, 2NF, or 3NF? UNF

  Studies(studentNo, fName, lName, DOB, startDate, {courses(courseCode, tutorCode, tutorName)})
  Primary key studentNo

Student Number	Student firstname	Student lastname	Student DOB	Date Started College	Course Codes	Tutor Codes	Tutor LastName
1	Charles	Dickens	6/12/84	5/9/03	LW012 IT003 EN045	LPB IKA EMW	Brown Anderson White
2	William	Shakespeare	12/7/85	5/9/03	IT003 HI031	IKA HJD	Anderson Dawson

Which Normal Form?

- Is this table in UNF, 1NF, 2NF, or 3NF? 1NF

  Project(projCode, empNo, empName, deptNo, deptName, hourlyRate)
  Primary key projCode, empNo

Project Code	Employee No.	Employee Name	Department No.	Department Name	Hourly Rate
PC010	S10001	A Smith	L004	IT	22.00
PC010	S10030	L Jones	L023	Pensions	18.50
PC010	S21010	P Lewis	L004	IT	21.00
PC045	S10010	B Jones	L004	IT	21.75
PC045	S10001	A Smith	L004	IT	18.00
PC045	S31002	T Gilbert	L028	Database	25.50
PC045	S13210	W Richards	L008	Salary	17.00
PC064	S31002	T Gilbert	L028	Database	23.25
PC064	S21010	P Lewis	L004	IT	17.50
PC064	S10034	B James	L009	HR	16.50

Which Normal Form?

- Is this table in UNF, 1NF, 2NF, or 3NF? 2NF

  Winners(tournament, year, winner, winnerDOB)
  Primary key tournament, year

Tournament	Year	Winner	Winner Date of Birth
Indiana Invitational	1998	Al Fredrickson	21 July 1975
Cleveland Open	1999	Bob Albertson	28 September 1968
Des Moines Masters	1999	Al Fredrickson	21 July 1975
Indiana Invitational	1999	Chip Masterson	14 March 1977

Which Normal Form?

- Is this table in UNF, 1NF, 2NF, or 3NF? 2NF

  Book(bookId, genreId, genreType, price)
  Primary key bookId

Book ID	Genre ID	Genre Type	Price
1	1	Gardening	25.99
2	2	Sports	14.99
3	1	Gardening	10.00
4	3	Travel	12.99
5	2	Sports	17.99