WELCOME, TO SQL COURSE

BASIC STEP BY STEP ADVANCE

By Vishal Chauhan

Complete SQL With Notes

1.Introduction to SQL-What Is SQL & Database

2.Data Types, Primary-Foreign Keys & Constraints

a.Install postgresqland pgadmin4

3.Create Table In SQL & Create Database

4.INSERT UPDATE, DELETE & ALTER Table

5.SELECT Statement & WHERE Clause with Example

6.How To Import Excel File (CSV) to SQL

7.Functions in SQL & String Function

8.Aggregate Functions –Types & Syntax

9.Group By and Having Clause

10.Time Stamp and Extract Function, Date Time Function

11.SQL JOINS –Types & Syntax

12.SELF JOIN, UNION & UNION ALL

13. Subquery

14.Window Function –Types & Syntax

15.Case Statement/Expression with examples

16.CTE-Common Table Expression with examples

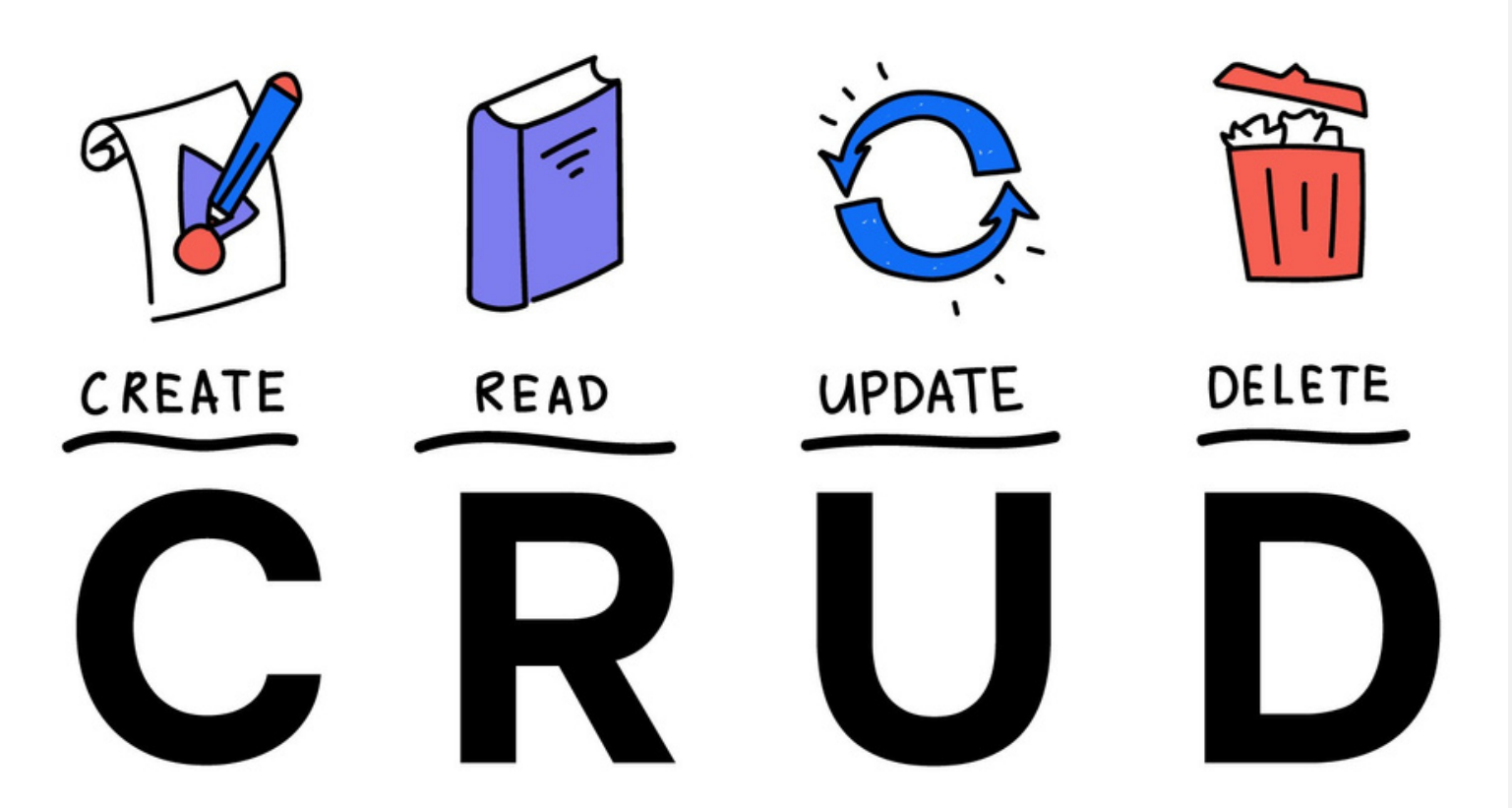
Introduction to SQL

- What is SQL
- It’s applications
- SQL v/s NoSQL
- Types of SQL Commands
- What is Database
- Excel v/s Database in SQL

What is SQL?

SQL (Structured Query Language) is a programming language used to interact with database

SQL Application



CRUD is an acronym for CREATE, READ(SELECT), UPDATE, and DELETE statements in SQL

SQL v/s NoSQL

Relational Database	Non-Relational Database
SQL database	NoSQL database
Data stored in tables	Data stored are either key-value pairs, document-based, graph databases or wide-column stores
These databases have fixed or static or predefined schema	They have dynamic schema
Low performance with huge volumes of data Eg: PostgreSQL, MySQL, MS SQL Server	Easily work with huge volumes of data Eg: MongoDB, Cassandra, Hbase

SQL Commands

There are mainly 3 types of SQL commands:

- **DDL**(Data Definition Language): create, alter, and drop
- **DML**(Data Manipulation Language): select, insert, update and delete
- **DCL**(Data Control Language): grant and revoke permission to users

What is Database?

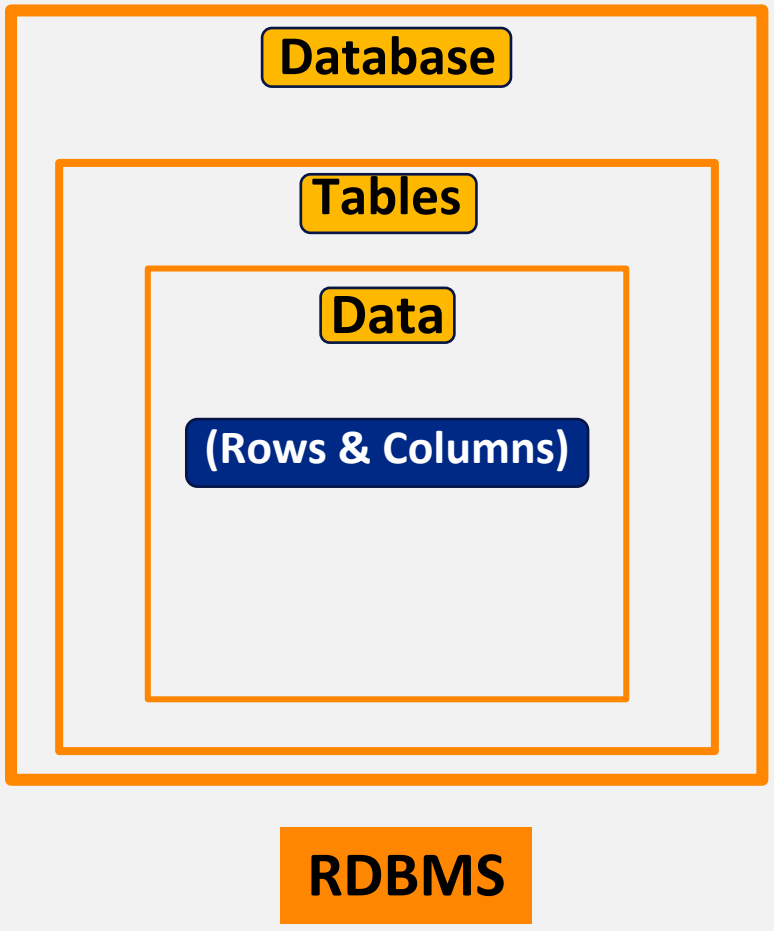
Database is a system that allow users to store and organise data

Excel v/s Database

Excel	Database
Easy to use-untrained person can work	Trained person can work
Data stored less data	Stores large amount of data
Good for one time analysis, quick charts	Can automate tasks
No data integrity due to manual operation	High data integrity
Low search/filter capabilities	High search/filter capabilities

SQL Databases

SQL Structure



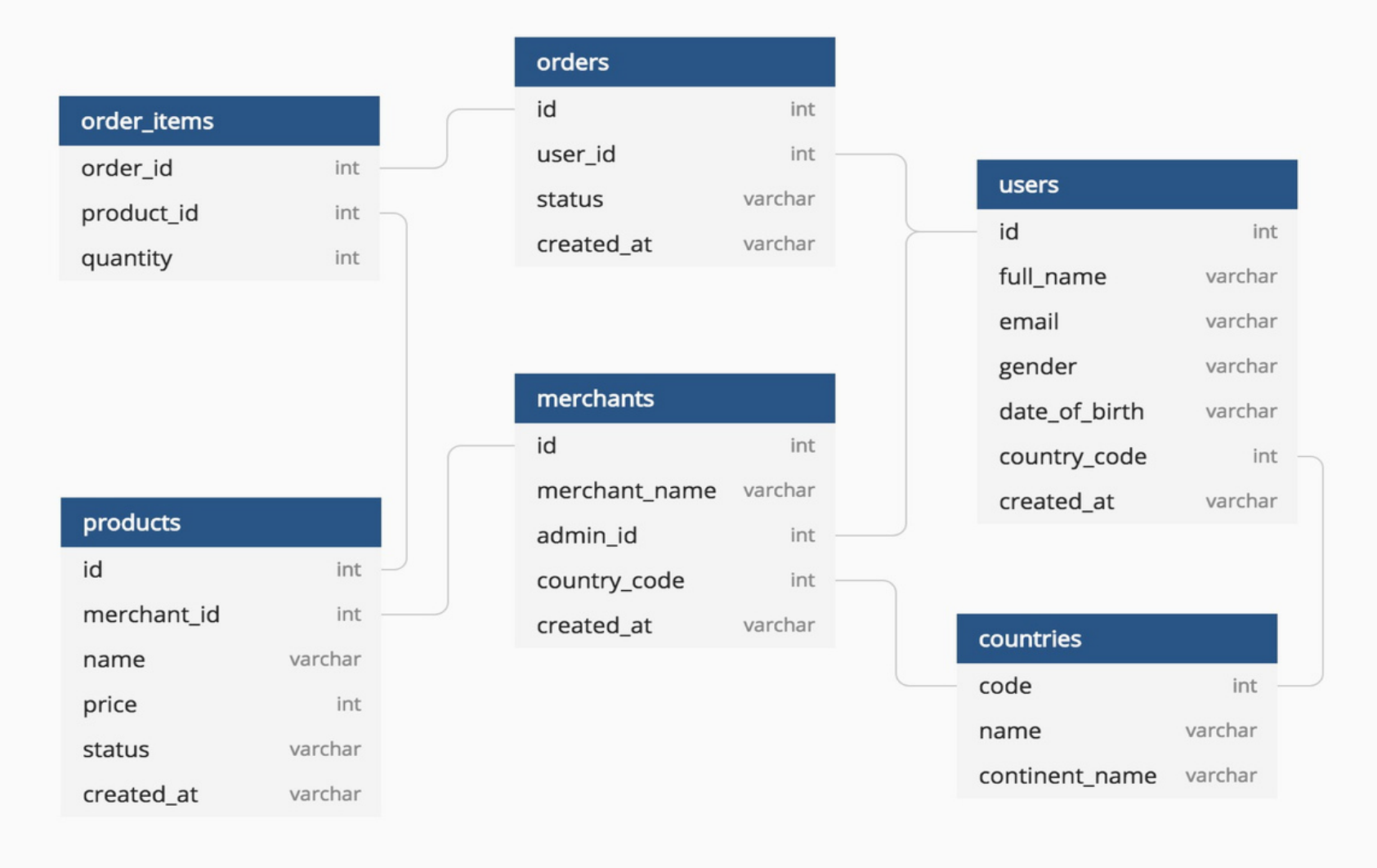
Example

Columns

Rows

```
mysql> SELECT* FROM employee;
+--------+----------+--------------------+---------+---------+
| emp_id | emp_name | emp_dept           | emp_age | emp_sex |
+--------+----------+--------------------+---------+---------+
| E00001 | JHONNY   | BACKEND DEVELOPER  |      26 | male    |
| E00002 | DARSHI   | NULL               |      27 | male    |
| E00003 | JASMINE  | NULL               |      37 | female  |
| E00004 | LILLY    | NULL               |      47 | female  |
| E00005 | RONALD   | UI DEVELOPER       |      26 | male    |
+--------+----------+--------------------+---------+---------+
5 rows in set (0.01 sec)
```

Database Diagram



Example

Creating Database & Tables

- Data types
- Primary & Foreign keys
- Constraints
- SQL Commands
  - CREATE
  - INSERT
  - UPDATE
  - BACKUP
  - DELETE
  - ALTER
  - DROP, TRUNCATE

Data Types

- Data type of a column defines what value the column can store in table
- Defined while creating tables in database
- Data types mainly classified into three categories + most used
  - String: char, varchar, etc
  - Numeric: int, float, bool, etc
  - Date and time: date, datetime, etc

Data Types

Commonly Used data types in SQL:

- **int:** used for the integer value
- **float:**used to specify a decimal point number
- **bool:**used to specify Boolean values true and false
- **char:**fixed length string that can contain numbers, letters, and special characters
- **varchar:**variable length string that can contain numbers, letters, and special characters
- **date:**date format YYYY-MM-DD
- **datetime:**date & time combination, format is YYYY-MM-DD hh:mm:ss

Primary and Foreign Keys:

Primary key (PK):

- A Primary key is a unique column we set in a table to easily identify and locate data in queries
- A table can have only one primary key, which should be unique and NOT NULL

Foreign keys (FK):

- A Foreign key is a column used to link two or more tables together
- A table can have any number of foreign keys, can contain duplicate and NULL values

Constraints

- Constraints are used to specify rules for data in a table
- This ensures the accuracy and reliability of the data in the table
- Constraints can be specified when the table is created with the CREATE TABLE statement, or
- after the table is created with the ALTER TABLE statement
- Syntax

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

Constraints

Commonly used constraints in SQL:

- NOT NULL -Ensures that a column cannot have a NULL value
- UNIQUE -Ensures that all values in a column are different
- PRIMARY KEY -A combination of a NOT NULL and UNIQUE
- FOREIGN KEY -Prevents actions that would destroy links between tables (used to link multiple tables together)
- CHECK -Ensures that the values in a column satisfies a specific condition
- DEFAULT -Sets a default value for a column if no value is specified
- CREATE INDEX -Used to create and retrieve data from the database very quickly

Creating Database & Tables

SQL Tutorial

Create Table

The CREATE TABLE statement is used to create a new table in a database • Syntax

```
CREATE TABLE table_name
(
    column_name1 datatypeconstraint,
    column_name2 datatypeconstraint,
    column_name3 datatypeconstraint,
);
```

- **Example**

```
CREATE TABLE customer
(
CustIDint8 PRIMARY KEY,
    CustNamevarchar(50) NOT NULL,
Age int NOT NULL,
City char(50),
Salary numeric
);
```

Insert, Update, Delete Values in Table

+

Alter, Drop & Truncate Table

SQL Tutorial

Insert Values In Table

The INSERT INTO statement is used to insert new records in a table • Syntax

```
INSERT INTO TABLE_NAME
(column1, column2, column3,...columnN)
VALUES
(value1, value2, value3,...valueN);
```

- **Example**

```
INSERT INTO customer
(CustID, CustName, Age, City, Salary)
VALUES
(1, 'Sam', 26, 'Delhi', 9000),
(2, 'Ram', 19, 'Bangalore', 11000),
(3, 'Pam', 31, 'Mumbai', 6000),
(4, 'Jam', 42, 'Pune', 10000);
```

Update Values In Table

The UPDATE command is used to update existing rows in a table • Syntax

```
UPDATE TABLE_NAME
SET “Column_name1” = ‘value1’, “Column_name2” = ‘value2’ WHERE “ID” = ‘value’
```

- **Example**

```
UPDATE  customer
SET CustName= 'Xam’, Age= 32
WHERE CustID= 4;
```

ALTER Table

The ALTER TABLE statement is used to add, delete, or modify columns in an existing table

- **ALTER TABLE -ADD Column Syntax**

```
ALTER TABLE table_name
ADD COLUMN column_name;
```

- **ALTER TABLE -DROP COLUMN Syntax**

```
ALTER TABLE table_name
DROP COLUMN column_name;
```

- **ALTER TABLE -ALTER/MODIFY COLUMN Syntax**

```
ALTER TABLE table_name
ALTER COLUMN column_namedatatype;
```

Delete Values In Table

The DELETE statement is used to delete existing records in a table • Syntax

DELETE FROM table_nameWHERE condition;

- **Example**

DELETE FROM customer WHERE CustID= 3;

Drop & Truncate Table

The DROP TABLE command deletes a table in the database • Syntax

```
DROP TABLE table_name;
```

The TRUNCATE TABLE command deletes the data inside a table, but not the table itself

- **Syntax**

```
TRUNCATE TABLE table_name;
```

SELECT & WHERE CLAUSE

SQL Tutorial

Creating a Classroom dataset for practice

```
CREATE TABLE classroom
(
rollnoint8 PRIMARY KEY,
    name varchar(50) NOT NULL,
    house char(12) NOT NULL,
grade char(1)
);

INSERT INTO classroom
(rollno, name, house, grade)
VALUES
(1, ‘Sam’, ‘Akash’, ‘B’),
(2, ‘Ram’, ‘Agni’, ‘A’),
(3, ‘Shyam’, ‘Jal’, ’B’),
(4, ‘Sundar’, ‘Agni’, ’A’),
(5, ‘Ram’, ‘Yayu’, ‘B’);
```

SELECT Statement

The SELECT statement is used to select data from a database. • Syntax

```
SELECT column_nameFROMtable_name;
```

To select all the fields available in the table

- **Syntax**

```
SELECT * FROMtable_name;
```

To select distinct/unique fields available in the table

- **Syntax**

```
SELECT DISTINCT Column_nameFROMtable_name;
```

WHERE Clause

The WHERE clause is used to filter records.

It is used to extract only those records that fulfill a specified condition

- **Syntax**

```
SELECT   column_nameFROMtable_name
WHERE conditions;
```

- **Example**

```
SELECT name FROMclassroom
WHERE grade=‘A’;
```

Operators In SQL

The SQL reserved words and characters are called operators, which are used with a WHERE clause in a SQL query

Most used operators:

1.Arithmetic operators :arithmetic operations on numeric values

Example: Addition (+), Subtraction (-), Multiplication (*), Division (/), Modulus (%)

2.Comparison operators: compare two different data of SQL table

- Example: Equal (=), Not Equal (!=), Greater Than (>), Greater Than Equals to (>=)

3.Logical operators: perform the Boolean operations

- Example: ALL, IN, BETWEEN, LIKE, AND, OR, NOT, ANY

4.Bitwise operators: perform the bit operations on the Integer values

Example: Bitwise AND (&), Bitwise OR(|)

-

LIMIT Clause

The LIMIT clause is used to set an upper limit on the number of tuples returned by SQL.

Example: below code will return 5 rows of data

```
SELECT   column_nameFROMtable_name
LIMIT5;
```

ORDER BY Clause

The ORDER BY is used to sort the result-set in ascending (ASC) or descending order (DESC).

Example: below code will sort the output data by column name in ascending order

```
SELECT column_nameFROMtable_name
ORDER BY column_namee ASC;
```

IMPORT CSV FILE

SQL Tutorial In

STRING FUNCTION

SQL Tutorial

Functions In SQL

Functions in SQL are the database objects that contains a set of SQL statements to perform a specific task. A function accepts input parameters, perform actions, and then return the result.

Types of Function:

1.System Defined Function : these are built-in functions

- Example: rand(), round(), upper(), lower(), count(), sum(), avg(), max(), etc

2.User-Defined Function : Once you define a function, you can call it in the same way as the built-in functions

Most Used String Functions

String functions are used to perform an operation on input string and return an output string

- **UPPER()** converts the value of a field to uppercase
- **LOWER()** converts the value of a field to lowercase
- **LENGTH()** returns the length of the value in a text field
- **SUBSTRING()** extracts a substring from a string
- **NOW()** returns the current system date and time
- **FORMAT()** used to set the format of a field
- **CONCAT()** adds two or more strings together
- **REPLACE()** Replaces all occurrences of a substring within a string, with a new substring
- **TRIM()** removes leading and trailing spaces (or other specified characters) from a string

AGGREGATE FUNCTION

SQL Tutorial

Most Used Aggregate Functions

Aggregate function performs a calculation on multiple values and returns a single value.

And Aggregate functionaare often used with GROUP BY & SELECT statement

- **COUNT()** returns number of values
- **SUM()** returns sum of all values
- **AVG()** returns average value
- **MAX()** returns maximum value
- **MIN()** returns minimum value
- **ROUND()** Rounds a number to a specified number of decimal places

GROUP BY & HAVING CLAUSE

SQL Tutorial

GROUP BY Statement

The GROUP BY statement group rows that have the same values into summary rows.

It is often used with aggregate functions (COUNT(), MAX(), MIN(), SUM(), AVG()) to group the result-set by one or more columns

- **Syntax**

```
SELECT column_name(s)
FROM table_name
GROUP BY column_name(s);
```

- **Example**

```
SELECTmode, SUM(amount) AS total
FROM payment
GROUP BY mode
```

HAVING Clause

The **HAVING** clause is used to apply a filter on the result of **GROUP BY** based on the specified condition.

The **WHERE**clause places conditions on the selected columns, whereas the **HAVING** clause places conditions on groups created by the **GROUP BY** clause

Syntax

```
SELECTcolumn_name(s)
FROM table_name
WHEREcondition(s)
GROUP BY column_name(s)
HAVING condition(s)
```

- **Example**

```
SELECT mode, COUNT(amount) AS total

FROM payment
GROUP BY mode
HAVING COUNT(amount) >= 3
ORDER BY total DESC
```

Quick Assignment: 01

Order of execution in SQL:

SELECT, FROM, WHERE, GROUP BY, HAVING, ORDER BY, LIMIT

?

Answer

(no cheating)

TIMESTAMPS & EXTRACT

SQL Tutorial

TIMESTAMP

The **TIMESTAMP**data type is used for values that contain both date and time parts

- **TIME** contains only time, format HH:MI:SS
- **DATE** contains on date, format YYYY-MM-DD
- **YEAR** contains on year, format YYYY or YY
- **TIMESTAMP** contains date and time, format YYYY-MM-DD HH:MI:SS
- **TIMESTAMPTZ** contains date, time and time zone

TIMESTAMP functions/operators

Below are the TIMESTAMP functions and operators in SQL:

- SHOW TIMEZONE
- SELECT NOW()
- SELECT TIMEOFDAY()
- SELECT CURRENT_TIME
- SELECT CURRENT_DATE

EXTRACT Function

The **EXTRACT()** function extracts a part from a given date value.

Syntax: SELECT **EXTRACT**(MONTHFROM date_field) FROM Table

- **YEAR**
- **QUARTER**
- **MONTH**
- **WEEK**
- **DAY**
- **HOUR**
- **MINUTE**
- **DOW**–day of week
- **DOY**–day of year

JOINS

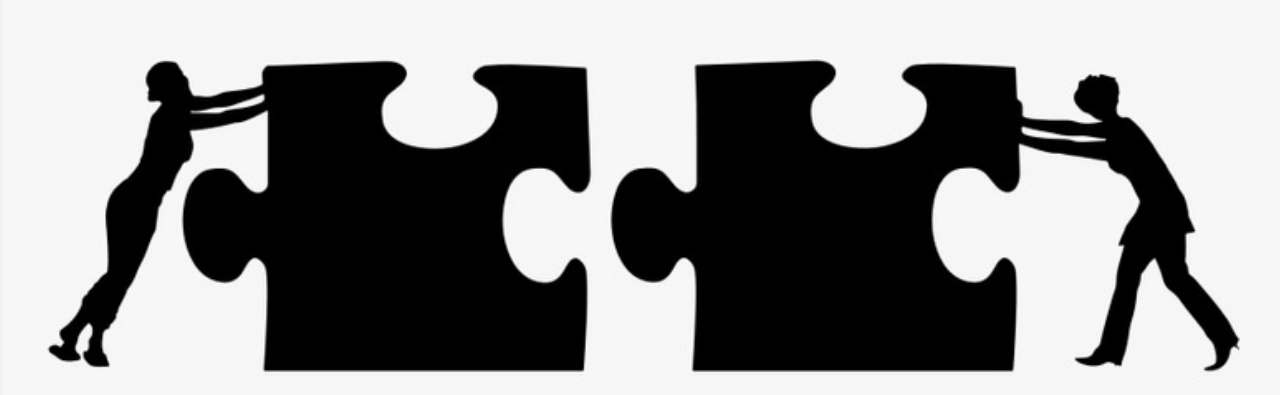
SQL Tutorial

TOPICS IN JOIN

- WHAT IS JOIN?
- USE OF JOIN
- JOIN TYPES
- WHICH JOIN TO USE
- JOIN SYNTAX
- EXAMPLES IN SQL

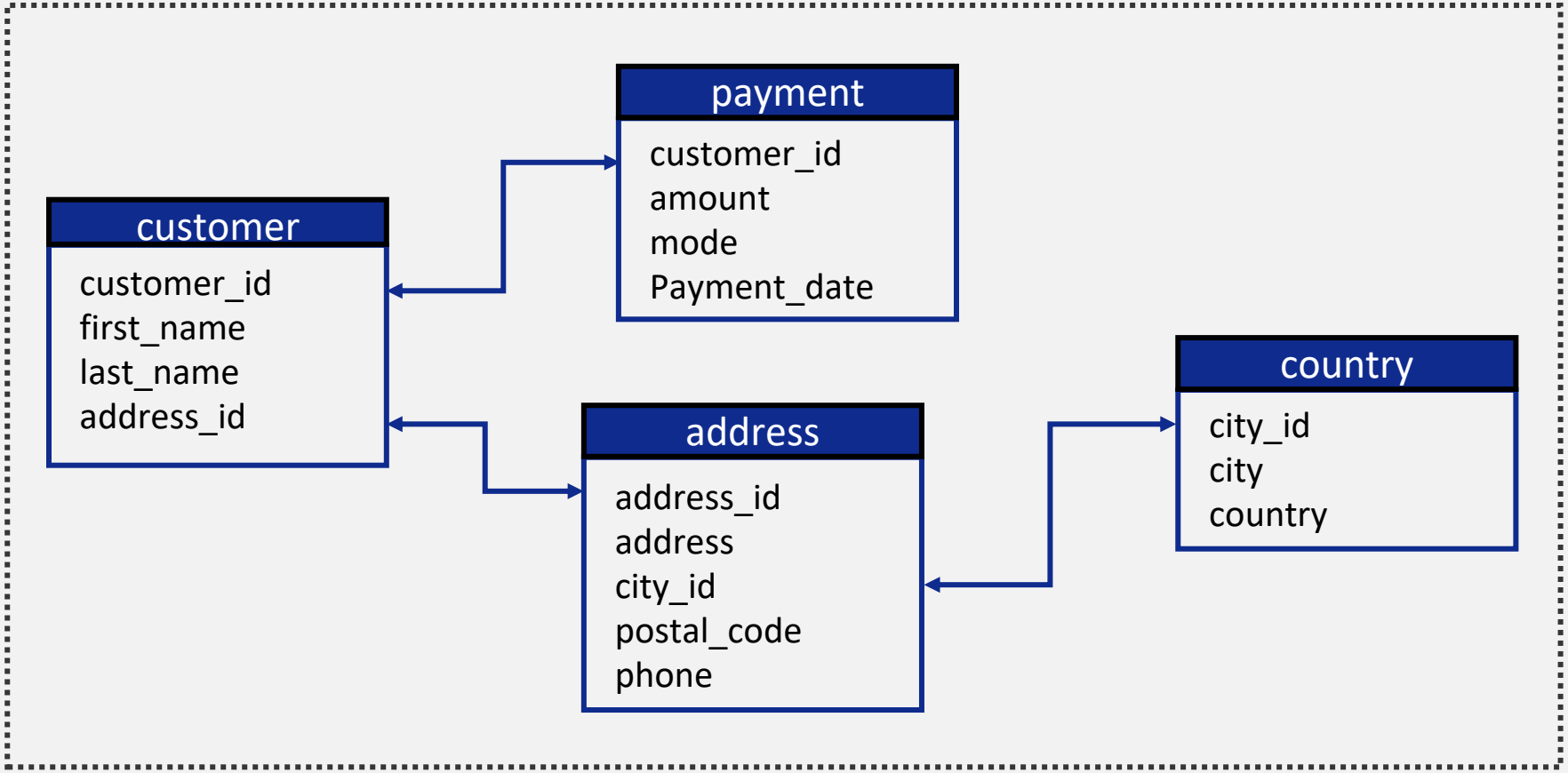
SQL JOIN

- **JOIN** means to combine something.
- A **JOIN**clause is used to combine data from two or more tables, based on a related column between them
- Let’s understand the joins through an example:



JOIN Example

Question: How much amount was paid by customer ‘Madan’, what was mode and payment date?



JOIN Example

customer_id [PK] bigint	first_name character varying (50)	last_name character varying (50)	address_id bigint
1	Mary	Smith	5
2	Madan	Mohan	6
3	Linda	Williams	7
4	Barbara	Jones	8
5	Elizabeth	Brown	9

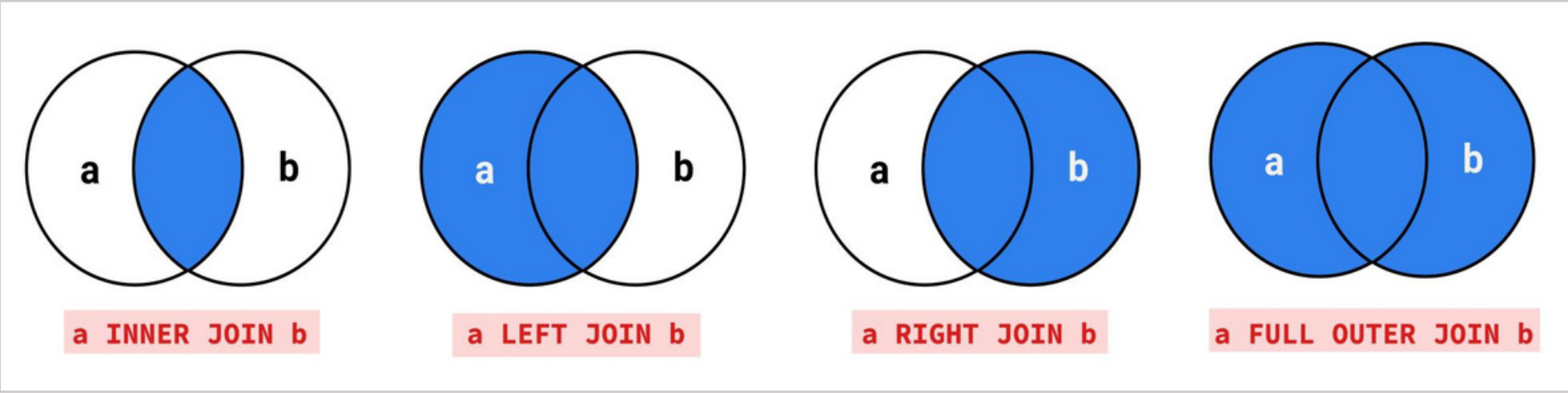
customer_id [PK] bigint	amount bigint	mode character varying (50)	payment_date date
1	60	Cash	2020-09-24
2	30	Credit Card	2020-04-27
3	90	Credit Card	2020-07-07
4	50	Debit Crad	2020-02-12
5	40	Mobile Payment	2020-11-20

Question: How much amount was paid by customer ‘Madan’, what was mode and payment date?

Answer: Amount = 30,
Mode = Credit Card,
Date = 2020-04-27

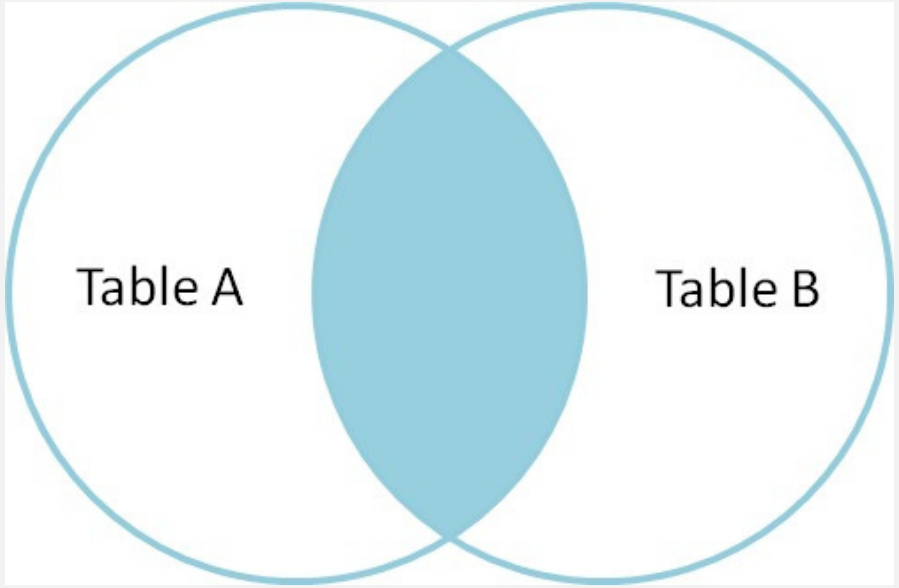
TYPES OF JOINS

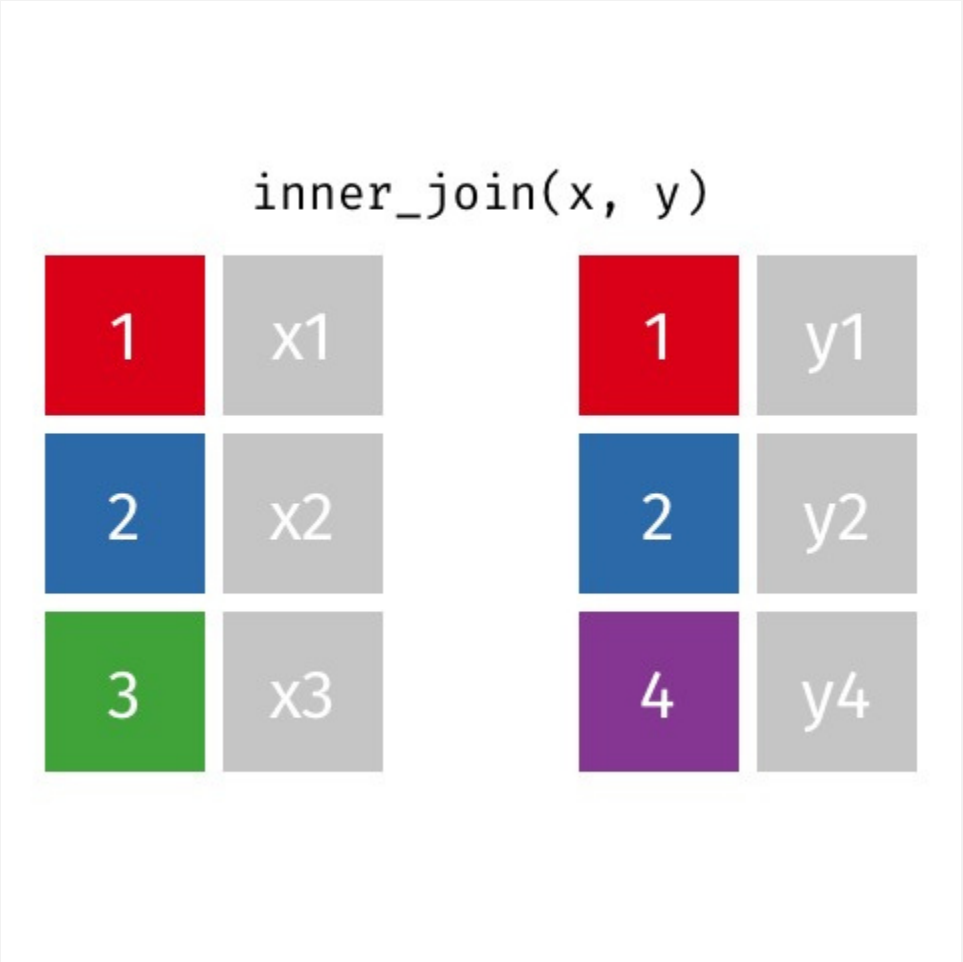
- INNER JOIN
- LEFT JOIN
- RIGHT JOIN
- FULL JOIN



INNER JOIN

- Returns records that have matching values in both tables

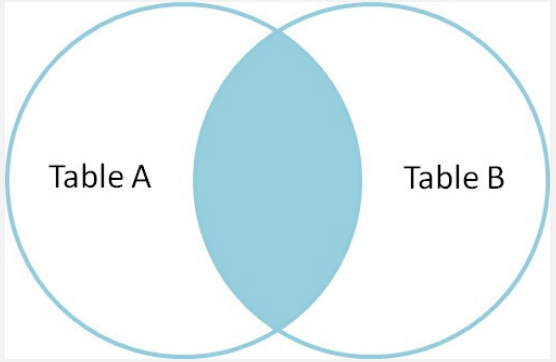




INNER JOIN

- **Syntax**

```
SELECT column_name(s)
FROM TableA
INNER JOIN TableB
        ON TableA.col_name= TableB.col_name
```

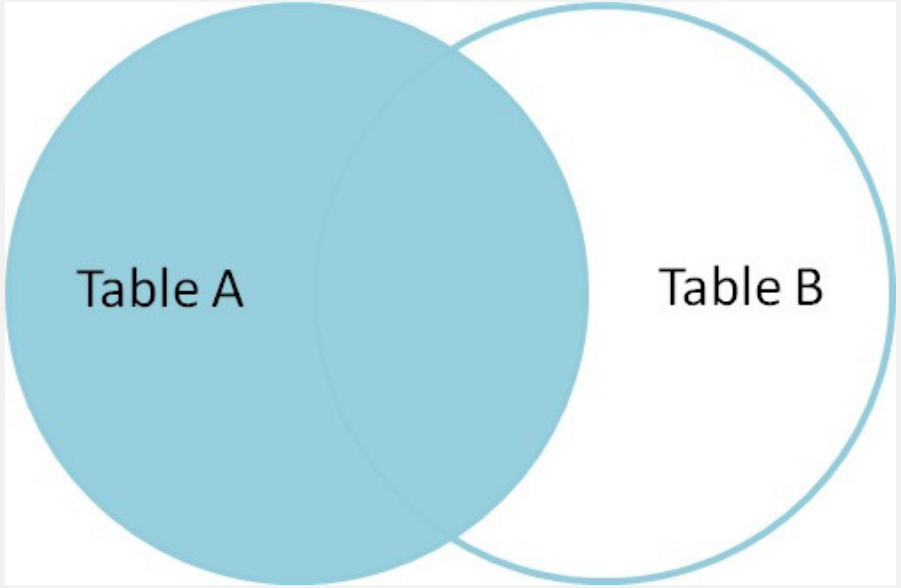


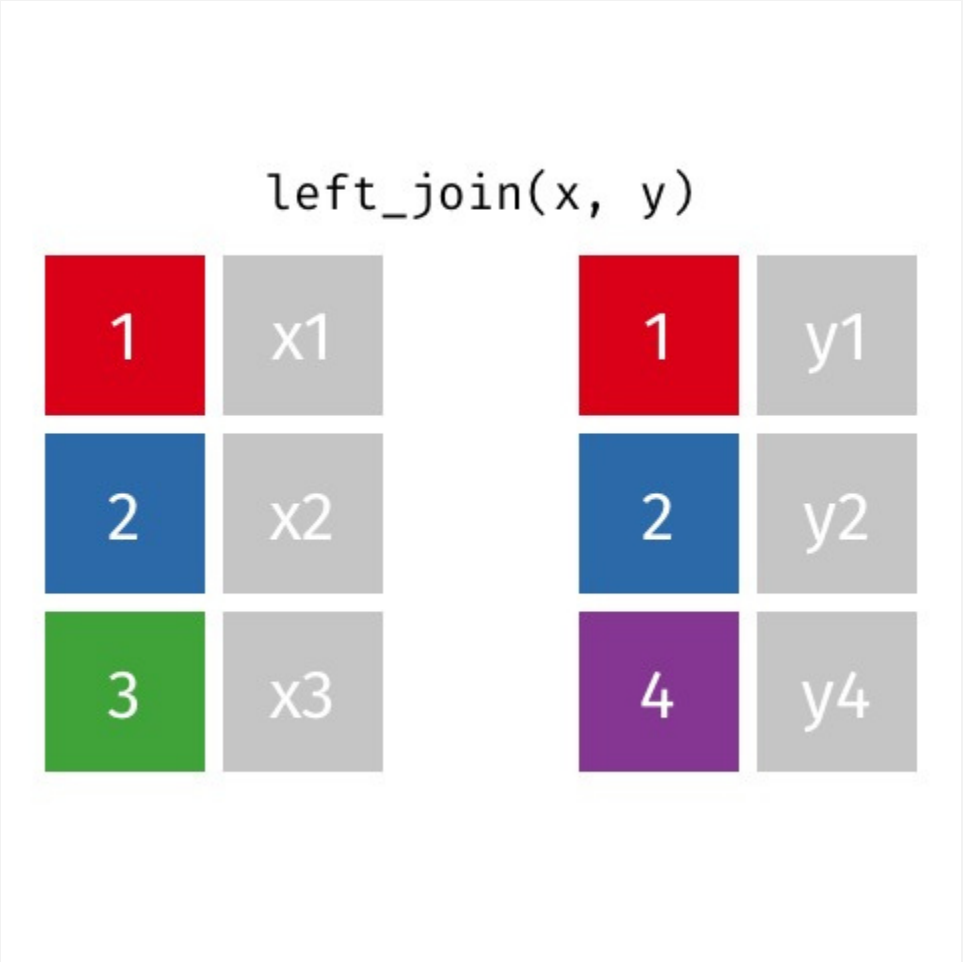
- **Example**

```
SELECT *
FROM customer AS c
INNER JOIN payment AS p
        ON c.customer_id= p.customer_id
```

LEFT JOIN

- Returns all records from the left table, and the matched records from the right table

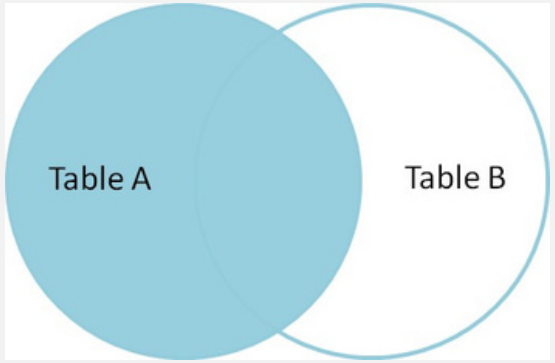




LEFT JOIN

- **Syntax**

```
SELECT column_name(s)
FROM TableA
LEFT JOIN TableB
        ON TableA.col_name= TableB.col_name
```

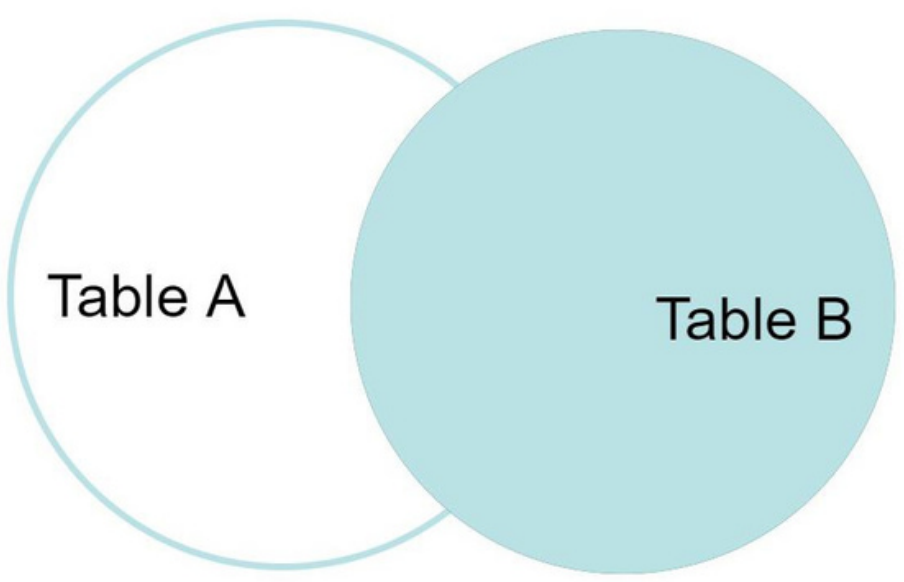


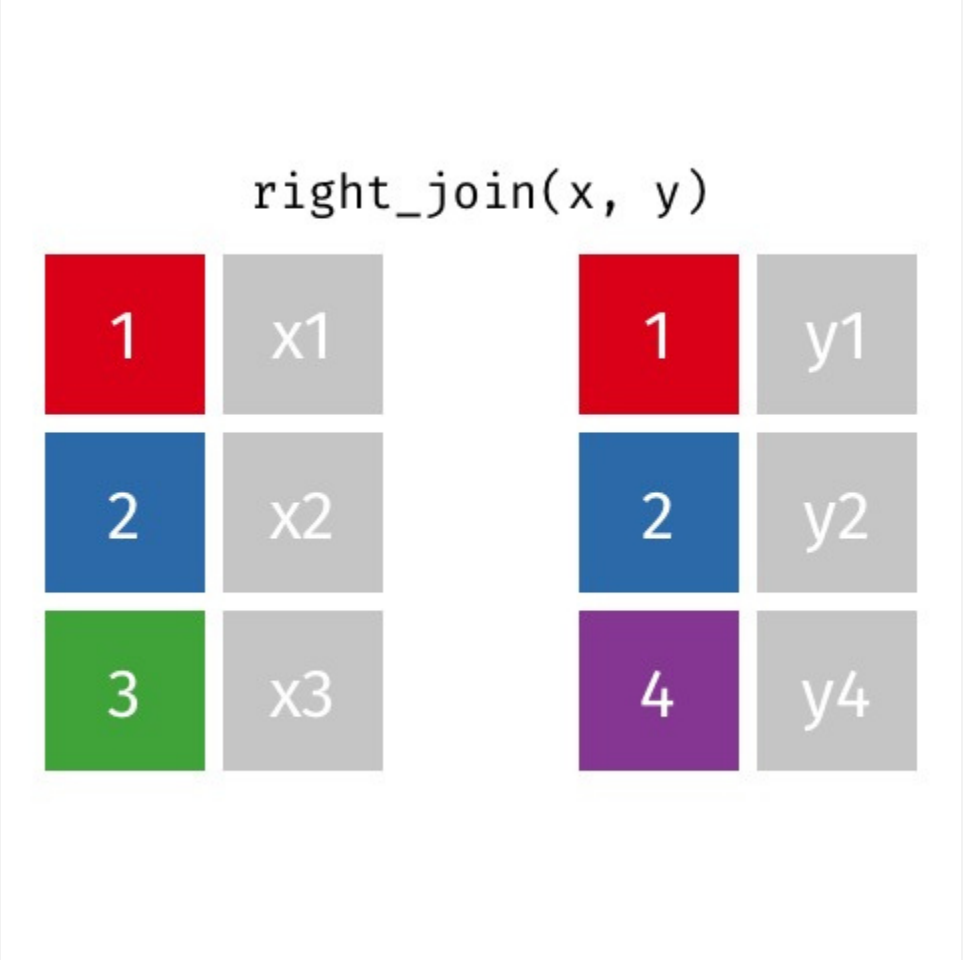
- **Example**

```
SELECT *
FROM customer AS c
LEFT JOIN payment AS p
        ON c.customer_id= p.customer_id
```

RIGHT JOIN

- Returns all records from the right table, and the matched records from the left table

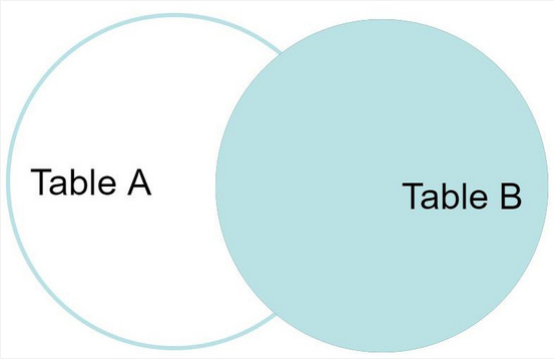




RIGHT JOIN

- **Syntax**

```
SELECT column_name(s)
FROM TableA
RIGHT JOIN TableB
        ON TableA.col_name= TableB.col_name
```

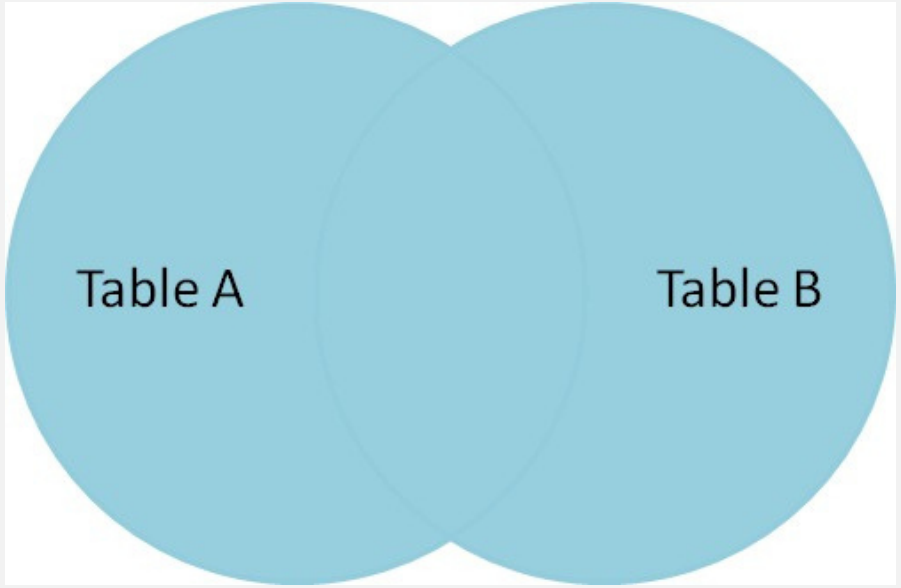


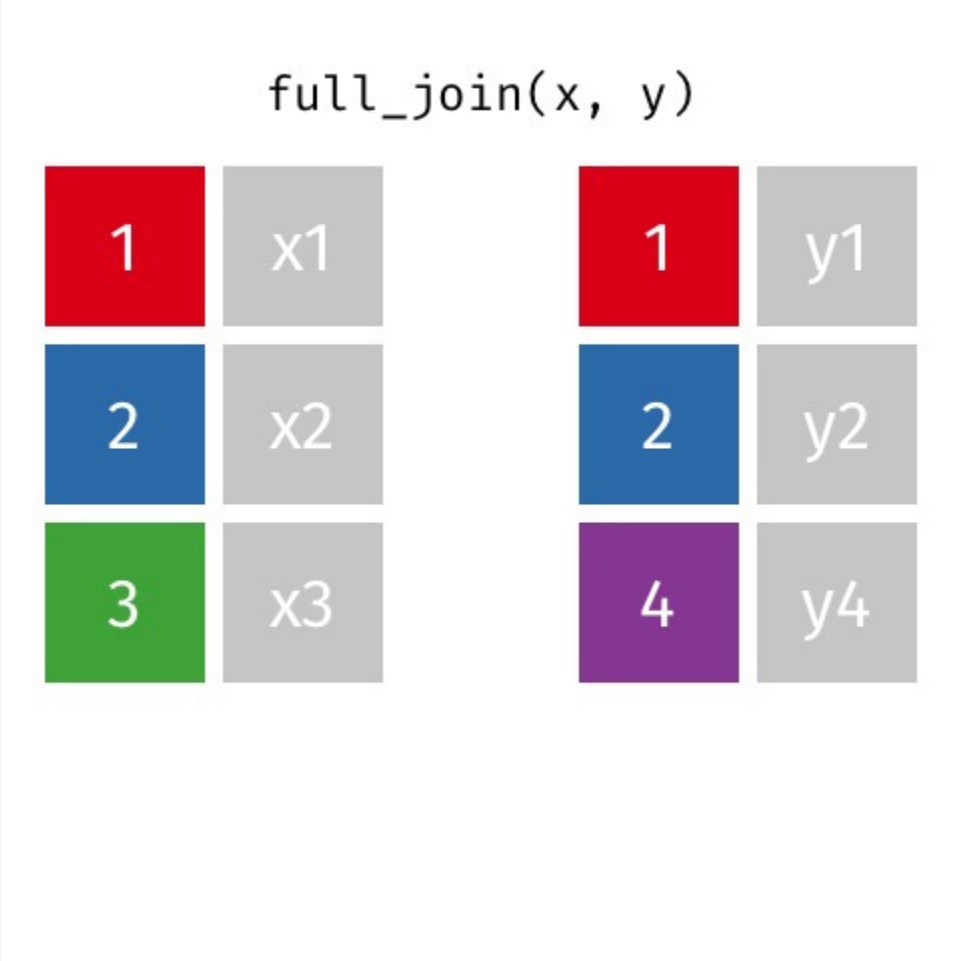
- **Example**

```
SELECT *
FROM customer AS c
RIGHT JOIN payment AS p
        ON c.customer_id= p.customer_id
```

FULL JOIN

- Returns all records when there is a match in either left or right table

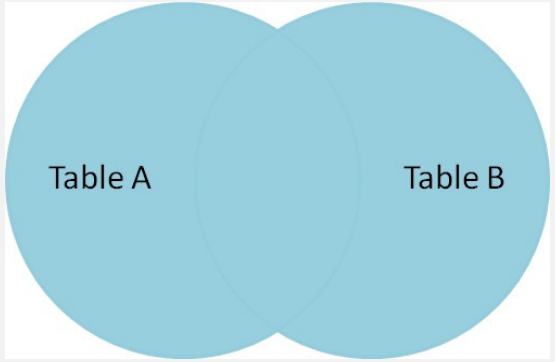




FULL JOIN

- **Syntax**

```
SELECT column_name(s)
FROM TableA
FULL OUTER JOIN TableB
        ON TableA.col_name= TableB.col_name
```

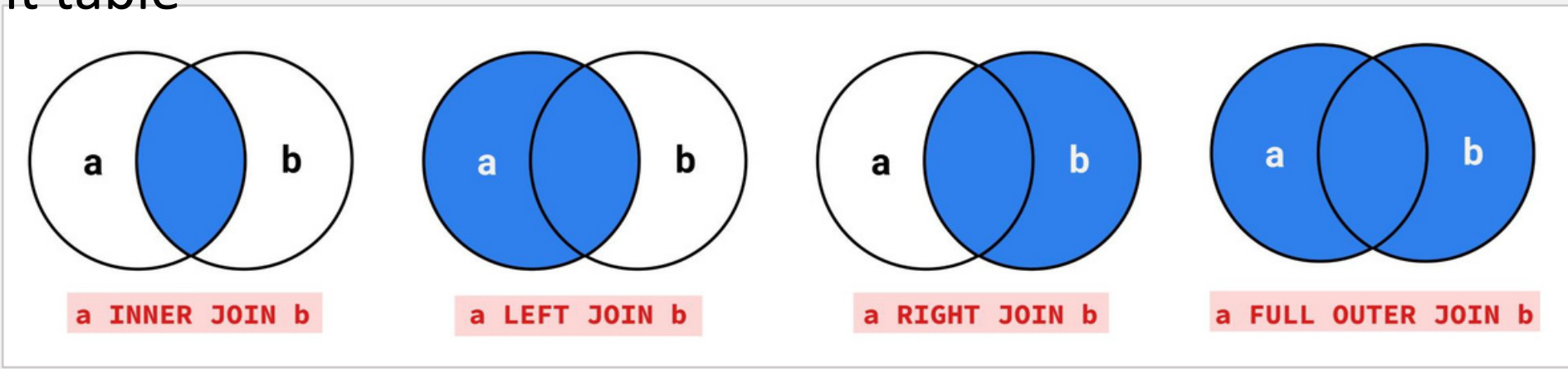


- **Example**

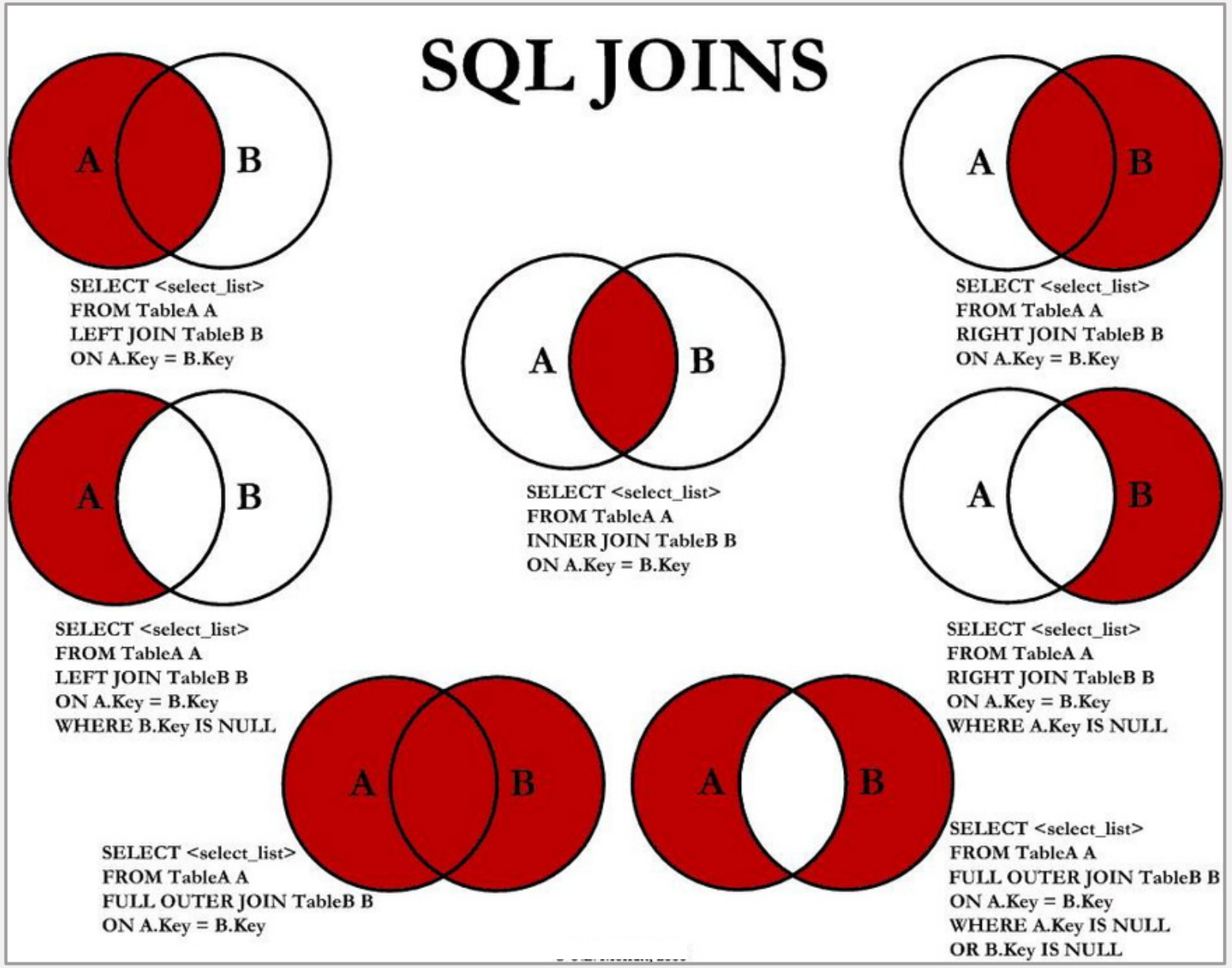
```
SELECT *
FROM customer AS c
FULL OUTER JOIN payment AS p
        ON c.customer_id= p.customer_id
```

Which JOIN To Use

- **INNER JOIN:** Returns records that have matching values in both tables
- **LEFT JOIN:** Returns all records from the left table, and the matched records from the right table
- **RIGHT JOIN:** Returns all records from the right table, and the matched records from the left table
- **FULL JOIN:** Returns all records when there is a match in either left or right table



JOIN CHEAT SHEET



SELF JOIN

SQL Tutorial

SELF JOIN

- A **self join** is a regular join in which a table is joined to itself
- **SELF Joins** are powerful for comparing values in a column of rows with the same table
- Syntax

```
SELECT column_name(s)
FROM Table AS T1
JOIN Table AS T2
ON T1.col_name = T2.col_name
```

SELF JOIN example

empid [PK] bigint	empname character varying (50)	manager_id bigint
1	Agni	3
2	Akash	4
3	Dharti	2
4	Vayu	3

Table: emp

- Find the name of respective managers for each of the employees?

SELF JOIN example

empid [PK] bigint	empname character varying (50)	manager_id bigint
1	Agni	3
2	Akash	4
3	Dharti	2
4	Vayu	3

mngr character varying (50)
Dharti
Vayu
Akash
Dharti

```
SELECT T2.empname, T1.empname
FROM emp AS T1
JOIN emp AS T2
ON T1.empid = T2.manager_id
```

UNION

The SQL **UNION** clause/operator is used to combine/concatenate the results of two or more SELECT statements without returning any duplicate rows and keeps **unique records**

To use this UNION clause, each SELECT statement must have

- The same number of columns selected and expressions
- The same data type and
- Have them in the same order

- **Syntax**

  SELECT column_name(s) FROM **TableA**
  UNION
  SELECT column_name(s) FROM **TableB**

- **Example**

```
        SELECT cust_name, cust_amountfrom custA
UNION
        SELECT cust_name, cust_amountfrom custB
```

UNION ALL

In **UNION ALL** everything is same as **UNION**, it combines/concatenate two or more table but keeps all records, **including duplicates**

- **Syntax**

  SELECT column_name(s) FROM
  TableA UNION ALL
  SELECT column_name(s) FROM
  TableB

- **Example**

  SELECT cust_name, cust_amountfrom custA
  UNION ALL
  SELECT cust_name, cust_amountfrom custB

UNION Example

Table: custA

cust_name character (30)	cust_amount bigint
Madan Mohan	2100
Gopi Nath	1200
Govind Dev	5000

Table: custB

cust_name character (30)	cust_amount bigint
Gopal Bhat	1500
Madan Mohan	2100

SUB QUERY

SQL Tutorial

SUB QUERY

A **Subquery**or Inner query or a Nested query allows us to create complex query on the output of another query

- Sub query syntax involves two SELECT statements

- **Syntax**

SELECT column_name(s)

FROM table_name

WHERE column_name***operator***

(**SELECT column_nameFROM table_nameWHERE ...**);

SUB QUERY Example

Question: Find the details of customers, whose payment amount is more than the average of total amount paid by all customers

Divide above question into two parts:

1. Find the average amount
2. Filter the customers whose amount >average amount

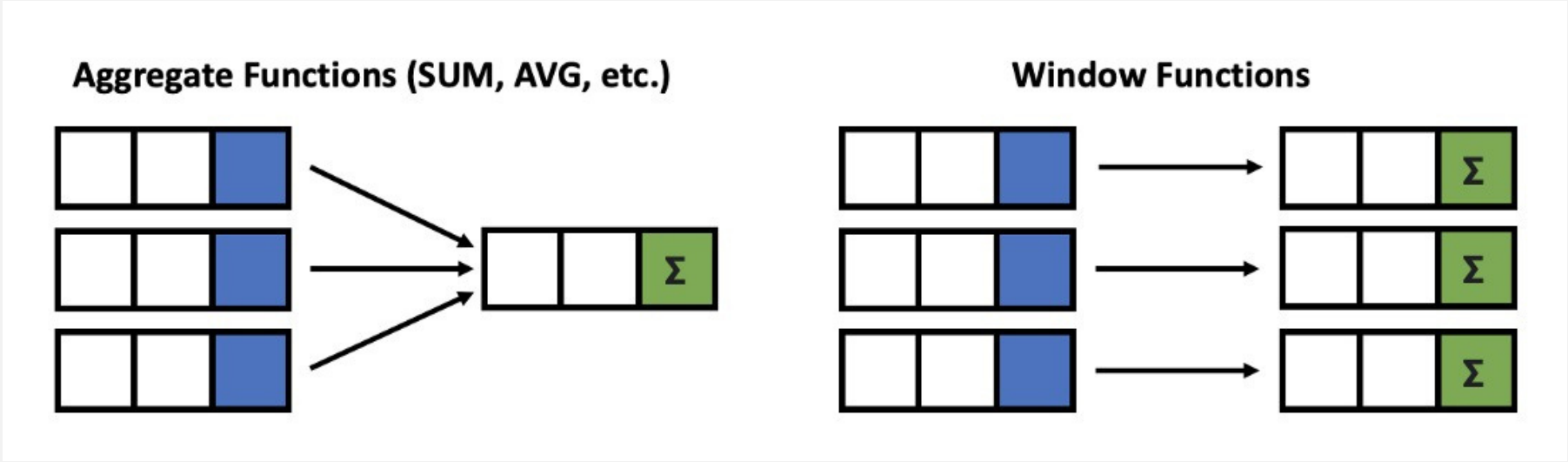
	customer_id [PK] bigint	amount bigint	mode character varying (50)	payment_date date
1	1	60	Cash	2020-09-24
2	2	30	Credit Card	2020-04-27
3	8	110	Cash	2021-01-26
4	10	70	mobile Payment	2021-02-28
5	11	80	Cash	2021-03-01

WINDOWS FUNCTION

SQL Tutorial

WINDOW FUNCTION

- **Window functions** applies aggregate, ranking and analytic functions over a particular window (set of rows).
- And **OVER**clause is used with window functions to define that window.



Give output one row per aggregation

The rows maintain their separate identities

WINDOW FUNCTION SYNTAX

```
SELECT column_name(s),
       fun( ) OVER (   [ <PARTITION  BY  Clause>
                       ] [ <ORDER BY Clause> ]
                       [ <ROW or RANGE Clause> ] )
FROM table_name
```

Select a function

- Aggregate functions
- Ranking functions
- Analytic functions

Define a Window

- PARTITION BY
- ORDER BY
- ROWS

WINDOW FUNCTION TERMS

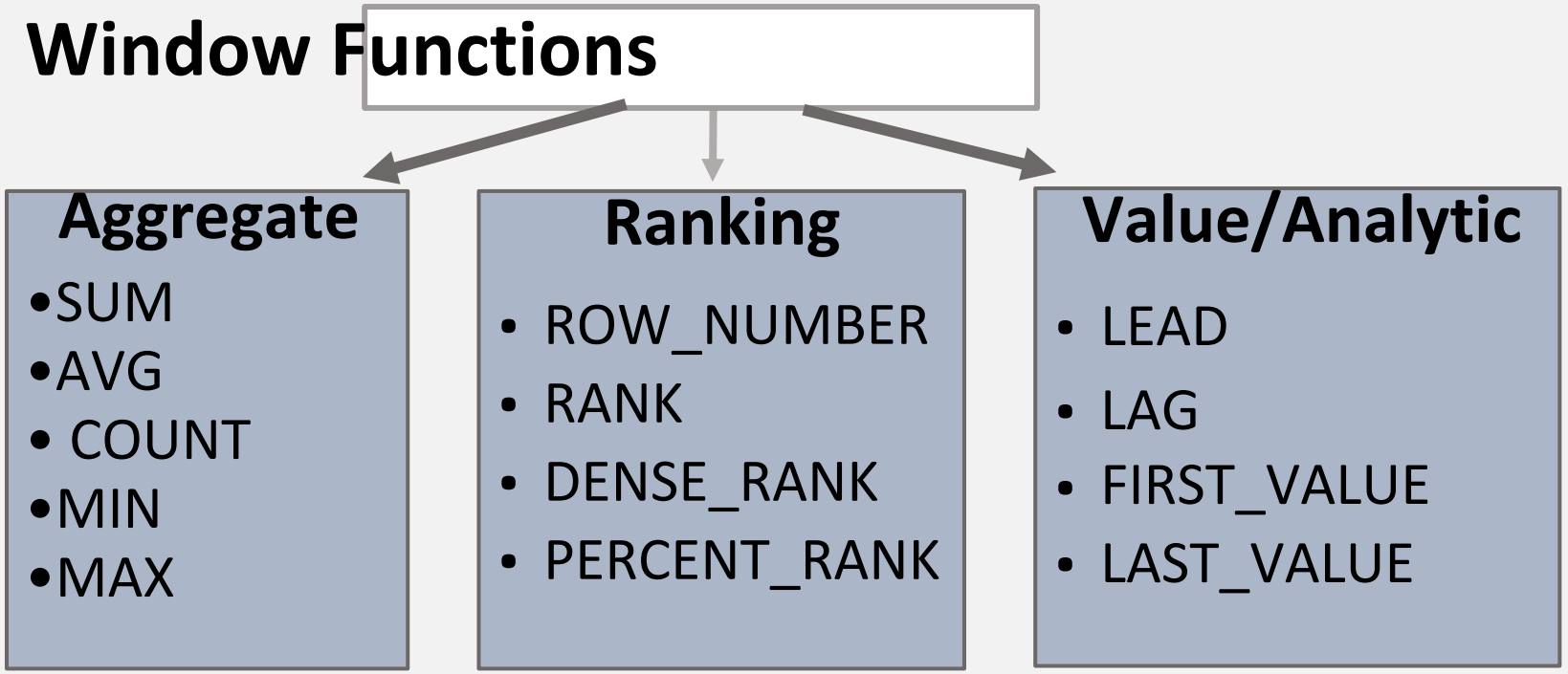
Let's look at some definitions:

Window function applies aggregate, ranking and analytic functions over a particular window; for example, sum, avg, or row_number

- **Expression** is the name of the column that we want the window function operated on. This may not be necessary depending on what window function is used
- **OVER** is just to signify that this is a window function
- **PARTITION BY** divides the rows into partitions so we can specify which rows to use to compute the window function
- **ORDER BY** is used so that we can order the rows within each partition. This is optional and does not have to be specified
- **ROWS** can be used if we want to further limit the rows within our partition. This is optional and usually not used

WINDOW FUNCTION TYPES

There is no official division of the SQL window functions into categories but high level we can divide into three types



AGGREGATE FUNCTION Example

```
SELECTnew_id, new_cat,
SUM(new_id) OVER( PARTITION BY new_catORDER BY new_id) AS "Total",
AVG(new_id) OVER( PARTITION BY new_catORDER BY new_id) AS "Average",
COUNT(new_id) OVER( PARTITION BY new_catORDER BY new_id) AS "Count",
MIN(new_id) OVER( PARTITION BY new_catORDER BY new_id) AS "Min",
MAX(new_id) OVER( PARTITION BY new_catORDER BY new_id) AS "Max"
FROM test_data
```

new_id	new_cat	Total	Average	Count	Min	Max
100	Agni	300	150	2	100	200
200	Agni	300	150	2	100	200
500	Dhart	1200	600	2	500	700
700	Dharti	1200	600	2	500	700
200	Vay	1000	333.33333	3	200	500
300	u	1000	333.33333	3	200	500
500	Vayu	1000	333.33333	3	200	500
	u					

```
SELECTnew_id, new_cat,
SUM(new_id) OVER( ORDER BY new_idROWS BETWEEN UNBOUNDED PRECEDING AND UNBOUNDED FOLLOWING) AS "Total",
AVG(new_id) OVER( ORDER BY new_idROWS BETWEEN UNBOUNDED PRECEDING AND UNBOUNDED FOLLOWING) AS "Average",
COUNT(new_id) OVER( ORDER BY new_idROWS BETWEEN UNBOUNDED PRECEDING AND UNBOUNDED FOLLOWING) AS "Count",
MIN(new_id) OVER( ORDER BY new_idROWS BETWEEN UNBOUNDED PRECEDING AND UNBOUNDED FOLLOWING) AS "Min",
MAX(new_id) OVER( ORDER BY new_idROWS BETWEEN UNBOUNDED PRECEDING AND UNBOUNDED FOLLOWING) AS "Max"
FROM test_data
```

new_id	new_cat	Total	Average	Count	Min	Ma
100	Agni	2500	357.14286	7	100	x
200	Agni	2500	357.14286	7	100	700
200	Vayu	2500	357.14286	7	100	700
300	Vayu	2500	357.14286	7	100	700
500	Vayu	2500	357.14286	7	100	700
500	Dharti	2500	357.14286	7	100	700
700	Dharti	2500	357.14286	7	100	700
						700

AGGREGATE FUNCTION Example

NOTE: Above we have used: "**ROWS** BETWEEN UNBOUNDED PRECEDING AND UNBOUNDED FOLLOWING" which will give a SINGLE output based on all INPUT VaSluQLe Bsy/ PRAishRaTbIhT MIOisNhr a(if used)

RANKING FUNCTION Example

```
SELECTnew_id,
ROW_NUMBER()OVER(ORDER BY new_id) AS "ROW_NUMBER",
RANK() OVER(ORDER BY new_id) AS "RANK",
DENSE_RANK()OVER(ORDER BY new_id) AS "DENSE_RANK",
PERCENT_RANK() OVER(ORDER BY new_id) AS "PERCENT_RANK"
FROM test_data
```

new_id	ROW_NUMBER	RANK	DENSE_RANK	PERCENT_RANK
100	1	1	1	0
200	2	2	2	0.166
200	3	2	2	0.166
300	4	4	3	0.5
500	5	5	4	0.666
500	6	5	4	0.666
700	7	7	5	1

ANALYTIC FUNCTION Example

```
SELECT new_id,
FIRST_VALUE(new_id) OVER( ORDER BY new_id) AS "FIRST_VALUE",
LAST_VALUE(new_id) OVER( ORDER BY new_id) AS "LAST_VALUE",
LEAD(new_id) OVER( ORDER BY new_id) AS "LEAD",
LAG(new_id) OVER( ORDER BY new_id) AS "LAG"
FROM test_data
```

new_id	FIRST_VALUE	LAST_VALUE	LEA	LA
100	100	100	**D**	**G**
200	100	200	200	null
200	100	200	200	100
300	100	300	300	200
500	100	500	500	200
500	100	500	500	300
700	100	700	700	**500**

NOTE: If you just want the single last value from whole column, use: "**ROWS** BETWEEN UNBOUNDED PRECEDING AND UNBOUNDED FOLLOWING"

Quick Assignment: WINDOW FUNCTION

Offset the LEAD and LAG values by 2 in the output columns ?

INPUT

new_id
100
200
200
300
500
500
700

OUTPUT

new_id	LEA	LAG
100	D	NULL
200	200	NULL
200	300	100
300	500	200
500	500	200
500	700	300
700	NULL	500

ANALYTIC FUNCTION Assignment

```
SELECT new_id,
LEAD(new_id,2) OVER( ORDER BY new_id) AS "LEAD_by2",
LAG(new_id, 2) OVER( ORDER BY new_id) AS "LAG_by2"
FROM test_data
```

new_id	LEAD_by2	LAG_by2
100	200	null
200	300	null
200	500	100
300	500	200
500	700	200
500	null	300
700	null	500

CASE EXPRESSION

SQL Tutorial

CASE Expression

- The CASE expression goes through conditions and returns a value when the first condition is met (like if-then-else statement). If no conditions are true, it returns the value in the ELSE clause.

- If there is no ELSE part and no conditions are true, it returns NULL.
- Alsocalled CASE STATEMENT

CASE Statement Syntax

- **General CASE Syntax**

```
CASE
      WHENcondition1 THENresult1
      WHENcondition2 THENresult2
   WHEN conditionN THEN resultN
ELSE other_result
END;
```

- **Example:**

```
SELECTcustomer_id, amount,
CASE
      WHENamount > 100 THEN'Expensive product'
      WHENamount = 100 THEN'Moderate product'
ELSE'Inexpensive product'
ENDAS ProductStatus
FROM payment
```

CASE Expression Syntax

- **CASE Expression Syntax**

```
CASE Expression
      WHENvalue1 THENresult1
      WHENvalue2 THENresult2
   WHEN valueN THEN resultN
ELSE other_result
END;
```

- **Example:**

```
SELECT customer_id,
CASE amount
     WHEN500 THEN'Prime Customer'
    WHEN100 THEN'Plus Customer'
ELSE'Regular Customer'
ENDAS CustomerStatus
FROM payment
```

COMMON TABLE EXPRESSION

SQL Tutorial

Common Table Expression (CTE)

- A common table expression, or CTE, is a temporary named result set created from a simple SELECT statement that can be used in a subsequent SELECT statement
- We can define CTEs by adding a WITH clause directly before SELECT, INSERT, UPDATE, DELETE, or MERGE statement.
- The **WITH** clause can include one or more CTEs separated by commas

Common Table Expression (CTE)

- **Syntax**

```
WITHmy_cteAS (
SELECT a,b,c
        FROM Table1 )
SELECT a,c
FROM my_cte
```

CTE query

Main query

The name of this CTE is my_cte, and the CTE query is SELECT a,b,cFROM Table1. The CTE starts with the **WITH**keyword, after which you specify the name of your CTE, then the content of the query in parentheses. The main query comes after the closing parenthesis and refers to the CTE. Here, the main query (also known as the outer query) is SELECT a,cFROM my_cte

CTE- Example

1. Example EASY

```
WITH my_cteAS (
                SELECT *, AVG(amount) OVER(ORDER BY p.customer_id) AS "Average_Price",
COUNT(address_id) OVER(ORDER BY
c.customer_id) AS "Count"
                FROM payment as p
INNER JOIN customer AS c
                 ON p.customer_id= c.customer_id
)
SELECT first_name, last_name
FROM my_cte
```

1. Example Multiple CTEs

```
WITH my_cpAS (
                SELECT *, AVG(amount) OVER(ORDER BY p.customer_id)
AS "Average_Price",
COUNT(address_id) OVER(ORDER BY c.customer_id) AS
"Count"
FROM payment as p
INNER JOIN customer AS c
ON p.customer_id= c.customer_id
),
my_caAS (
SELECT *
FROM customer as c
INNER JOIN address AS a
ON a.address_id= c.address_id
INNER JOIN country as cc
ON cc.city_id= a.city_id
)
SELECT cp.first_name, cp.last_name, ca.city, ca.country,
cp.amount FROM my_caas ca , my_cpas cp
```

2. Example Advance

```
WITH my_cteAS (
SELECT mode, MAX(amount) AS highest_price,
SUM(amount) AS total_price
FROM payment
GROUP BY mode
)
SELECT payment.*, my.highest_price, my.total_price
FROM payment
JOIN my_ctemy
ON payment.mode= my.mode
ORDER BY payment.mode
```