QC-1-SQL

1. Three Models in Database Design (RDBMS):

- **Conceptual Model:**
  - **Definition:** The conceptual model is a high-level representation of organizational data. It defines what the system contains and the rules governing it, often in the form of ER diagrams (Entity-Relationship diagrams).
  - **Example:**
    - **Real-life:** Think of a blueprint for building a house, which shows rooms, doors, and windows but not how the wiring or plumbing is done.
    - **Technical:** An ER diagram showing entities like `Customer`, `Order`, and `Product`, with their relationships (e.g., a customer places orders).
- **Logical Model:**
  - **Definition:** The logical model takes the conceptual model and translates it into a logical structure that can be implemented in a database. It focuses on the structure, data types, relationships, and constraints without considering physical storage.
  - **Example:**
    - **Real-life:** Designing a room layout with furniture placement but without worrying about where the electrical outlets are.
    - **Technical:** A relational schema with tables such as `Customer`, `Order`, and `Product`, showing primary keys, foreign keys, and data types.
- **Physical Model:**
  - **Definition:** The physical model is the actual implementation of the logical model into a database system. It deals with the specifics of storage, indexing, and retrieval.

- **Example:**
  - **Real-life:** The actual construction of the house, including the placement of plumbing, electrical systems, and materials used.
  - **Technical:** Implementing the database schema in SQL, optimizing tables, choosing indexes, and defining storage parameters.

2. What is Dialect in SQL?

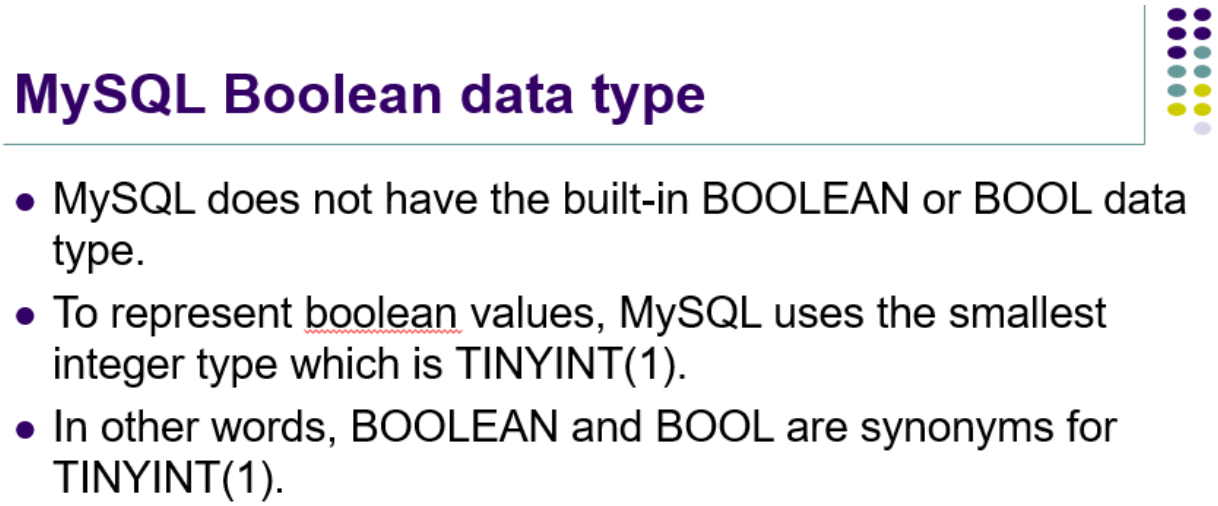
- **Definition:** A dialect in SQL refers to the specific version or variant of SQL used by a particular RDBMS. Different database systems like MySQL, PostgreSQL, Oracle, etc., may have slight variations in syntax and features.
- **Example:**
  - **Real-life:** Different accents or slang in the same language (e.g., American English vs. British English).
  - **Technical:** MySQL uses `LIMIT` for pagination, while Oracle uses `ROWNUM`.

3. Sublanguages in SQL:

- **DDL (Data Definition Language):**
  - **Definition:** Commands that define the structure of the database, such as creating, altering, and dropping tables.
  - **Example:** `CREATE TABLE`, `ALTER TABLE`.
- **DML (Data Manipulation Language):**
  - **Definition:** Commands that manipulate the data within the database, like inserting, updating, and deleting records.
  - **Example:** `INSERT INTO`, `UPDATE`, `DELETE`.
- **TCL (Transaction Control Language):**
  - **Definition:** Commands that manage transactions within the database, ensuring that they are completed successfully.

    - **Example:** `COMMIT`, `ROLLBACK`, `SAVEPOINT`.
- **DQL (Data Query Language):**
    - **Definition:** Commands that query and retrieve data from the database.
    - **Example:** `SELECT`.
- **DCL (Data Control Language):**
    - **Definition:** Commands that control access to the data within the database.
    - **Example:** `GRANT`, `REVOKE`

DATE TYPE	SPEC	DATA TYPE	SPEC
CHAR	String (0 - 255)	INT	Integer (-2147483648 to 214748-3647)
VARCHAR	String (0 - 255)	BIGINT	Integer (-9223372036854775808 to 9223372036854775807)
TINYTEXT	String (0 - 255)	FLOAT	Decimal (precise to 23 digits)
TEXT	String (0 - 65535)	DOUBLE	Decimal (24 to 53 digits)
BLOB	String (0 - 65535)	DECIMAL	"DOUBLE" stored as string
MEDIUMTEXT	String (0 - 16777215)	DATE	YYYY-MM-DD
MEDIUMBLOB	String (0 - 16777215)	DATETIME	YYYY-MM-DD HH:MM:SS
LONGTEXT	String (0 - 4294967295)	TIMESTAMP	YYYYMMDDHHMMSS
LONGBLOB	String (0 - 4294967295)	TIME	HH:MM:SS
TINYINT	Integer (-128 to 127)	ENUM	One of preset options
SMALLINT	Integer (-32768 to 32767)	SET	Selection of preset options
MEDIUMINT	Integer (-8388608 to 8388607)	BOOLEAN	TINYINT(1)



4.

What is Integrity in RDBMS?

Set of rules followed by table or entity to make sure that data is consistent and no any sort of data inconsistency. Integrity refers to the correctness, consistency, and accuracy of the data stored in a database

Types of Integrity:

- **Entity Integrity:** Ensures that each row in a table is uniquely identified, typically through primary keys.
- **Referential Integrity:** Ensures that foreign keys in a table correctly reference primary keys in another table.
- **Domain Integrity:** Ensures that data values in a column are valid based on their data type, format, or range.

5. What is Data Multiplicity?

- **Definition:** Data multiplicity refers to the relationship between tables and how data in one table relates to data in another table, commonly defined as one-to-one, one-to-many, or many-to-many relationships.
- **Example:**
  - **Real-life:** A teacher can teach multiple classes (one-to-many), but each class can only have one teacher assigned (one-to-one).
  - **Technical:** An `Authors` table related to a `Books` table where an author can write multiple books (one-to-many).

7. Normalization:

Normalization is the process of organizing data to reduce redundancy and improve data integrity by dividing a database into smaller tables and defining relationships between them.

- **1NF (First Normal Form):**
  - **Definition:** A table is in 1NF if all columns contain atomic values, meaning each column contains only one value per row.
  - **Example:**
    - **Real-life:** A contact list where each contact's phone numbers are stored in separate rows rather than a single field.
    - **Technical:** Splitting a `Contacts` table to ensure each phone number is stored in a different row rather than a comma-separated list.

- 2NF

TEACHER_ID	SUBJECT	TEACHER_AGE

Definition: A table is in 2NF if it is in 1NF and all non-key attributes are fully functionally dependent on the primary key.

3NF (Third Normal Form):

- **Definition:** A table is in 3NF if it is in 2NF and all columns are only dependent on the primary key and not on any other non-primary key attribute.
- **Example:**
  - **Real-life:** An employee database where employee names are associated only with their IDs and not redundantly with other information.
  - **Technical:** Splitting the `Employee` table into separate tables for `EmployeeDetails` (e.g., `EMPID`, `EMPNAME`) and `AddressDetails` (e.g., `PINCODE`, `CITY`).

BCNF

- BCNF is the advance version of 3NF. It is stricter than 3NF.
- A table is in BCNF if every functional dependency X → Y, X is the super key of the table.
- For BCNF, the table should be in 3NF, and for every FD, LHS is super key

EMP_ID	EMP_COUNTRY	EMP_DEPT	DEPT_TYPE	EMP_DEPT_NO

Fourth normal form (4NF)

- A relation will be in 4NF if it is in Boyce Codd normal form and has no multi-valued dependency.
- For a dependency A → B, if for a single value of A, multiple values of B exists, then the relation will be a multi-valued dependency.

STU_ID	COURSE	HOBBY

Fifth normal form (5NF)

- A relation is in 5NF if it is in 4NF and not contains any join dependency and

joining should be lossless.

What is SQL? What are some SQL databases?

- **SQL (Structured Query Language):** SQL is a standard programming language used to manage and manipulate relational databases. It allows you to query, update, insert, delete, and manage data.
- **Some SQL Databases:**
  - **MySQL**
  - **PostgreSQL**
  - **Oracle Database**
  - **Microsoft SQL Server**
  - **SQLite**

2. What is ERD?

- **ERD (Entity-Relationship Diagram):** An ERD is a graphical representation of entities and their relationships to each other within a database. It is used during the conceptual design phase to model the data and its relationships visually.
- **Example:** In an ERD, you might have entities like `Customer`, `Order`, and `Product`, with relationships such as a customer can place many orders.

3. What are the 5 Sublanguages of SQL? Which Commands Correspond to Them?

- **DDL (Data Definition Language):**
  - **Commands:** `CREATE`, `ALTER`, `DROP`, `TRUNCATE`
  - **Purpose:** Defines the structure of the database (e.g., tables, schemas).
- **DML (Data Manipulation Language):**

    - **Commands:** `INSERT`, `UPDATE`, `DELETE`
    - **Purpose:** Manipulates data within the database.
- **TCL (Transaction Control Language):**
    - **Commands:** `COMMIT`, `ROLLBACK`, `SAVEPOINT`
    - **Purpose:** Manages transactions in the database.
- **DQL (Data Query Language):**
    - **Commands:** `SELECT`
    - **Purpose:** Retrieves data from the database.
- **DCL (Data Control Language):**
    - **Commands:** `GRANT`, `REVOKE`
    - **Purpose:** Controls access to data within the database.

4. What is the Difference Between DELETE, DROP, and TRUNCATE Commands?

- **DELETE:**
    - **Purpose:** Deletes specific rows from a table based on a condition.
    - **Effect:** Rows can be deleted conditionally. The operation can be rolled back.
- **DROP:**
    - **Purpose:** Completely removes a table, index, or database.
    - **Effect:** Entire structure is removed, and the operation cannot be rolled back.
- **TRUNCATE:**
    - **Purpose:** Removes all rows from a table.
    - **Effect:** All data is deleted, but the table structure remains. The operation cannot be rolled back.

5. What are Some SQL Clauses You Can Use with SELECT Statements?

- **Clauses:**
  - `WHERE`: Filters rows based on a condition.
  - `ORDER BY`: Sorts the result set.
  - `GROUP BY`: Groups rows that have the same values in specified columns.
  - `HAVING`: Filters groups based on a condition.
  - `LIMIT`: Limits the number of rows returned.
  - `JOIN`: Combines rows from two or more tables based on a related column.

6. What is the Difference Between WHERE and HAVING?

- **WHERE:**
  - **Purpose:** Filters rows before grouping is applied.
  - **Use Case:** Used with SELECT, UPDATE, DELETE.
- **HAVING:**
  - **Purpose:** Filters groups after the GROUP BY clause has been applied.
  - **Use Case:** Used with GROUP BY to filter aggregated data.

7. Explain What the ORDER BY and GROUP BY Clauses Do

- **ORDER BY:**
  - **Purpose:** Sorts the result set by one or more columns, either in ascending (`ASC`) or descending (`DESC`) order.
  - **Example:** `SELECT * FROM Employees ORDER BY Salary DESC;`
- **GROUP BY:**

- **Purpose:** Groups rows that have the same values in specified columns, often used with aggregate functions (e.g., `SUM`, `COUNT`).
- **Example:** `SELECT Department, COUNT(*) FROM Employees GROUP BY Department;`

8. Explain the Concept of Relational Integrity

- **Relational Integrity:** Ensures the accuracy and consistency of data within a relational database. It prevents data anomalies through rules like foreign key constraints, ensuring that relationships between tables remain valid.
- **Example:** Ensuring that every order in an `Orders` table has a valid customer in the `Customers` table through a foreign key constraint.

9. List the Integrity Constraints

- **Primary Key Constraint:** Ensures that each row in a table is unique.
- **Foreign Key Constraint:** Ensures that a value in one table matches a value in another, maintaining referential integrity.
- **Unique Constraint:** Ensures that all values in a column are unique.
- **Not Null Constraint:** Ensures that a column cannot have NULL values.
- **Check Constraint:** Ensures that all values in a column satisfy a specific condition

10. Define the Word “Schema”

- **Schema:** A schema is a logical container for database objects such as tables, views, indexes, and procedures. It defines the structure of the database.
- **Example:** In a school database, you might have a `SchoolSchema` containing tables like `Students`, `Teachers`, and `Classes`.

Candidate Key:

- **Definition:** A column, or a set of columns, that can uniquely identify a row in a table. A table can have multiple candidate keys.
- **Example:** Both `EmployeeID` and `NationalIDNumber` can be candidate keys in an `Employees` table.

12. What Conditions Lead to Orphan Records?

- **Orphan Records:** These occur when a record in a child table references a record in the parent table that no longer exists. This typically happens when a referenced record is deleted from the parent table without updating or removing the related records in the child table.
- **Example:** Deleting a `Customer` from the `Customers` table while their orders still exist in the `Orders` table.

16. Explain the Different Isolation Levels. What Read Phenomena Do Each Prevent?

- **Isolation Levels:**
  - **Read Uncommitted:** No isolation; dirty reads are possible.
  - **Read Committed:** Prevents dirty reads but allows non-repeatable reads.
  - **Repeatable Read:** Prevents dirty and non-repeatable reads but allows phantom reads.
  - **Serializable:** Prevents dirty, non-repeatable, and phantom reads; highest isolation level.
- **Read Phenomena:**
  - **Dirty Read:** Reading uncommitted data from another transaction.
  - **Non-Repeatable Read:** Data is read twice during a transaction, but the data changes in between reads.
  - **Phantom Read:** New rows are added by another transaction after the initial read, leading to inconsistent results.

17. What is the Difference Between Joins and Set Operators?

- **Joins:**
  - **Purpose:** Combines columns from two or more tables based on related columns.
  - **Example:** `INNER JOIN`, `LEFT JOIN`, `RIGHT JOIN`, `FULL OUTER JOIN`.
- **Set Operators:**
  - **Purpose:** Combines result sets from two or more SELECT queries.
  - **Example:** `UNION`, `UNION ALL`, `INTERSECT`, `EXCEPT`.

Isolation in SQL Transactions

Isolation is one of the four key properties of a database transaction, as part of the ACID (Atomicity, Consistency, Isolation, Durability) principles. It determines how the operations within one transaction are isolated from the operations in other concurrent transactions.

- **Purpose of Isolation:**
  - Isolation ensures that transactions are executed in such a way that they do not interfere with each other, maintaining data integrity and consistency.
  - Depending on the isolation level, transactions can either see changes made by other concurrent transactions or be shielded from them until they are complete.

Real-Life Example of Isolation Levels:

Imagine you're at a bookstore:

- **Read Uncommitted:** You look at a book and decide to buy it. The cashier starts processing your purchase, but before the payment is confirmed, someone else (another transaction) comes in and changes the price of the book. You saw the "dirty" or unconfirmed price.

- **Read Committed:** You wait for the cashier to finish processing before checking the price. This way, you only see the final, confirmed price. However, if you check the price again later, someone might have changed it in the meantime.
- **Repeatable Read:** Once you check the price, no one else can change it while you're still deciding. But, if new books arrive (phantom rows), you won't see them unless you start your check again.
- **Serializable:** The cashier closes the section of the store where the book is located so that no one else can buy, move, or change anything until you finish your transaction. You have a fully isolated experience.

Isolation Level	Dirty Read	Non-Repeatable Read	Phantom Read
Read Uncommitted	Allowed	Allowed	Allowed
Read Committed	Prevented	Allowed	Allowed
Repeatable Read	Prevented	Prevented	Allowed
Serializable	Prevented	Prevented	Prevented

1. What is the Difference Between Joins and Set Operators?

- **Joins:**
  - **Purpose:** Joins combine columns from two or more tables based on a related column between them.
  - **Operation:** Rows from the joined tables are combined into a single result based on a specified condition (like matching keys).
  - **Example:**
    - **Technical:** If you have two tables, `Employees` and `Departments`, you can use a join to combine them based on a common column like

`DepartmentID`, to get employee details along with their department names.

    - **Real-Life:** Imagine merging two lists, one of students and one of their courses, based on a common student ID to see which students are in which courses.

- **Set Operators:**
    - **Purpose:** Set operators combine the results of two or more `SELECT` statements into a single result set.
    - **Operation:** They work on the entire result sets of queries rather than on individual rows or columns.
    - **Types:** UNION, UNION ALL, INTERSECT, and EXCEPT.
    - **Example:**
        - **Technical:** Use `UNION` to combine two lists of employees from different branches into a single list.
        - **Real-Life:** Merging two guest lists from different events to create one master list.

2. What Are the Types of Joins? Explain the Differences.

- **Inner Join:**
    - **Description:** Returns only the rows that have matching values in both tables.
    - **Example:** Finding all employees who have a matching department in the `Departments` table.
- **Left (Outer) Join:**
    - **Description:** Returns all rows from the left table and the matched rows from the right table. If no match is found, `NULL` is returned for columns from the right table.

    - **Example:** Getting a list of all employees, including those who are not assigned to any department.
- **Right (Outer) Join:**
    - **Description:** Returns all rows from the right table and the matched rows from the left table. If no match is found, `NULL` is returned for columns from the left table.
    - **Example:** Getting a list of all departments, including those with no employees assigned.
- **Full (Outer) Join:**
    - **Description:** Returns all rows when there is a match in either the left or right table. If there is no match, `NULL` is returned for the columns without a match in both tables.
    - **Example:** Listing all employees and all departments, showing relationships where they exist and `NULL` where they do not.
- **Cross Join:**
    - **Description:** Returns the Cartesian product of both tables, meaning all possible combinations of rows.
    - **Example:** Pairing every employee with every department, regardless of whether they work there.
- **Self Join:**
    - **Description:** A join where a table is joined with itself, useful for hierarchical data.
    - **Example:** Finding all employees and their managers if both are stored in the same table.

3. Explain the Difference Between UNION, UNION ALL, and INTERSECT

- **UNION:**

    - **Description:** Combines the results of two `SELECT` statements and removes duplicate rows.
    - **Example:** Merging two lists of customers from different regions, showing each customer only once.
- **UNION ALL:**
    - **Description:** Combines the results of two `SELECT` statements but includes all duplicates.
    - **Example:** Merging two lists of customers from different regions, showing all customers, even if they appear in both lists.
- **INTERSECT:**
    - **Description:** Returns only the rows that are present in both `SELECT` statements.
    - **Example:** Finding customers who are in both the online and in-store customer lists.

4. What is a Cascade Delete?

- **Description:** A database feature where deleting a row in a parent table automatically deletes related rows in a child table.
- **Example:**
    - **Technical:** If you delete a department from the `Departments` table, all employees in that department are automatically deleted from the `Employees` table.
    - **Real-Life:** Deleting a folder on your computer that also deletes all the files within it.

5. What is the Purpose of a View? What About an Index?

- **View:**

- **Purpose:** A virtual table that is based on the result of a `SELECT` query. It provides a way to simplify complex queries or present data in a specific format without storing it physically.
- **Example:** Creating a view that shows only active employees, which simplifies queries that need this data.
- Data is Fetched At Runtime.

Index:

- **Purpose:** A database object that improves the speed of data retrieval operations on a table at the cost of slower write operations.
- **Example:** Indexing a `CustomerName` column so that searches for customers by name are faster.

6. What's the Difference Between a Clustered and Non-Clustered Index?

- **Clustered Index:**
  - **Description:** Physically sorts the data rows in the table according to the index key. There can be only one clustered index per table because the data can be sorted in only one way.
  - **Example:** Indexing a `PrimaryKey` column, such as `CustomerID`, so that the table is physically sorted by `CustomerID`.
- **Non-Clustered Index:**
  - **Description:** Creates a separate structure to hold the index, with pointers to the physical data. Multiple non-clustered indexes can exist on a table.
  - **Example:** Indexing a `LastName` column separately, allowing faster searches by `LastName` without altering the physical order of the table.

In SQL, a trigger is **a database object that automatically executes SQL code when a specific database event occurs**. Triggers are usually associated with a

particular table and can be invoked before or after the following events:

- INSERT: A new row is inserted in the table
- UPDATE: An existing row of the table gets updated
- DELETE: A row in the table gets deleted

Triggers can be used for a variety of purposes, such as:

- Logging: Automatically writing to another table when a record is inserted, updated, or deleted from a table
- Data validation: Ensuring data is a certain type and correct values can be set when needed
- Data synchronization: Keeping related tables updated

```
CREATE TRIGGER trigger_name
ON table_name
AFTER INSERT, UPDATE, DELETE
AS
BEGIN
-- SQL code to execute
END;
```

8. How Would You Set Up a Primary Key That Automatically Increments with Every INSERT Statement?

```
CREATE TABLE Employees (
EmployeeID INT AUTO_INCREMENT PRIMARY KEY,
Name VARCHAR(100)
);
```

9. What is the Difference Between Scalar and Aggregate Functions? Give Examples of Each.

- **Scalar Functions:**

    - **Description:** Operate on a single value and return a single value.
    - **Examples:**
        - `UPPER()`: Converts a string to uppercase.
        - `LEN()`: Returns the length of a string.
    - **Real-Life:** Taking a single product and checking its price.
- **Aggregate Functions:**
    - **Description:** Operate on a set of values and return a single summary value.
    - **Examples:**
        - `SUM()`: Calculates the total of a numeric column.
        - `COUNT()`: Counts the number of rows.
    - **Real-Life:** Summing up the total sales in a day from all transactions.

10. What are Stored Procedures?

- **Description:** A stored procedure is a group of SQL statements that can be executed as a single unit. Stored procedures are used to encapsulate repetitive tasks, enforce business rules, or manage transactions.
- **Example:**
    - **Technical:** Creating a stored procedure to calculate and apply discounts to all products in a category.
    - **Real-Life:** A recipe (stored procedure) that you follow every time you bake a cake (run a process).

11. Explain the Parameter Types in Stored Procedures (IN, OUT, INOUT)

- **IN Parameter:**

    - **Description:** Passes a value into the procedure. The procedure can read but not modify this value.
    - **Example:** A stored procedure that takes a customer ID as input and retrieves the customer's details.
- **OUT Parameter:**
    - **Description:** Returns a value from the procedure. The procedure writes to this parameter, but it cannot be used as input.
    - **Example:** A stored procedure that calculates and returns a total invoice amount.
- **INOUT Parameter:(price,discount)**
    - **Description:** Passes a value into the procedure and returns a possibly modified value from the procedure.
    - **Example:** A stored procedure that takes an initial discount rate, modifies it based on certain rules, and returns the updated rate.

```
DELIMITER //
CREATE PROCEDURE procedure_name(IN param1 datatype, OUT param2 datatype)
BEGIN
-- SQL code to execute
-- Example: SELECT SUM(some_column) INTO param2 FROM some_table WHERE some_condition;
END//
DELIMITER ;
```

12. Difference Between Stored Procedure and Stored Function

- **Stored Procedure:**
    - **Purpose:** Performs an action such as modifying data, handling business logic, or managing transactions. It may or may not return a value.
    - **Example:** A procedure that updates inventory levels after a sale.

- **Stored Function:**
  - **Purpose:** Primarily used to calculate and return a value. Functions must return a value and are often used in queries.
  - **Example:** A function that calculates the total price after tax and returns it for use in a query.
- **Key Differences:**
  - **Return Value:** Functions must return a value, whereas stored procedures may return zero or more values.
  - **Usage in Queries:** Functions can be used in SQL queries like any other expression, while procedures cannot.
  - **Side Effects:** Procedures can perform actions like modifying data, while functions should not modify the database state.

```
DELIMITER //
CREATE FUNCTION GetTotalSalesByRegion(regionName VARCHAR(50))
RETURNS DECIMAL(10,2)
BEGIN
DECLARE totalSales DECIMAL(10,2);
SELECT SUM(SalesAmount) INTO totalSales FROM Sales WHERE Region =
regionName;
RETURN totalSales;
END//
DELIMITER ;
```

Both `BETWEEN` and `IN` are SQL operators used to filter query results based on specified conditions, but they serve different purposes and are used in different contexts.

1. `BETWEEN` Operator

Purpose:

- `BETWEEN` is used to filter results within a specific range. It is commonly used with numeric values, dates, or other ordered types.

```
SELECT column_name
FROM table_name
WHERE column_name BETWEEN value1 AND value2;
```

2. `IN` Operator

Purpose:

- `IN` is used to filter results based on a list of specific values. It allows you to specify multiple discrete values for a column.

Characteristics:

- **Exact Match:** The `IN` operator checks if the column value matches any of the values in the list.
- **Non-Range:** It does not work with ranges but with a set of distinct values

```
SELECT column_name
FROM table_name
WHERE column_name IN (value1, value2, value3, ...);
```

1. Anomalies

In database management, anomalies refer to inconsistencies or errors that arise due to poor database design, particularly in non-normalized databases. These anomalies can lead to problems with data integrity, redundancy, and efficiency. There are several types of anomalies:

1. Update Anomaly

Definition:
An update anomaly occurs when data is duplicated in multiple places, and a

change in one place is not reflected everywhere, leading to inconsistencies.

2. Insertion Anomaly

Definition:
An insertion anomaly occurs when certain data cannot be inserted into the database without the presence of other data. This often happens in a poorly designed schema where some attributes are dependent on other attributes.

Example:
Consider a table where new department information cannot be entered without assigning an employee to that department:

EmployeeID	EmployeeName	DepartmentName	DepartmentLocation
1	John Smith	HR	Building A
2	Jane Doe	IT	Building B

If you want to add a new department, such as "Marketing," you cannot do so without assigning at least one employee to it:

- **Desired Insertion:**
  - Department Name: Marketing
  - Location: Building D

This insertion anomaly occurs because the table structure requires that at least one employee be linked to the department.

3. Deletion Anomaly

Definition:
A deletion anomaly occurs when the deletion of a record causes unintended loss of other valuable information.

Example:
Consider a table that stores employee and department information:

EmployeeID	EmployeeName	DepartmentName	DepartmentLocation

1	John Smith	HR	Building A
2	Jane Doe	IT	Building B
3	Alice Johnson	HR	Building A

If you delete all employees from the HR department, you also lose information about the HR department itself:

- **Action:** Delete all employees from the HR department.
- **Resulting Table:**

EmployeeID	EmployeeName	DepartmentName	DepartmentLocation
2	Jane Doe	IT	Building B

The HR department data is now lost, even though the department information may be valuable independently.

Deterministic Functions:

- Always return the same result given the same input parameters.
- **Example:** `ABS()` (absolute value function), `UPPER()` (convert text to uppercase).

Non-Deterministic Functions:

- May return different results even if given the same input parameters, often because they rely on external factors.
- **Example:** `NOW()` (returns the current date and time), `RAND()` (generates a random number)

Super Key

- **Definition:** A set of one or more attributes that can uniquely identify a record in a table.

- **Example:** In a table with columns `EmployeeID`, `Email`, and `PhoneNumber`, a super key might be `{EmployeeID}`, `{Email}`, or `{EmployeeID, Email}`.
- **Key Difference:** Super key is a broader term that includes all possible keys.

Primary Key

- **Definition:** A specific super key chosen to uniquely identify each record in a table. It must be unique and not null.
- **Example:** `{EmployeeID}` in an `Employees` table.
- **Key Difference:** It is a unique and non-null key selected from among the super keys.

Candidate Key

- **Definition:** Any set of attributes that can uniquely identify a record and can be a potential primary key. There may be multiple candidate keys.
- **Example:** `{EmployeeID}`, `{Email}` in an `Employees` table.
- **Key Difference:** Candidate keys are the possible choices for the primary key.

Alternate Key

- **Definition:** A candidate key that is not chosen as the primary key.
- **Example:** If `{EmployeeID}` is chosen as the primary key, `{Email}` would be an alternate key.
- **Key Difference:** Alternate keys are candidate keys not used as the primary key.

Foreign Key

- **Definition:** An attribute or set of attributes in one table that refers to the primary key of another table, used to establish relationships between tables.

- **Example:** In an `Orders` table, `CustomerID` may be a foreign key referring to `CustomerID` in a `Customers` table.
- **Key Difference:** It establishes a relationship between tables and ensures referential integrity.

Compound Key: A primary key that consists of more than one column to uniquely identify a row.

Composite Key: Another term for a compound key. It involves using multiple columns to create a unique identifier for a row

Surrogate Key: An artificial key created to uniquely identify a row in a table. It has no business meaning and is usually an auto-incremented number.