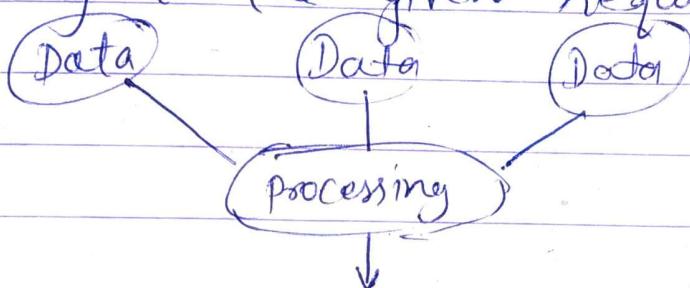




- * Data - is a collection of facts about the object of interest.
→ Data is raw and unorganised fact that required to be processed to make it meaningful.

- * Information - Information is a set of data which is processed in a meaningful way according to the given requirement.



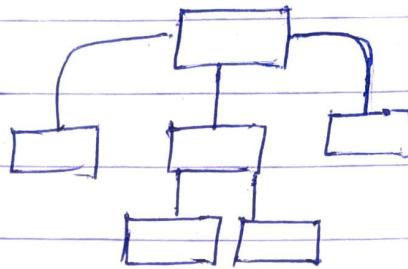
- # Database - is a organized collection of data, which is stored and accessed from Computer system.

- # DBMS - is a software which is used to manage the database.

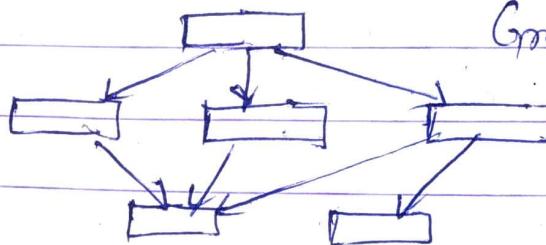
4 types of Database → Network
→ Relational
→ NoSQL
→ Hierarchical



1) Hierarchical - e.g. - tree structure



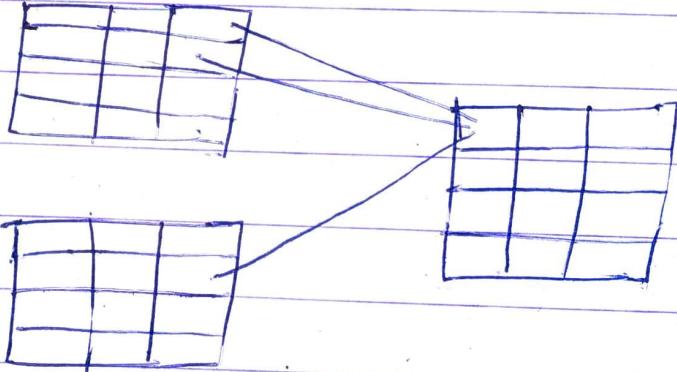
2) Network -



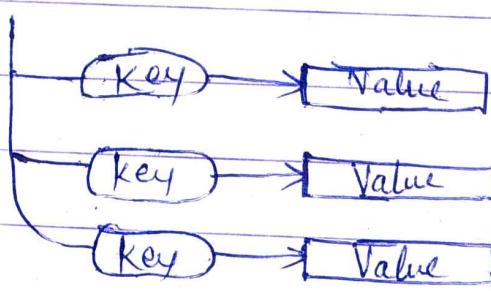
Graph structure

3) Relational:

Tabular structure



4) NoSQL -



key-value
pair Graph

Document
structure

\neq → denotes not equal to \neq



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Relational - Relational Database store data in relations i.e., tables. Each relation have a name.

ID	NAME	MOB	DEPT
1	Rishikesh	OPPO	CSE
2	Abhishek	Redmi	EE
3	—II—	—II—	—II—
4	—II—	—II—	—II—

Tuples/records
Rows

Attributes/columns/fields

- Column name → attribute
- Row name → Tuple
- No. of Rows/records/tuples → Cardinality of the relation
- No. of columns/fields/attributes → Degree of the relation.
- A collection of relations with distinct relation names is called as Relational model.

Primary Key - A column whose values uniquely identify every row in a table.



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more → Turn page →

facts.

- 1) A relational database consists of a collection of Tables.
- 2) A relationship among a set of Values in a tables is represented by a Row.
- 3) The set of permitted values of an attribute is called Domain.
- 4) The attribute value that is currently unknown is NULL.

Candidate Key - A candidate key is a minimal set of columns/attributes that can be used to uniquely identify a single row/tuple in a relation.
→ Candidate keys are determined during database design.

A primary key is the candidate key that is selected to uniquely identify a tuple in a relation.

- It must uniquely identify a tuple
- must not allow NULL values.

When 2 or more column together identify the unique row then it referred to as Composite Primary Key.



Foreign key - A foreign key is a set of one or more columns in the child table whose values are required to match with corresponding columns in the parent table.

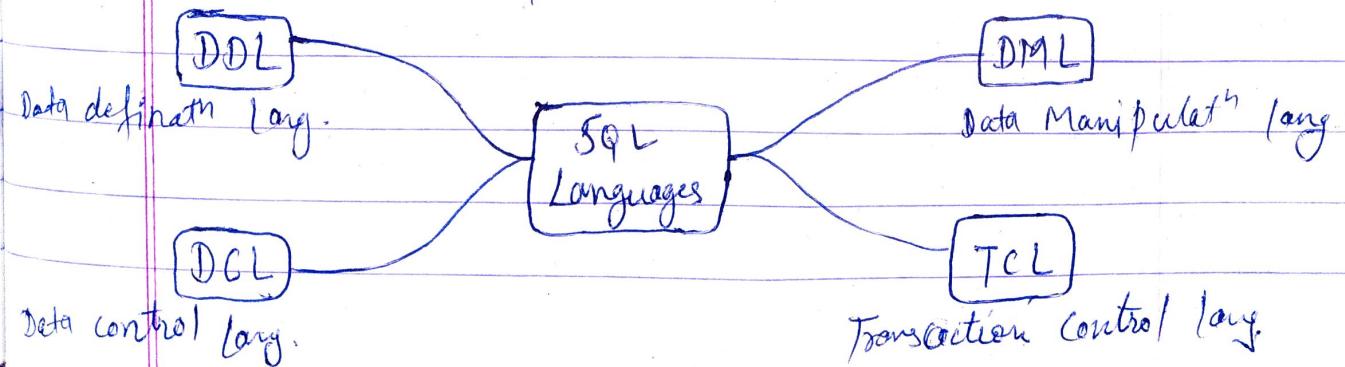
ER model is a graphical representation of entities and their relationship which helps in understanding data independent.

Crow foot notation is one of the ways to represent cardinality of relationship in an ER model.

4 symbol)-

- 1) Exactly one
- 2) Zero or one
- 3) Zero, one or more
- 4) One or more

⇒ SQL - Structured Query Language is used to manage data in all relational databases like DB2, Oracle, SQL Server etc.



→ ALTER → DDL (TRUNCATE)

→ REVOKE → DCL

→ INSERT → DML



NUMBER(3,1)



precision scale

1) NUMBER(3) → e.g. → 999.0 ↗ scale

2) NUMBER(3,2) → 9.99 ↗ scale

3) NUMBER(3,3) → 0.999 ↗ scale

Scale is the number of digits allowed after the decimal point.

precision is the total number of significant digits.

Column - A single field in a table, A Column contains a particular piece of information within a table.

Row - A record in a table.

Schema → Information about database and table

Layout and properties.

Keyword - Reserve word



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Any column in a table can be defined as the primary key, as long as it meets the following conditions:

- No two rows can have same value.
- No NULL value.
- Values in primary key columns should never be modified or updated.

Why MySQL?

- 1) Easy to use
- 2) free
- 3) Supported on every OS
- 4) Most popular DBMS.

>> SELECT → use to retrieve data

Normalization - means the process of efficiently organizing data in a database.

Range → BETWEEN 2 AND 5

List → IN ('Rishi', 'Abhi', 'Shakti')

LIKE → string pattern match → LIKE "%g%"

→ DROP Table statement is used to drop an existing table from the database.

⇒ `DROP TABLE <table name>;`

→ first drop the child table then parent table
~~not~~ direct dropping parent table is not allowed



Reason → due to foreign / primary key.

→ CREATE → used to create a table / database.

Syntax - CREATE TABLE students (

StdID INTEGER PRIMARY KEY,

Sname VARCHAR (20),

Contactno. NUMBER (10));

→ REFERENCES - It is used to declare foreign key or get reference from parent table.

→ by using CASCADE CONSTRAINTS we drop parent table first.

↳ DROP TABLE student CASCADE CONSTRAINTS

Reason → The clause CASCADE CONSTRAINTS will remove all referential integrity constraints that refer to the primary or unique keys in the tables.

→ NOT NULL is only applied on column

→ A Column can be given the default value by using DEFAULT option.

ORACLE doesn't support Default value.
(database)



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Data type of column and default expression must be the same.

→ CHECK constraint is used to limit the values than can be specified for a column.

→ Gender CHAR(1) CHECK (Gender IN('M','F'))

Normalisation - Normalisation is the process of reorganizing data in a database to ensure that there is no data redundancy and no data dependencies.

Update -

update student set ~~Mob~~ = 9876543210
Where Sid = 'S04';

Alter -

→ Alter table student drop column Sname;
(Sname → name column delete)

→ Alter table student rename column Sid to StudId;

→ Alter table student modify Sname Varchar(50);



→ Limit → limit value
offset value

→ Limit → It instruct return how many rows
e.g.: Limit 5.

→ OFFSET - It instruct return from where to
e.g.- limit 5 offset 5.

SQL - SQL is Structured query Language,
Which is a Computer Language for
Storing, manipulating & retrieving data
in relational database.

→ When we have fix no. of data store use
CHAR

→ otherwise VARCHAR

→ desc / describe student;

→ used to known the table character
→ To see structure of table.

Integer allowed 38 digit (default)

→ if 100.5 is store in integer then it round
and store 101 in database.

To store decimal value.

Expenses Number (5,2)

Select → Length(name), Length(Address) from Students;
returns length of name (int) and address length.



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Expense Number;

→ Then it stores any values like 1.23,
23.45, 28, 22.2228 etc.

TIMESTAMP -

Time TIMESTAMP;

→ It gives (SYSTEM STAMP) system instance time.

CLOB → character data > 4000 bytes.

BLOB → Binary data like image, video etc.

DATE → Syntax → it always stores

↳ DD-MM-^(YY) (2-2 digit each)

DEFAULT - It is used to set default value.

e.g. → DOJ Date default SYSDATE;

→ if user doesn't provide date (DOJ) then it gets default value as system date.

check - Check constraint is used for where we know value is only from these list

e.g. → Gender is always M or F.

* Check constraints allow NULL value



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Syntax - check.

- Gender check (1) constraint st-gender check
Gender IN ("M", "F");
or → Age Number constraint st-age check(age > 18);

Q- Why SQL - 1) Allow user to access data in the relational database management system.

- 2) easy to learn
- 3) Widely used in World.

SQL Architecture

[SQL Query]



[Query Language]
processor

← [parser + Optimizer]



[DBMS]
Engine

← [File Manager
Transaction manager]



physical database



Command is classified into the following groups based on their nature -

1) DDL - Data definition Language.

commands → CREATE (to create a new table)
ALTER (modify the table)
DROP (delete Whole table)

2) DML - Data manipulation language.

commands - SELECT
INSERT
DELETE
UPDATE

3) DCL - Data control language.

Commands - GRANT → gives a privilege to user.
REVOKE → Takes back the privilege



RDBMS - Relational database management system is a database management system that is based on the relational model introduced by E. F. Codd.

Table - The data in an RDBMS is stored in database objects which are called as tables.

Record or row - A record is also called a row of data is each individual entry that exists in a table. (Horizontal entity)

Column - A column is a vertical entity in a table that contains all information associated with a specific field in a table.

NULL value - A NULL value in a table is a value in a field that appears to be blank, which means a field with a NULL value is a field with no value.

Constraints - Constraints are the rules enforced on data columns on a table.



These are used to limit the type of data that can go into a table.



Database Normalisation - DB Normalisation is the process of efficiently organizing data in a database.

There are 2 reasons of this normalisation process:

- » Eliminating redundant data.
 - ↳ Storing same data more than one table.
- » Ensuring data dependencies make sense.
- * First normal form (1NF) - First normal form (1NF) sets basic rules for an organized database:
 - Define the data items required, because they become the columns in a table.
 - place the related data items in a table.
 - Ensure that there are no repeating groups of data.
 - Ensure that there is a primary key.
- * It contains an atomic value.
- * It states that an attribute of table cannot hold multiple values.

Syntax → Set of rules & guidelines of writing code/anything.



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* Second normal form (2NF) - 2NF states that should meet all the rules for 1NF and there must be no ~~partial~~ ~~dependent~~ ~~functional~~ ~~independents~~ of ~~any~~ of the ~~entites~~ on the primary key.

* Third normal form (3NF) - A table is in a third normal form when the following conditions are met:

- It is in the second normal form.
- All non-primary fields are dependent on the primary key.



Reduce the data duplication, also used to achieve Various SQL command Syntax - the data integrity.

→ Select statement → select / fetch value
SELECT col1, col2, from table-name;

→ DISTINCT clause → used to find single value
SELECT DISTINCT col1, col2 FROM table-name

→ WHERE clause → check condition.
SELECT col1, col2 FROM tb-name
WHERE Condition;

* BCNF \rightarrow Boyce Codd & Table should be in BNF

\rightarrow & for every FD, LHS is superkey.

* 4NF \rightarrow A relation will be in 4NF

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\rightarrow if it is in Boyce Codd normal form and has no multi-

\rightarrow AND/OR clause -

valued dependency

SELECT C1, C2 FROM tbname

WHERE Cond1 AND/OR Cond2;

\rightarrow exactly

\rightarrow exactly value

\rightarrow IN clause - check IN list and fetch match values.

SELECT C1, C2 FROM tbname

WHERE colname IN (values);

\rightarrow BETWEEN clause - check from 2.

SELECT C1, C2 FROM tbname

WHERE colname BETWEEN val-1 AND val-2;

\rightarrow LIKE clause - check pattern. '%a'/'a%'

SELECT C1 FROM TBname

WHERE Colname LIKE (pattern);

\rightarrow ORDER BY clause -

SELECT C1 from tbname

WHERE condition.

ORDER BY Colname ASC/DESC;

\rightarrow GROUP BY clause -

SELECT C1 FROM tbname

WHERE condition

GROUP BY Colname;



→ Having clause use with group by clause.

→ COUNT clause - count no. of ~~row~~ row.

SELECT COUNT(column) FROM tablename
WHERE condition;

→ HAVING clause -

SELECT SUM(column) FROM tablename
WHERE condition.

GROUP BY column

HAVING (arithmetic condition)

SQL operators - Aggregations -

Avg() → return average of selected column

Count() → no. of row

Max() → maximum value in a row

Min() → minimum value in a row

Sum() → Sum of row.



→ CREATE TABLE -

```
CREATE TABLE table-name (  
    col1 datatype,  
    col2 datatype,  
    col3 datatype,  
    :  
    :  
    PRIMARY KEY (colname)  
);
```

→ DROP TABLE -

```
DROP TABLE table-name;
```

→ CREATE INDEX -

```
CREATE UNIQUE INDEX index-name  
ON tablename (col1, col2, ... colN);
```

→ DROP INDEX -

```
ALTER TABLE table-name  
DROP INDEX index-name;
```

→ DESCRIBE table -

```
DESC table-name;
```



→ TRUNCATE TABLE -

TRUNCATE TABLE table-name;

→ ALTER TABLE - (Update use)

ALTER TABLE table-name {ADD/DROP/Modify
column-name {datatype};}

→ Rename to new table name -

ALTER TABLE table-name RENAME TO new_name;

→ INSERT INTO -

INSERT INTO table-name (col1, col2 ... colN)
VALUES (val1, val2 ... valN);

→ UPDATE Statement

UPDATE table-name SET col1 = val1, col2 =
val2 ...
[Where Condition];

→ DELETE Statement

DELETE FROM table-name
WHERE {condition};



→ CREATE DATABASE -

CREATE DATABASE database-name;

→ DROP database -

DROP DATABASE database-name;

→ USE Statement -

USE database-name;

→ COMMIT -

COMMIT;

→ ROLLBACK -

ROLLBACK;

Data type - It is an attributes that specifies the type of data of any object.

#) Exact Numeric data types-

bigin, int, smallint, tinyint, bit, decimal, numeric, money, smallmoney.

#) Approx. Numeric data type-

float, real, datetime, smalldatetime, date, time

A datetime datatype has 3.33 milliseconds accuracy.
And smalldatetime has -
1 minute accuracy.



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#) Character string data types.

char. → max. length of 8000 character.

varchar → max. of 8,000 character (non-Unicode)

text → Max. 2,147,483,647 characters.

Operators in SQL -

An operator is a reserved word or a character used in SQL statement WHERE clause to perform operations such as comparison and arithmetic operators.

- Arithmetic operators
- Comparison operators
- Logical operators.
- Operators used to negate conditions.

- Arithmetic operator → +, -, *, /, %
- Comparison operator → =, !=, <> (not equal), >
<, >=, <=, !<, !>
- Logical operators. → ALL, AND, ANY, BETWEEN
LIKE, NOT, IS NULL, EXISTS, IN, OR, UNIQUE

* Where age IN (25, 30) → it gives all value from age 25 to 30.

OR Where age BETWEEN 25 AND 27.



Union - union return all the value of 2 table except duplicate value

UNION ALL - It return all value of 2 table also duplicate value.

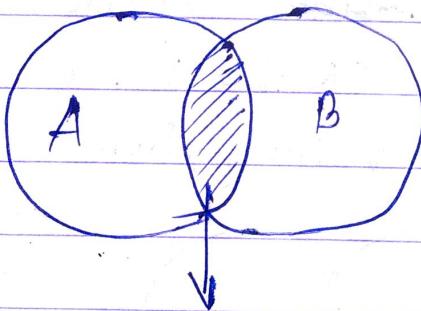
→ SELECT Sname, Sbranch from student

UNION ALL

SELECT Sname, Sbranch from student2

SQL Join - Combine rows/columns from two or more tables, based on a related column between them in a database.

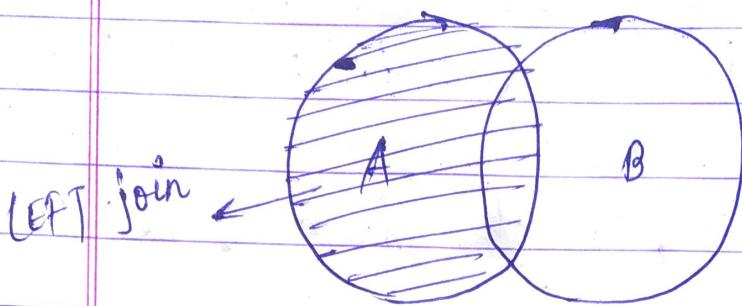
* INNER JOIN - Return rows when there is a match in both tables.



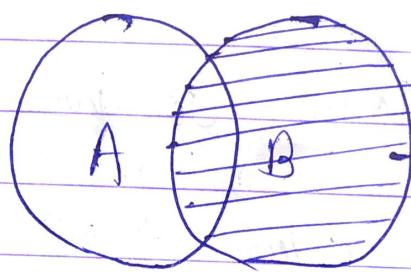
INNER



* LEFT JOIN - Return all rows from the left table, even if there are no matches in the right tables.



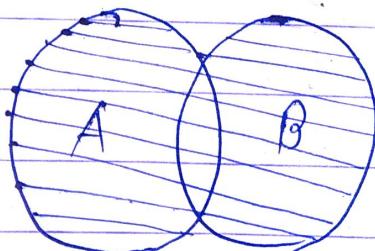
* RIGHT JOIN -



(Vice versa of
left join)

* FULL OUTER JOIN - Return rows when there is a match in one of the tables. यहाँ ~~सभी~~ condition match होनी होती है तो वह NULL value नहीं होती।

* Return all values from both tables.

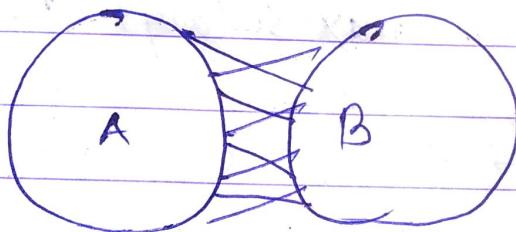




* SELF JOIN - Used to join a table to itself as if the table were two tables, temporarily renaming at least one table in the SQL statement.



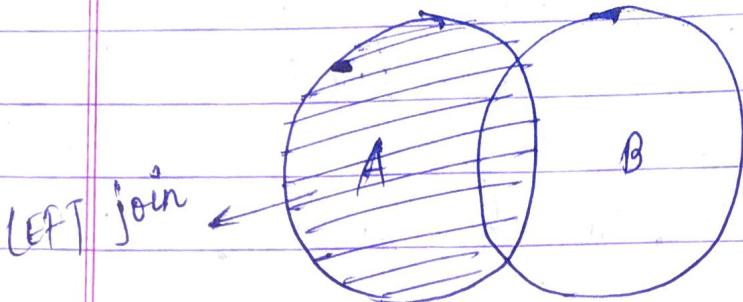
* CARTESIAN JOIN (CROSS JOIN) :- Return the Cartesian product of the sets of records from the two or more joined tables.



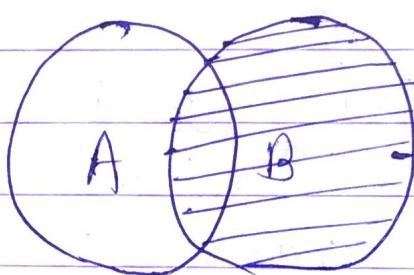
if A table has 3 record
*~~one~~ and B table has 4 record
then final table get $3 \times 4 = 12$ record.



* LEFT JOIN - Return all rows from the left table, even if there are no matches in the right tables.

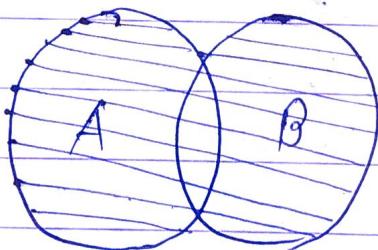


* RIGHT JOIN -



* FULL OUTER JOIN - Return rows when there is a match in one of the tables. यदि ~~सभी~~ condition match होती है तो वह NULL value भी होती है।

* Return all values from both tables.

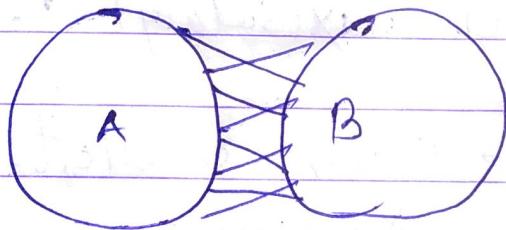




* SELF JOIN - Used to join a table to itself as if the table were two tables, temporarily renaming at least one table in the SQL statement.



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if A table has 3 record
** and B table has 4 record
then final table get $3 \times 4 = 12$ record.



SQL Operators - Aggregation function

1) Avg() → Return the average value from specified columns

~~records~~

→ SELECT avg(salary) FROM employees;

2) Count() → Return number of table rows

→ SELECT Count(*) FROM employees;

3) Max() → Return largest value among the records.

→ SELECT max(salary) FROM employees;

4) Min() → Return smallest value among the records.

→ SELECT min(salary) FROM employees;

5) Sum() → Return the sum of specified column values.

→ SELECT sum(salary) FROM employees;

→ SHOW DATABASES;
→ USE student;



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Expression - An expression is a combination of one or more values, operators and SQL function that evaluate to a value. These SQL Expressions are like formulae and they are written in query language.

There are different types of SQL expressions, which are mentioned below:

→ Boolean → Numeric → Date
↓ ↓ ↓

Select * from customer where salary = 10000;

Select (5+6);

Select current_timestamp;
Select GETDATE();

CREATE table infoStudent As
Select Firstname, class from student.

It makes another table name infoStudent having all value of student table (firstname, class).

Where Clause - Where clause is used to specify a condition while fetching the data from a single table or by joining the multi-table.



SQL - AND & OR Conjunctive Operators

The SQL AND & OR operators are used to combine multiple conditions to narrow down the result set in SQL Statement.

⇒ N number of conditions using the AND & OR operators

~~DELETE~~ - UPDATE - UPDATE query is used to modify the existing records in a table.

→ WHERE clause with the UPDATE query to update the selected row, otherwise all rows would be affected.

e.g. UPDATE Sname SET ADDRESS = 'PUNE'

WHERE ID = 6; / otherwise all Sname have pune.

DELETE - It is used to delete the existing records from a table.

→ WHERE clause is used to delete the selected rows, otherwise all the records would be deleted.

e.g. → DELETE FROM table-name
WHERE condition;

All database do not support TOP clause

LIMIT → support MySQL

ROWNUM → Oracle



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LIKE clause - It is used to compare a value to similar values using wildcard operators (% & _)

- 1) % - percent sign
 - 2) _ - underscore sign
- The % sign represent 0, 1 or multiple characters.
- The (_) sign represent a single char or number.

e.g. - SELECT * FROM table

WHERE name LIKE 'RA%'

OR ('%A%')

← %

SELECT * FROM table

WHERE name LIKE 'RAHU_'

OR (_AHU_)

← _

TOP - This clause is used to fetch a TOP N number of X percent records from a table

TOP e.g. - SELECT TOP 3 * FROM table;

LIMIT e.g. - SELECT * FROM table → MySQL
LIMIT 3;

ROWNUM e.g. → SELECT * FROM table → Oracle
WHERE ROWNUM ≤ 3;

* Some database sort the query results in an ascending order by default.



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ORDER BY clause - used to sort the data in ascending or descending order, based on one or more columns.

e.g. `SELECT col1 FROM table`

`WHERE condition`

`ORDER BY DESCLASC;`

GROUP BY - used ~~to~~ in collaboration with the SELECT statements to arrange identical data into groups

→ This GROUP BY clause follows the WHERE clause in a SELECT Statements and precedes the ORDER BY clause.

e.g:- table →

1-	Ramesh	4000/-
2-	sahil	2000/-
3-	Ramesh	4500/-

`SELECT name, sum(salary) FROM table`

~~WHERE~~ GROUP BY name;

⇒ O/p →

Ramesh	9500
Sahil	2000



DISTINCT Keyword - used in conjunction with the SELECT statement to eliminate all the duplicate records and fetching only unique records.

e.g.: - SELECT DISTINCT cols FROM table
WHERE Condition.

~~Clause - Key - A DBMS~~

Normalisation - ACID properties -

- * Atomicity - The entire transaction take place at once or doesn't happen at all
- * Consistency - The database must be consistent before and after the transaction
- * Isolation - Multiple Transactions occur independently without interference.
- * Durability - The changes of a successful transaction occurs even if the system failure occurs.