

# SQL

## • What is SQL ?

SQL (Structured Query Language) is a programming language designed for managing data in relational database. SQL has a variety of functions that allow its users to read, manipulate, and change data. Though SQL is commonly used by engineers in software development, it's also popular with data analysts for a few reasons:

- It's semantically easy to understand and learn.
- Because it can be used to access large amounts of data directly where it's stored, analysts don't have to copy data into other applications.
- Compared to spreadsheet tools, data analysis done in SQL is easy to audit and replicate. For analysts, this means no more looking for the cell with the typo in the formula.

## • SELECT \* Example

The following SQL statement selects all the columns from the "Sales" table:

Example - `SELECT * FROM Sales;`

- Select columns wise

Example - `SELECT year,  
month,  
west  
FROM Sales`

- Rename Columns

Example - `SELECT west AS "west Region"  
FROM Sales`

- LIMIT Clause

The **LIMIT** clause is used to specify the number of records to return

Example - `SELECT *  
FROM Sales  
LIMIT 100`

- WHERE Clause

The **WHERE** clause is used to filter records. It is used to extract only those records that fulfill a specified condition.

Example - `SELECT *  
FROM sales  
WHERE country = "Canada";`

- Comparison Operators on numerical data

The most basic way to filter data is using comparison operators. The easiest way to understand them is to start by looking at a list of them:

Equal to	=
Not equal to	<> or !=
Greater than	>
Less than	<
Greater than or equal to	>=
Less than or equal to	<=

Example -

- `SELECT *`  
    `FROM sales`  
    `WHERE city = "kolkata";`

- `SELECT *`  
    `FROM sales`  
    `WHERE city != "kolkata";`

- `SELECT *`  
    `FROM sales`  
    `WHERE Month > "January";`

- `SELECT *`  
    `FROM sales`  
    `WHERE sale_amount < 50000`

## • Arithmetic in SQL

You can perform arithmetic in SQL using the same operators you would in Excel: +, -, \*, /. However, in SQL you can only perform arithmetic across columns on values in a given row. To clarify, you can only add values in multiple columns from the same row together using + — if you want to add values across multiple rows, you'll need to use aggregate functions.

Example - `SELECT year,  
month,  
west,  
south,  
west + south AS south_plus_west  
FROM sales ;`

Example -

`SELECT year,  
month,  
west,  
south,  
west + south - 4 * year AS new_column  
FROM sales ;`

Example - `SELECT year,  
month,  
west,  
south,  
(west + south) / 2 AS south_west_avg  
FROM sales ;`

## • CREATE TABLE

The **CREATE TABLE** statement is used to create a new table in a database.

Example- **CREATE TABLE** person(  
    PersonID int,  
    LastName varchar(255),  
    FristName varchar(255),  
    Address varchar(255),  
    city varchar(255),  
);

## • INSERT INTO

The **INSERT INTO** statement is used to insert new records in a table.

1. specify both the column names and the values to be inserted:

```
INSERT INTO table_name(column1, column2, column3, ...)
VALUES (value1, value2, value3, ....);
```

2. If you are adding values for all the columns of the table you do not need to specify the column names in the SQL query.

```
INSERT INTO table_name
VALUES (value1, value2, value3, ....);
```

- What is a NULL value?

A field with a NULL value is a field with no value.

If a field in a table is optional, it is possible to insert a new record or update a record without adding a value to this field. Then, the field will be saved with a NULL value.

- How to Test for NULL Values?

It is not possible to test for NULL values with comparison operators, such as =, <, or <>.

We will have to use the IS NULL and IS NOT NULL operators instead.

- The IS NULL Operator

The IS NULL operator is used to test for empty values (NULL values).

Example -  

```
SELECT customerName, contactName, Address  
FROM sales  
WHERE Address IS NULL ;
```

- The IS NOT NULL Operator

The IS NOT NULL operator is used to test for non-empty values (NOT NULL values).

Example -  

```
SELECT customerName, contactName, Address  
FROM sales  
WHERE Address IS NOT NULL ;
```

## • UPDATE Statement

The UPDATE statement is used to modify the existing records in a table.

Example -

```
UPDATE Sales  
SET contactName = "Alan", city = "Goa"  
WHERE customer ID = 1;
```

## • UPDATE Multiple Records

It is the WHERE clause that determines how many records will be updated.

Example -

```
UPDATE Sales  
SET PostalCode = 00000  
WHERE Country = "India";
```

## Notes :-

Be careful when updating records. If you omit the WHERE clause, ALL records will be updated!

## • DELETE Statement

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

Example -

```
DELETE FROM Sales WHERE CustomerName = "Bob";
```

- Delete All Records

It is possible to delete all rows in a table without deleting the table. This means that the table structure, attributes, and indexes will be intact:

Example -

```
DELETE FROM table_name ;
```

- Aliases

Aliases are used to give a table, or a column in a table, a temporary name.

Aliases are often used to make column names more readable.

An alias only exists for the duration of that query.

An alias is created with the AS keyword.

- Alias Column Example

```
SELECT column_name AS alias_name  
FROM table_name ;
```

- Alias Table Example

```
SELECT column_name (s)  
FROM table_name AS alias_name ;
```



## • SQL Logical Operators

Logical operators allow you to use multiple comparison operators in one query.

Each logical operator is a special snowflake, so we'll go through them individually in the following lessons.

- **LIKE** allows you to match similar values, instead of exact values.
- **IN** allows you to specify a list of values you'd like to include.
- **BETWEEN** allows you to select only rows within a certain range.
- **IS NULL** allows you to select rows that contain no data in a given column.
- **AND** allows you to select only rows that satisfy two conditions.
- **OR** allows you to select rows that satisfy either of two conditions.
- **NOT** allows you to select rows that do not match a certain condition.

## • LIKE Operator

```
SELECT *
```

```
FROM Sales
```

```
WHERE "group" LIKE "New%";
```

- IN Operator

SELECT \*

FROM Songs

WHERE artist IN ('Taylor swift', 'Usher');

- BETWEEN Operator

SELECT \*

FROM Songs

WHERE year\_rank BETWEEN 5 AND 10;

- AND Operator

SELECT \*

FROM Songs

WHERE year = 2012 AND year\_rank <= 10;

- OR Operator

SELECT \*

FROM Songs

WHERE year\_rank = 5 OR artist = "Sonu";

- NOT Operator

SELECT \*

FROM Sales

WHERE NOT Country = "Japan";

- Combining AND, OR and NOT  
SELECT \* FROM sales  
WHERE country = 'Japan' AND (city = 'Goa' OR city = 'Puri')

- ORDER BY

```
SELECT *  
FROM sales  
ORDER BY country, CustomerName ;
```

```
SELECT * FROM sales  
ORDER BY country ASC, CustomerName DESC ;
```

- Using Comments (How to use comments)

```
SELECT * -- This is select command  
FROM sales  
WHERE year = 2020 ;
```

- /\* Here's a comment so long and descriptive that it could only fit on multiple lines. Fortunately, it, too, will not affect how this code runs. \*/

```
SELECT *  
FROM sales  
WHERE year = 2015 ;
```

# SQL Aggregate Function

SQL is excellent at aggregating data the way you might in a pivot table in Excel. You will use aggregate functions all the time, so it's important to get comfortable with them. The functions themselves are the same ones you will find in Excel or any other analytics program.

- **COUNT** counts how many rows are in a particular column.
- **SUM** adds together all the values in a particular column.
- **MIN** and **MAX** return the lowest and highest values in a particular column, respectively.
- **AVG** calculates the average of a group of selected values.

Example:-  

```
SELECT COUNT(*)  
FROM Sales ;
```

Example :-  

```
SELECT COUNT (column_name)  
FROM table_name  
WHERE condition ;
```

Example :-  

```
SELECT SUM (column_name)  
FROM table_name  
WHERE condition ;
```

Example :- `SELECT MIN (column-name)  
FROM table-name  
WHERE condition;`

Example :- `SELECT MAX (column-name)  
FROM table-name  
WHERE condition;`

Example :- `SELECT AVG (column-name)  
FROM table-name  
WHERE condition;`

### The SQL GROUP BY clause.

**GROUP BY** allows you to separate data into groups, which can be aggregated independently of one another.

```
SELECT year,  
       COUNT(*) AS count  
FROM sales  
GROUP BY year;
```

### Multiple column

```
SELECT year,  
       month,  
       COUNT(*) AS count  
FROM sales  
GROUP BY year, month;
```

## GROUP BY Column numbers

```
SELECT year,  
       month,  
       COUNT(*) AS count  
FROM sales  
GROUP BY 1, 2 ;
```

## Using GROUP BY with ORDER BY

```
SELECT year,  
       month,  
       COUNT(*) AS count  
FROM sales  
GROUP BY year, month  
ORDER BY month, year ;
```

## Using GROUP BY with LIMIT

```
SELECT column_name,  
FROM table_name  
WHERE condition  
GROUP BY column_name  
LIMIT number ;
```

## HAVING Clause

The **HAVING** clause was added to SQL because the **WHERE** keyword cannot be used with aggregate functions.

Example :-  
SELECT column\_name(s)  
FROM table\_name  
WHERE condition  
GROUP BY column\_name(s)  
HAVING condition  
ORDER BY column\_name(s);

- SELECT year,  
month,  
MAX(high) AS month\_high  
FROM sales  
GROUP BY year, month  
HAVING MAX(high) > 400  
ORDER BY year, month;

## The SQL CASE statement

The CASE statement is SQL's way of handling if/then logic. The CASE statement is followed by at least one pair of WHEN and THEN statements - SQL's equivalent of IF/THEN in Excel. Because of this pairing, you might be tempted to call this SQL CASE WHEN, but CASE is the accepted term.

Every CASE statement must end with the END statement. The ELSE statement is optional, and provides a way to capture values not specified in the WHEN/THEN statement. CASE is easiest to understand in the context of an example.

## Syntax

### CASE

```
WHEN condition1 THEN result1  
WHEN condition2 THEN result2  
WHEN conditionN THEN resultN  
ELSE result
```

END ;

Example:- SELECT orderID, Quantity,

### CASE

```
WHEN Quantity > 30 THEN "The quantity is greater than 30"  
WHEN Quantity = 30 THEN "The quantity is 30"  
ELSE "The quantity is under 30"
```

END AS QuantityText

FROM sales ;

## SQL DISTINCT

You'll occasionally want to look at only the unique values in a particular column. You can do this using **SELECT DISTINCT** syntax.

Example:- • SELECT DISTINCT month  
FROM sales ;

• SELECT DISTINCT year, month  
FROM sales ;



## Using DISTINCT in aggregations

```
SELECT COUNT(DISTINCT month) AS unique-months  
FROM sales;
```

## MySQL JOINS

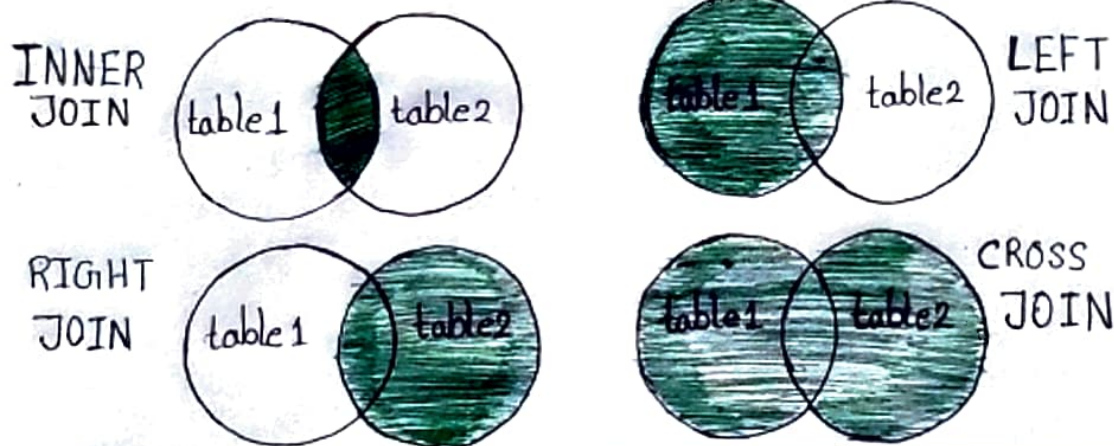
A **JOIN** clause is used to combine rows from two or more tables, based on a related column between them.

Example:-

```
SELECT *  
FROM benn.college-football-players players  
JOIN benn.college-football-teams teams  
ON teams.school_name = players.school_name
```

## Supported Types of JOINS in MySQL

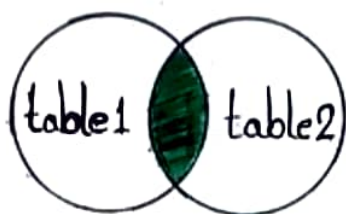
- **INNER JOIN**: Returns records that have matching values in both tables.
- **LEFT JOIN**: Returns all records from the left table, and the matched records from the right table.
- **RIGHT JOIN**: Returns all records from the right table, and the matched records from the left table.
- **CROSS JOIN**: Returns all records from both tables.



## INNER JOIN

The **INNER JOIN** keyword selects records that have matching values in both tables.

### INNER JOIN



Example :-

```
SELECT column_name(s)  
FROM table 1
```

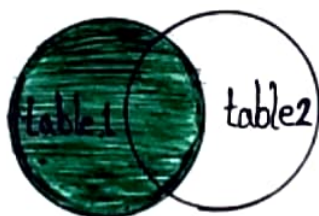
```
INNER JOIN table 2
```

```
ON table1.column_name = table2.column_name;
```

## LEFT JOIN

The **LEFT JOIN** keyword returns all records from the left table (table 1), and the matching records (if any) from the right table (table 2).

### LEFT JOIN



Example :-

```
SELECT column_name(s)  
FROM table 1
```

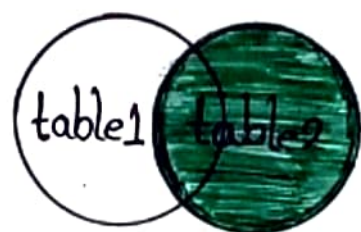
```
LEFT JOIN table 2
```

```
ON table1.column_name = table2.column_name;
```

## RIGHT JOIN

The **RIGHT JOIN** keyword returns all records from the right table (table 2), and the matching records (if any) from the left table (table 1).

### RIGHT JOIN



Example :-

```
SELECT column_name(s)
FROM table 1
RIGHT JOIN table 2
ON table 1.column_name = table 2.column_name ;
```

## CROSS JOIN

The **CROSS JOIN** keyword returns all records from both tables (table 1 and table 2).

### CROSS JOIN



Example :-

```
SELECT column_name(s)
FROM table 1
CROSS JOIN table 2 ;
```

## SELF JOIN

A self join is a regular join, but the table is joined with itself.

Example :-

```
SELECT column_name(s)
FROM table1 T1, table1.T2
WHERE condition ;
```

## UNION Operator

SQL joins allow you to combine two datasets side-by-side, but **UNION** allows you to stack one dataset on top of the other. Put differently, **UNION** allows you to write two separate **SELECT** statements, and to have the results of one statement display in the same table as the results from the other statement.

Example :-

- SELECT column\_name(s) FROM table 1  
**UNION**  
SELECT column\_name(s) FROM table 2 ;
- SELECT column\_name(s) FROM table 1  
**UNION ALL**  
SELECT column\_name(s) FROM table 2 ;

## IN Operator

The **IN** operator allows you to specify multiple values in a **WHERE** clause.

The **IN** operator is a shorthand for multiple **OR** conditions.

Example :-

- SELECT \* FROM Sales  
WHERE country IN ("India", "Nepal", "UK");
- SELECT \* FROM sales  
WHERE country NOT IN ("India", "Nepal", "UK");
- SELECT \* FROM sales  
WHERE country IN (SELECT country FROM suppliers);

## EXISTS Operator

The **EXISTS** operator is used to test for the existence of any record in a subquery.

The **EXISTS** operator returns TRUE if the subquery returns one or more records.

Example :-

```
SELECT column_name(s)
FROM table_name
WHERE EXISTS
(SELECT column_name FROM table_name WHERE condition);
```

## ANY and ALL Operator

The **ANY** and **ALL** operator allow you to perform a comparison between a single column value and a range of other values.

## ANY Operator

- It returns a boolean value as a result.
- It returns TRUE if ANY of the subquery values meet the condition.

**ANY** means that the condition will be true if the operation is true for any of the values in the range.

Example:-

```
SELECT ProductName FROM sales
WHERE ProductID = ANY
(SELECT ProductID FROM OrderDetails
WHERE Quantity > 99) ;
```

## ALL Operator

- It returns a boolean value as a result.
- It returns TRUE if ALL of the subquery values meet the condition.
- It is used with **SELECT**, **WHERE** and **HAVING** statements.

**ALL** means that the condition will be true only if the operation is true for all values in the range.

Example:-

- SELECT **ALL** ProductName  
FROM sales  
WHERE TRUE ;

- `SELECT ProductName FROM sales  
WHERE ProductID = ALL  
(SELECT ProductID FROM OrderDetails  
WHERE Quantity = 10) ;`

## INSERT INTO SELECT

The `INSERT INTO SELECT` statement copies data from one table and inserts it into another table.

The `INSERT INTO SELECT` statement requires that the data types in source and target tables matches.

The existing records in the target table are unaffected.

Example:- • `INSERT INTO table 2  
SELECT * FROM table 1  
WHERE condition ;`

- `INSERT INTO table 2 (column1, column2, column3, ...)  
SELECT column1, column2, column3, ...  
FROM table 1  
WHERE condition ;`

## INSERT INTO Statement

The `INSERT INTO` statement is used to insert new records in a table.

It is possible to write the `INSERT INTO` statement in two ways.

- Specify both the column names and the values to be inserted.

```
INSERT INTO table_name(column1, column2, column3, ...)
VALUES (value1, value2, value3, ...);
```

- If you are adding values for all the columns of the table, you do not need to specify the column names in the SQL query. However, make sure the order of the values is in the same order as the columns in the table. Here, the **INSERT INTO** syntax would be as follows.

```
INSERT INTO table_name
VALUES (value1, value2, value3, ...);
```

## IFNULL() Function

**IFNULL()** function lets you return an alternative value if an expression is NULL.

The example below returns 0 if the value is NULL.

- ```
SELECT contactname,
   IFNULL (bizphone, homephone) AS phone
FROM contacts;
```
- ```
SELECT name,
   IFNULL (officephone, mobilephone) AS contact
FROM employee;
```