

Databases

1NF	2NF	3NF
Every table must have a primary key	Must already be in 1NF	Must already be in 2NF
All field names must be unique	Remove any partial dependencies	Remove any transitive dependencies – in other words, ensure that non key fields are not dependant on each other
Values in fields should be from the same domain – rules that describe the available values of a field type.	Fix any many-to-many relationships created as a result.	
Values in fields should be atomic - means more than one data item in a field		
No two records may be identical		

ONF

Fields must not be atomic –

name	date of birth	gender	course number	course name	lecturer
Tony Gibbons	15/02/1979	M	F451 G403 P202	Computing History of Art Classics	CSA, Craig Sargent AOH, Austin O'Harel CSA, Craig Sargent
Mathew Robinson	14/03/1980	M	G403 Q947 P202	History of Art Textiles Classics	AOH, Austin O'Harel LCO, Linda Cox CSA, Craig Sargent
Claire Matthews	21/05/1974	F	F451 J564 P554	Computing Drama Physics	CSA, Craig Sargent LCO, Linda Cox JHA, James Hayes
Alfred Pillar-Hofman	22/03/1982	M	P202 H544 J390	Classics History English lit	CSA, Craig Sargent SRU, Simon Russel LCO, Linda Cox
James Applegate	01/02/1978	M	Q947 G403 J564	Textiles History of Art Drama	LCO, Linda Cox AOH, Austin O'Harel LCO, Linda Cox

To get to **first normal form (1NF)**, a table should follow five rules:

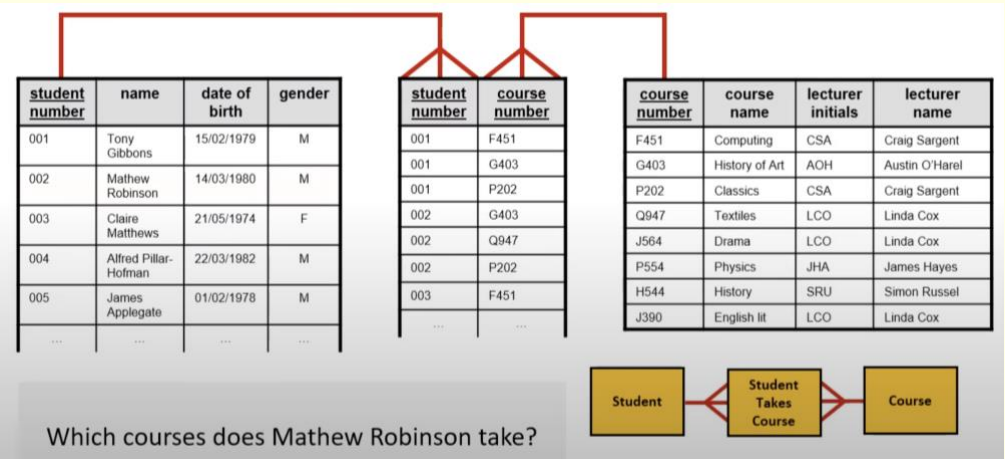
1. All **field** names must be unique.
2. Values in **fields** should be from the same **domain**.
3. Values in **fields** should be atomic.
4. No two **records** can be identical.
5. Each **table** needs a **primary key**.

1NF

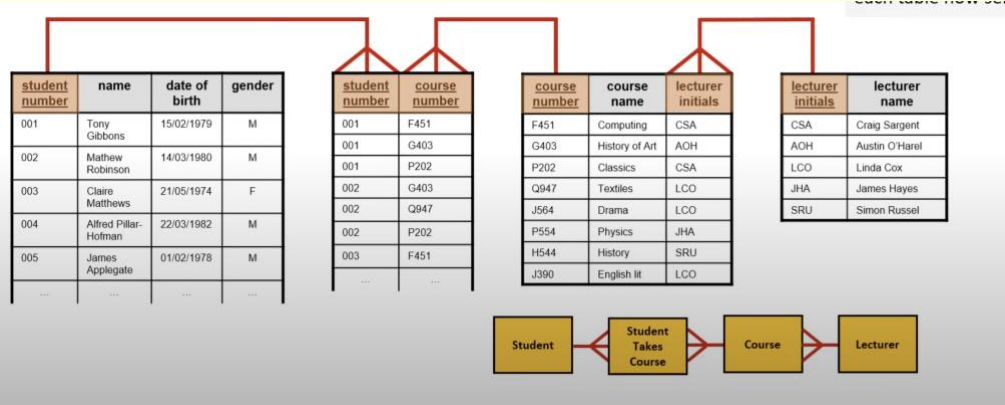
name	date of birth	gender	course number	course name	lecturer initials	lecturer name
Tony Gibbons	15/02/1979	M	F451	Computing	CSA	Craig Sargent
Tony Gibbons	15/02/1979	M	G403	History of Art	AOH	Austin O'Harel
Tony Gibbons	15/02/1979	M	P202	Classics	CSA	Craig Sargent
Mathew Robinson	14/03/1980	M	G403	History of Art	AOH	Austin O'Harel
Mathew Robinson	14/03/1980	M	Q947	Textiles	LCO	Linda Cox
Mathew Robinson	14/03/1980	M	P202	Classics	CSA	Craig Sargent
Claire Matthews	21/05/1974	F	F451	Computing	CSA	Craig Sargent
Claire Matthews	21/05/1974	F	J564	Drama	LCO	Linda Cox
Claire Matthews	21/05/1974	F	P554	Physics	JHA	James Hayes
Alfred Pillar-Hofman	22/03/1982	M	P202	Classics	CSA	Craig Sargent
Alfred Pillar-Hofman	22/03/1982	M	H544	History	SRU	Simon Russel
Alfred Pillar-Hofman	22/03/1982	M	J390	English lit	LCO	Linda Cox
James Applegate	01/02/1978	M	Q947	Textiles	LCO	Linda Cox
James Applegate	01/02/1978	M	G403	History of Art	AOH	Austin O'Harel
James Applegate	01/02/1978	M	J564	Drama	LCO	Linda Cox

2NF

Partial dependency means many to many relationships– Create another table so there is one-to-many instead



3NF



Practice Question

Every bank account has an account number and sort code. The sort code identifies the bank branch (location of the bank) with which the account is held and the account number uniquely identifies the bank account.

CustomerID	Forename	Surname	Acc No	Sort Code	Branch Name
145204	Elaine	Murray	14725200	67-34-56	Hull
657875	Jordan	Rogers	62703441	67-45-67	Truro
735951	Monim	Khan	96385547	67-00-11	Cambridge
744078	Tom	Banner	45623929	67-00-11	Cambridge

State why the table in Fig. 5.1 is not in Third Normal Form.

Explain how the database could be put into Third Normal Form. [3]

Customers’ details are stored in the flat file database table Customer. An extract of the table is shown below

CustomerID	Surname	Title	Phone	CarReg
JJ178	James	Mr	(0121) 343223	DY51 KKY
HG876	Habbick	Miss	(01782) 659234	PG62 CRG
EV343	Elise	Mrs	(07834) 123998	HN59 GFR
PG127	Pleston	Mr	(07432) 234543	JB67 DSF

Write the SQL statement that would show only the CustomerID and Surname fields for customers with the Title “Miss” or “Mrs”[4]

A video streaming service uses a relational database. An extract of the data from two tables from this database is shown in Fig. 2.

Membership contains data about current memberships that customers hold and package contains data about different streaming packages available.

Username	FirstName	StartDate	PackageType
User001	Amaya	08/05/2016	Premium
User002	Amit	06/06/2019	Basic
User003	Tom	17/08/2019	Free
User004	Kareem	08/08/2017	Basic
User005	Sarah	25/03/2020	Premium

Membership

PackageType	CostPerMonth (£)	Adverts
Premium	12.99	false
Basic	7.99	true
Free	0.00	true

Package

Fig. 2

The Adverts field indicates if customers will be shown adverts. true indicates that customers will be shown adverts, and false indicates that adverts are not shown.

Write Structured Query Language (SQL) to return the Username and FirstName fields for all customers who see adverts.

[5]

SQL Cheat Sheet

SELECT Statement

SELECT column1, column2, ...
FROM table_name;

SELECT * FROM table_name;

SELECT column1, column2, ...
FROM table_name
WHERE condition;

SELECT column1, column2, ...
FROM table_name
GROUP BY column1;
ORDER BY column1 [ASC | DESC],
column2 [ASC | DESC],

SELECT * FROM users
WHERE age > 18 AND city = 'New York';

SELECT * FROM users
WHERE name LIKE 'J%';

INSERT INTO Statement

INSERT INTO table_name (column1,
column2, ...)
VALUES (value1, value2, ...);

INSERT INTO users (name, age)
VALUES ('John Doe',25);

DELETE Statement

DELETE FROM table_name
WHERE condition;

DELETE FROM users
WHERE name="John";

Nested SELECT

SELECT Name FROM TblSoftware
WHERE Price < (
SELECT PriceFROM TblSoftware
WHERE Name = 'DCCDraw')

Operators

- = : Equal
- != or <> : Not equal
- > : Greater than
- < : Less than
- >= : Greater than or equal
- <= : Less than or equal
- BETWEEN ... AND ... : Range
- LIKE : Pattern matching
- IN : Specify multiple values
- IS NULL : Null values

Logical Operators

AND OR NOT

UPDATE table_name
SET column1 = value1, column2 =
value2, ...
WHERE condition;

JOIN
(INNER JOIN)

Combines data from two or more
tables based on a related column

SELECT users.name, orders.order_id
FROM users
JOIN orders
ON users.user_id = orders.user_id;
(retrieves user names and their
corresponding order IDs)