SQL

SQL stands for **Structured Query Language**. SQL is a standard database language used to access and manipulate data in databases

Our SQL tutorial will teach you how to use SQL in: MySQL, SQL Server, MS Access, Oracle, Sybase, Informix, Postgres, and other database systems

What is a database ?

Data is **unorganized** information, so to **organize** the data we make database

Difference Between DBMS and RDBMS ?

DBMS : in DBMS data is **stored as a file** and it can be used by one **single** user
RDBMS : In RDBMS data is stored in a **tabular form** and it can used by **multiple users** and it is the advanced version of DBMS

Datatypes in SQL :

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Data Type	From	To
BigInt	-263 (-9,223,372,036,854,775,808)	263 -1 (9,223,372,036,854,775,807)

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Int	-231 (-2,147,483,648)	231-1 (2,147,483,647)
smallint	-215 (-32,768)	215-1 (32,767)
tinyint	0	28-1 (255)
bit	0	1
decimal	-1038+1	1038-1
numeric	-1038+1	1038-1

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money	-922,337,203,685,477.5808	922,337,203,685,477.5807
smallmoney	-214,748.3648	214,748.3647

Approximate Numeric Datatype

The subtypes of this datatype are given in the table with the range.

Data Type	From	To
Float	-1.79E+308	1.79E+308
Real	-3.40E+38	3.40E+38

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SQL Date and Time Data Types

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Data Type	Description
DATE	Stores date in the format `YYYY-MM-DD`
TIME	Stores time in the format `HH:MI:SS`
DATETIME	Stores date and time information in the format `YYYY-MM-DD HH:MI:SS`
TIMESTAMP	Stores number of seconds passed since the Unix epoch (`'1970-01-01 00:00:00' UTC`)
YEAR	Stores year in a 2-digit or 4-digit format. Range 1901 to 2155 in 4-digit format. Range 70 to 69, representing 1970 to 2069.

SQL Character and String Data Types

Data Type	Description
CHAR	Fixed length with a maximum length of 8,000 characters
VARCHAR	Variable-length storage with a maximum length of 8,000 characters
VARCHAR(max)	Variable-length storage with provided max characters, not supported in MySQL
TEXT	Variable-length storage with a maximum size of 2GB data

Note: These data types are for character streams. They should not be used with Unicode data.

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SQL Unicode Character and String Data Types

Data Type	Description
NCHAR	Fixed length with a maximum length of 4,000 characters
NVARCHAR	Variable-length storage with a maximum length of 4,000 characters
NVARCHAR(max)	Variable-length storage with provided max characters
NTEXT	Variable-length storage with a maximum size of 1GB data

Note: These data types are not supported in MySQL databases.

SQL Binary Data Types

Data Type	Description
BINARY	Fixed length with a maximum length of 8,000 bytes
VARBINARY	Variable-length storage with a maximum length of 8,000 bytes
VARBINARY(max)	Variable-length storage with provided max bytes
IMAGE	Variable-length storage with a maximum size of 2 GB binary data

SQL Miscellaneous Data Types

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Data Type	Description
CLOB	Character large objects that can hold up to 2 GB
BLOB	For large binary objects
XML	For storing XML data

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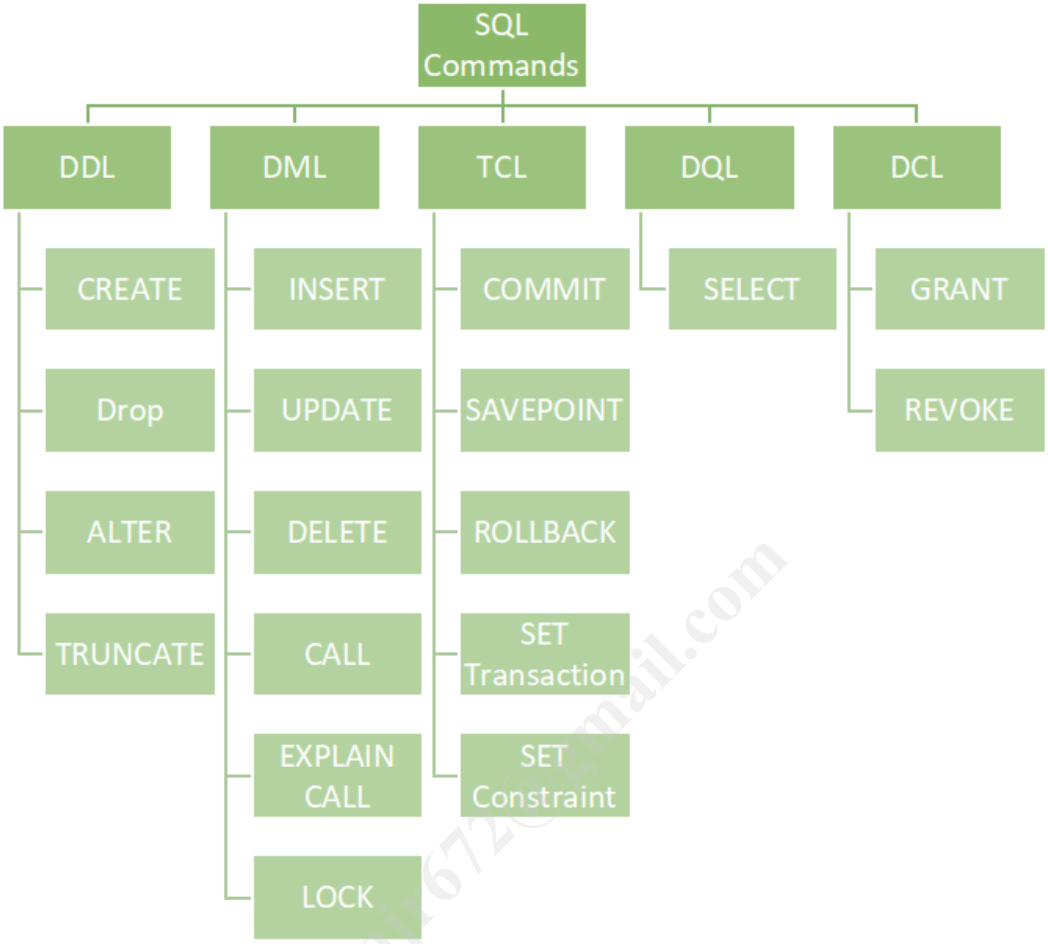

Data Definition language
Data manipulation language
Data Query language
Data Control language
Transaction control language

Note:
SQL is not a case sensitive , we can use uppercase , lowercase and upperlowercases
Ex: YUvaRaj, cUStOmers (it will work)

Query 1: Create table and adding columns

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Create table Employee (id int(255),Firstname varchar(255),LastName varchar(255),RollNumber int(255),Age int(255));

Query 2: Rename the table
Alter table Practice Rename to Employee;

Query 3 : Add Extra One column in existing table
Alter table Employee add column Student varchar(255);

Query 4 : Delete one column in existing table
Alter table Employee drop column Student;

Query 5 : Delete Entire table
Drop table Employee;

Query 6: Creating the table and Inserting the data into the table

```
CREATE TABLE GFG_Employees (
  id INT PRIMARY KEY,
  name VARCHAR (20) ,
  email VARCHAR (25),
  department VARCHAR(20)
);
```

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```
Multiple values adding in a table
```

INSERT INTO GFG_Employees (id, name, email, department) VALUES

(1, 'Jessie', 'jessie23@gmail.com', 'Development'),
(2, 'Praveen', 'praveen_dagger@yahoo.com', 'HR'),
(3, 'Bisa', 'dragonBall@gmail.com', 'Sales'),
(4, 'Rithvik', 'msvv@hotmail.com', 'IT'),
(5, 'Suraj', 'srjsunny@gmail.com', 'Quality Assurance'),
(6, 'Om', 'OmShukla@yahoo.com', 'IT'),

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(7, 'Naruto', 'uzumaki@konoha.com', 'Development');

DELETE remove the specific row based on the given condition,

TRUNCATE removes all the record from the table at once, whereas the DROP command removes the table or databases and as well as the structure.

Query 7: Deleting the single record in a table

```
DELETE FROM GFG_Employees WHERE NAME = 'Rithvik'
```

Query 8 : Deleting the multiple records in a table With the same Name inside the column

Delete from GFG_Employees where department='Development' ;

Or

Delete from GFG_Employess where Name ='Rithvik' and department='Development';

Query 9: Delete All the records from the table

Delete from GFG_Employees;

What is the difference between Drop and delete?

Drop is used to delete all the records and structure in the database

Delete is used to delete only the records in the database but structure remains same

Important Note:

DELETE is a DML (Data Manipulation Language) command, the operation performed by DELETE can be

rolled back or undone by using the COMMIT or ROLLBACK command.

Query 10 : We need to see all the columns from the table

Select * from Customers - Customers is the table name

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Query 11 : we need to fetch the particular columns from the table
Select FristName, LastName,age,Rollnumber from Customers
Ex : Select column1,column2,column3 from tableName;

SQL DISTINCT STATEMENT

The SQL distinct statement is used to return only distinct (**Different**) values

NOTE : For Example: in Employee table , each employee will be located in **different** places and some of the employees will be located in **same** places ,
only different locations employees we should show

Query 12: We Need to fetch only different countries in a column
Select Distinct Country from Customers;

Note: Country is the column and table is the customers

Query 13: Select Statement with Where clause
Where is used to see only the particular data

Example 1: we need to see only one data with all columns use *
Select * from customers **where** age=25; - All the columns whose age contains 25 data will be displayed

Example 2: if we want to see only the column with the particular data , remove * add column name
Select age from customers **where** age=25;

Query 14: Select Statement with Order By clause desc order
Select* from Employee order by age desc; - descending order
* is to fetch entire table
Select is to select particular table
Order by is asc , desc
Note: we should use column after order by clause and which format we should order.

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Query 15: Select Statement with Order By clause ASC order
Select* from Employee order by age Asc; - Ascending order

Limit Clause

Query 16 : we need to see only 50 records which table is having 100 records
Select * from Employee limit 50;

Limit with order by clause

Query 17 : we need to see that 50 records in ascending order - order by clause
Select * from Employee order by age desc limit 50;

SQL LIMIT OFFSET

LIMIT OFFSET parameter skips a specified number of rows before returning the result set.

OFFSET can only be used with the **ORDER BY** clause. It cannot be used on its own.

OFFSET value must be greater than or equal to zero. It cannot be negative, else returns an error.

Note Important : The first value X is the offset value and the second value Y is the LIMIT value

Query 18 : Skip 3 rows from starting and print only 60 values from 100
Select * from **Table name** limit **offset value** ,**limit value**
Select * from customers limit 3,2;
Output:
It will print skipping the first 3 rows and it will show only 2 rows

Note : Always offset value should not be greater than limit values
If the table has 100 rows and if we keep limit has 200 still it will print showing 100 rows values
Limit exceeds does not effect the Query only offset effects

Note : same instead of using * , if we use column name we can print only column values
Select Column name from Table limit 3;

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SQL operators :

SQL AND and **SQL OR operators**

AND - Displays a record when the both the conditions are true
Or - Displays a record if only one conditions is true

Query 19 : AND
Select * from customers where first_name =’yuvaraj’ and age =26;

NOTE : AND condition check both the values are there or not in the table it will check
If one of the value is not there , it will throw an error

Query 20 : OR
Select * from customers where first_name =’yuvaraj’ or age =26;

NOTE: OR condition check any of the value is there or not in the table , if one value is present , it will display the records

Combining **AND** and **OR** operators :

Select * from customers where First_name=’Robert’ **and** (age=22 or age =31);
Select * from customers where age = 31 **or** (first_name=’Robert’ and first_name=’david’);

Like Operator

Pattern	Meaning

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‘a%’	Match strings that start with ‘a’
‘%a’	Match strings with end with ‘a’
‘a%t’	Match strings that contain the start with ‘a’ and end with ‘t’.
‘%wow%’	Match strings that contain the substring ‘wow’ in them at any position.
‘_wow%’	Match strings that contain the substring ‘wow’ in them at the second position.
‘_a%’	Match strings that contain ‘a’ at the second position.
‘a_ _%’	Match strings that start with ‘a and contain at least 2 more characters.

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Note Easy : Above table if u understand we can write N Number of queries using Like operator

SQL IN Operator

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Query 21: Fetch all the records which is country india , Pakistan

Select * from Customers where country in ('india','pakistan');

`Note: If any of the conditions are passed using the IN operator, they will be considered true`

Output : it will display all the records which are india and pakistan

Between

Query 22: Fetch the rows whose age has between 25 to 18

Select * from Customers where age Between 18 and 25;

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JOINS

SQL Join operation combines data or rows from two or more tables based on a common field between them.

Types of Joins in SQL :

1) Inner Join
2) Left Join
3) Right Join
4) Full Join
5) Natural Join

Note: All the conditions are same , we need to understand

Inner Join:

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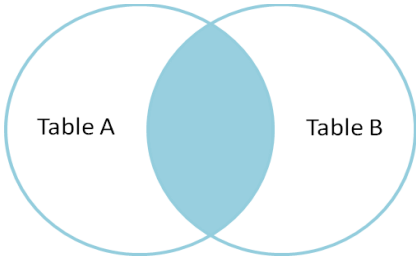


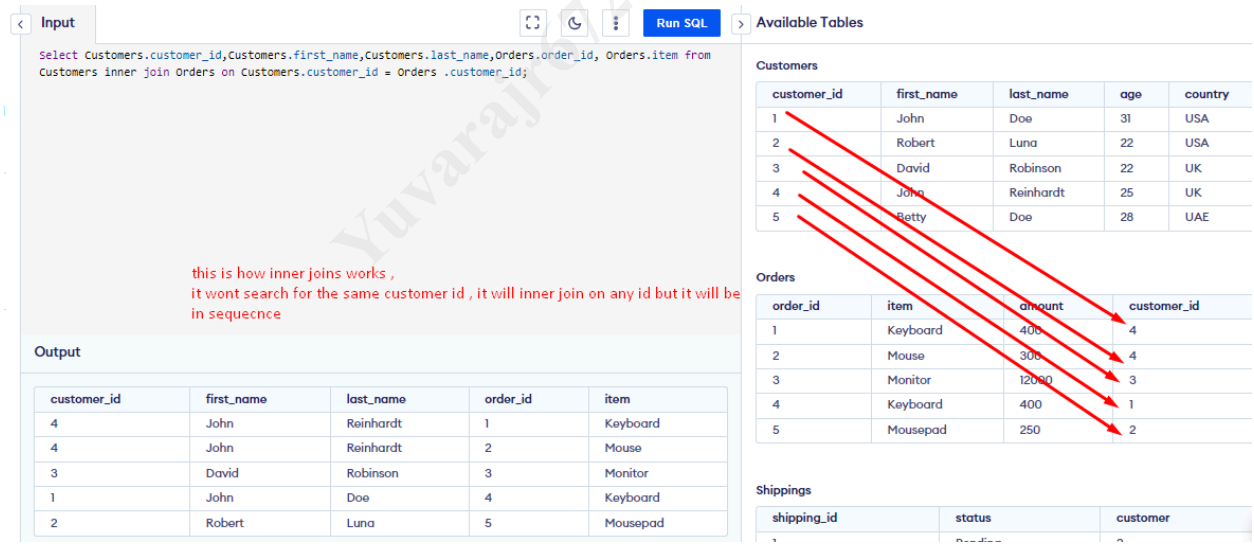
Query 23:

Select Orders.order_id,Customers.customer_id,Customers.first_name,Customers.age,Customers.country from Customers Left join Orders on Customers.Customer_id = Orders.Customer_id

Explanation :

Select TableA.Column1,TableA.column2,TableB.column1 from TableA Inner Join TableB on TableA.Samecolumn = TableB.samecolumn

Note: Check for both the tables **same column** is there or not , if it is there in condition right same column names



Red color is same column

Select TableA.Column1,TableA.column2,TableB.column1 from TableA Inner Join TableB on

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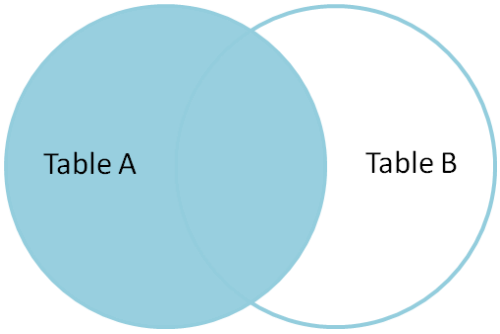
Above Query is how many column we need to print

Left Join :



Input

Run SQL

```
Select Customers.customer_id,Customers.first_name,Customers.last_name,Orders.order_id, Orders.item from
Customers left join Orders on Customers.customer_id = Orders .customer_id;
```

left join
customer id 1 will search for another table customer id 1 same number

Output

customer_id	first_name	last_name	order_id	item
1	John	Doe	4	Keyboard
2	Robert	Luna	5	Mousepad
3	David	Robinson	3	Monitor
4	John	Reinhardt	1	Keyboard
4	John	Reinhardt	2	Mouse
5	Betty	Doe		

Available Tables

Customers

customer_id	first_name	last_name	age	countr
1	John	Doe	31	USA
2	Robert	Luna	22	USA
3	David	Robinson	22	UK
4	John	Reinhardt	25	UK
5	Betty	Doe	28	UAE

Orders

order_id	item	amount	customer_id
1	Keyboard	400	4
2	Mouse	300	4
3	Monitor	12000	3
4	Keyboard	400	1
5	Mousepad	250	2

Shippings

shipping_id	status	customer
1	Pending	2

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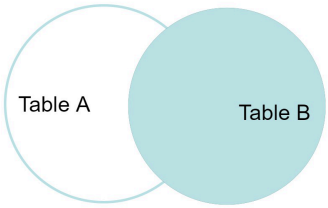
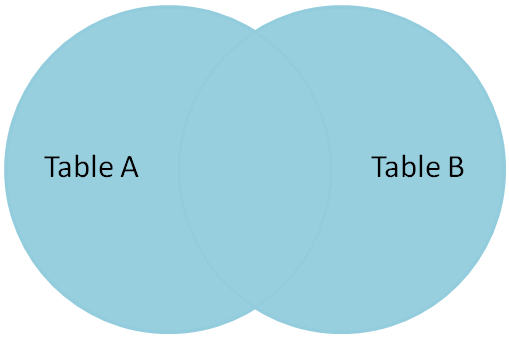
Right Join :



Full Join :



Query 24: How to find the Highest salary in a table?
SELECT * FROM Orders WHERE amount = (SELECT MAX(amount) FROM Orders);

Explanation: Select * from **table_name** where **columnName** = (select **Max(column_name**) from Table name);

Query 25: How to find the Lowest salary in a table?
SELECT * FROM Orders WHERE amount = (SELECTmin(amount) FROM Orders);

Note: above two Queries to fetch the Entire row which has max salary and min salary

Query 25: How to find the highest salary only for that column ?
Select Max(age) from Customers;

Query 26: How to find the Lowest salary only for that column ?
Select min(age) from Customers;

Query 27 : How to find the Average amount ?

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Select Avg(amount) from Orders;
Avg is calculated by adding all the amount and divided by how many amounts we have added

Query 28 : How many types of Keys are there in relational database management system

1) *Candidate Key*
2) *Primary Key*
3) *Super Key*
4) *Alternate Key*
5) *Foreign Key*
6) *Composite Key*

Primary Key:

Primary Key is a set of attributes (or attribute) which **uniquely** identify the tuples in relation or table. The primary key is a minimal super key, so **there is one and only one primary key in any relationship**. For example,

```
Student{ID, Aadhar_ID, F_name, M_name, L_name, Age}
```

Here only **ID** or **Aadhar_ID** can be **primary** key because the name, age can be same, but ID or Aadhar_ID can't be same.

Candidate Key:
A candidate key is a set of attributes (or attribute) which uniquely identify the tuples in relation or table. As we know that Primary key is a minimal super key, so there is one and only one primary key in any relationship but there is more than one candidate key can take place. Candidate key's attributes can contain a NULL value which opposes to the primary key. For example,

```
Student{ID, Aadhar_ID, F_name, M_name, L_name, Age}
```

Here we can see the two candidate keys **ID** and **Aadhar_ID**. So here, there are present more than one candidate keys, which can uniquely identify a tuple in a relation.

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Foreign Key:

A FOREIGN KEY is a field (or collection of fields) in one table, that refers to the PRIMARY KEY in another table

Group BY

The `GROUP BY` clause in SQL arranges query output into groups
GROUP BY is usually used with the aggregate functions such as `COUNT()`, `SUM()`, `AVG()`, `MIN()`, `MAX()`.

id	date	movie	director	number_of_streams
1	2022-04-01	Fargo	Coen brothers	495
2	2022-04-01	The Big Lebowski	Coen brothers	512
3	2022-04-01	No Country for Old Men	Coen brothers	270
4	2022-04-01	Dogtooth	Yorgos Lanthimos	157
5	2022-04-01	The Lobster	Yorgos Lanthimos	247
6	2022-04-01	The Killing of a Sacred Deer	Yorgos Lanthimos	320

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Query 29 : Find the total number of streams by date.

Explanation :
Total number of streams they have asked , so we need to use **sum ()** aggregate function
Total number of streams by date they have asked so we need to use Group by () with the help of date you need to Group

Query Answer: Select date,sum(number_of_streams) as total number_of_streams from movie_streaming group by date;

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Query 30: Find the total number of streams by `date` and `director`.

Explanation:
Total number of streams we need to use - sum()
Group by date and director
Note : see first Explanation you will understand clearly

Query Answer: Select date, director, sum(number_of_streams) as total number_of_streams from movie_streaming group by date ,director;

Query 31: Find the total number of streams by date and director. Show only dates with a total number of streams above 740

Select date,director sum(number_of_streams) as total number_of_streams from movie_streaming Group by date ,director **having** sum (number_of_streams) >740;

Query 32: How do you filter groups in an SQL Query?

Groups in an SQL query are filtered using the `HAVING` clause.
`HAVING` cannot be used without `GROUP BY` ; it's always written after `GROUP BY`, and its purpose is to filter data resulting from an aggregate function

Query 33: what is the difference between Group By and Where clause?

Both **where** and **Having** are used to filter data in SQL.
The main difference is that where is used on non aggregate function while having is used on aggregate functions

Query 34: What function can be used with Group By ?

The `GROUP BY` clause is usually used with SQL's aggregate functions.

- `SUM()` – Adds up all the row values.
- `COUNT()` – Counts the number of rows.
- `AVG()` – Returns the average value.

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- `MIN()` – Returns the smallest value.
- `MAX()` – Returns the largest value.

Format of writing a Query? Important :

Select - 5
From - 1
Where - 2
Group By -3
Having -4
Order by -6

Execution flow - 1 2 3 4 5 6
Writing a query : **select ____, from ____ where ____ Group by ____ having _____ orderby ___**

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Insert into Employee(Employeeid,Firstname,lastName) values(1,'Yuvaraj','raj');
Types of Operators in SQL ?

Different types of operators in SQL are:

1. Arithmetic operator
2. Comparison operator
3. Logical operator
4. Bitwise Operators
5. Compound Operators

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Arithmetic operator :

" + " The addition is used to perform an **addition** operation on the data values.

" - " This operator is used for the **subtraction** of the data values.

" / " This operator works with the **'ALL'** keyword and it calculates division operations.

" * " This operator is used for **multiplying** data values

" % " Modulus is used to get the remainder when data is **divided** by another

Example 1:

In the following example, we are trying to perform the **addition** operation to give all employees a bonus of 5000 to their existing salary.

```
SELECT ID, NAME, SALARY, SALARY + 5000 AS "SALARY_BONUS" FROM employee;
```

Output

When we execute the above query, the output is obtained as follows –

ID	NAME	SALARY	SALARY_BONUS
1	Khilan	57500.84	62500.84
2	Ramesh	25550.12	30550.12
3	Komal	44200.09	49200.09
4	kaushik	47275.43	52275.43
5	Chaitali	40700.76	45700.76
6	Hardhik	44200.09	49200.09

Example 2:

In here, we are using the **- operator** to find the salary difference between the highest-paid and lowest-paid employees.

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```
SELECT MAX(salary), MIN(salary), MAX(salary)-MIN(salary) AS salary_difference FROM employee;
```

Output

On executing the above query, the output is displayed as follows –

MAX(salary)	MIN(salary)	salary_difference
57500.84	25550.12	31950.72

Example 3:

Now, we are performing *** operation** to give all employees a 10% bonus on their salary.

```
SELECT NAME, AGE, ADDRESS, SALARY * 1.10 AS new_salary_with_bonus
FROM employee;
```

Output

The table for the above query produced as given below –

NAME	AGE	ADDRESS	new_salary_with_bonus
Khilan	22	Nijamabad	63250.9240
Ramesh	21	Hyderabad	28105.1320
Komal	23	Chennai	48620.0990
kaushik	18	Bangalore	52002.9730
Chaitali	23	Ranchi	44770.8360
Hardhik	19	Noida	48620.0990

Example 4:

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Here, we are using the / operator to calculate the average salary of all employees.

```
SELECT AVG(SALARY) AS average_salary FROM employee;
```

Output

Following is the output of the above query –

average_salary
43237.888333

Example

In the following example, we are using the % operator to find out the employees having an even employee ID.

```
SELECT * FROM employee WHERE ID % 2 = 0;
```

Output

The output produced is as shown below –

ID	NAME	AGE	ADDRESS	SALARY	JOIN_DATE
2	Ramesh	21	Hyderabad	25550.12	2023-01-02
4	kaushik	18	Bangalore	47275.43	2023-03-15
6	Hardhik	19	Noida	44200.09	2023-06-04

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