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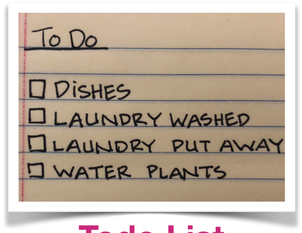
SQL TUTORING SUMMER 2020

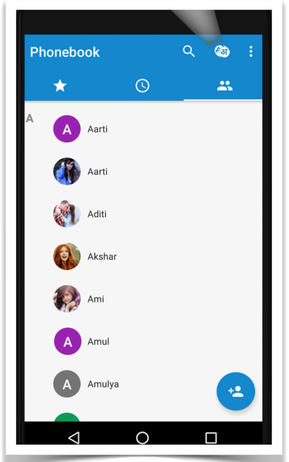
What is DataBase ?

DataBase is a collection of related information

DataBase can be stored in different ways



Todo List



Phone book

My 4 best friends

Names of Facebook users

Names of Students in a School

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Advantages of Storing Data in Computer's Memory or Cloud

1) Huge amount of data can be stored ✓

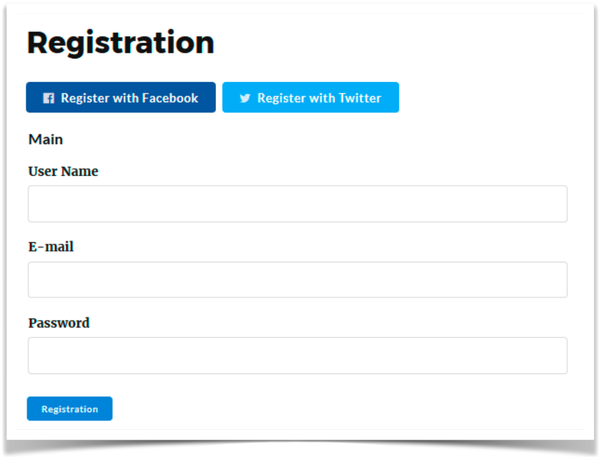
2) Easy to Create, Read, Update, Delete ✓

3) Easy to access ✓

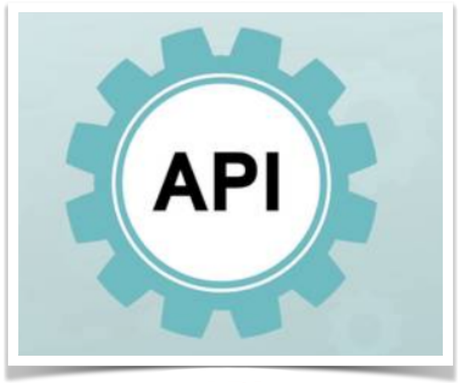
4) Quick access ✓

5) Security ✓

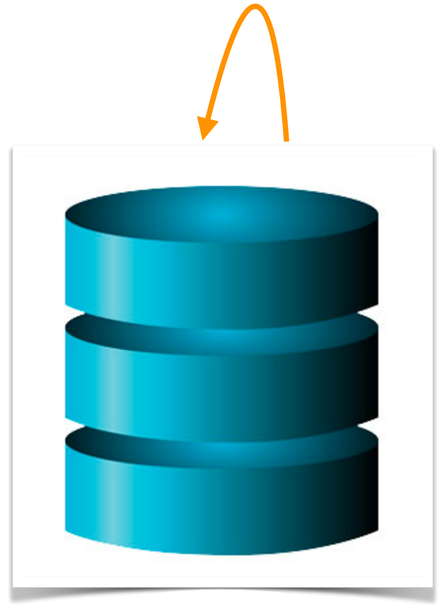
Database Validation Test



User Interface



API



Database

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END To END (E2E) Testing

1) If you send data ta database by using UI
   A) Validate data from UI by using search functionality (Selenium)
   B) Validate data by using SQL Codes (SQL + Selenium)
   C) Validate data by using API Codes (API + Selenium)

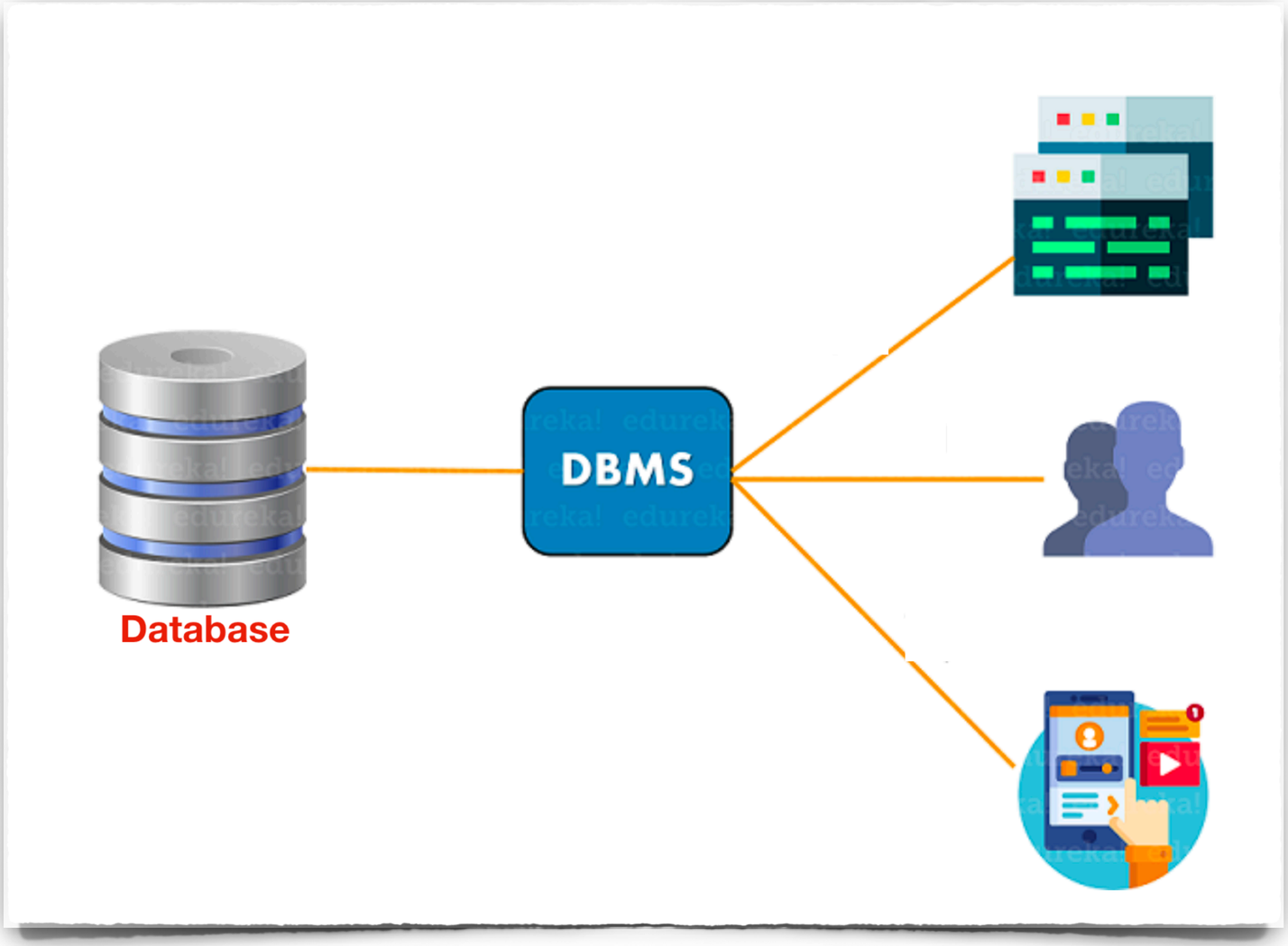
2) If you send data to database by using SQL codes
   A) Validate data from UI by using search functionality (Selenium)
   B) Validate data by using SQL Codes (SQL + Selenium)
   C) Validate data by using API Codes (API + Selenium)

3) If you send data to database by using API codes
   A) Validate data from UI by using search functionality (Selenium)
   B) Validate data by using SQL Codes (SQL + Selenium)
   C) Validate data by using API Codes (API + Selenium)

Data Base Management System (DBMS)

DBMS is a special software program which enables its users

1) To access database,
2) To Create, Read, Update, Delete, (CRUD)
3) To get reports form database,
4) To control access to the database, (Security)
5) To interact with other applications



Tables in SQL

Row *(Record)* ====>

Row *(Record)* ====>

Row *(Record)* ====>

Row *(Record)* ====>

contactID	name	company	email
1	Bill Gates	Microsoft	bill@XBoxOneRocks.com
2	Steve Jobs	Apple	steve@rememberNewton.com
3	Linus Torvalds	Linux Foundation	linus@gnuWho.org
4	Andy Harris	Wiley Press	andy@aharrisBooks.net

Column *(Field)* ^====

Column *(Field)* ^====

Column *(Field)* ^====

Column *(Field)* ^====

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Relational Databases *(SQL Databases)*

1) A relational database stores data in tables.

2) The relationship between each data point is clear and searching through those relationships is easy.

3) The relationship between tables and field types is called a schema.

4) Relational Databases are also called SQL Databases. (Structured Query Language)

Schema

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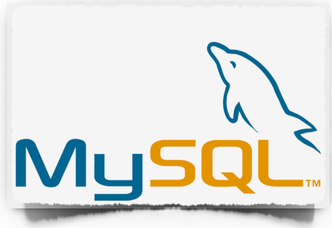
Popular Relational Databases(SQL Database)

SQL Server : Developed by Microsoft

Cons: It can be expensive – with the Enterprise level costing thousands of dollars.
Pros: It has rich user interface and can handle large quantities of data.



MySQL Server : Created by a Swedish Company

Cons: Tends to stop working when it's given too many operations at a given time.
Pros: It's free and open-source. There's also a lot of documentation and online support.

PostgreSQL Server : Created by a computer science professor Michael Stonebraker.

Cons: Installation and configuration can be difficult.
Pros: If you need additional features in PostgreSQL, you can add it yourself – a difficult task in most databases.

PL/SQL is a procedural language designed specifically to embrace SQL statements within its syntax.
PL/SQL program units are compiled by the Oracle Database server and stored inside the database.

Pros: PL/SQL provides high security level.
PL/SQL provides support for Object-Oriented Programming.

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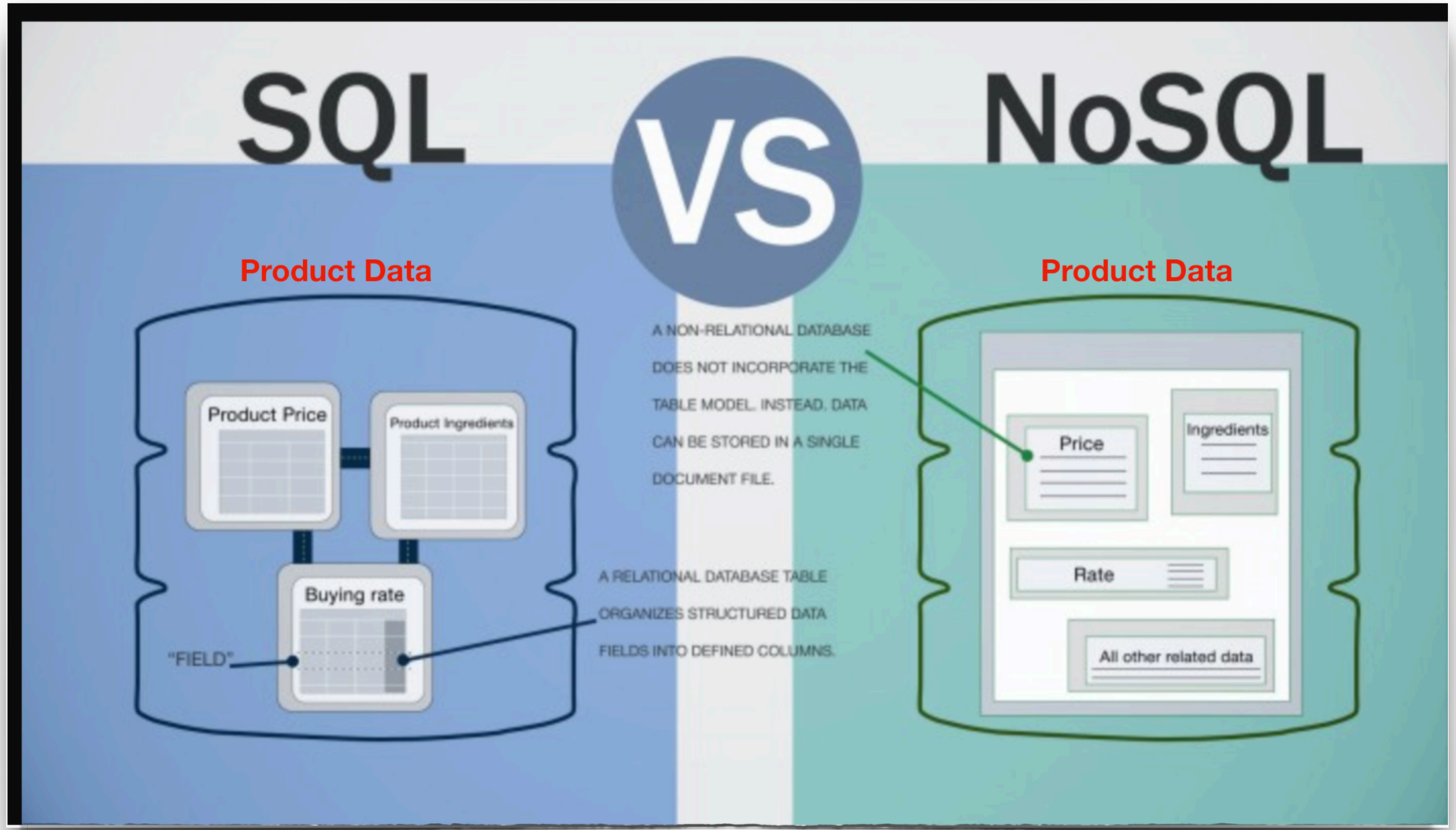
Non Relational Databases *(non-SQL Databases)*

A non-relational database does not use the tabular schema of rows and columns like in relational databases



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Primary Key

Primary Key : Primary keys must contain **UNIQUE** values, and **cannot contain NULL** values.
For data whose all attributes are same, we need **primary key** to differentiate between them
A table can have only **one** primary key; and in the table, this primary key **can consist of multiple columns**

Note: Primary key can be anything, a number, String, character etc.

Note: If you use real values as a primary key like SSN or email address, it is called "**Natural Key**"
If you use any values like 1, 2, 3, 4, … , it is called "**Surrogate Key.**"
Surrogate key values are just numbers.

StudentID	FirstName	LastName
10	John	Walker
11	Tom	Hanks
12	Kevin	Star
13	Carl	Wall
14	Andrei	Apazniak
15	Mark	High
16	Clara	Star
17	John	Ocean
18	John	Walker
19	Pamela	Star
20	Carl	Wall

Email	FirstName	LastName
JWalker@gmail.com	**John**	**Walker**
THanks@gmail.com	Tom	Hanks
KStar@gmail.com	Kevin	Star
CWall@gmail.com	**Carl**	**Wall**
AApazniak@gmail.com	Andrei	Apazniak
MHigh@gmail.com	Mark	High
CStar@gmail.com	Clara	Star
JOcean@gmail.com	John	Ocean
JWalker01@gmail.com	**John**	**Walker**
PStar@gmail.com	Pamela	Star
CWall01@gmail.com	**Carl**	**Wall**

Foreign Key

A **Foreign Key** is a key used to create **link between two tables**.

A **Foreign Key** is a field *(or collection of columns)* **in one table that refers to the Primary Key in another table.**

A table can have many **Foreign Key**s

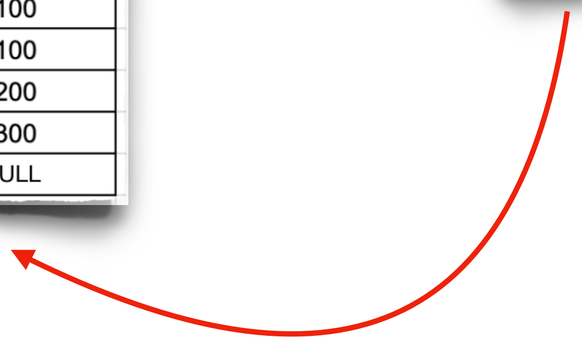
Foreign Key can have NULL values and repeated values

StudentID	FirstName	LastName	CourseID
10	John	Walker	200
11	Tom	Hanks	400
12	Kevin	Star	400
13	Carl	Wall	200
14	Andrei	Apazniak	300
15	Mark	High	400
16	Clara	Star	100
17	John	Ocean	100
18	John	Walker	200
19	Pamela	Star	300
20	Carl	Wall	NULL

Child Table

CourseID	CourseName	CourseCredit	CourseFee
100	Biology	3	1200
200	Math	3	1200
300	English	2	600
400	Selective	1	200

Parent Table



The "CourseID" column in the "Parent Table" table is the primary key.
The "CourseID" column in the “Child Table" table is a foreign key.

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Foreign and Primary Key

Note: Foreign key can create a relation between the table and the table itself.

1) Who is the Manager of Michael Scott ?

2) What is the job name of Angela Martin ?

3) What is the average salary of Manual Testers ?

4) What is the job name of the highest salary ?

Emp_ID	first_name	last_name	birth_date	Gender	salary	Job_ID	Manager_ID
100	Jan	Levinson	1961-05-11	F	110,000	1	NULL
101	Michael	Scott	1964-03-15	M	75,000	2	100
102	Josh	Porter	1969-09-05	M	78,000	3	100
103	Angela	Martin	1971-06-25	F	63,000	2	101
104	Andy	Bernard	1973-07-22	M	65,000	3	101

Job_ID	Job_Name
2	SDET
3	Manual Tester
1	QE Lead

SQL Composite Key

A composite key is a combination of two or more columns in a table that can be used to uniquely identify each row in the table when the columns are combined uniqueness is guaranteed, but when it taken individually it does not guarantee uniqueness.

Note: Branch_ID and Recruiter are the primary keys for the Job and Recruiter tables; in addition, they are foreign key for the Company table.
The combination of Job_ID and Recruiter foreign keys in Company table is primary key for Company table.

Job_ID	Job_Name
2	SDET
3	Manual Tester
1	QE Lead

Job Table

Recruiter	NumberOfClient
Mark Eye	121
John Ted	283
Cory Al	67
Angela Star	301

Recruiter Table

Job_ID	Recruiter	Company
2	Mark Eye	RCG
3	John Ted	RCG
1	Mark Eye	Signature
1	John Ted	InfoLog
1	Cory Al	InfoLog
2	Angela Star	Signature

Company Table

Difference between “UNIQUE KEY” and “PRIMARY KEY”

Primary Key

Only one primary key is allowed to use in a table.

Primary key does not accept NULL values.

Unique Key

A table can have more than one unique key.

Unique key constraints can accept multiple NULL values for column.

Common features of “UNIQUE KEY” and “PRIMARY KEY”

Primary Key

A primary key of one table can be referenced by the foreign key of another table.

Primary key does not allow duplication

Unique Key

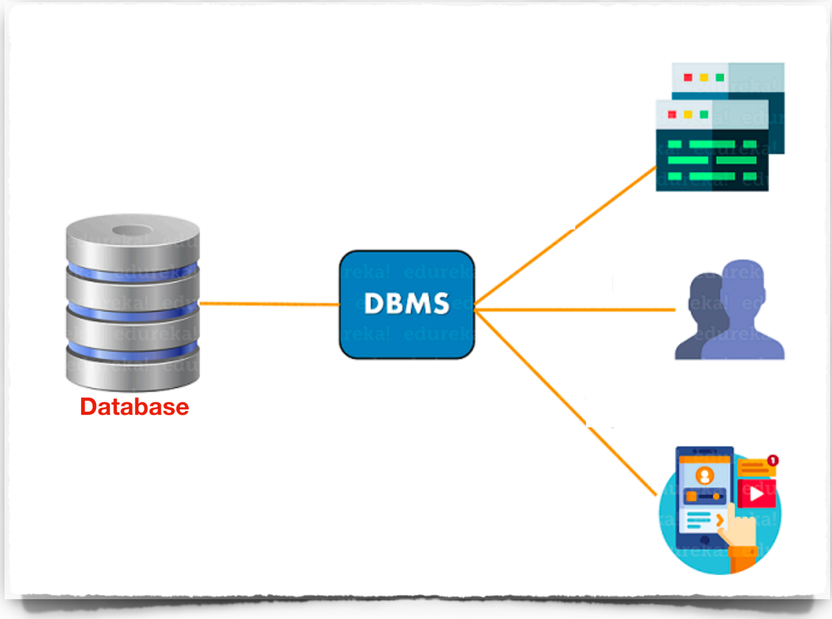
Unique keys are also referenced by the foreign key of another table.

Unique key also does not allow duplication

What is SQL ?

SQL stands for Structured Query Language

SQL is a language used for interacting with Relational Data Base Management Systems (RDBMS)



By using SQL we can;

1) **Create and Manage databases**
2) **Create and Design database tables**
3) **Create, Read, Update, and Delete data (CRUD)**
4) **Perform administration tasks like security, user management etc.**

We can use SQL for all RDBMS (MySQL, Microsoft SQL, PostgreSQL, Oracle SQL)
The concepts are same but implementation can be slightly different.

More about SQL

SQL is the combination of 4 different languages;

1) Data Control Language (DCL)

DCL is used to control privileges in Database. To perform any operation in the database, such as for creating tables, sequences or views, a user needs privileges.

DCL manages users and permissions

2) Data Definition Language (DDL)

DDL deals with descriptions of the database schema (tables, columns, rows) **and is used to create and modify the structure of database objects**

3) Data Manipulation Language (DML)

DML deals with the manipulation of data present in the database. For example, insert, update, and delete data

4) Data Query Language (DQL)

DQL is used to query the database for information

DQL is used to get information that is already stored in database

Working with Related Tables

<===== One to One Relation ====>

1) Find the address of the Tom Hanks
2) Find the address of the John Walker
3) Find the address of the student whose ID is 17

StudentID	FirstName	LastName
10	John	Walker
11	Tom	Hanks
12	Kevin	Star
13	Carl	Wall
14	Andrei	Apazniak
15	Mark	High
16	Clara	Star
17	John	Ocean
18	John	Walker
19	Pamela	Star
20	Carl	Wall

StudentID	Street	ZipCode	City	State
10	1234 W 23th Street	33018	Hialeah	Florida
11	1235 N 3th Street	22145	Austwell	Texas
12	1236 SE 12th Street	54234	Orange	California
13	1237 N 5th Street	33018	Hialeah	Florida
14	1238 SW 53th Street	33026	Miami	Florida
15	1239 S 123th Street	22314	Avery	Texas
16	1240 N 1st Street	12345	Arlington	Virginia
17	1241 NW 2nd Street	65432	Pittsburgh	Pensylvania
18	1242 W 5th Street	22133	Baytown	Texas
19	1243 SE 55th Street	74352	Beachwood	Ohio
20	1244 SW 17th Street	22314	Avery	Texas

<===== One to Many Relation ====>

1) Find the names of the students who take Biology class

2) Find the names of the students who take Selective class

3) Find the names of the students who take the class whose course fee is 600

CourseID	CourseName	CourseCredit	CourseFee	InstructorID
100	Biology	3	1200	1
200	Math	3	1200	2
300	English	2	600	3
400	Selective	1	200	1

StudentID	FirstName	LastName	CourseID
10	John	Walker	200
11	Tom	Hanks	400
12	Kevin	Star	400
13	Carl	Wall	200
14	Andrei	Apazniak	300
15	Mark	High	400
16	Clara	Star	100
17	John	Ocean	100
18	John	Walker	200
19	Pamela	Star	300
20	Carl	Wall	400

<===== Many to Many Relation ====>

To resolve Many to Many relation we need Linking Table

1) Find the names of the students whose instructor is Mark Adam
2) Find the names of the instuctors of Kevin Star
3) Find the names of the instuctors of Pamela Star

StudentID	FirstName	LastName
10	John	Walker
11	Tom	Hanks
12	Kevin	Star
13	Carl	Wall
14	Andrei	Apazniak
15	Mark	High
16	Clara	Star
17	John	Ocean
18	John	Walker
19	Pamela	Star
20	Carl	Wall

StudentID	InstructorID
12	1
11	2
12	2
13	1
15	1
17	3
15	4

InstructorID	FirstName	LastName	Phone	Department
1	Mark	Adam	1234567891	Science
2	Eve	Sky	1239876543	Engineering
3	Leo	Ocean	1237845691	Language
4	Andy	Mark	1232134567	Health