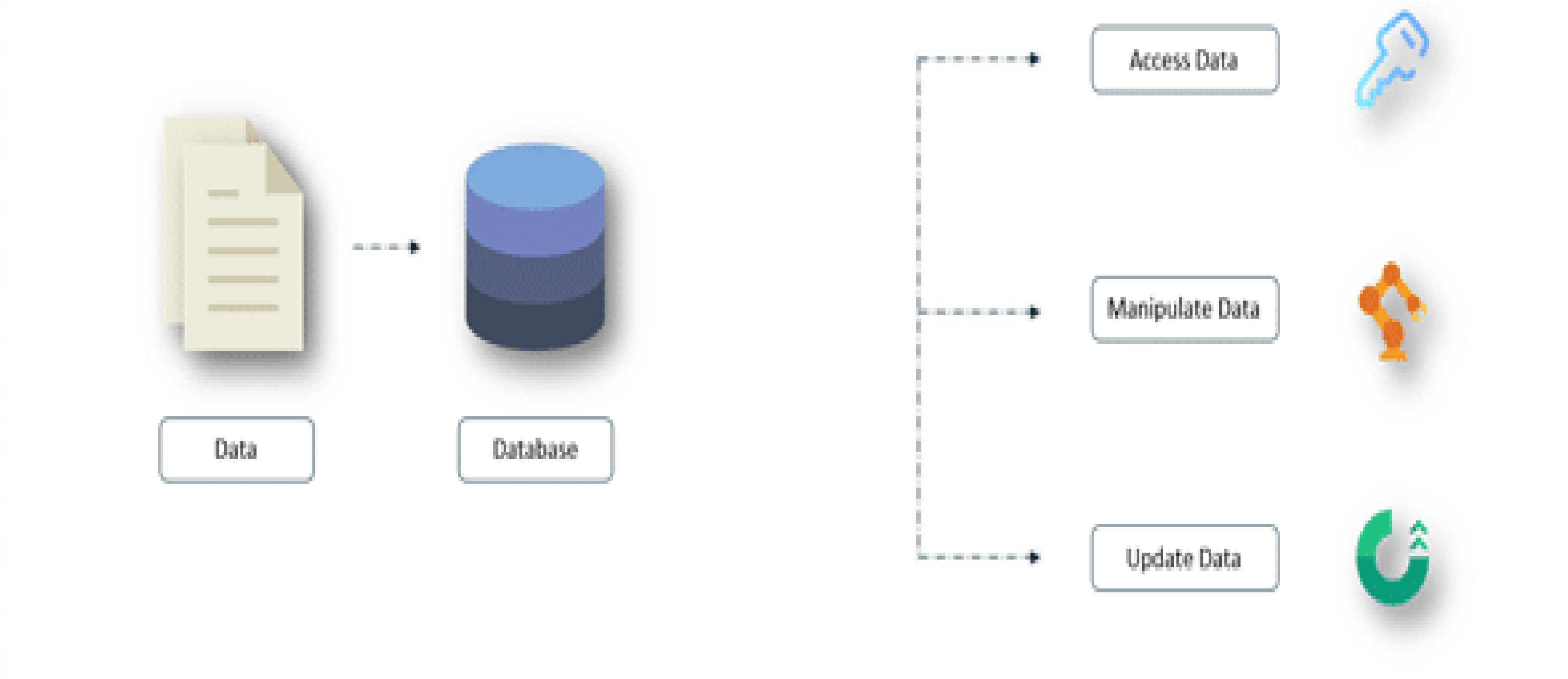
SQL For Testers

What Is a Database?

- A database is a well-organized collection of data that is stored in an electronic format. To be more specific, a SQL database is an electronic system that allows to easily access, manipulate, and update the data.



Why we need database?

- Difficult to manage data in Spreadsheets
- Manual Validation of data in Spreadsheets is difficult
- Flexibility to update data in Database
- Multiple people can edit the data at the same time

SQL Introduction

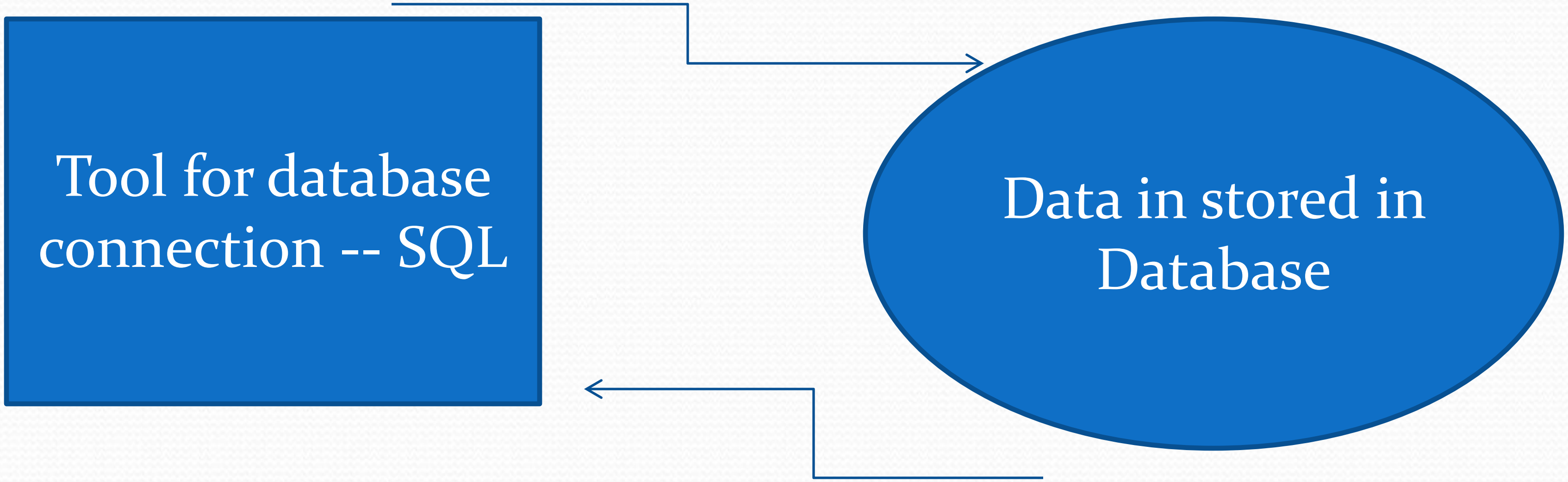
SQL- **S**tructured **Q**uery **L**anguage

- ➢ SQL is a standard language for storing, manipulating and retrieving data in databases
- ➢SQL keywords are **NOT case sensitive** Ex. SELECT as select
- ➢ Semicolon is the standard way to separate each SQL statement in database systems. ex. Select * from employee;
- ➢ SQL became a standard of the American National Standards Institute (ANSI) in 1986, and of the International Organization for Standardization (ISO) in 1987
- ➢Standard language for dealing with Relational Database which can be used to **Create**, **Read**, **Update** and **Delete** database records(**CRUD** Operations)

What SQL can do?

- SQL Can **execute queries** against database
- SQL Can **retrieve data** from a database
- SQL Can **Insert records** into a database
- SQL Can **Update records** into a database
- SQL Can **Delete data** from a database
- SQL Can create **new databases**
- SQL Can create **new tables**
- SQL Can create **stored procedures** in a database
- SQL can **create views** in a database
- SQL Can **Set permissions** on tables , procedure and views

Creating DB, Creating table, updating data in table, Delete

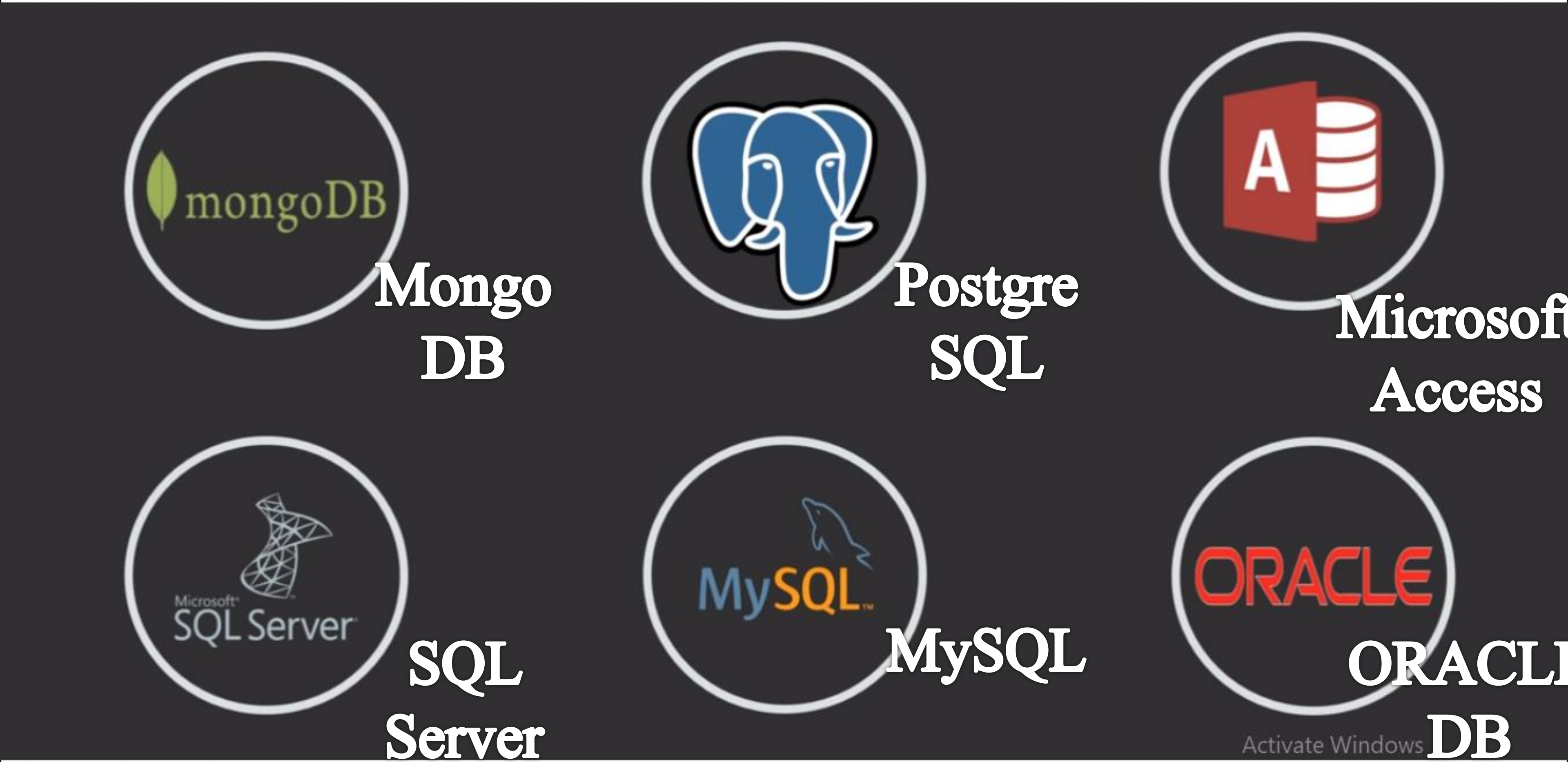


Tool for database connection -- SQL

Data in stored in Database

Retrieve data from db

Few Popular Databases Management Studio



Mongo DB

Postgre SQL

Microsoft Access

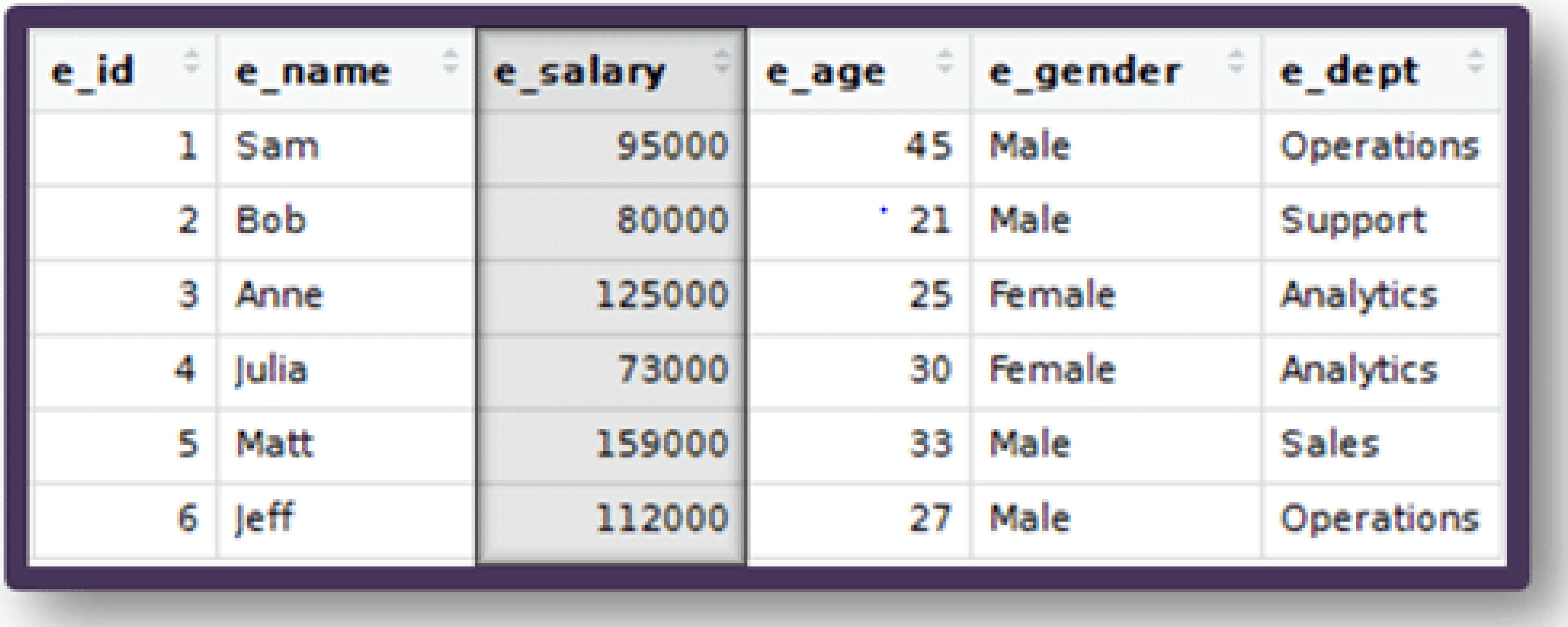
SQL Server

MySQL

ORACLE DB

Overview of Tables in SQL : Records and Fields

- Tables contain rows and columns, where the rows are known as records and the columns are known as fields.

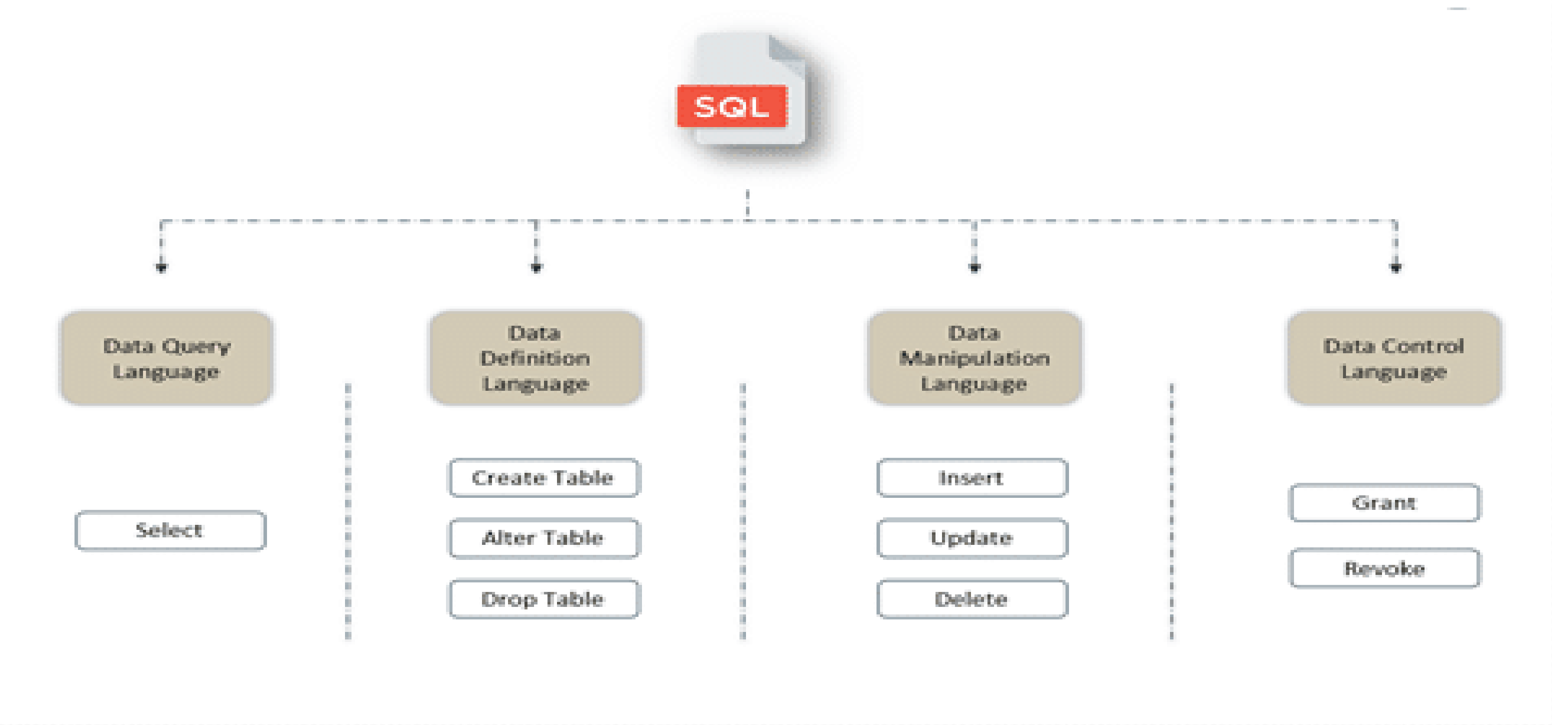


e_id	e_name	e_salary	e_age	e_gender	e_dept
1	Sam	95000	45	Male	Operations
2	Bob	80000	21	Male	Support
3	Anne	125000	25	Female	Analytics
4	Julia	73000	30	Female	Analytics
5	Matt	159000	33	Male	Sales
6	Jeff	112000	27	Male	Operations

Types of SQL Commands

SQL commands are traditionally divided into four categories:

- Data Query Language (DQL Commands in SQL)
- Data Definition Language (DDL Commands in SQL)
- Data Manipulation Language (DML Commands in SQL)
- Data Control Language (DCL Commands in SQL)



Types of SQL Commands Continued….

Data Query Language (DQL Commands in SQL)

- Data Query Language comprises only one command 'select.' This command can be accompanied by many other clauses to compose queries.

Data Definition Language (DDL Commands in SQL)

- The basic DDL commands in SQL are Create Tables, Alter Tables, and Drop Tables and Truncate Tables.

Command	What it does?
CREATE TABLE	It creates new table
DROP TABLE	It deletes the ENTIRE table
ALTER TABLE	Modifies the existing table
TRUNCATE TABLE	deletes the data inside a table, but not the table itself

Types of SQL Commands Continued….

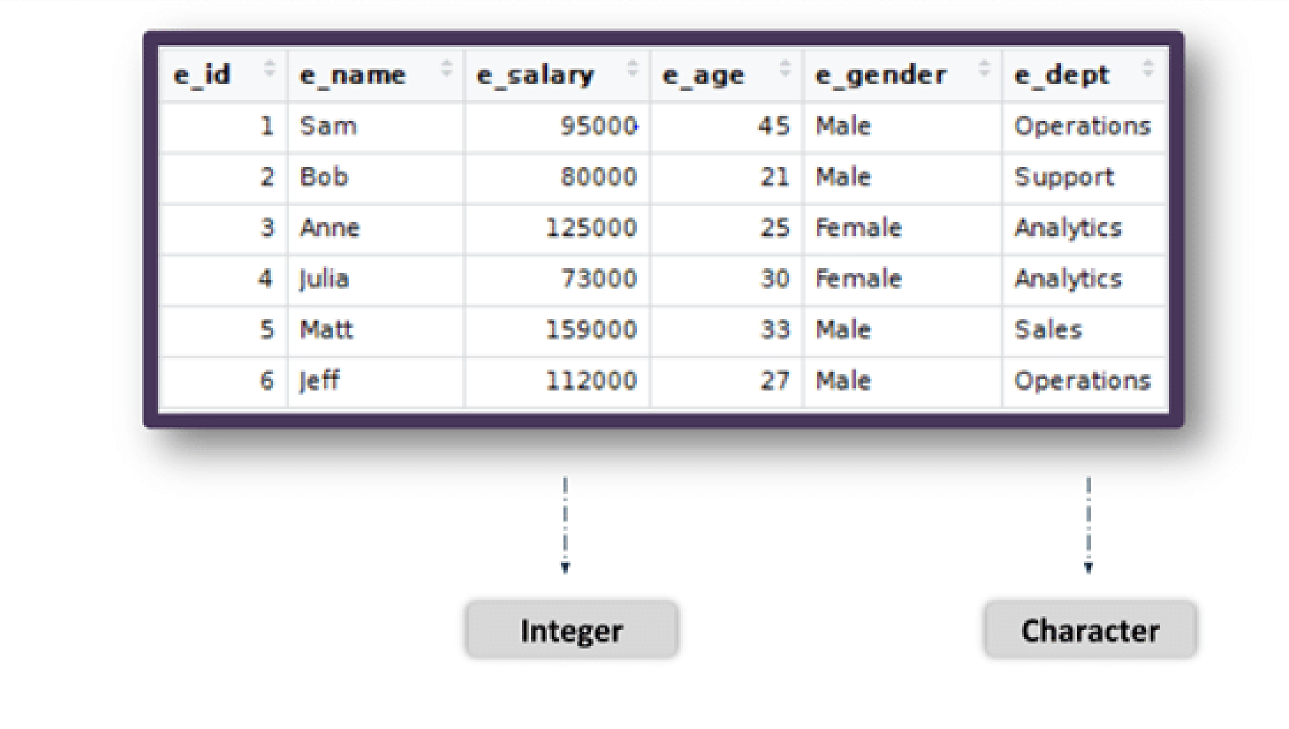
Data Manipulation Language (DML Commands in SQL)

- To deal with the data itself directly
- SQL Commands come under DML are as follows: INSERT, UPDATE, DELETE, SELECT

Command	What it does?
SELECT	Retrieve Information from the database
INSERT	Add new information to the database
UPDATE	Modifies the information currently stored in the database
DELETE	Delete information from the database

What Is SQL Data Types?

- Data type in SQL basically defines the kind of data that will go into a particular column. All entries of one particular column will be of the same data type.



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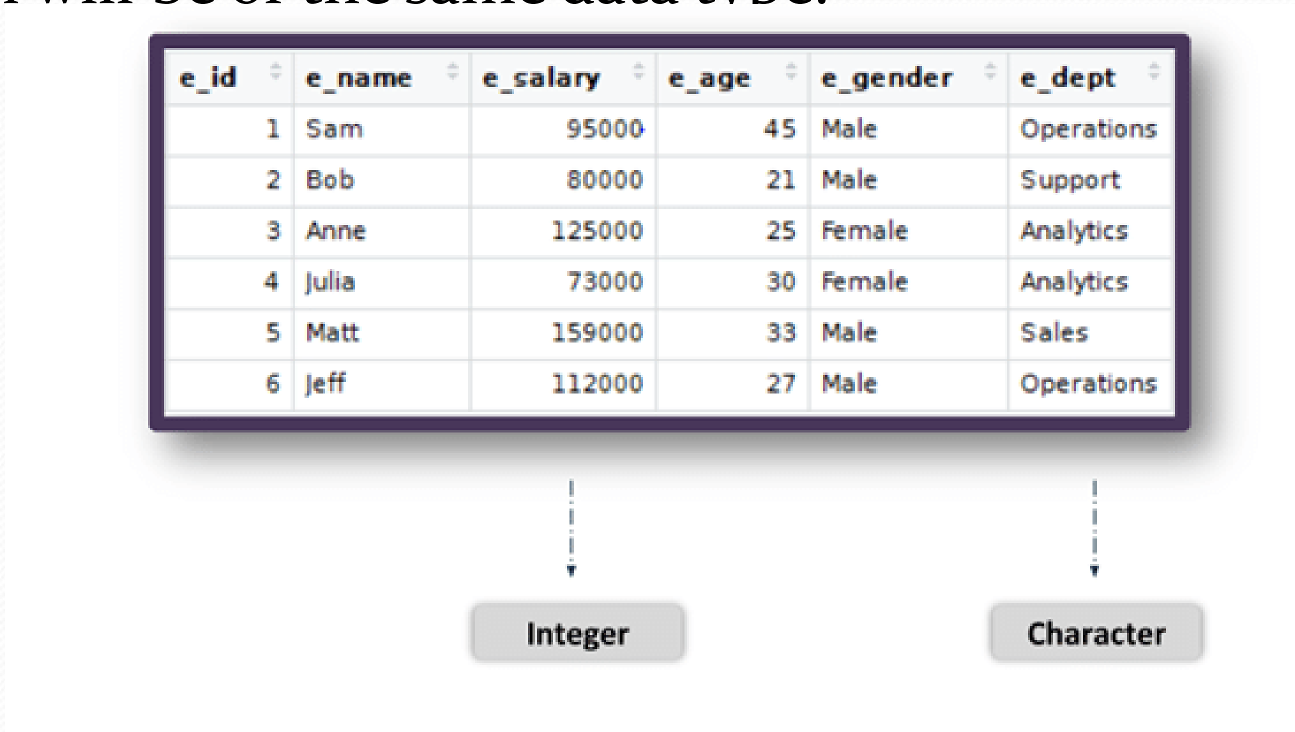
5	Matt	159000	33	Male	Sales
6	Jeff	112000	27	Male	Operations

Integer
Character

Different Data Types in SQL

- Data type in SQL basically defines the kind of data that will go into a particular column. All entries of one particular column will be of the same data type.



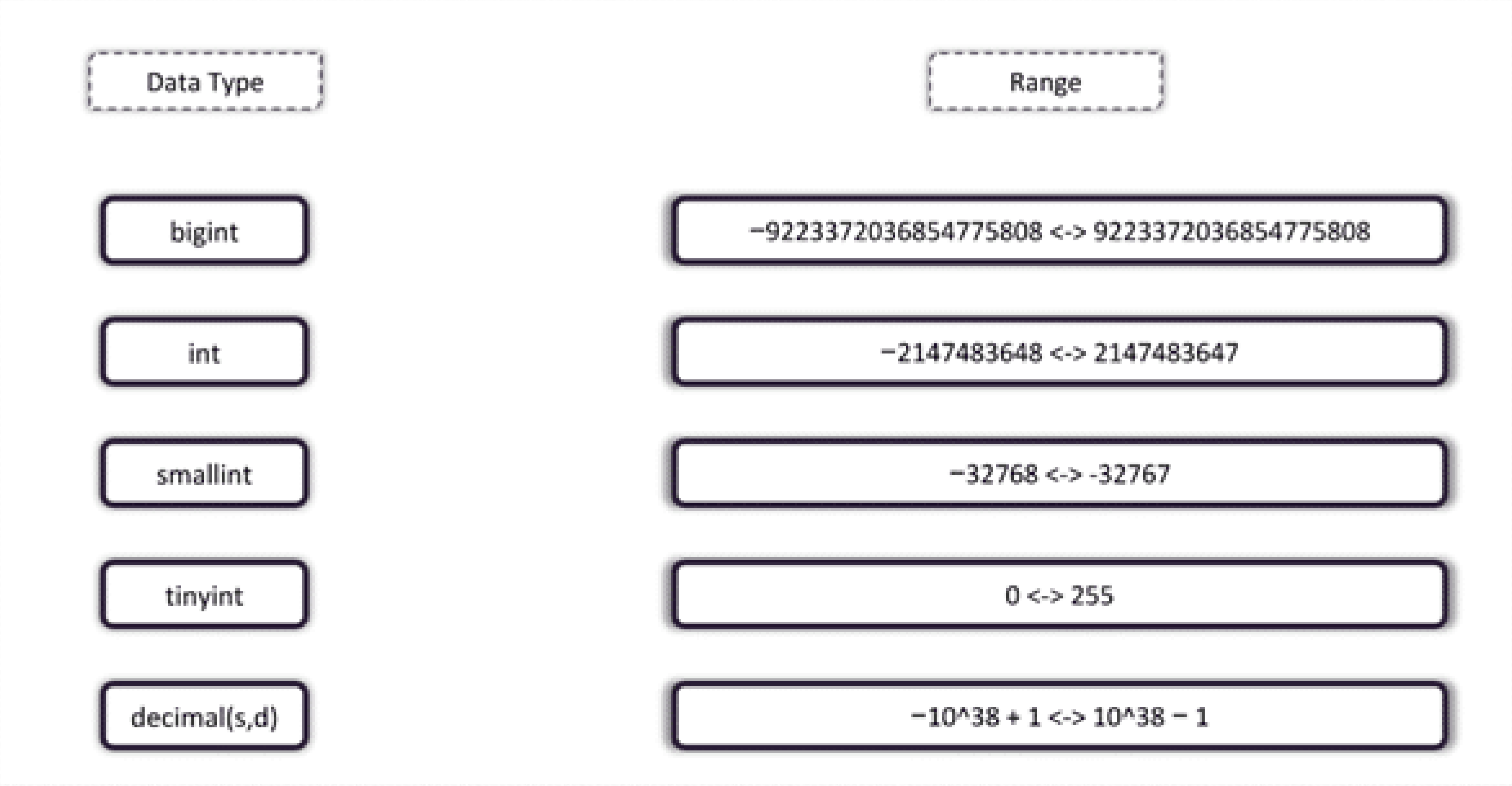
e_id	e_name	e_salary	e_age	e_gender	e_dept
1	Sam	95000	45	Male	Operations
2	Bob	80000	21	Male	Support
3	Anne	125000	25	Female	Analytics
4	Julia	73000	30	Female	Analytics
5	Matt	159000	33	Male	Sales
6	Jeff	112000	27	Male	Operations

Integer

Character

Different Data Types in SQL Continued…..

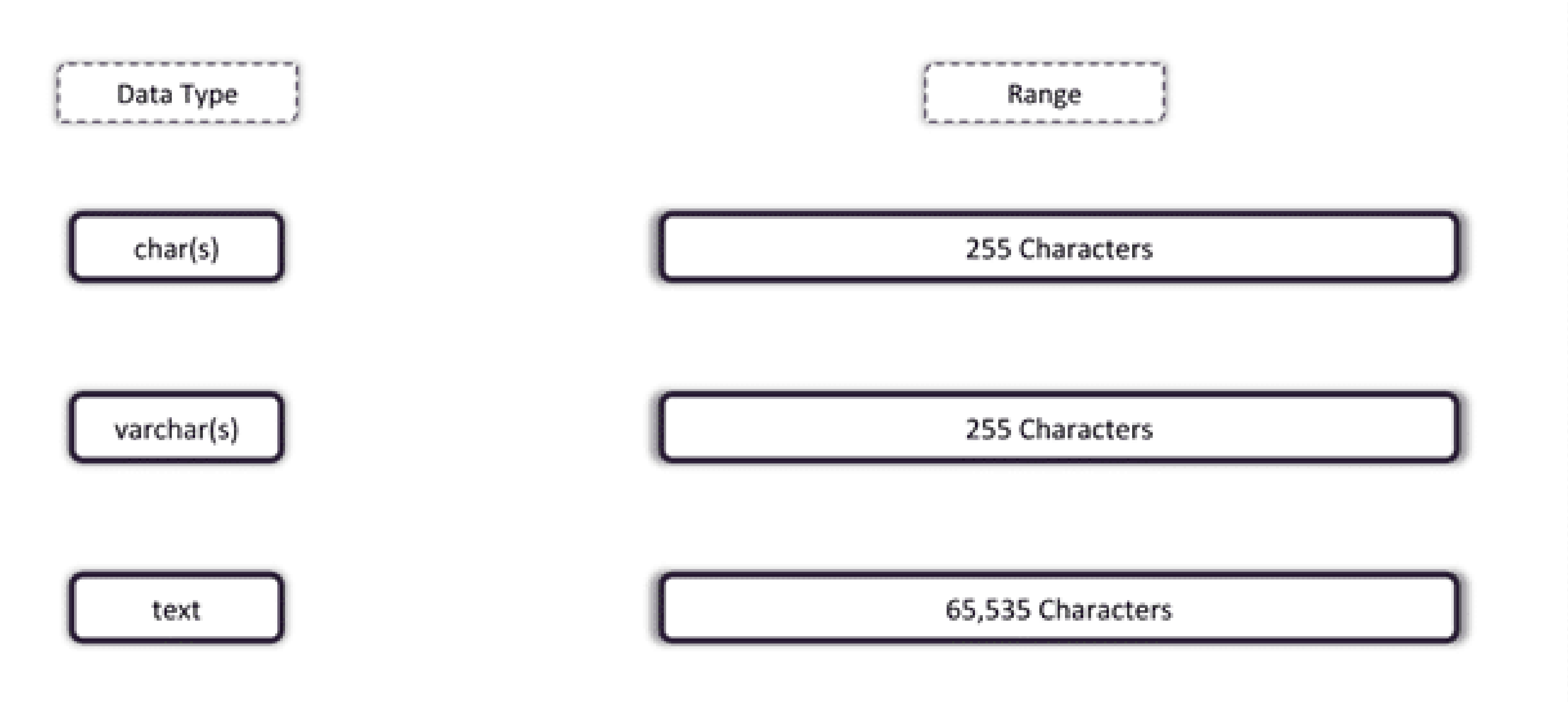
- **Numeric Data Types in SQL:** Numeric data types store all numerical values or integer values.



Data Type	Range
bigint	−9223372036854775808 <-> 9223372036854775808
int	−2147483648 <-> 2147483647
smallint	−32768 <-> -32767
tinyint	0 <-> 255
decimal(s,d)	−10^38 + 1 <-> 10^38 − 1

Different Data Types in SQL Continued…..

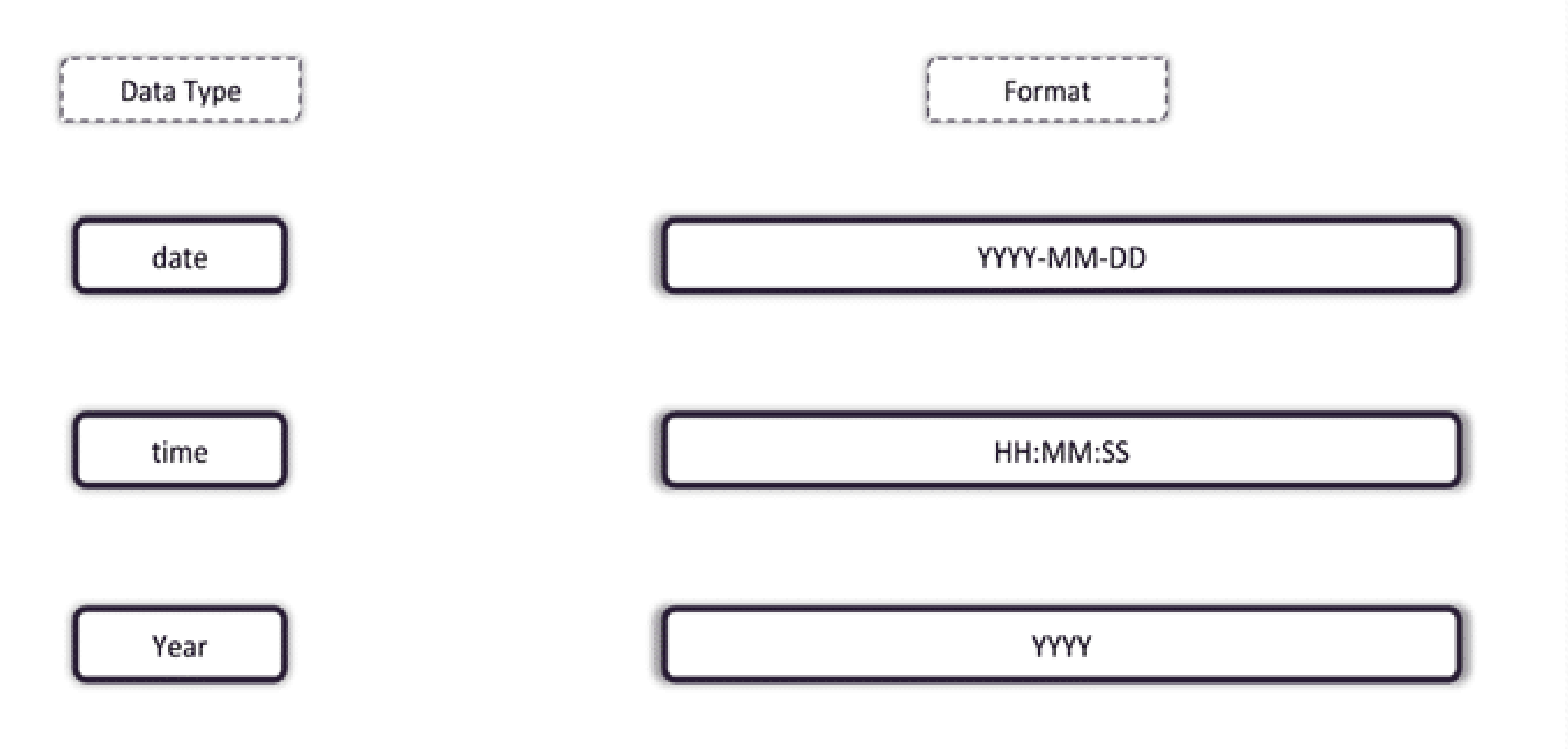
- **Character Data Types in SQL:** Character data types store all alphabetic values and special characters.



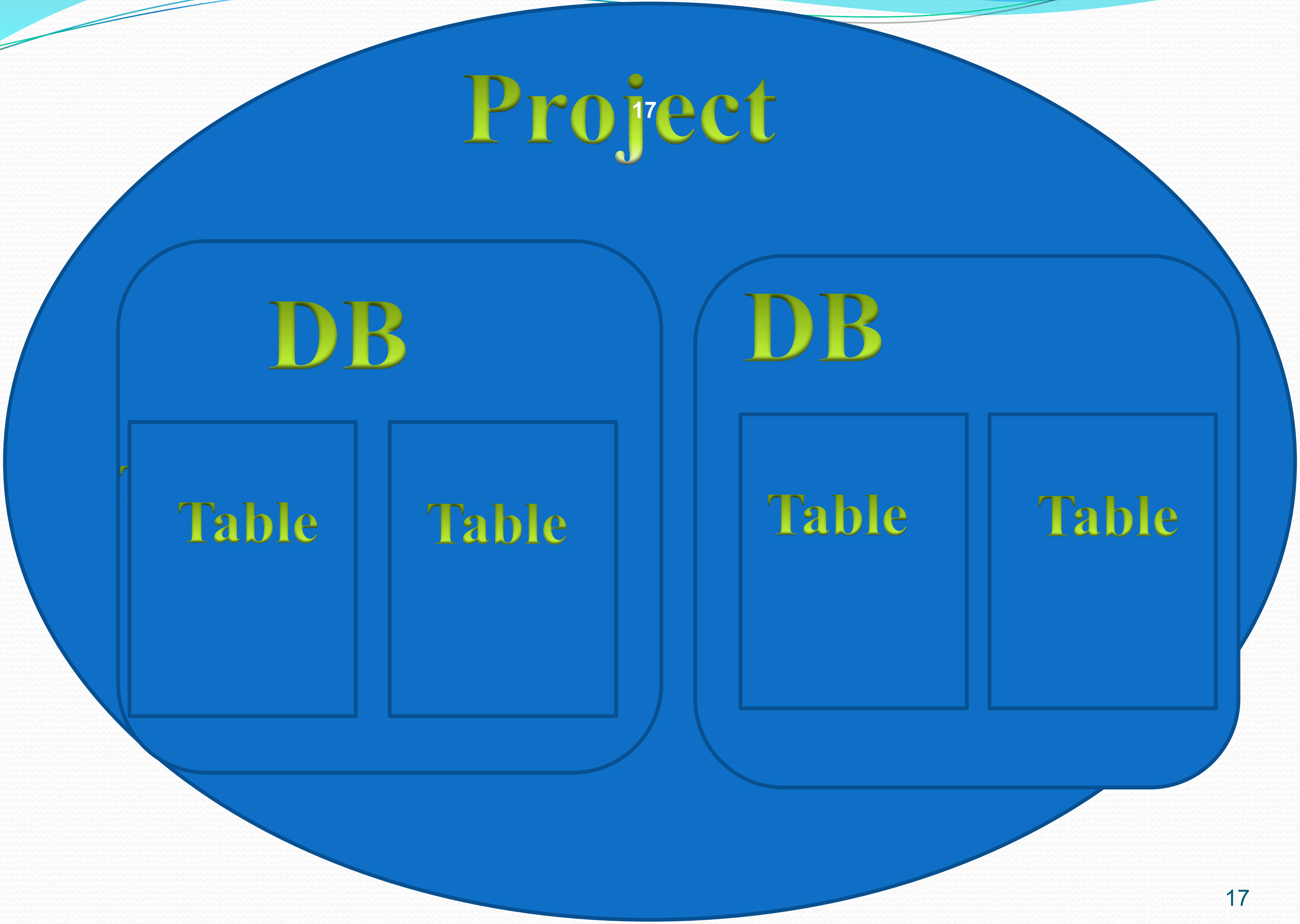
Data Type	Range
char(s)	255 Characters
varchar(s)	255 Characters
text	65,535 Characters

Different Data Types in SQL Continued…..

- **Date and Time Data Types in SQL:** Date and Time data types store a date or a date/time value.



Data Type	Format
date	YYYY-MM-DD
time	HH:MM:SS
Year	YYYY



Project

DB

Table

Table

DB

Table

Table

Tables in SQL

Product

Sr no./ PName	Price	Category	Manufacturer
Gizmo	$50	Gadgets	GizmoWorks
Powergizmo	$40	Gadgets	GizmoWorks
SingleTouch	$10	Photography	Canon
MultiTouch	$200	Household	Hitachi

Data Types in SQL

- Characters / String:
  - CHAR(20) -- fixed length
  - VARCHAR(255) -- variable length
- Numbers:
  - INT
  - REAL, FLOAT -- differ in precision
  - Decimal
- Times and dates:
  - DATE
  - DATETIME -- SQL Server
- Binary data type
  - Binary

SQL **DDL** command-

- **Create – Table & db**

Syntax- CREATE DATABASE *databasename*;

Ex. CREATE DATABASE velocity;

Syntax-

```
CREATE TABLE table_name (
    column1 datatype,
    column2 datatype,
    column3 datatype,    .... );
```

Ex.
```
CREATE TABLE Persons (
    PersonID int,
    LastName varchar(255),
    FirstName varchar(255),
    Address varchar(255),
    City varchar(255)   );
```

SQL **DDL** command-

❑ **Drop–** The DROP DATABASE, DROP TABLE statement is used to drop an existing SQL database, existing table in a database.

Syntax- DROP DATABASE *databasename*;
Ex. DROP DATABASE testDB;

Syntax- DROP TABLE *table_name*;
Ex. DROP TABLE Shippers;

❑ **Alter** - The ALTER TABLE statement is used to add, delete, or modify columns in an existing table.

Syntax- ALTER TABLE *table_name*
ADD *column_name datatype*;
Ex. ALTER TABLE Persons
ADD Email varchar(255);

SQL **DDL** command-

❑ **TRUNCATE–** The SQL TRUNCATE TABLE command is **used to delete complete data** from an existing table.

❑ You can also use DROP TABLE command to delete complete table but it would remove complete table structure form the database

Syntax- TRUNCATE TABLE table_name;

Ex. TRUNCATE TABLE CUSTOMERS;

Tables in SQL

VCTC

Fname	Lname	Gender	Mockresult	Location
Aditya	Patki	M	7	Nagpur
Atish	Jain	M	8	Nagpur
Deepka	Roy	F	7	Pune
Jason	Borges	M	7	Bider
Neha	Bedre	F	8	Pune
Neha	Joshi	F	9	Pune
Pooja	Patil	F	8	Abad
Shri	Patil			Goa

SQL **DML** command-

❑ **INSERT-** INSERT statement is used to insert a single record or multiple records into a table in SQL Server.

```
Syntax-  INSERT INTO  T.N. (C.N.1, C.N.2, ... )
         VALUES (value1, value2, ... );

Syntax- INSERT INTO T.N.
        VALUES (value1, value2, value3, ...);

Ex.      INSERT INTO VCTC VALUES('Adity','Patki','M',7,'Ngapur');
         INSERT INTO VCTC VALUES('Atish','Jain','M',7,'Ngapur');

Ex.      INSERT INTO VCTC  (Fname, Lname, Gender, Location)
                   VALUES(‘Amol',‘Reddy',‘M‘,‘Latur');
```

SQL **DML** command-

- ❑ **SELECT–** Select statement is used to fetch the data from a database table.

Syntax- SELECT * FROM T.N.;

SELECT C.N.S. FROM T.N.;

T.N.– indicates table_name
C.N.S– indicates Coloumn_names

Ex. SELECT * FROM VCTC;
SELECT Fname, Lname FROM VCTC;

SQL **DML** command-

- ❑ **DISTINCT** clause/keyword is used in conjunction with the SELECT statement to eliminate all the duplicate records and fetching only unique records.

Syntax- SELECT DISTINCT C.N.S. FROM T.N
SELECT DISTINCT * FROM T.N

Ex. SELECT DISTINCT Fname FROM VCTC

- ❑ **TOP** clause is used to fetch a TOP N number or X percent records from a table.

Syntax- SELECT TOP no./ percent C.N.S FROM T.N.

Ex. SELECT TOP 3 * FROM VCTC;

SQL **DML** command-

- ❑ **Aggregate Function-**

- ❑ **COUNT()** function returns the number of rows that matches.
- ❑ **AVG()** function returns the average value of a numeric column.
- ❑ **SUM()** function returns the total sum of a numeric column.
- ❑ **MAX()** function returns the max number of rows that matches a specified criterion.
- ❑ **MIN()** function returns the min value of a numeric column.

Syntax-

```
SELECT COUNT (C.N.) FROM   T.N.
SELECT AVG (C.N.) FROM    T.N.
SELECT SUM (C.N.) FROM   T.N.
SELECT MAX (C.N.) FROM  T.N.
SELECT  MIN (C.N.) FROM   T.N.
```

Ex.

```
SELECT COUNT  (Mockresult) FROM VCTC;
SELECT AVG  (Mockresult) FROM VCTC;
SELECT SUM (Mockresult) FROM VCTC;
```

SQL **DML** command-

- ❑ **WHERE** clause is used to specify a condition while fetching the data from a single table

Syntax- SELECT C.N.S. FROM T.N.
WHERE Condition

- ❑ Condition we can write as ---- (C.N. operators value)

Ex. SELECT * FROM VCTC
WHERE FName = ‘Neha’;

SQL **DML** command-

- **AND, OR, NOT-** operators are used to combine multiple conditions to narrow data in an SQL statement.

Syntax- SELECT C.N.S. FROM T.N.
WHERE Condition AND Condition
Syntax- SELECT C.N.S. FROM T.N.
WHERE Condition OR Condition
Syntax- SELECT C.N.S. FROM T.N.
WHERE NOT Condition

Ex. SELECT * FROM VCTC
Where Fname = ‘Aditya’ AND Lname = ‘Patki’ ;
Ex. SELECT * FROM VCTC
Where Fname = ‘Aditya’ OR Lname = ‘Shabe’ ;
Ex. SELECT * FROM VCTC
Where NOT Fname = ‘Aditya’ ;

SQL **DML** command-

❑ **LIKE** clause is used to compare a value to similar values using **wildcard operators.** There are two wildcards used in conjunction with the LIKE operator.

❑ **Wildcard operates** – 1. **percent sign (%)** → Matches one or more characters.
2. **underscore (_)** → Matches one character.
3. **[charlist]%** → Matches more characters in charlist
4. **[! charlist]%** → Not matches characters sequence

Syntax- SELECT C.N.S FROM T.N.
WHERE C.N. LIKE 'Pattern'

Ex. SELECT * FROM VCTC
where Fname LIKE 'Adi%';
Ex. SELECT * FROM VCTC
where Fname LIKE 'Adi_y';
Ex. SELECT * FROM VCTC
where Fname LIKE '[AN]% ';

SQL **DML** command-

❑ **BETWEEN** keyword / operator used to selects values within a given range with a WHERE clause

```
Syntax-  SELECT  C.N.S FROM  T.N.
            WHERE  C.N. BETWEEN  Value1 AND  Value2

Ex. SELECT * FROM  VCTC
WHERE  Mockresult  BETWEEN 6  AND  9;
```

❑ **IN** keyword / operator allows you to specify multiple values in a WHERE clause

```
Syntax-  SELECT  C.N.S FROM  T.N.
            WHERE  C.N.  IN  (Value1, Value2, Value3)

Ex. SELECT * FROM  VCTC
WHERE Mockresult  IN  ( 6 , 9);
```

SQL **DML** command-

❑ **IS NULL & IS NOT NULL -** keyword / operator used with WHERE clause.

❑ To test NULL values, We will have to use the IS NULL and IS NOT NULL operators

Syntax- SELECT C.N.S FROM T.N.
WHERE C.N. IS NULL

Ex. SELECT * FROM VCTC
WHERE Mockresult C.N. IS NOT NULL ;

SQL **DML** command-

❑ **Order By-** ORDER BY clause is used to sort the records in your result set

Syntax- SELECT C.N.S FROM T.N.

ORDER BY C.N.S ASC | DESC;

Ex. SELECT * FROM VCTC

ORDER BY *Fname*, *Loaction* ASC;

❑ **Alise -** COLUMN ALIASES are used to make changes column headings in your result set easier to read & same as TABLE ALIASES are used to shorten your SQL to make it easier to read.

Syntax- C.N. [AS] alias_name

T. N. [AS] alias_name

Ex. SELECT * FROM VCTC [AS] VV

Ex. SELECT Fanme as FN FROM VCTC WHERE FN = “Pooja”

SQL **DML** command-

❑ **Update-** UPDATE statement is used to update existing records in a table in a SQL Server database.

Syntax-

```
UPDATE  T.N.
SET  C.N.1 = Value1, C.N. 2= Value2,...
WHERE condition;
```

Ex.

```
UPDATE  VCTC
SET  Fname = ‘Ams’, Lname= ‘ Navalagire’
WHERE  Fname = ‘ Amol’
```

❑ **Delete-** DELETE statement is used to delete a single record or multiple records from a table in SQL Server.

Syntax-

```
DELETE   FROM  T.N. WHERE condition;
```

Ex.

```
DELETE   FROM  VCTC  WHERE   Fname = ‘Amol’
```

SQL **DML** command-

❑ **Union -** UNION operator is used to **combine the result sets of 2 or more SELECT** statements. It **removes duplicate rows** between the various SELECT statements.

❑ Each SELECT statement within the UNION operator must have the same number of columns in the result sets with similar data types.

Syntax-

```
SELECT  C.N.S  FROM  T.N 1.
UNION
SELECT  C.N.S  FROM  T.N 2;
```

Ex.

```
SELECT  *  FROM  VCTC.
UNION
SELECT  *  FROM  VKVP;
```

❑ **Union All -** UNION ALL operator is used to combine the result sets of 2 or more SELECT statements. It **returns all rows** from the query and it does not remove duplicate rows between the various SELECT statements.

Each SELECT statement within the SQL Server UNION ALL operator must have the same number of fields in the result sets with similar data types.

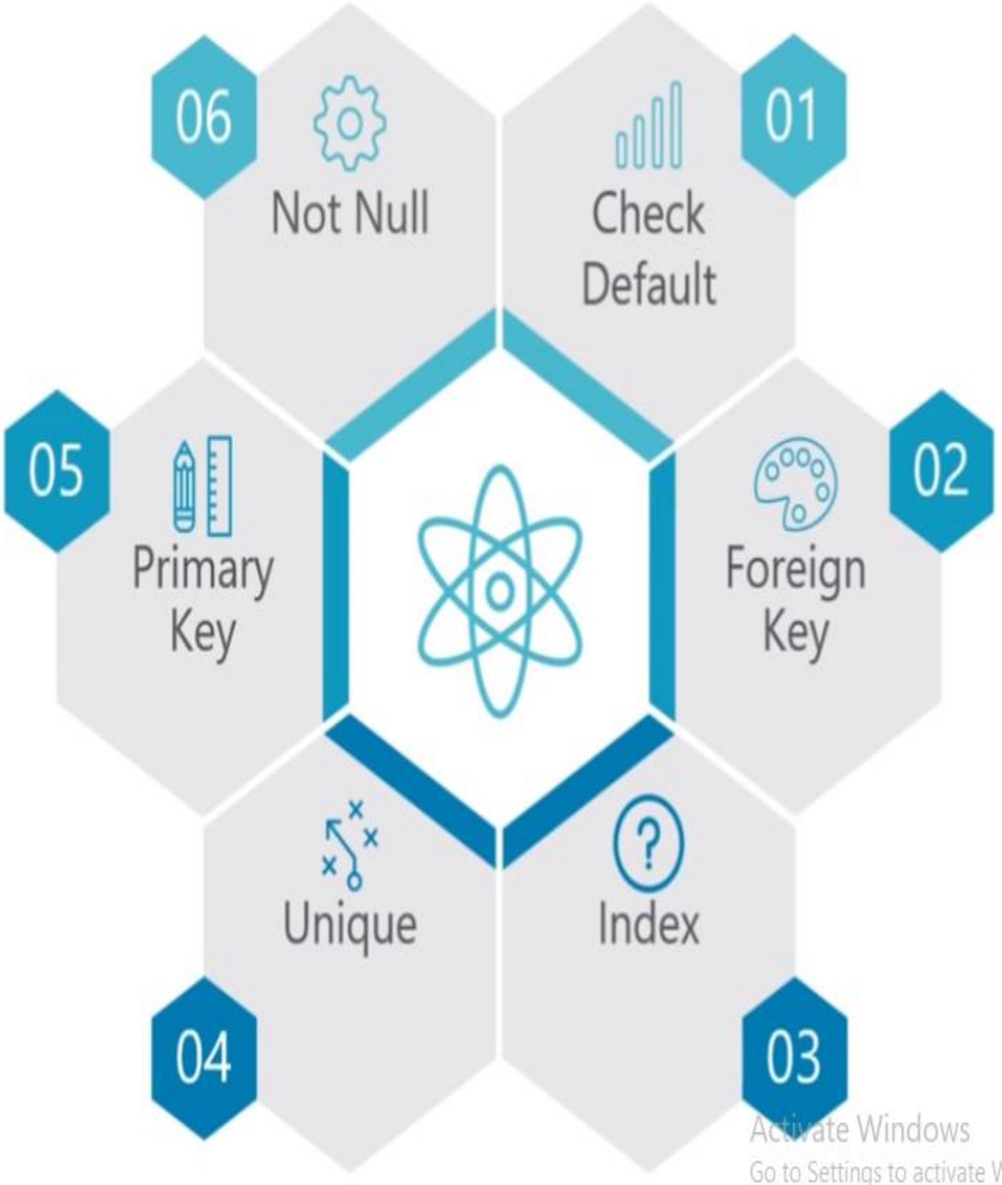
SQL **DML** command-

- **SELECT INTO-** SELECT INTO statement is used to **create a table from an existing table** by copying the existing table's columns.

```
Syntax- SELECT  C.N.S
        INTO  new  T. N.  [In db]
        FROM  old T. N. ;

Ex.     SELECT  *
        INTO  VCTCViman
        FROM  VCTC;
```

TABLE CONSTRAINTS



01 Check Default

02 Foreign Key

03 Index

04 Unique

05 Primary Key

06 Not Null

SQL Table constrains-

❑ SQL constraints are used to **specify rules for data in a table**. Constraints can be used when the table is created with the CREATE TABLE statement

❑ **NOT NULL -** The NOT NULL constraint forces a column to **NOT accept NULL values**. Becz while creating table if value not present it take NULL value in C.N.

❑ **UNIQUE -** The UNIQUE constraint ensures, **all values** in a column are **different.**

❑ **PRIMARY KEY -** The PRIMARY KEY constraint uniquely identifies each record in a table. Primary keys must contain **UNIQUE values**, and cannot contain **NULL** values.

❑ **FOREIGN KEY -** A FOREIGN KEY is a key used to **link two tables together**. A FOREIGN KEY is a field (or collection of fields) in one table that refers to the PRIMARY KEY in another table.

❑ **CHECK -** The CHECK constraint is used to **limit the value range** that can be placed in a column. If you define a CHECK constraint on a single column it allows only certain values for this column.

❑ **DEFAULT -** The DEFAULT constraint is used to provide a **default value** for a column.

SQL Table constrains-

❑ SQL constraints are used to **specify rules for data in a table**. Constraints can be used when the table is created with the CREATE TABLE statement

```
Syntax- CREATE TABLE  T.N. (
          C.N.1  datatype  constraint,
          C.N 2  datatype  constraint,
          C.N.3  datatype  constraint,     ....);

          Ex. CREATE TABLE  VCTC (
             Sr No          int               Primary Key,
             Fname          varchar(255)      Not Null,
             Lname          varchar(255)      ,
             Mockresult     int               Check (Mockresult  < 10) ,
             Location       varchar(255)      Default  ‘Punevctc’
             Mobileno       int               Unique   );
```

Constrains Difference-

Primary Key	Foreign Key	Unique Key
The PRIMARY KEY constraint uniquely identifies each record in a table. Primary keys must contain UNIQUE values	A FOREIGN KEY is a key used to link two tables together. A FOREIGN KEY is a field (or collection of fields) in one table that refers to the PRIMARY KEY in another table.	The UNIQUE constraint ensures that all values in a column are different.
Primary key cannot have a NULL value.	Foreign key can accept multiple null value.	Unique Constraint may have a NULL value.
Each table can have only one primary key.	We can have more than one foreign key in a table.	Each table can have more than one Unique Constraint.
Primary key is clustered index	Foreign keys do not automatically create an index, clustered or non-clustered	Unique key is a unique non-clustered index

SQL Join-

- ❑ JOINS are used to **retrieve data from multiple tables**. A SQL Server JOIN is performed whenever two or more tables are joined in a SQL statement.

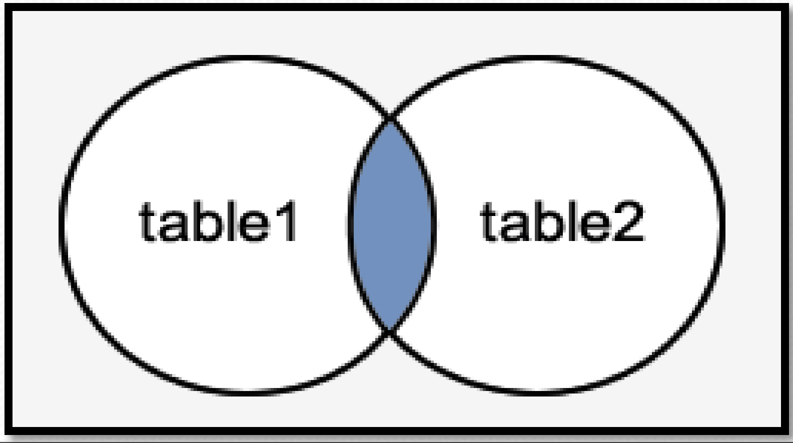
- ❑ There are 5 different types of SQL Server joins:

1. INNER JOIN 2. LEFT JOIN
3. RIGHT JOIN 4. FULL JOIN 5. SELF JOIN

Syntax -

```
SELECT  TN1 . CN1, TN1 . CN2, TN2 . CN1, TN2 . CN2
FROM  TN1
INNER JOIN  TN2
ON  TN1 . CN (Primary Key) = TN2 . CN (Foreign Key)
```

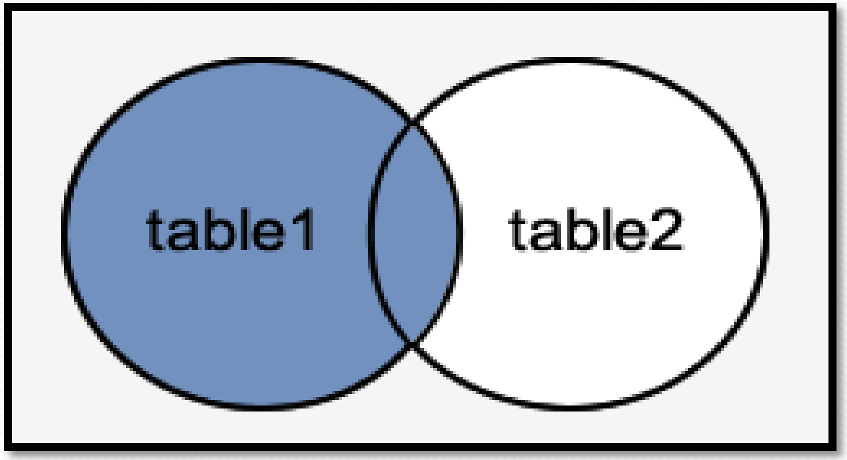
- ❑ **INNER JOIN** - It is the most common type of join. SQL Server INNER JOINS return all rows from multiple tables where two table contains common values in the join condition is met.

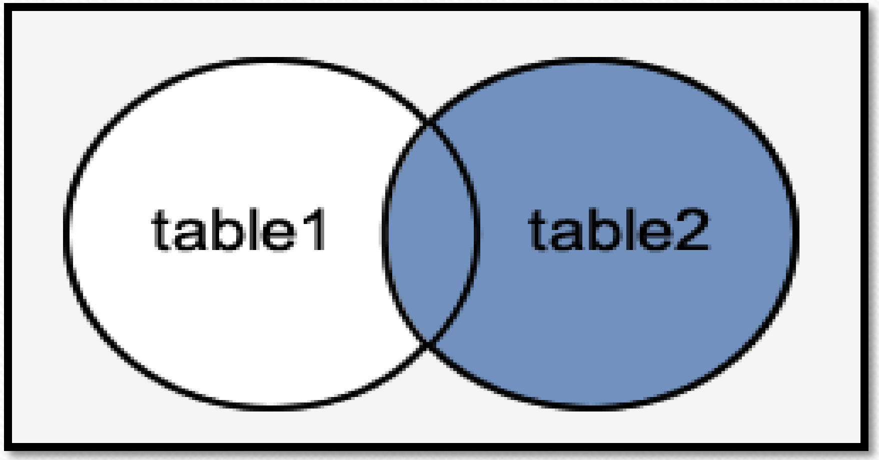


SQL Join-

- ❑ **LEFT JOIN** - join returns all rows from the LEFT-hand table specified in the ON condition and **only** those rows from the other table where the joined fields are equal (join condition is met).

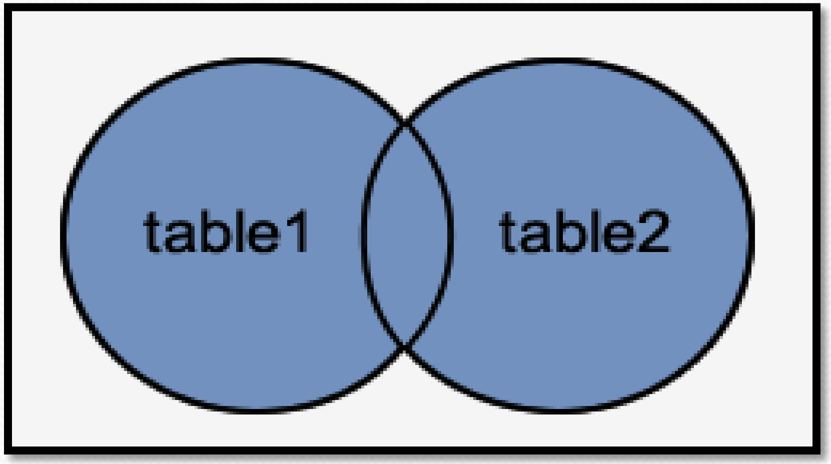
- ❑ **RIGHT JOIN** - This type of join returns all rows from the RIGHT-hand table specified in the ON condition and **only** those rows from the other table where the joined fields are equal (join condition is met).





SQL Join-

- ❑ **FULL JOIN** - This type of join returns all rows from the LEFT-hand table and RIGHT-hand table with nulls in place where the join condition is not met.



- ❑ **SELF JOIN** - A self join is a join in which a table is joined with itself (which is also called Unary relationships). The self join can be viewed as a join of two copies of the same table. The table is not actually copied, but SQL performs the command as though it were.

Syntax -
```
SELECT TN1 . CN , TN2 . CN
FROM TN1 , TN2
WHERE T1 . CN = T2 . CN
```

SQL Group By-

- **Group By** - The GROUP BY statement is often used with aggregate functions (COUNT, MAX, MIN, SUM, AVG) to group the result-set by one or more columns.

  Syntax-

  ```
  SELECT   C.N.S,  Aggregate_function (CN)
  FROM     T.N
  GROUP BY  C.N.S
  ```

- **Having Clause-** HAVING clause is used in combination with the GROUP BY clause to provide a specific condition.

  Ex. -

  ```
  SELECT   Fname,  Count (*)
  FROM     VCTC
  GROUP  BY  Fname
  HAVING Count (*)  >  1
  ```

SQL View & Index & SP -

- ❑ **View** –A view is a virtual table whose contents are defined by a query

Syntax-

```
CREATE VIEW view_name AS
SELECT  C.N.S
FROM   T.N.
WHERE  condition;
```

- ❑ **Index** –Indexes are used to retrieve data from the database more quickly than otherwise. The users cannot see the indexes, they are just used to speed up searches/queries.

Syntax-

```
CREATE INDEX index_name
ON   T.N. (C.N);
```

Ex-

```
CREATE INDEX  Vctclist
ON   VCTC (StudentID);
```

SQL Questions-

1. Explain DML and DDL?
2. How many Aggregate functions are available in SQL?
3. What is the difference in BETWEEN and IN condition operators?
4. What is the difference between the HAVING clause and WHERE clause?
5. What is the difference between DELETE, TRUNCATE & DROP ?
6. What are different Clauses used in SQL?
7. What are different SQL constraints?
8. What is the difference between UNIQUE key, PRIMARY KEY & FORGIN KEY constraints?
9. What are different JOINS used in SQL?

SQL Questions-

10. How to write a query to show the details of a student from Students table whose name start with K?
11.What is the syntax to add a record to a table?
12. What is the syntax of GROUP BY in SQL?
13. Define the SQL DELETE statement.
14. Write a SQL SELECT query that only returns each name only once from a table?
15. Write an SQL query to get the first maximum salary of an employee from a table named employee_table.
16. Write an SQL query to get the second maximum salary of an employee from a table named employee_table.
17. Write an SQL query to get the third maximum salary of an employee from a table named employee_table.

SQL Questions-

18. Write an SQL query to fetch unique values from a table?
19. Write an SQL query to fetch data from table whose name start with Vipul & Krishna?
20 Write an SQL query to print details of the Workers whose SALARY lies between 100000 and 500000.
21. Write an SQL query to print details of the Workers who have joined in Feb'2014.
22. Write an SQL query to fetch the count of employees working in the department 'Admin'.
23. Write an SQL query to fetch worker names with salaries >= 50000 and <= 100000.

24. What do you mean by Stored Procedures? How do we use it?
25. What are the Indexes & Views in SQL?
26. What is schema?

SQL Questions-

For practice see SQL quires in below link

https://www.techbeamers.com/sql-query-questions-answers-for-practice/