

# SQL

- SQL stands for Structured Query Language. It is used for storing and managing data in relational database management system (RDMS).
- It is a standard language for Relational Database System. It enables a user to create, read, update and delete relational databases and tables.
- All the RDBMS like MySQL, Informix, Oracle, MS Access and SQL Server use SQL as their standard database language.
- SQL allows users to query the database in a number of ways, using English-like statements.

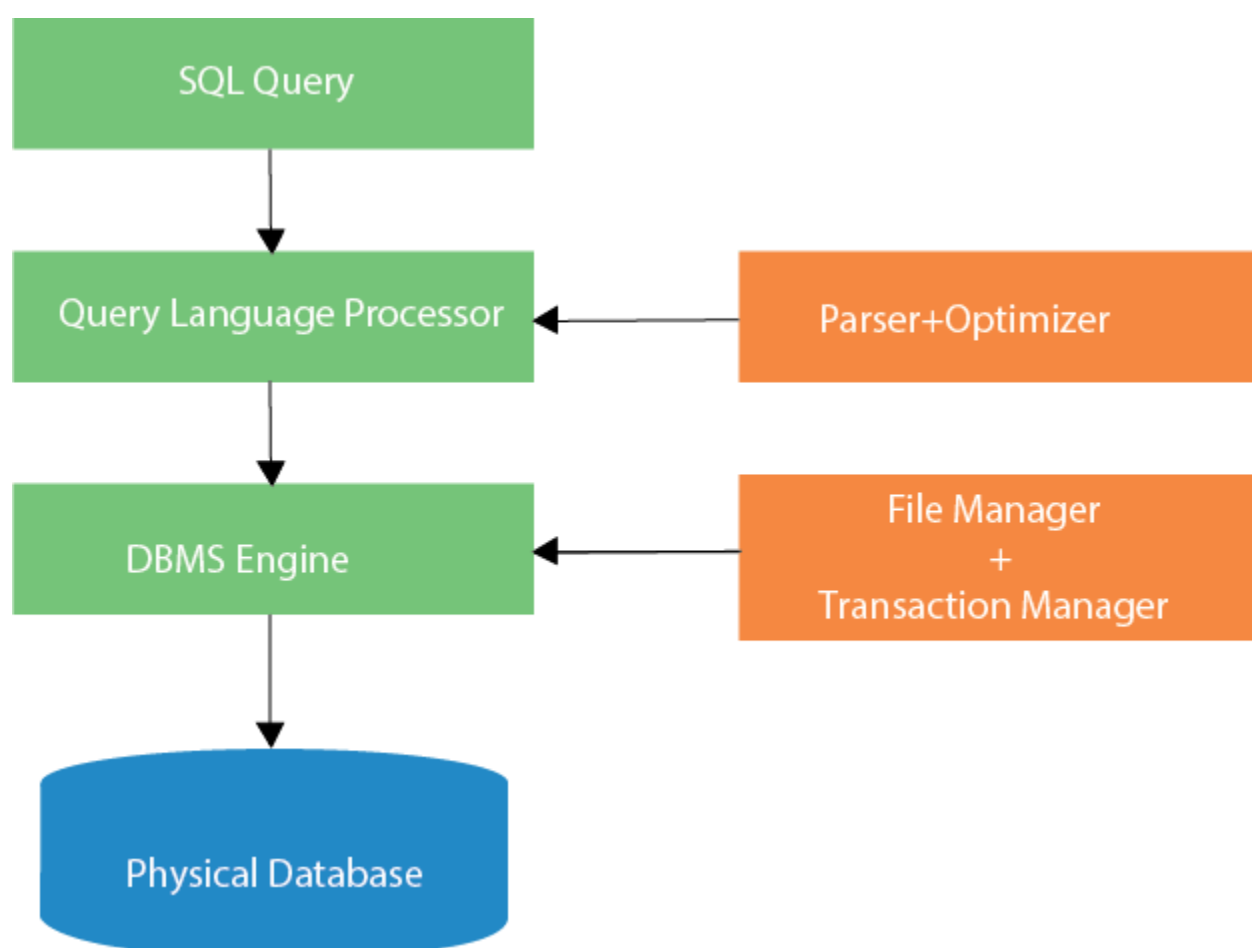
## Rules:

SQL follows the following rules:

- Structure query language is not case sensitive. Generally, keywords of SQL are written in uppercase.
- Statements of SQL are dependent on text lines. We can use a single SQL statement on one or multiple text line.
- Using the SQL statements, you can perform most of the actions in a database.
- SQL depends on tuple relational calculus and relational algebra.

## SQL process:

- When an SQL command is executing for any RDBMS, then the system figure out the best way to carry out the request and the SQL engine determines that how to interpret the task.
- In the process, various components are included. These components can be optimization Engine, Query engine, Query dispatcher, classic, etc.
- All the non-SQL queries are handled by the classic query engine, but SQL query engine won't handle logical files.



## Characteristics of SQL

- SQL is easy to learn.
- SQL is used to access data from relational database management systems.
- SQL can execute queries against the database.
- SQL is used to describe the data.
- SQL is used to define the data in the database and manipulate it when needed.
- SQL is used to create and drop the database and table.
- SQL is used to create a view, stored procedure, function in a database.
- SQL allows users to set permissions on tables, procedures, and views.

# Advantages of SQL

There are the following advantages of SQL:

## High speed

Using the SQL queries, the user can quickly and efficiently retrieve a large amount of records from a database.

## No coding needed

In the standard SQL, it is very easy to manage the database system. It doesn't require a substantial amount of code to manage the database system.

## Well defined standards

Long established are used by the SQL databases that are being used by ISO and ANSI.

## Portability

SQL can be used in laptop, PCs, server and even some mobile phones.

## Interactive language

SQL is a domain language used to communicate with the database. It is also used to receive answers to the complex questions in seconds.

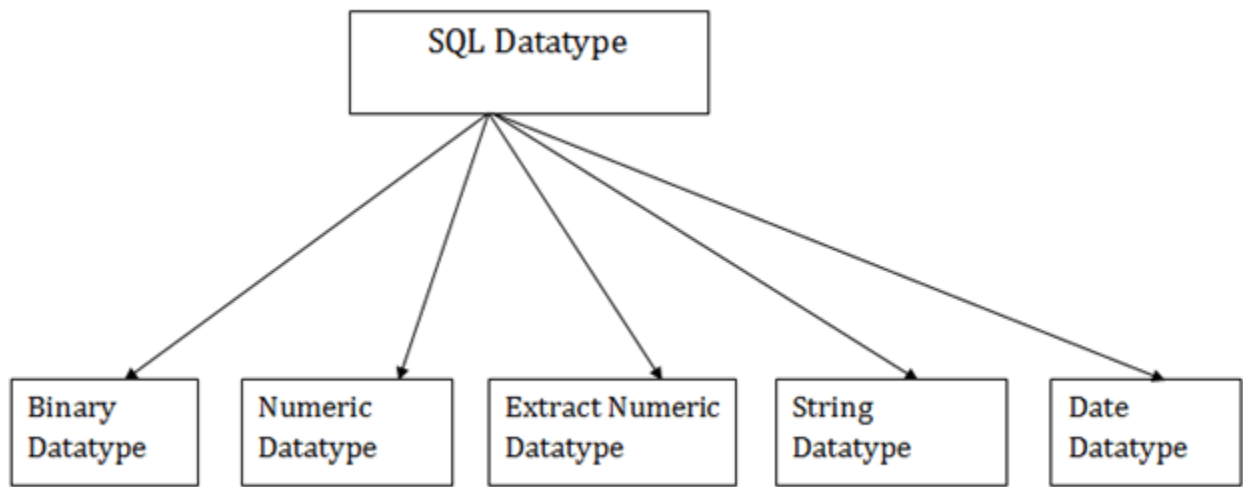
## Multiple data view

Using the SQL language, the users can make different views of the database structure.

# SQL Datatype

- SQL Datatype is used to define the values that a column can contain.
- Every column is required to have a name and data type in the database table.

## Datatype of SQL:



## 1. Binary Datatypes

There are Three types of binary Datatypes which are given below:

Data Type	Description
binary	It has a maximum length of 8000 bytes. It contains fixed-length binary data.
varbinary	It has a maximum length of 8000 bytes. It contains variable-length binary

	data.
image	It has a maximum length of 2,147,483,647 bytes. It contains variable-length binary data.

## 2. Approximate Numeric Datatype :

The subtypes are given below:

Data type	From	To	Description
float	-1.79E 308	+ 1.79E 308	It is used to specify a floating-point value e.g. 6.2, 2.9 etc.
real	-3.40e 38	+ 3.40E 38	It specifies a single precision floating point number

## 3. Exact Numeric Datatype

The subtypes are given below:

Data type	Description
int	It is used to specify an integer value.
smallint	It is used to specify small integer value.
bit	It has the number of bits to store.
decimal	It specifies a numeric value that can have a decimal number.
numeric	It is used to specify a numeric value.

## 4. Character String Datatype

The subtypes are given below:

Data type	Description
char	It has a maximum length of 8000 characters. It contains Fixed-length non-unicode characters.
varchar	It has a maximum length of 8000 characters. It contains variable-length non-unicode characters.
text	It has a maximum length of 2,147,483,647 characters. It contains variable-length non-unicode characters.

## 5. Date and time Datatypes

The subtypes are given below:

Datatype	Description
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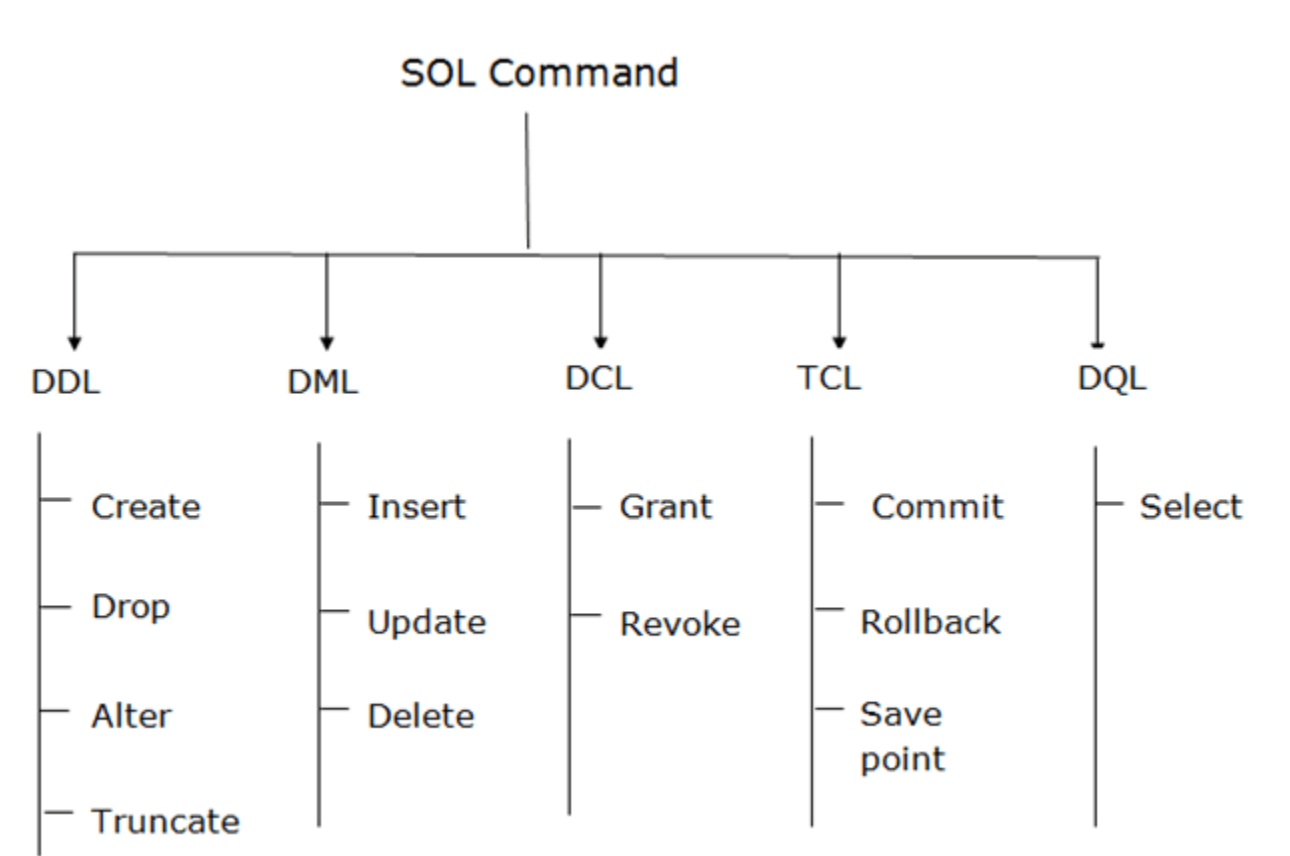
date	It is used to store the year, month, and days value.
time	It is used to store the hour, minute, and second values.
timestamp	It stores the year, month, day, hour, minute, and the second value.

## SQL Commands

- SQL commands are instructions. It is used to communicate with the database. It is also used to perform specific tasks, functions, and queries of data.
- SQL can perform various tasks like create a table, add data to tables, drop the table, modify the table, set permission for users.

## Types of SQL Commands

There are five types of SQL commands: DDL, DML, DCL, TCL, and DQL.



### 1. Data Definition Language (DDL)

- DDL changes the structure of the table like creating a table, deleting a table, altering a table, etc.
- All the command of DDL are auto-committed that means it permanently save all the changes in the database.

Here are some commands that come under DDL:

- CREATE
- ALTER
- DROP
- TRUNCATE

**a. CREATE** It is used to create a new table in the database.

**Syntax:**

1. CREATE TABLE TABLE\_NAME (COLUMN\_NAME DATATYPES[,....]);

**Example:**

1. CREATE TABLE EMPLOYEE(Name VARCHAR2(20), Email VARCHAR2(100), DOB DATE);

**b. DROP:** It is used to delete both the structure and record stored in the table.

**Syntax**

1. DROP TABLE table\_name;

#### Example

1. DROP TABLE EMPLOYEE;

**c. ALTER:** It is used to alter the structure of the database. This change could be either to modify the characteristics of an existing attribute or probably to add a new attribute.

#### Syntax:

To add a new column in the table

1. ALTER TABLE table\_name ADD column\_name COLUMN-definition;

To modify existing column in the table:

1. ALTER TABLE table\_name MODIFY(column\_definitions....);

#### EXAMPLE

1. ALTER TABLE STU\_DETAILS ADD(ADDRESS VARCHAR2(20));
2. ALTER TABLE STU\_DETAILS MODIFY (NAME VARCHAR2(20));

**d. TRUNCATE:** It is used to delete all the rows from the table and free the space containing the table.

#### Syntax:

1. TRUNCATE TABLE table\_name;

#### Example:

1. TRUNCATE TABLE EMPLOYEE;

## 2. Data Manipulation Language

- DML commands are used to modify the database. It is responsible for all form of changes in the database.
- The command of DML is not auto-committed that means it can't permanently save all the changes in the database. They can be rollback.

Here are some commands that come under DML:

- INSERT
- UPDATE
- DELETE

**a. INSERT:** The INSERT statement is a SQL query. It is used to insert data into the row of a table.

#### Syntax:

1. INSERT INTO TABLE\_NAME
2. (col1, col2, col3,.... col N)
3. VALUES (value1, value2, value3, .... valueN);

Or

1. INSERT INTO TABLE\_NAME
2. VALUES (value1, value2, value3, .... valueN);

#### For example:

1. INSERT INTO javatpoint (Author, Subject) VALUES ("Sonoo", "DBMS");

**b. UPDATE:** This command is used to update or modify the value of a column in the table.

#### Syntax:

1. UPDATE table\_name SET [column\_name1 = value1,...column\_nameN = valueN] [WHERE CONDITION]

**For example:**

1. UPDATE students
2. SET User\_Name = 'Sonoo'
3. WHERE Student\_Id = '3'

**c. DELETE:** It is used to remove one or more row from a table.

**Syntax:**

1. DELETE FROM table\_name [WHERE condition];

**For example:**

1. DELETE FROM javatpoint
2. WHERE Author="Sonoo";

### 3. Data Control Language

DCL commands are used to grant and take back authority from any database user.

Here are some commands that come under DCL:

- Grant
- Revoke

**a. Grant:** It is used to give user access privileges to a database.

**Example**

1. GRANT SELECT, UPDATE ON MY\_TABLE TO SOME\_USER, ANOTHER\_USER;

**b. Revoke:** It is used to take back permissions from the user.

**Example**

1. REVOKE SELECT, UPDATE ON MY\_TABLE FROM USER1, USER2;

### 4. Transaction Control Language

TCL commands can only use with DML commands like INSERT, DELETE and UPDATE only.

These operations are automatically committed in the database that's why they cannot be used while creating tables or dropping them.

Here are some commands that come under TCL:

- COMMIT
- ROLLBACK
- SAVEPOINT

**a. Commit:** Commit command is used to save all the transactions to the database.

**Syntax:**

1. COMMIT;

**Example:**

1. DELETE FROM CUSTOMERS
2. WHERE AGE = 25;
3. COMMIT;

**b. Rollback:** Rollback command is used to undo transactions that have not already been saved to the database.

**Syntax:**

1. ROLLBACK;

**Example:**

1. DELETE FROM CUSTOMERS
2. WHERE AGE = 25;
3. ROLLBACK;

**c. SAVEPOINT:** It is used to roll the transaction back to a certain point without rolling back the entire transaction.

**Syntax:**

1. SAVEPOINT SAVEPOINT\_NAME;

## 5. Data Query Language

DQL is used to fetch the data from the database.

It uses only one command:

- SELECT

**a. SELECT:** This is the same as the projection operation of relational algebra. It is used to select the attribute based on the condition described by WHERE clause.

**Syntax:**

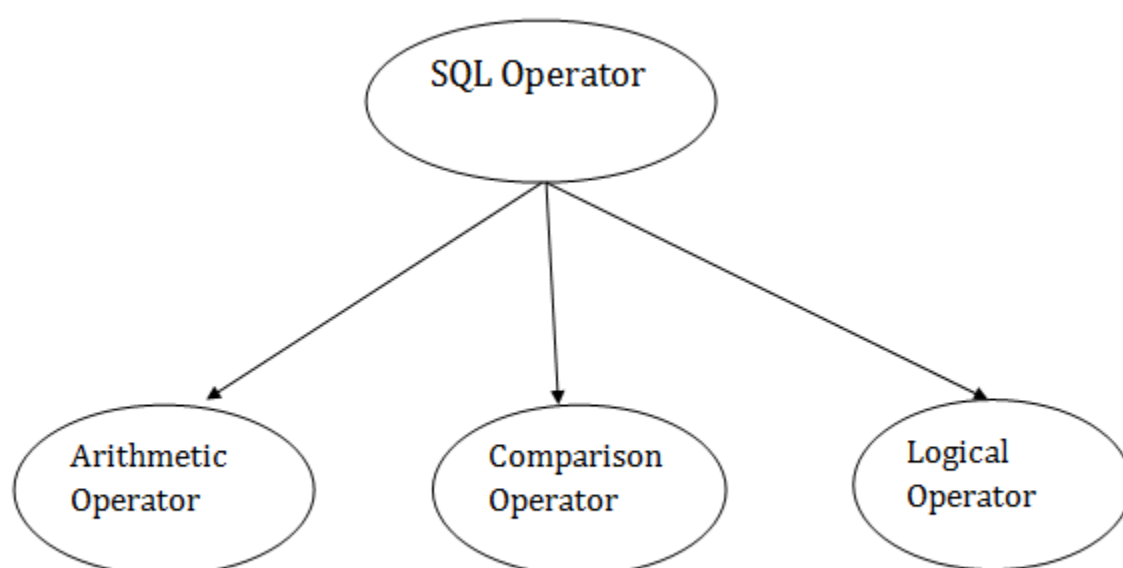
1. SELECT expressions
2. FROM TABLES
3. WHERE conditions;

**For example:**

1. SELECT emp\_name
2. FROM employee
3. WHERE age > 20;

## SQL Operator

There are various types of SQL operator:



## SQL Arithmetic Operators

Let's assume 'variable a' and 'variable b'. Here, 'a' contains 20 and 'b' contains 10.

Operator	Description	Example
+	It adds the value of both operands.	a+b will give 30
-	It is used to subtract the right-hand operand from the left-hand operand.	a-b will give 10
*	It is used to multiply the value of both operands.	a*b will give 200
/	It is used to divide the left-hand operand by the right-hand operand.	a/b will give 2
%	It is used to divide the left-hand operand by the right-hand operand and returns reminder.	a%b will give 0

## SQL Comparison Operators:

Let's assume 'variable a' and 'variable b'. Here, 'a' contains 20 and 'b' contains 10.

Operator	Description	Example
=	It checks if two operands values are equal or not, if the values are queal then condition becomes true.	(a=b) is not true
!=	It checks if two operands values are equal or not, if values are not equal, then condition becomes true.	(a!=b) is true
<>	It checks if two operands values are equal or not, if values are not equal then condition becomes true.	(a<>b) is true
>	It checks if the left operand value is greater than right operand value, if yes then condition becomes true.	(a>b) is not true
<	It checks if the left operand value is less than right operand value, if yes then condition becomes true.	(a<b) is true
>=	It checks if the left operand value is greater than or equal to the right operand value, if yes then condition becomes true.	(a>=b) is not true
<=	It checks if the left operand value is less than or equal to the right operand value, if yes then condition becomes true.	(a<=b) is true
!<	It checks if the left operand value is not less than the right operand value, if yes then condition becomes true.	(a!=b) is not true
!>	It checks if the left operand value is not greater than the right operand value, if yes then condition becomes true.	(a!>b) is true

## SQL Logical Operators

There is the list of logical operator used in SQL:

Operator	Description
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ALL	It compares a value to all values in another value set.
AND	It allows the existence of multiple conditions in an SQL statement.
ANY	It compares the values in the list according to the condition.
BETWEEN	It is used to search for values that are within a set of values.
IN	It compares a value to that specified list value.
NOT	It reverses the meaning of any logical operator.
OR	It combines multiple conditions in SQL statements.
EXISTS	It is used to search for the presence of a row in a specified table.
LIKE	It compares a value to similar values using wildcard operator.

## SQL Table

- SQL Table is a collection of data which is organized in terms of rows and columns. In DBMS, the table is known as relation and row as a tuple.
- Table is a simple form of data storage. A table is also considered as a convenient representation of relations.

Let's see an example of the **EMPLOYEE** table:

EMP_ID	EMP_NAME	CITY	PHONE_NO
1	Kristen	Washington	7289201223
2	Anna	Franklin	9378282882
3	Jackson	Bristol	9264783838
4	Kellan	California	7254728346
5	Ashley	Hawaii	9638482678

In the above table, "EMPLOYEE" is the table name, "EMP\_ID", "EMP\_NAME", "CITY", "PHONE\_NO" are the column names. The combination of data of multiple columns forms a row, e.g., 1, "Kristen", "Washington" and 7289201223 are the data of one row.

## Operation on Table

1. Create table
2. Drop table
3. Delete table
4. Rename table

### SQL Create Table

SQL create table is used to create a table in the database. To define the table, you should define the name of the table and also define its columns and column's data type.

#### Syntax

1. create table "table\_name"
2. ("column1" "data type",
3. "column2" "data type",

- 4. "column3" "data type",
- 5. ...
- 6. "columnN" "data type");

Example

- 1. SQL> CREATE TABLE EMPLOYEE (
- 2. EMP\_ID INT NOT NULL,
- 3. EMP\_NAME VARCHAR (25) NOT NULL,
- 4. PHONE\_NO INT NOT NULL,
- 5. ADDRESS CHAR (30),
- 6. PRIMARY KEY (ID)
- 7. );

If you create the table successfully, you can verify the table by looking at the message by the SQL server. Else you can use DESC command as follows:

SQL> DESC EMPLOYEE;

Field	Type	Null	Key	Default	Extra
EMP_ID	int(11)	NO	PRI	NULL	
EMP_NAME	varchar(25)	NO		NULL	
PHONE_NO	NO	int(11)		NULL	
ADDRESS	YES			NULL	char(30)

- o 4 rows in set (0.35 sec)

Now you have an EMPLOYEE table in the database, and you can use the stored information related to the employees.

Drop table

A SQL drop table is used to delete a table definition and all the data from a table. When this command is executed, all the information available in the table is lost forever, so you have to very careful while using this command.

Syntax

- 1. DROP TABLE "table\_name";

Firstly, you need to verify the **EMPLOYEE** table using the following command:

- 1. SQL> DESC EMPLOYEE;

Field	Type	Null	Key	Default	Extra
EMP_ID	int(11)	NO	PRI	NULL	
EMP_NAME	varchar(25)	NO		NULL	
PHONE_NO	NO	int(11)		NULL	
ADDRESS	YES			NULL	char(30)

- o 4 rows in set (0.35 sec)

This table shows that EMPLOYEE table is available in the database, so we can drop it as follows:

- 1. SQL>DROP TABLE EMPLOYEE;

Now, we can check whether the table exists or not using the following command:

- 1. Query OK, 0 rows affected (0.01 sec)

As this shows that the table is dropped, so it doesn't display it.

## SQL DELETE table

In SQL, DELETE statement is used to delete rows from a table. We can use WHERE condition to delete a specific row from a table. If you want to delete all the records from the table, then you don't need to use the WHERE clause.

### Syntax

- 1. DELETE FROM table\_name WHERE condition;

### Example

Suppose, the EMPLOYEE table having the following records:

EMP_ID	EMP_NAME	CITY	PHONE_NO	SALARY
1	Kristen	Chicago	9737287378	150000
2	Russell	Austin	9262738271	200000
3	Denzel	Boston	7353662627	100000
4	Angelina	Denver	9232673822	600000
5	Robert	Washington	9367238263	350000
6	Christian	Los angels	7253847382	260000

The following query will DELETE an employee whose ID is 2.

- 1. SQL> DELETE FROM EMPLOYEE
- 2. WHERE EMP\_ID = 3;

Now, the EMPLOYEE table would have the following records.

EMP_ID	EMP_NAME	CITY	PHONE_NO	SALARY
1	Kristen	Chicago	9737287378	150000
2	Russell	Austin	9262738271	200000
4	Angelina	Denver	9232673822	600000
5	Robert	Washington	9367238263	350000
6	Christian	Los angels	7253847382	260000

If you don't specify the WHERE condition, it will remove all the rows from the table.

- 1. DELETE FROM EMPLOYEE;

Now, the EMPLOYEE table would not have any records.

# SQL SELECT Statement

In SQL, the SELECT statement is used to query or retrieve data from a table in the database. The returns data is stored in a table, and the result table is known as result-set.

### Syntax

- 1. SELECT column1, column2, ...
- 2. FROM table\_name;

Here, the expression is the field name of the table that you want to select data from.

Use the following syntax to select all the fields available in the table:

- 1. SELECT \* FROM table\_name;

### Example:

EMPLOYEE				
EMP_ID	EMP_NAME	CITY	PHONE_NO	SALARY
1	Kristen	Chicago	9737287378	150000
2	Russell	Austin	9262738271	200000
3	Angelina	Denver	9232673822	600000
4	Robert	Washington	9367238263	350000
5	Christian	Los angels	7253847382	260000

To fetch the EMP\_ID of all the employees, use the following query:

- 1. SELECT EMP\_ID FROM EMPLOYEE;

### Output

EMP_ID
1
2
3
4
5

To fetch the EMP\_NAME and SALARY, use the following query:

- 1. SELECT EMP\_NAME, SALARY FROM EMPLOYEE;

EMP_NAME	SALARY
Kristen	150000
Russell	200000

Angelina	600000
Robert	350000
Christian	260000

To fetch all the fields from the EMPLOYEE table, use the following query:

- SELECT \* FROM EMPLOYEE

#### Output

EMP_ID	EMP_NAME	CITY	PHONE_NO	SALARY
1	Kristen	Chicago	9737287378	150000
2	Russell	Austin	9262738271	200000
3	Angelina	Denver	9232673822	600000
4	Robert	Washington	9367238263	350000
5	Christian	Los angels	7253847382	260000

## SQL INSERT Statement

The SQL INSERT statement is used to insert a single or multiple data in a table. In SQL, You can insert the data in two ways:

- Without specifying column name
- By specifying column name

### Sample Table

EMPLOYEE				
EMP_ID	EMP_NAME	CITY	SALARY	AGE
1	Angelina	Chicago	200000	30
2	Robert	Austin	300000	26
3	Christian	Denver	100000	42
4	Kristen	Washington	500000	29
5	Russell	Los angels	200000	36

### 1. Without specifying column name

If you want to specify all column values, you can specify or ignore the column values.

#### Syntax

- INSERT INTO TABLE\_NAME
- VALUES (value1, value2, value 3, .... Value N);

#### Query

- INSERT INTO EMPLOYEE VALUES (6, 'Marry', 'Canada', 600000, 48);

**Output:** After executing this query, the EMPLOYEE table will look like:

EMP_ID	EMP_NAME	CITY	SALARY	AGE
1	Angelina	Chicago	200000	30
2	Robert	Austin	300000	26
3	Christian	Denver	100000	42
4	Kristen	Washington	500000	29
5	Russell	Los angels	200000	36
6	Marry	Canada	600000	48

## 2. By specifying column name

To insert partial column values, you must have to specify the column names.

### Syntax

1. INSERT INTO TABLE\_NAME
2. [(col1, col2, col3,... col N)]
3. VALUES (value1, value2, value 3, .... Value N);

### Query

1. INSERT INTO EMPLOYEE (EMP\_ID, EMP\_NAME, AGE) VALUES (7, 'Jack', 40);

**Output:** After executing this query, the table will look like:

EMP_ID	EMP_NAME	CITY	SALARY	AGE
1	Angelina	Chicago	200000	30
2	Robert	Austin	300000	26
3	Christian	Denver	100000	42
4	Kristen	Washington	500000	29
5	Russell	Los angels	200000	36
6	Marry	Canada	600000	48
7	Jack	null	null	40

**Note:** In SQL INSERT query, if you add values for all columns then there is no need to specify the column name. But, you must be sure that you are entering the values in the same order as the column exists.

## SQL Update Statement

The SQL UPDATE statement is used to modify the data that is already in the database. The condition in the WHERE clause decides that which row is to be updated.

### Syntax

1. UPDATE table\_name
2. SET column1 = value1, column2 = value2, ...

- 3. WHERE condition;

Sample Table

EMPLOYEE				
EMP_ID	EMP_NAME	CITY	SALARY	AGE
1	Angelina	Chicago	200000	30
2	Robert	Austin	300000	26
3	Christian	Denver	100000	42
4	Kristen	Washington	500000	29
5	Russell	Los angels	200000	36
6	Marry	Canada	600000	48

Updating single record

Update the column EMP\_NAME and set the value to 'Emma' in the row where SALARY is 500000.

Syntax

- 1. UPDATE table\_name
- 2. SET column\_name = value
- 3. WHERE condition;

Query

- 1. UPDATE EMPLOYEE
- 2. SET EMP\_NAME = 'Emma'
- 3. WHERE SALARY = 500000;

**Output:** After executing this query, the EMPLOYEE table will look like:

EMP_ID	EMP_NAME	CITY	SALARY	AGE
1	Angelina	Chicago	200000	30
2	Robert	Austin	300000	26
3	Christian	Denver	100000	42
4	Emma	Washington	500000	29
5	Russell	Los angels	200000	36
6	Marry	Canada	600000	48

Updating multiple records

If you want to update multiple columns, you should separate each field assigned with a comma. In the EMPLOYEE table, update the column EMP\_NAME to 'Kevin' and CITY to 'Boston' where EMP\_ID is 5.

Syntax

- 1. UPDATE table\_name

- 2. SET column\_name = value1, column\_name2 = value2
- 3. WHERE condition;

Query

- 1. UPDATE EMPLOYEE
- 2. SET EMP\_NAME = 'Kevin', City = 'Boston'
- 3. WHERE EMP\_ID = 5;

Output

EMP_ID	EMP_NAME	CITY	SALARY	AGE
1	Angelina	Chicago	200000	30
2	Robert	Austin	300000	26
3	Christian	Denver	100000	42
4	Kristen	Washington	500000	29
5	Kevin	Boston	200000	36
6	Marry	Canada	600000	48

Without use of WHERE clause

If you want to update all row from a table, then you don't need to use the WHERE clause. In the EMPLOYEE table, update the column EMP\_NAME as 'Harry'.

Syntax

- 1. UPDATE table\_name
- 2. SET column\_name = value1;

Query

- 1. UPDATE EMPLOYEE
- 2. SET EMP\_NAME = 'Harry';

Output

EMP_ID	EMP_NAME	CITY	SALARY	AGE
1	Harry	Chicago	200000	30
2	Harry	Austin	300000	26
3	Harry	Denver	100000	42
4	Harry	Washington	500000	29
5	Harry	Los angels	200000	36
6	Harry	Canada	600000	48

SQL DELETE Statement

The SQL DELETE statement is used to delete rows from a table. Generally, DELETE statement removes one or more records form a table.



Syntax

- 1. DELETE FROM table\_name WHERE some\_condition;

Sample Table

EMPLOYEE				
EMP_ID	EMP_NAME	CITY	SALARY	AGE
1	Angelina	Chicago	200000	30
2	Robert	Austin	300000	26
3	Christian	Denver	100000	42
4	Kristen	Washington	500000	29
5	Russell	Los angels	200000	36
6	Marry	Canada	600000	48

Deleting Single Record

Delete the row from the table EMPLOYEE where EMP\_NAME = 'Kristen'. This will delete only the fourth row.

Query

- 1. DELETE FROM EMPLOYEE
- 2. WHERE EMP\_NAME = 'Kristen';

**Output:** After executing this query, the EMPLOYEE table will look like:

EMP_ID	EMP_NAME	CITY	SALARY	AGE
1	Angelina	Chicago	200000	30
2	Robert	Austin	300000	26
3	Christian	Denver	100000	42
5	Russell	Los angels	200000	36
6	Marry	Canada	600000	48

Deleting Multiple Record

Delete the row from the EMPLOYEE table where AGE is 30. This will delete two rows(first and third row).

Query

- 1. DELETE FROM EMPLOYEE WHERE AGE= 30;

**Output:** After executing this query, the EMPLOYEE table will look like:

EMP_ID	EMP_NAME	CITY	SALARY	AGE
2	Robert	Austin	300000	26

3	Christian	Denver	100000	42
5	Russell	Los angels	200000	36
6	Marry	Canada	600000	48

## Delete all of the records

Delete all the row from the EMPLOYEE table. After this, no records left to display. The EMPLOYEE table will become empty.

### Syntax

- DELETE \* FROM table\_name;
- or
- DELETE FROM table\_name;

### Query

- DELETE FROM EMPLOYEE;

**Output:** After executing this query, the EMPLOYEE table will look like:

EMP_ID	EMP_NAME	CITY	SALARY	AGE
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**Note:** Using the condition in the **WHERE** clause, we can delete single as well as multiple records. If you want to delete all the records from the table, then you don't need to use the **WHERE** clause.

## Views in SQL

- Views in SQL are considered as a virtual table. A view also contains rows and columns.
- To create the view, we can select the fields from one or more tables present in the database.
- A view can either have specific rows based on certain condition or all the rows of a table.

### Sample table:

#### Student\_Detail

STU_ID	NAME	ADDRESS
1	Stephan	Delhi
2	Kathrin	Noida
3	David	Ghaziabad
4	Alina	Gurugram

#### Student\_Marks

STU_ID	NAME	MARKS	AGE
1	Stephan	97	19
2	Kathrin	86	21
3	David	74	18
4	Alina	90	20

5	John	96	18
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## 1. Creating view

A view can be created using the **CREATE VIEW** statement. We can create a view from a single table or multiple tables.

**Syntax:**

1. CREATE VIEW view\_name AS
2. SELECT column1, column2.....
3. FROM table\_name
4. WHERE condition;

## 2. Creating View from a single table

In this example, we create a View named DetailsView from the table Student\_Detail.

**Query:**

1. CREATE VIEW DetailsView AS
2. SELECT NAME, ADDRESS
3. FROM Student\_Details
4. WHERE STU\_ID < 4;

Just like table query, we can query the view to view the data.

1. SELECT \* FROM DetailsView;

**Output:**

NAME	ADDRESS
Stephan	Delhi
Kathrin	Noida
David	Ghaziabad

## 3. Creating View from multiple tables

View from multiple tables can be created by simply include multiple tables in the SELECT statement.

In the given example, a view is created named MarksView from two tables Student\_Detail and Student\_Marks.

**Query:**

1. CREATE VIEW MarksView AS
2. SELECT Student\_Detail.NAME, Student\_Detail.ADDRESS, Student\_Marks.MARKS
3. FROM Student\_Detail, Student\_Mark
4. WHERE Student\_Detail.NAME = Student\_Marks.NAME;

To display data of View MarksView:

1. SELECT \* FROM MarksView;

NAME	ADDRESS	MARKS
Stephan	Delhi	97
Kathrin	Noida	86

David	Ghaziabad	74
Alina	Gurugram	90

## 4. Deleting View

A view can be deleted using the Drop View statement.

### Syntax

1. DROP VIEW view\_name;

### Example:

If we want to delete the View **MarksView**, we can do this as:

1. DROP VIEW MarksView;

## SQL Index

- Indexes are special lookup tables. It is used to retrieve data from the database very fast.
- An Index is used to speed up select queries and where clauses. But it slows down the data input with insert and update statements. Indexes can be created or dropped without affecting the data.
- An index in a database is just like an index in the back of a book.
- **For example:** When you reference all pages in a book that discusses a certain topic, you first have to refer to the index, which alphabetically lists all the topics and then referred to one or more specific page numbers.

## 1. Create Index statement

It is used to create an index on a table. It allows duplicate value.

### Syntax

1. CREATE INDEX index\_name
2. ON table\_name (column1, column2, ...);

### Example

1. CREATE INDEX idx\_name
2. ON Persons (LastName, FirstName);

## 2. Unique Index statement

It is used to create a unique index on a table. It does not allow duplicate value.

### Syntax

1. CREATE UNIQUE INDEX index\_name
2. ON table\_name (column1, column2, ...);

### Example

1. CREATE UNIQUE INDEX websites\_idx
2. ON websites (site\_name);

## 3. Drop Index Statement

It is used to delete an index in a table.

### Syntax

1. DROP INDEX index\_name;

### Example

1. DROP INDEX websites\_idx;

# SQL Sub Query

A Subquery is a query within another SQL query and embedded within the WHERE clause.

**Important Rule:**

- A subquery can be placed in a number of SQL clauses like WHERE clause, FROM clause, HAVING clause.
- You can use Subquery with SELECT, UPDATE, INSERT, DELETE statements along with the operators like =, <, >, >=, <=, IN, BETWEEN, etc.
- A subquery is a query within another query. The outer query is known as the main query, and the inner query is known as a subquery.
- Subqueries are on the right side of the comparison operator.
- A subquery is enclosed in parentheses.
- In the Subquery, ORDER BY command cannot be used. But GROUP BY command can be used to perform the same function as ORDER BY command.

## 1. Subqueries with the Select Statement

SQL subqueries are most frequently used with the Select statement.

**Syntax**

1. SELECT column\_name
2. FROM table\_name
3. WHERE column\_name expression operator
4. ( SELECT column\_name from table\_name WHERE ... );

**Example**

Consider the EMPLOYEE table have the following records:

ID	NAME	AGE	ADDRESS	SALARY
1	John	20	US	2000.00
2	Stephan	26	Dubai	1500.00
3	David	27	Bangkok	2000.00
4	Alina	29	UK	6500.00
5	Kathrin	34	Bangalore	8500.00
6	Harry	42	China	4500.00
7	Jackson	25	Mizoram	10000.00

The subquery with a SELECT statement will be:

1. SELECT \*
2. FROM EMPLOYEE
3. WHERE ID IN (SELECT ID
4. FROM EMPLOYEE
5. WHERE SALARY > 4500);

This would produce the following result:

ID	NAME	AGE	ADDRESS	SALARY
4	Alina	29	UK	6500.00
5	Kathrin	34	Bangalore	8500.00
7	Jackson	25	Mizoram	10000.00

## 2. Subqueries with the INSERT Statement

- SQL subquery can also be used with the Insert statement. In the insert statement, data returned from the subquery is used to insert into another table.
- In the subquery, the selected data can be modified with any of the character, date functions.

### Syntax:

1. INSERT INTO table\_name (column1, column2, column3....)
2. SELECT \*
3. FROM table\_name
4. WHERE VALUE OPERATOR

### Example

Consider a table EMPLOYEE\_BKP with similar as EMPLOYEE.

Now use the following syntax to copy the complete EMPLOYEE table into the EMPLOYEE\_BKP table.

1. INSERT INTO EMPLOYEE\_BKP
2.   SELECT \* FROM EMPLOYEE
3.   WHERE ID IN (SELECT ID
4.   FROM EMPLOYEE);

## 3. Subqueries with the UPDATE Statement

The subquery of SQL can be used in conjunction with the Update statement. When a subquery is used with the Update statement, then either single or multiple columns in a table can be updated.

### Syntax

1. UPDATE table
2. SET column\_name = new\_value
3. WHERE VALUE OPERATOR
4.   (SELECT COLUMN\_NAME
5.   FROM TABLE\_NAME
6.   WHERE condition);

### Example

Let's assume we have an EMPLOYEE\_BKP table available which is backup of EMPLOYEE table. The given example updates the SALARY by .25 times in the EMPLOYEE table for all employee whose AGE is greater than or equal to 29.

1. UPDATE EMPLOYEE
2.   SET SALARY = SALARY \* 0.25
3.   WHERE AGE IN (SELECT AGE FROM CUSTOMERS\_BKP
4.   WHERE AGE >= 29);

This would impact three rows, and finally, the EMPLOYEE table would have the following records.

ID	NAME	AGE	ADDRESS	SALARY
----	------	-----	---------	--------

1	John	20	US	2000.00
2	Stephan	26	Dubai	1500.00
3	David	27	Bangkok	2000.00
4	Alina	29	UK	1625.00
5	Kathrin	34	Bangalore	2125.00
6	Harry	42	China	1125.00
7	Jackson	25	Mizoram	10000.00

## 4. Subqueries with the DELETE Statement

The subquery of SQL can be used in conjunction with the Delete statement just like any other statements mentioned above.

### Syntax

1. DELETE FROM TABLE\_NAME
2. WHERE VALUE OPERATOR
3. (SELECT COLUMN\_NAME
4. FROM TABLE\_NAME
5. WHERE condition);

### Example

Let's assume we have an EMPLOYEE\_BKP table available which is backup of EMPLOYEE table. The given example deletes the records from the EMPLOYEE table for all EMPLOYEE whose AGE is greater than or equal to 29.

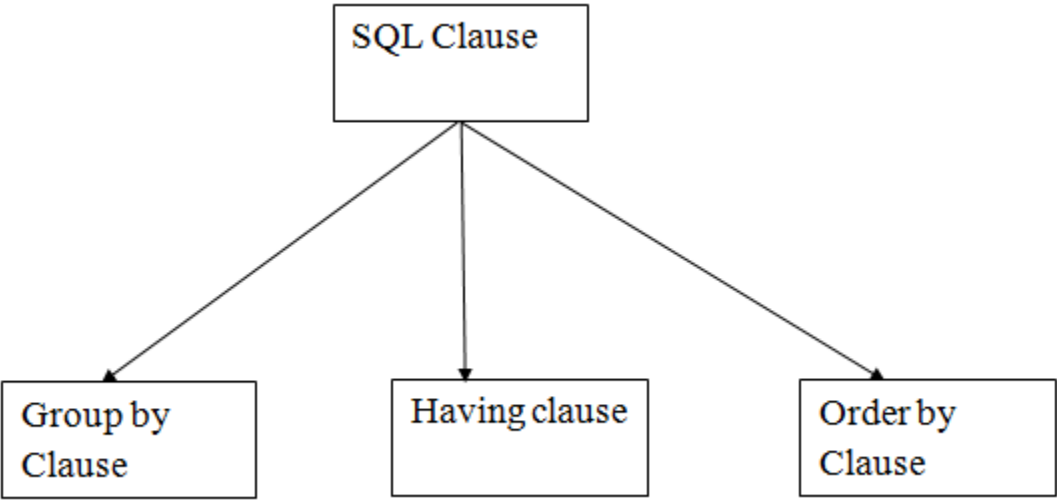
1. DELETE FROM EMPLOYEE
2. WHERE AGE IN (SELECT AGE FROM EMPLOYEE\_BKP
3. WHERE AGE >= 29 );

This would impact three rows, and finally, the EMPLOYEE table would have the following records.

ID	NAME	AGE	ADDRESS	SALARY
1	John	20	US	2000.00
2	Stephan	26	Dubai	1500.00
3	David	27	Bangkok	2000.00
7	Jackson	25	Mizoram	10000.00

## SQL Clauses

The following are the various SQL clauses:



## 1. GROUP BY

- SQL GROUP BY statement is used to arrange identical data into groups. The GROUP BY statement is used with the SQL SELECT statement.
- The GROUP BY statement follows the WHERE clause in a SELECT statement and precedes the ORDER BY clause.
- The GROUP BY statement is used with aggregation function.

### Syntax

1. SELECT column
2. FROM table\_name
3. WHERE conditions
4. GROUP BY column
5. ORDER BY column

### Sample table:

#### PRODUCT\_MAST

PRODUCT	COMPANY	QTY	RATE	COST
Item1	Com1	2	10	20
Item2	Com2	3	25	75
Item3	Com1	2	30	60
Item4	Com3	5	10	50
Item5	Com2	2	20	40
Item6	Cpm1	3	25	75
Item7	Com1	5	30	150
Item8	Com1	3	10	30
Item9	Com2	2	25	50
Item10	Com3	4	30	120

### Example:

1. SELECT COMPANY, COUNT(\*)
2. FROM PRODUCT\_MAST



3. GROUP BY COMPANY;

Output:

```
Com1    5
Com2    3
Com3    2
```

## 2. HAVING

- HAVING clause is used to specify a search condition for a group or an aggregate.
- Having is used in a GROUP BY clause. If you are not using GROUP BY clause then you can use HAVING function like a WHERE clause.

Syntax:

1. SELECT column1, column2
2. FROM table\_name
3. WHERE conditions
4. GROUP BY column1, column2
5. HAVING conditions
6. ORDER BY column1, column2;

Example:

1. SELECT COMPANY, COUNT(\*)
2. FROM PRODUCT\_MAST
3. GROUP BY COMPANY
4. HAVING COUNT(\*)>2;

Output:

```
Com1    5
Com2    3
```

## 3. ORDER BY

- The ORDER BY clause sorts the result-set in ascending or descending order.
- It sorts the records in ascending order by default. DESC keyword is used to sort the records in descending order.

Syntax:

1. SELECT column1, column2
2. FROM table\_name
3. WHERE condition
4. ORDER BY column1, column2... ASC|DESC;

Where

**ASC:** It is used to sort the result set in ascending order by expression.

**DESC:** It sorts the result set in descending order by expression.

### Example: Sorting Results in Ascending Order

Table:

CUSTOMER

CUSTOMER_ID	NAME	ADDRESS
12	Kathrin	US
23	David	Bangkok

34	Alina	Dubai
45	John	UK
56	Harry	US

Enter the following SQL statement:

1. SELECT \*
2. FROM CUSTOMER
3. ORDER BY NAME;

**Output:**

CUSTOMER_ID	NAME	ADDRESS
34	Alina	Dubai
23	David	Bangkok
56	Harry	US
45	John	UK
12	Kathrin	US

### Example: Sorting Results in Descending Order

Using the above CUSTOMER table

1. SELECT \*
2. FROM CUSTOMER
3. ORDER BY NAME DESC;

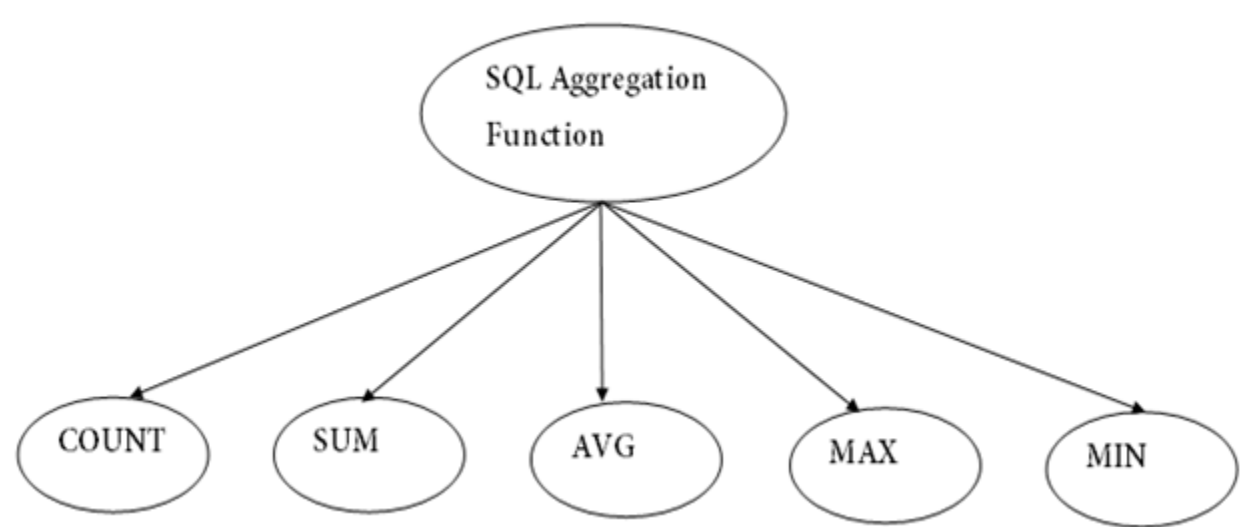
**Output:**

CUSTOMER_ID	NAME	ADDRESS
12	Kathrin	US
45	John	UK
56	Harry	US
23	David	Bangkok
34	Alina	Dubai

## SQL Aggregate Functions

- SQL aggregation function is used to perform the calculations on multiple rows of a single column of a table. It returns a single value.
- It is also used to summarize the data.

### Types of SQL Aggregation Function



## 1. COUNT FUNCTION

- COUNT function is used to Count the number of rows in a database table. It can work on both numeric and non-numeric data types.
- COUNT function uses the COUNT(\*) that returns the count of all the rows in a specified table. COUNT(\*) considers duplicate and Null.

### Syntax

1. COUNT(\*)
2. or
3. COUNT( [ALL|DISTINCT] expression )

### Sample table:

#### PRODUCT\_MAST

PRODUCT	COMPANY	QTY	RATE	COST
Item1	Com1	2	10	20
Item2	Com2	3	25	75
Item3	Com1	2	30	60
Item4	Com3	5	10	50
Item5	Com2	2	20	40
Item6	Cpm1	3	25	75
Item7	Com1	5	30	150
Item8	Com1	3	10	30
Item9	Com2	2	25	50
Item10	Com3	4	30	120

### Example: COUNT()

- 1. SELECT COUNT(\*)
- 2. FROM PRODUCT\_MAST;

Output:

10

Example: COUNT with WHERE

- 1. SELECT COUNT(\*)
- 2. FROM PRODUCT\_MAST;
- 3. WHERE RATE>=20;

Output:

7

Example: COUNT() with DISTINCT

- 1. SELECT COUNT(DISTINCT COMPANY)
- 2. FROM PRODUCT\_MAST;

Output:

3

Example: COUNT() with GROUP BY

- 1. SELECT COMPANY, COUNT(\*)
- 2. FROM PRODUCT\_MAST
- 3. GROUP BY COMPANY;

Output:

Com1	5
Com2	3
Com3	2

Example: COUNT() with HAVING

- 1. SELECT COMPANY, COUNT(\*)
- 2. FROM PRODUCT\_MAST
- 3. GROUP BY COMPANY
- 4. HAVING COUNT(\*)>2;

Output:

Com1	5
Com2	3

## 2. SUM Function

Sum function is used to calculate the sum of all selected columns. It works on numeric fields only.

Syntax

- 1. SUM()
- 2. or
- 3. SUM( [ALL|DISTINCT] expression )

Example: SUM()

- 1. SELECT SUM(COST)
- 2. FROM PRODUCT\_MAST;

Output:

670

**Example: SUM() with WHERE**

- 1. SELECT SUM(COST)
- 2. FROM PRODUCT\_MAST
- 3. WHERE QTY>**3**;

**Output:**

320

**Example: SUM() with GROUP BY**

- 1. SELECT SUM(COST)
- 2. FROM PRODUCT\_MAST
- 3. WHERE QTY>**3**
- 4. GROUP BY COMPANY;

**Output:**

Com1	150
Com2	170

**Example: SUM() with HAVING**

- 1. SELECT COMPANY, SUM(COST)
- 2. FROM PRODUCT\_MAST
- 3. GROUP BY COMPANY
- 4. HAVING SUM(COST)>=**170**;

**Output:**

Com1	335
Com3	170

**3. AVG function**

The AVG function is used to calculate the average value of the numeric type. AVG function returns the average of all non-Null values.

**Syntax**

- 1. AVG()
- 2. or
- 3. AVG( [ALL|DISTINCT] expression )

**Example:**

- 1. SELECT AVG(COST)
- 2. FROM PRODUCT\_MAST;

**Output:**

67.00

**4. MAX Function**

MAX function is used to find the maximum value of a certain column. This function determines the largest value of all selected values of a column.

**Syntax**

- 1. MAX()
- 2. or
- 3. MAX( [ALL|DISTINCT] expression )

**Example:**

- 1. SELECT MAX(RATE)

```
2. FROM PRODUCT_MAST;  
30
```

## 5. MIN Function

MIN function is used to find the minimum value of a certain column. This function determines the smallest value of all selected values of a column.

### Syntax

1. MIN()
2. or
3. MIN( [ALL|DISTINCT] expression )

### Example:

1. SELECT MIN(RATE)
2. FROM PRODUCT\_MAST;

### Output:

```
10
```

# SQL JOIN

As the name shows, JOIN means to combine something. In case of SQL, JOIN means "to combine two or more tables".

In SQL, JOIN clause is used to combine the records from two or more tables in a database.

## Types of SQL JOIN

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

### Sample Table

EMPLOYEE

EMP_ID	EMP_NAME	CITY	SALARY	AGE
1	Angelina	Chicago	200000	30
2	Robert	Austin	300000	26
3	Christian	Denver	100000	42
4	Kristen	Washington	500000	29
5	Russell	Los angels	200000	36
6	Marry	Canada	600000	48

PROJECT

PROJECT_NO	EMP_ID	DEPARTMENT
101	1	Testing
102	2	Development

103	3	Designing
104	4	Development

## 1. INNER JOIN

In SQL, INNER JOIN selects records that have matching values in both tables as long as the condition is satisfied. It returns the combination of all rows from both the tables where the condition satisfies.

### Syntax

1. SELECT table1.column1, table1.column2, table2.column1,....
2. FROM table1
3. INNER JOIN table2
4. ON table1.matching\_column = table2.matching\_column;

### Query

1. SELECT EMPLOYEE.EMP\_NAME, PROJECT.DEPARTMENT
2. FROM EMPLOYEE
3. INNER JOIN PROJECT
4. ON PROJECT.EMP\_ID = EMPLOYEE.EMP\_ID;

### Output

EMP_NAME	DEPARTMENT
Angelina	Testing
Robert	Development
Christian	Designing
Kristen	Development

## 2. LEFT JOIN

The SQL left join returns all the values from left table and the matching values from the right table. If there is no matching join value, it will return NULL.

### Syntax

1. SELECT table1.column1, table1.column2, table2.column1,....
2. FROM table1
3. LEFT JOIN table2
4. ON table1.matching\_column = table2.matching\_column;

### Query

1. SELECT EMPLOYEE.EMP\_NAME, PROJECT.DEPARTMENT
2. FROM EMPLOYEE
3. LEFT JOIN PROJECT
4. ON PROJECT.EMP\_ID = EMPLOYEE.EMP\_ID;

### Output

EMP_NAME	DEPARTMENT
Angelina	Testing

Robert	Development
Christian	Designing
Kristen	Development
Russell	NULL
Marry	NULL

### 3. RIGHT JOIN

In SQL, RIGHT JOIN returns all the values from the values from the rows of right table and the matched values from the left table. If there is no matching in both tables, it will return NULL.

#### Syntax

1. SELECT table1.column1, table1.column2, table2.column1,....
2. FROM table1
3. RIGHT JOIN table2
4. ON **table1.matching\_column** = **table2.matching\_column**;

#### Query

1. SELECT EMPLOYEE.EMP\_NAME, PROJECT.DEPARTMENT
2. FROM EMPLOYEE
3. RIGHT JOIN PROJECT
4. ON **PROJECT.EMP\_ID** = **EMPLOYEE.EMP\_ID**;

#### Output

EMP_NAME	DEPARTMENT
Angelina	Testing
Robert	Development
Christian	Designing
Kristen	Development

### 4. FULL JOIN

In SQL, FULL JOIN is the result of a combination of both left and right outer join. Join tables have all the records from both tables. It puts NULL on the place of matches not found.

#### Syntax

1. SELECT table1.column1, table1.column2, table2.column1,....
2. FROM table1
3. FULL JOIN table2
4. ON **table1.matching\_column** = **table2.matching\_column**;

#### Query

1. SELECT EMPLOYEE.EMP\_NAME, PROJECT.DEPARTMENT
2. FROM EMPLOYEE
3. FULL JOIN PROJECT
4. ON **PROJECT.EMP\_ID** = **EMPLOYEE.EMP\_ID**;



Output

EMP_NAME	DEPARTMENT
Angelina	Testing
Robert	Development
Christian	Designing
Kristen	Development
Russell	NULL
Marry	NULL

SQL Set Operation

The SQL Set operation is used to combine the two or more SQL SELECT statements.

Types of Set Operation

- 1. Union
- 2. UnionAll
- 3. Intersect
- 4. Minus



1. Union

- The SQL Union operation is used to combine the result of two or more SQL SELECT queries.
- In the union operation, all the number of datatype and columns must be same in both the tables on which UNION operation is being applied.
- The union operation eliminates the duplicate rows from its resultset.

Syntax

- 1. SELECT column\_name FROM table1
- 2. UNION
- 3. SELECT column\_name FROM table2;

Example:

The First table

ID	NAME
1	Jack
2	Harry
3	Jackson

The Second table

ID	NAME
3	Jackson
4	Stephan
5	David

Union SQL query will be:

- 1. SELECT \* FROM First
- 2. UNION
- 3. SELECT \* FROM Second;

The resultset table will look like:

ID	NAME
1	Jack
2	Harry
3	Jackson
4	Stephan
5	David

2. Union All

Union All operation is equal to the Union operation. It returns the set without removing duplication and sorting the data.

Syntax:

- 1. SELECT column\_name FROM table1
- 2. UNION ALL
- 3. SELECT column\_name FROM table2;

**Example:** Using the above First and Second table.

Union All query will be like:

- 1. SELECT \* FROM First
- 2. UNION ALL
- 3. SELECT \* FROM Second;

The resultset table will look like:

ID	NAME
1	Jack
2	Harry
3	Jackson
3	Jackson
4	Stephan
5	David

3. Intersect

- It is used to combine two SELECT statements. The Intersect operation returns the common rows from both the SELECT statements.
- In the Intersect operation, the number of datatype and columns must be the same.
- It has no duplicates and it arranges the data in ascending order by default.

Syntax

- 1. SELECT column\_name FROM table1
- 2. INTERSECT
- 3. SELECT column\_name FROM table2;

Example:

Using the above First and Second table.

Intersect query will be:

- 1. SELECT \* FROM First
- 2. INTERSECT
- 3. SELECT \* FROM Second;

The resultset table will look like:

ID	NAME
3	Jackson

4. Minus

- It combines the result of two SELECT statements. Minus operator is used to display the rows which are present in the first query but absent in the second query.
- It has no duplicates and data arranged in ascending order by default.

Syntax:

- 1. SELECT column\_name FROM table1

- 2. MINUS
- 3. SELECT column\_name FROM table2;

**Example**

**Using the above First and Second table.**

Minus query will be:

- 1. SELECT \* FROM First
- 2. MINUS
- 3. SELECT \* FROM Second;

The resultset table will look like:

ID	NAME
1	Jack
2	Harry