SQL fundamentals

1. DDL - Data Definition Language

DDL (Data Definition Language) actually consists of SQL commands that can be used for defining, altering and deleting database structures such as tables, indexes and schemas. It simply deals with descriptions of the database schema and is used to create and modify the structure of database objects in the database

Command	Description	Syntax
CREATE	Create database or its objects (table, index, function, views, store procedure and triggers)	CREATE TABLE table_name (column1 data_type, column2 data_type, ...);
DROP	Delete objects from the database	DROP TABLE table_name;
ALTER	Alter the structure of the database	ALTER TABLE table_name ADD COLUMN column_name data_type;

TRUNCATE	Remove all records from a table, including all spaces allocated for the records are removed	TRUNCATE TABLE table_name;
COMMENT	Add comments to the data dictionary	COMMENT ON TABLE table_name IS 'comment_text';
RENAME	Rename an object existing in the database	RENAME TABLE old_table_name TO new_table_name;

Example:

```
CREATE TABLE employees (
    employee_id INT PRIMARY KEY,
    first_name VARCHAR(50),
    last_name VARCHAR(50),
    hire_date DATE
);
```

2. DQL - Data Query Language

DQL is used to fetch data from the database. The main command is SELECT, which retrieves records based on the query. The output is returned as a result set (a temporary table) that can be viewed or used in applications.

Command	Description	Syntax
SELECT	It is used to retrieve data from the database	SELECT column1, column2, ...FROM table_name WHERE condition;
FROM	Indicates the **table(s)** from which to retrieve data.	SELECT column1 FROM table_name;
WHERE	Filters rows **before** any grouping or aggregation	SELECT column1 FROM table_name WHERE condition;

GROUP BY	Groups rows that have the same values in specified columns.	SELECT column1,
		AVG_FUNCTION(column2)
		FROM table_name
		GROUP BY column1;

HAVING	Filters the results of GROUP BY	SELECT column1,
		AVG_FUNCTION(column2)
		FROM table_name
		GROUP BY column1
		HAVING condition;

DISTINCT	Removes **duplicate rows** from the result set	SELECT DISTINCT column1, column2, ...
		FROM table_name;

ORDER BY	Sorts the result set by one or more columns	SELECT column1
		FROM table_name
		ORDER BY column1 [ASC | DESC];

LIMIT	By default, it sorts in **ascending order** unless specified as DESC	SELECT * FROM table_name LIMIT number;

Note: *DQL has only one command,* ***SELECT****. Other terms like FROM, WHERE, GROUP BY, HAVING, ORDER BY, DISTINCT and LIMIT are* ***clauses*** *of SELECT, not separate commands.*

Example:

```
SELECT first_name, last_name, hire_date
FROM employees
WHERE department = 'Sales'
ORDER BY hire_date DESC;
```

This query retrieves employees first and last names, along with their hire dates, from the employees table, specifically for those in the 'Sales' department, sorted by hire date

3. DML - Data Manipulation Language

DML commands are used to manipulate the data stored in database tables. With DML, you can insert new records, update existing ones, delete unwanted data or retrieve information.

Command	Description	Syntax

INSERT	Insert data into a table	INSERT INTO table_name (column1, column2, ...) VALUES (value1, value2, ...);
UPDATE	Update existing data within a table	UPDATE table_name SET column1 = value1, column2 = value2 WHERE condition;
DELETE	Delete records from a database table	DELETE FROM table_name WHERE condition;

Example:

```
INSERT INTO employees (first_name, last_name, department)
 VALUES ('Jane', 'Smith', 'HR');
```

4. DCL - Data Control Language

DCL (Data Control Language) includes commands such as GRANT and REVOKE which mainly deal with the rights, permissions and other controls of the database system. These commands are used to control access to data in the database by granting or revoking permissions.

Command	Description	Syntax

GRANT	Assigns new privileges to a user account, allowing access to specific database objects, actions or functions.	GRANT privilege_type [(column_list)] ON [object_type] object_name TO user [WITH GRANT OPTION];
REVOKE	Removes previously granted privileges from a user account, taking away their access to certain database objects or actions.	REVOKE [GRANT OPTION FOR] privilege_type [(column_list)] ON [object_type] object_name FROM user [CASCADE];

Example:

```
GRANT SELECT, UPDATE ON employees TO user_name;
```

5. TCL - Transaction Control Language

Transactions group a set of tasks into a single execution unit. Each transaction begins with a specific task and ends when all the tasks in the group are successfully completed. If any of the tasks fail, transaction fails. Therefore, a transaction has only two results: success or failure.

Command	***Description***	***Syntax***

BEGIN TRANSACTION	*Starts a new transaction*	*BEGIN TRANSACTION [transaction_name];*
COMMIT	*Saves all changes made during the transaction*	*COMMIT;*
ROLLBACK	*Undoes all changes made during the transaction*	*ROLLBACK;*
SAVEPOINT	*Creates a savepoint within the current transaction*	*SAVEPOINT savepoint_name;*

Example:

```
BEGIN TRANSACTION;
UPDATE employees SET department = 'Marketing' WHERE department = 'Sales';
SAVEPOINT before_update;
UPDATE employees SET department = 'IT' WHERE department = 'HR';
ROLLBACK TO SAVEPOINT before_update;
COMMIT;
```

In this example, a transaction is started, changes are made and a savepoint is set. If needed, the transaction can be rolled back to the savepoint before being committed.