

SQL

SQL is short form of the Structured Query Language, and it is pronounced S-Q-L or sometimes as See-Quel.

This database language is mainly designed for maintaining the data in relational database management system. It is a special tool used by data professionals for handling structured data (data which is stored in the form of tables). It is also designed for stream processing in RDBMS.

You can easily create and manipulate the database, access and modify the tables rows and columns etc.

This query language became the standard of ANSI in the year of 1986 and ISO in the year of 1987.

Why SQL?

SQL is widely used in data science and analytics. Following are the reasons which explain why it is widely used:

- The basic use of SQL for data professionals and SQL users is to insert, update, delete the data from the relational

Database.

- SQL allows the data professionals and user to retrieve the data from the relational database management system.
- It also help them to describe the structured data.

* HISTORY OF SQL:-

"A Relational model of data for Large Shared Data Banks" was a paper which was published by the great Computer scientist "E. F. Codd" in 1970.

• Process of SQL :-

Structure Query language contains the following four components in its process:-

- Query Dispatcher
- Optimization Engines
- Classic Query Engine
- SQL Query Engine, etc.

A classic query engine allows data professionals and users to maintain non-SQL queries. The architecture of SQL is shown in the following diagram:

* SQL Command

- ① CREATE Command:- this command help in creating the new database, new table, view, and other object of the database.
- ② UPDATE Command:- this command help in updating or changing the stored data in the database.
- ③ DELETE Command:- This command help in removing or erasing the saved record from the database table. It removes single or multiple tuples from the table of the database.
- ④ SELECT Command:- This command help in accessing the single or multiple rows from one or multiple table(s) of the database. we can also use this command with the WHERE clause.

- ⑤ DROP Command:- This command help in

inserting the data of record into the database table we can easily insert the records in single as well as multiple rows of the table.

ADVANTAGES OF SQL

- 1 No programming needed
- 2 High-speed Query processing
- 3 Standardized language.
- 4 Portability
- 5 Interactive language
- 6 more than one Database

Disadvantages of SQL

- 1 cost
- 2 Interface is complex
- 3 Partial Database control

CHAR

VARCHAR

①	It stands for character. It stands for variable character.
②	It stores the values in fixed length that we declare while creating a table. It stores the value in a variable-length string with one or two-byte length prefix.
③	Their datatype cannot be padded with trailing cannot be padded space to keep them with any character specified length including space, which they are assigned.
④	It can hold最多 up to 255 characters. It can hold up to 65535 characters.
⑤	It supports static memory allocation. It supports dynamic memory allocation.

- **join**
A join is used to fetch all combine data (row or column) from two or more tables based on the defined condition. this join clause allows us to receive data from two or more result table in data into meaningful result set. we can join the table using condition. it indicates how SQL server can use data from one table to select rows from another table. in general tables are related to each other using foreign key constraints.

- **why use :?**

If you want to access more than one table through a select statement.

if you want to combine two or more table then SQL join statement is used. it combines rows that table in one table and one can retrieve the information by a select statement. A join of two or more table based on common field between them.

Types of join

/ simple join

- (i) **Inney join:-** The inney join is used to select all matching row or columns in both

tables as long as the defined condition is valid in SQL. i)

Syntax:-

Select column_1, column_2, column_3

FROM table_1 INNER JOIN table_2 ON

table_1.column = table_2.column;

We can represent the inner join through the Venn diagram as follows:

Inner join are the most common type of join and also the most symmetrical because they require a match in each table that forms a part part of the join. Rows that do not match are excluded from the final result set. (ii)

(2.) Outer join:- Outer join, on the other hand are symmetrical - all rows from one side of the join ~~table~~ are included in the final result set, regardless of whether they match rows on other side of the join. Depending on which side of the join to be preserved, SQL defines a left outer join side of the join and matching the WHERE clause from the table on the right appear. (3)

i) **left outer join** :- the left outer join
selects all records from the
left table (table 1) and the matched
rows of column from the right
table (table 2). if both tables
not contain any matched row or
column, it returns the NULL.

Syntax :- select column-1, column-
2, ... (CS) FROM table-1 left join table-2
ON table-1 . column name = table-2 .
column name;

(ii) **Right outer join** :- The right outer
join is used to retrieve all records
from the right table (table 2) and
the matched rows of column from
the left table (table 1). if both
tables do not contain any matched
rows of column, it returns the
NULL.

(3) **CROSS JOIN** :- It is also known as
CARTESIAN join, which retrieves the
Cartesian product of two or more
joined table. The CROSS JOIN
produces a table that merges each
rows from the first table with
each second table row. It is not
required to include

in CROSS JOIN.

Syntax:-

select * from table_1 cross join
table_2;

- (4) Self Join:- It is a self join used to create a table by joining itself as there were two tables. it makes temporary naming of at least one table in an SQL Statement.

- (5) Unions:- Union operator, which is used to combine the output of multiple SELECT queries into a single result set. most often, this operator is used to add the result set generated by queries to different table and create a single table of results. to illustrate consider the following tables:-

Group by

★ The group by statement is used for organizing semantically similar data into groups. The data is further organized with the help of equivalent function. It means, if different rows in a specific column have the same value, it will aggregate those rows in a group.

- The select statement is used with the group by clause in the SQL query.
- WHERE clause is placed before the group by clause in SQL.
- ORDER by clause is placed after the user define, group by clause, in SQL.

Syntax:-

Select column1, function_name
(column2)

From table_name

Where condition

Order by Column1, Column2;

function_name; table_name;

Condition which we used.

ORDER by

• ORDER by is a clause in SQL which shows the result-set of the SELECT statement in either ascending or descending order.

• This clause is always used with the SELECT query in Structured Query Language.

• We can use more than one table field in the ORDER BY clause. We have to separate the name of multiple columns by a comma.

Syntax:-

```
Select column-name-1 Column-name  
..... column-name - name N From  
table - name ORDER by column-  
name-1 column-name-2 ...  
column-name - N ;
```

• Use the following point follow:-

- (1) Create a simple database the table (camus)
- (2) Insert Data into the table.
- (3) View the inserted data without ORDER BY clause.
- (4) Use the ORDER BY clause.

Having

The having is a keyword in SQL which select the rows filtered by group by keyword based on the particular single or multiple condition.

it is used in SQL because the SQL does not allows you to use the WHERE Clause with their aggregate functions. in SQL, we can only use the HAVING clause in the SELECT query.

Follow the following steps.

- 1) Create the simple database + the table.
- 2) Insert the Data into the table.
- 3) View the inserted Data without the having clause.
- (4) Use the HAVING Clause.

SELECT first-column-Name, second-column-Name, ... Nth.Column-Name
FROM table-name GROUP BY column-Name HAVING Single or multiple conditions;

- HAVING Clause with SQL ORDER BY Clause:-
we can also use ORDER BY keyword with the HAVING clause in the select statement of SQL.

Syntax of Having Clause with ORDER BY Clause :-

SELECT function_name (column_name)
FROM Table - Name GROUP BY Column
Name Having column_name ORDER
By column_name DESC | ASC ;

Exit

The special exit operator can be used to if a subquery produced any result may produce this make it possible to conditionally execute the outer query only if exist next result before.

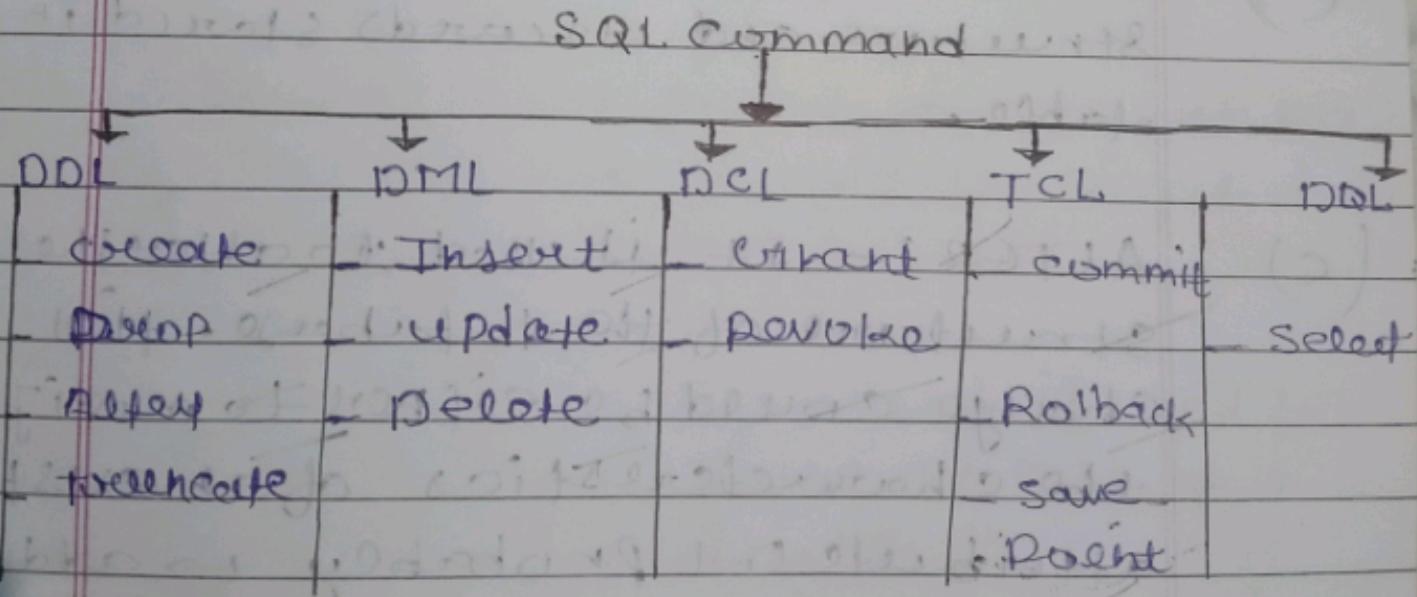
* SQL Cmd:-

- The SQL commands are instructions. It is used to communicate with the database. It is also used to perform specific tables, functions, and queries of data.

SQL can perform various tasks like create a table, add data to table & drop the table, modify the table, set permission users.

Type of SQL

There are five type of SQL Command DDL, DML, DCL, TCL, DQL,



- (1) Data Definition Language (DDL) :-
DDL changes the structure of the table like creating a table, deleting a table, altering a table etc.

Committed that means it Permanently
gave all the change in the database.

2.

- * Here are some command that come under DDL:-
 - CREATE
 - ALTER
 - DROP
 - TRUNCATE

(a) Create is used to create a new table in the database.

(b) DROP:- It is used to delete both the structure and records stored in the table.

(a)

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

(b)

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

2. **Data Manipulation Language (DML)**
- DML Command are use to modify the database. if it is possible for all transaction changes in the database. The command of DML is not auto-committed that means if you permanently save all the changes in the database, they can be rolledback.

- * Here are 3 one command that come under DML:-
- INSERT
- UPDATE
- DELETE

(a) **INSERT** :- The insert statement is a SQL query, if it used to insert data into the rows of a table.

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

(c) **DELETE** :- It is use to remove one or more rows from a table.

Syntax:-

Delete From table_name [WHERE Condition]

Ex:- Delete from bookprint

WHERE Author = "Soham"

(3) Data Control Language (DCL)

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

There are 3 DCL Commands that come under DCL:-

- GRANT

- REVOKE

(a) GRANT:- It is use to give user access privileges a database.

Ex:- Permission

GRANT SELECT, UPDATE ON MY_TABLE
TO SOME_USER, ANOTHER_USER;

(b) REVOKE:- It is use to take back permission from the user.

Ex:-

REVOKE SELECT, UPDATE ON MY_TABLE
FROM USER1, USER2;

(4) Transaction Control Language (TCL)

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

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

- COMMIT
- ROLLBACK
- SAVEPOINT

(a) Commit :- Commit command is used to save all the transactions on the database.

Syntax:-

COMMIT;

Ex:- Delete from CUSTOMERS

where AGE = 25;

Commit ;

(b) Rollback :- Rollback command is used to undo transaction that have not already been saved to the database.

Syntax:-

ROLLBACK;

Ex:- Delete from CUSTOMERS

WHERE AGE = 25;

ROLLBACK;

(c) Save Point :- it is used to roll the transaction back to a creation point without rolling back the entire transaction.

Syntax:-

SAVEPOINT SAVEPOINT - NAME;

(5)

Data Access language :- (DAL)

DAL is used to fetch the data from the database.

It uses only one command:

(9)

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

Syntax:-

SELECT expressions

FROM TABLES

WHERE conditions;

Example:-

SELECT emp-name

FROM employee

WHERE age > 20;

Subquery :-

The Subquery or Inner query is an SQL query placed inside another SQL query. It is embedded into the HAVING or WHERE clause of the SQL statement. A Subquery works just like a regular SELECT query, except that its result set always consist of a single column containing one or more values. Following rules which must be followed by the SQL subquery:-

- SELECT Statement,
- UPDATE Statement,
- INSERT Statement,
- Delete Statement,

The Subquery in SQL are always enclosed in the parenthesis and placed on the right side the SQL operators.

- we can use BETWEEN operator within the subquery but not with the subquery

- (i) **Subquery with Select Statement :-** In SQL inner query or nested queries are used most frequently with the SELECT statement. The syntax of subquery with the SELECT statement is described in the following block.

2) Subquery with Insert Statement :-
We can also use the subquery and nested queries with the INSERT statement in Structured Query Language. we can insert the result of the subqueries into the table of the outer query.

3) Subquery with UPDATE Statement :-
The subquery and nested query can be used with the UPDATE statement in Structured Query language for updating the column of the existing table. we can easily update one or more column using a subquery with the UPDATE statement.

4) Subquery with DELETE Statement :-
We can easily delete one or more records from SQL table using subquery with the Delete statement in Structured Query language.

* Type of Subquery

⇒ Subquery used in number :-

- 1) with in where and having clause
- 2) with the IN membership test
- 3) with the exist boolean test
- 4) with in from clause
- 5) with join
- 6) with in update and delete query

7) With comparison AND logical operator

* Subquery with exists operator:-
The special operator exists can be used to check if a query a subquery produce any result at all. this make possible to conditionally execute the outer query only if the exists return true.

example:-

Select * from clients
where exists (select BID from branches
services grouping BID having
Count(SID) > 5);

Select Avg(z.SFee) from (Select
BIDs, count(SID) as s_total
from services
group by BID) as z;

Subquery & Joins

- **Join :-** A join is a query that combines records from two or more tables. A join will be performed whenever multiple tables appear in the FROM clause of the query. The select list of the query can select any column from any of those tables. If join condition is omitted or invalid then a Cartesian product is formed. If any two of these tables have a column name is common then must qualify these columns throughout the query with table or table alias name to avoid ambiguity.
- **Subquery :-** A Subquery or Inner Query or Nested Query is a query within SQL query and embedded within the WHERE clause. A Subquery is a SELECT statement that is embedded in a clause of another SQL statement. They can be very useful to select rows from a table with a condition that depends on the data in the same or another table.

A Subquery use to set two data together

will be used in the main query as a condition to further restrict the data to be retrieved.

- ADVANTAGES OF JOIN:-

1. The advantages of a join includes that it executes faster.
2. The retrieval time of the query using joins almost always will be faster than that of a subquery.

- DISADVANTAGES:-

- 1) Join includes that they are not as easy to read as subqueries.
- 2) As the different type of join it can be confusing as to which join is the appropriate type of join to use to yield the correct desired result set.

Ques:- what is view? explain the benefit.
A views is nothing more than a SQL statement
that is stored in the database.
we can associate named a view is
actually a composition of a table
in the form ~~such as~~ ~~with all of~~
prodefine SQL query. a view select
row from a table a view can be
created from one or many table
which depend on such SQL query to
create view.

view which are type of virtual
table allow user to do the follow
structure data in a way that
user all classes of user find natured
on entitile.

view:- view is a original table based
on one or many table our view
is the table upon which a view
is base, all called base table.

* Benefit:-

① it don't contain any data itself.
Views are used for security purpose
because they provide ~~encapsulation~~
of the name of table.

③ Data is in the virtual table no
stored permanently.

(4) view display only selected data.
view is also known as ^{view} stored select statement.

(4) Types:- (1) simple (2) complex (3) force
Read only view (4) with clause optimizer

Table in Database:- Create view name as select * from table_name
where conditions;

• Benefits of view:-

virtual table (view)



A view is a virtual table containing data from one or more tables.



MySQL DATATYPE

1. Numeric Types :- Numeric datatype can broadly be divided into two categories, one for integers and the other for floating-point or decimal number.
- A number of different sub-types are available for each of those categories, each holding different size of data, and MySQL also allows you to specify whether the values in numeric fields should be signed or padded with zeroes.
- (i) The INT Type :- the five main int type supported in MySQL and TINYINT
- (ii) The FLOAT, DOUBLE, and DECIMAL Type
The three floating-point type supported in MySQL are FLOAT, DOUBLE, and DECIMAL. The FLOAT numeric type is used to represent a single-precision floating point number, while the Double data type is used to represent a double floating point number.
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(iii) **String Types:-** MySQL comes with eight basic string types, which can be used to store string data ranging from simple one-character strings to large blocks of text or binary data.

(4) Date and time:-

(5) **Complex Types:-**

(i) **The ENUM Type:-** An ENUM type is typically used for mutually exclusive data values, where selection of only a single item from the set is permitted. A common example of this is a gender attribute, which could be either male or female.
following ex:-

(ii) **The SET Type:-** The SET type, which allows the selection of any number of values from a predefined set of string values unlike fields declared using the ENUM type, which can contain zero, one or more than one element from the set of allowed values. This makes the SET type a good choice for multiple choice selection, such as the one in this Example:

Types of views

- (1) Simple view
- (2) complex view
- (3) Read only view
- (4) with check option
- (5) force view.

(1) simple view:- The view which contains sub-query that retrieves from one base table or view called simple view.

Syntax:- Create view view-name as select * from table name;

(2) Read only view:- It only allow to perform read operation on base table it restrict to perform write operation.

Syntax:- Create view view-name as select * from name with read only.

(3) Complex view:- Complex view contain sub-queries where sub query contains query.

The view which is constructed with the help of more than one - base - table then is called complex view.

Create view view-name as select * from
table-name1 union select * from

With the check option:- If which check option is given if the given condition satisfy in selected column the allow to perform write operation otherwise restricted.

Syntax:- Create view viewname as select * from table-name where condition with check option;

5) force view:- force view is used basically for the situation when we create a view using table but the table is non-existent at that time we use force view.

force view: create force view view-name as select * from table-name;

TEK

(Transaction control language.)

- It controls the transaction of database. It has those commands: commit, rollback, savepoint.

Syntax:-

① commit; ② Rollback ③ save Point

① Commit:- Commit command in SQL is used to save all the transaction-related changes permanently to the database. Whenever DDL commands such as INSERT, UPDATE and DELETE are used, the changes made by these commands are permanent only after closing the current session.

Syntax:- Commit;

Ex:- we will select an existing database i.e., school.

MySQL > USE school;

② Rollback:- While carrying a transaction, we must create savepoint to save different parts of the transaction. According to the user's back, the transaction of different savepoint

In this case, we have to rollback our transaction using the rollback command etc. to the savepoint INS, which we have created before executing the delete query.

Syntax:-

Rollback to savepoint - name;

③

SavePoint :- We can divide the database operations into parts. For example, we can consider all the insert related command that we will execute consecutively as one part of the transaction and the delete command as the other part of the transaction. Using the savepoint command in SQL, we can save these different parts of the same transaction using different names.

Syntax :-

Savepoint savepoint_name;

Index

Index is a special table used to speed up the searching of the data in the database table. It also retrieves a vast amount of data from the database frequently. The Index requires its own space in the hard disk.

The index concept is similar to moving our book. It is using a pointer. Index can be created explicitly or automatically. If you don't have index on the column, then the table can't access to user on a table in purpose is to reduce the memory of page by using an index path to locate data quickly. The index is used and maintained by the database server once an index is created. Drop action is required by the user. Indexes are logically and physically this means that they can be create or drop any time and have no effect on the base table or indexes.

Type of disorder: ① unic
emic = autoimmune

② hon-uh

80

one called motionally). A unit slider is created, automatically saving different ^a primary key units.

non-linear manifolds which can create new choices in design column to speed up access into the system

• Concurrency control

Concurrent control is the management procedure that is required for contracting concurrent executions of operations that take place on a database.

But before knowing about consensus
contract we should know about a
labeled consensus execution.
No to ensure the system must control
the instruction argument the
transaction validity of mechanism
are used.

Ques 1 : Sorting technique :-
Ans : There are various methods in sorting:-
1) Bubble sort

① Shared:- If a transaction has option share mode lock on the item of view then T₁ can read but can not write.

Exclusive:- If a transaction has option an exclusive mode (denoted by X) on item then T₁ can mode both read and write.

	S	X
S	True	false
X	false	false

* Granting of Locks:- When a transaction request a lock on a data item in particular mode a no as a transaction has on the same data item the lock can be granted. the it is locking protected one protocol that insures serializability is the to phase locking protocol the protocol required each transaction with lock and unlock request into phase:-

1) Drawing phase:- A transaction with lock.

Time stamping protocol:-

time stamp:- with each transaction T_i in the system we associate a unique fixed time stamp denoted $TS(T_i)$. the time stamp is assigned by the database system before the transaction execution :- if a time stamp $TS(T_i)$ and new transaction T_j enter the system $TS(T_j) < TS(T_i)$

There are two method for implementation this schema:-

- (1) use the value of system clock as the time stamp that is a transaction time stamp is = the value of clock when the transaction enter the system.
- (2) use a logical counter that is increased after a new time stamp has been assign that is a transaction time stamp is = value of counter when the transaction enter the system.

(Protocol)

- (3) validation based Pro:- it is based on (3) phase:-

① Read phase:- During the phase the system execution transaction; it reads the value various data items and store them in variable local to T. It performs all right operation on temporary local variable without update the actual database.

② Validation phase:- Checking is performed to make sure that there is no violation of serializability when the transaction update row applied to the database.

③ Write phase:- On the success of the validation phase, the transaction update are applied to the database, otherwise, the updates are discarded and the transaction is rolled back.

Distributed database:-

A distributed database system is a kind of database that is present over divided in more than one location, which means it is not limited to any single computer system. It is divided over the network of various systems.

Type of distributed database:-

Homogeneous Database System

Heterogeneous Database System

(1)

Homogeneous :- Each site stores the same database in a homogeneous database. Since each site has the same database stored, so all the data management schemes, O/S and data structures will be the same across all sites.

(2)

Heterogeneous :- In this type of database system, different sites are used to store the data and relational tables, which makes it difficult for database administrators to do the transaction and run the queries into the database.

- fragmentation:-

According to this method, the relationships are divided (i.e., broken up into smaller pieces), and each fragment is stored at the many locations where it is needed. To ensure there is no data loss, the pieces must be created in a way that allows for the reconstruction of the original relation.

Since fragmentation doesn't usually involve duplicate data, consistency is not a concern.

Type:-
① Horizontal fragmentation
② vertical fragmentation
③ mixed.

- Horizontal fragmentation:-

Horizontal fragmentation refers to the process of dividing a table horizontally by assigning each row for a group of rows of relation to one or more fragments. These fragments can be assigned to different sites in the distributed system.

In relational algebra horizontal table T_1 can be represented as follows:-

$\sigma_P(T)$ where, σ is algebra operator for selection.

P is condition satisfied by a horizontal fragmentation.

- **Vertical:** - Vertical fragmentation refers to the process of decomposing a table vertically by attributes or columns. In the fragmentation, some of the attributes are stored in other system.
- **Mixed / hybrid fragmentation:** - The combination of vertical fragmentation of a table followed by further horizontal fragmentation of some fragments is called mixed or hybrid fragmentation. The original relation can be obtained by the combination of JOIN and UNION operation which is given as follow:

DES Data Encryption Standard
is a block cipher with a 56-bit key length that has faced a significant challenge in data security.
DES has been found vulnerable to a
concrete attack known as the
Popularity of DES has been found
slightly on the decline. DES is a
block cipher and encrypts data in
blocks of six subjects can be broken
down by both of parallel test on all the
input of DES which finds you get
a ciphertext.

Operators

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

In SQL, an operator can either be a unary or binary operator.

The unary operator uses only one operand for performing the unary operations.

Whereas the binary operators use two operands for performing the binary operation.

Syntax of Unary SQL Operator

Operator SQL - operand

Syntax:-

operand1 SQL - operator operand2

SQL Operator symbols

Operators

①

**

Exponentiation operator

②

+,-

Identity operator, Negation operator.

③

*, /

Multiplication operator,
Division operator.

④

+,-,||

Addition, subtraction, string
Concatenation operator.

2024.05.13 11:42

=, !=, <, >, <=,

>=, IS NULL,

LIKE, BETWEEN, IN

Comparison operator

NOT

Logical negation operator.

OR AND

Conjunction operator

OR

Inclusion operator

For example:-

UPDATE employee-

Set salary = 20 - 3 * 5 WHERE Emp-ID
= 5;

- Type of operators:
- ⇒ SQL operators are categorised in the following categories.

①

Arithmetic operator

②

Comparison operator

③

Logical operator

④

Set operator

⑤

Bit wise operation

⑥

Unary operator.

- 1) SQL Arithmetic: - the arithmetic perform the mathematical operators on the numerical data of the SQL tables.

★ following are the arithmetic operator on SQL Data:

- 1) Addition (+)
- 2) Subtraction (-)
- 3) Multiplication (*)
- 4) Division (/)
- 5) Modulus Operator (%)

(2) Comparison operators:- The comparison operator in SQL compare two different data of SQL table and check whether they are the same, greater, and lesser.

following SQL various Comparison operator which are performed on the data stored in SQL database table.

- 1) Equal (=)
- 2) Not equal (!=)
- 3) Greater (>)
- 4) (\geq)
- 5) Less than (<)
- 6) Less than or equal to (\leq)

3) Logical operator:- The logical operator in SQL perform the Boolean operation which give two result true and false. These operators provide true value if both operand match the logical condition.

following are the various Logical operator which are performed on the data stored in SQL database tables.