Practical Number 2

Aim: Write and execute basic SQL query- create, alter, insert, update and delete.

Introduction:

SQL is a standard language for storing, manipulating and retrieving data in databases.

What is SQL?

- SQL stands for Structured Query Language
- SQL lets you access and manipulate databases
- SQL became a standard of the American National Standards Institute (ANSI) in 1986, and of the International Organization for Standardization (ISO) in 1987

What Can SQL do?

- SQL can execute queries against a database
- SQL can retrieve data from a database
- SQL can insert records in a database
- SQL can update records in a database
- SQL can delete records from a database
- SQL can create new databases
- SQL can create new tables in a database
- SQL can create stored procedures in a database
- SQL can create views in a database
- SQL can set permissions on tables, procedures, and views

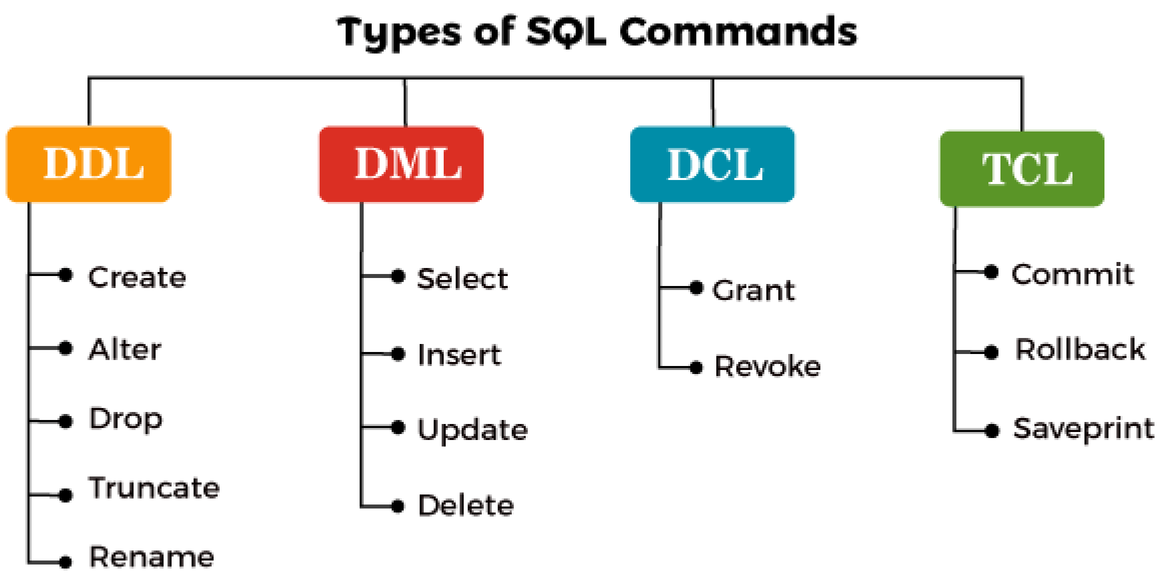
Semicolon after SQL Statements?

Some database systems require a semicolon at the end of each SQL statement. Semicolon is the standard way to separate each SQL statement in database systems that allow more than one SQL statement to be executed in the same call to the server.

Some of The Most Important SQL Commands

- SELECT - extracts data from a database
- UPDATE - updates data in a database
- DELETE - deletes data from a database
- INSERT INTO - inserts new data into a database
- CREATE DATABASE - creates a new database
- ALTER DATABASE - modifies a database
- CREATE TABLE - creates a new table
- ALTER TABLE - modifies a table
- DROP TABLE - deletes a table
- CREATE INDEX - creates an index (search key)

- DROP INDEX - deletes an index



SQL Commands

SQL*Plus is a command-line interface for interacting with Oracle databases. These commands are specific to SQL*Plus and are not standard SQL.

- **SHOW**: Displays database or session settings.
  Example:

  ```
  SHOW USER;
  ```

- **DESCRIBE**: Displays the structure of a table.
  Example:

  ```
  DESCRIBE employees;
  ```

- **EXIT**: Closes the SQL*Plus session.
  Example:

  ```
  EXIT;
  ```

- **SPOOL**: Saves query output to a file.
  Example:

  ```
  SPOOL output.txt;
  SELECT * FROM employees;
  SPOOL OFF;
  ```

DDL Commands (Data Definition Language)

These commands define the structure of a database, including creating, altering, and deleting schema objects.

- **CREATE**: Creates database objects like tables, views, indexes, etc.
  Example:

  ```
  CREATE TABLE employees (
      id NUMBER PRIMARY KEY,
      name VARCHAR2(100),
      hire_date DATE
  );
  ```

- **ALTER**: Modifies the structure of existing objects.
  Example:

  ```
  ALTER TABLE employees ADD salary NUMBER;
  ```

- **DROP**: Deletes database objects.
  Example:

  ```
  DROP TABLE employees;
  ```

- **TRUNCATE**: Removes all rows from a table, resetting it to an empty state.
  Example:

  ```
  TRUNCATE TABLE employees;
  ```

- **RENAME**: Changes the name of a database object.
  Example:

  ```
  RENAME employees TO staff;
  ```

- **COMMENT**: Adds comments to database objects.
  Example:

  ```
  COMMENT ON TABLE employees IS 'Stores employee details';
  ```

DML Commands (Data Manipulation Language)

These commands manipulate data stored in the database.

- **INSERT**: Adds new rows to a table.
  Example:
  ```
  INSERT INTO employees (id, name, hire_date)
  VALUES (1, 'John Doe', SYSDATE);
  ```

- **UPDATE**: Modifies existing data.
  Example:
  ```
  UPDATE employees
  SET salary = 50000
  WHERE id = 1;
  ```

- **DELETE**: Removes rows from a table.
  Example:
  ```
  DELETE FROM employees
  WHERE id = 1;
  ```

- **MERGE**: Combines INSERT and UPDATE functionality.
  Example:
  ```
  MERGE INTO employees e
  USING (SELECT 1 AS id, 'Jane Doe' AS name FROM dual) src
  ON (e.id = src.id)
  ```

```
WHEN MATCHED THEN
    UPDATE SET e.name = src.name
WHEN NOT MATCHED THEN
    INSERT (id, name) VALUES (src.id, src.name);
```

- **SELECT**: Retrieves data from the database.
  Example:
  `SELECT * FROM employees;`

To add multiple rows of data into a table, you can use either:

1. **Multiple `INSERT` statements**
2. **A single `INSERT` statement with `VALUES` for multiple rows** (for databases that support this syntax)
3. **`INSERT INTO` combined with `SELECT`**

Option 1: Multiple `INSERT` Statements

This approach is supported by all databases.

```
INSERT INTO employees (id, name, hire_date, salary)
VALUES (1, 'John Doe', TO_DATE('2025-01-01', 'YYYY-MM-DD'), 50000);

INSERT INTO employees (id, name, hire_date, salary)
VALUES (2, 'Jane Smith', TO_DATE('2025-01-02', 'YYYY-MM-DD'), 55000);

INSERT INTO employees (id, name, hire_date, salary)
VALUES (3, 'Alice Brown', TO_DATE('2025-01-03', 'YYYY-MM-DD'), 60000);
```

Option 2: Single `INSERT` with Multiple `VALUES`

This approach is supported by some databases like MySQL, PostgreSQL, and SQL Server.
Note: Oracle does not support this directly.

```
INSERT INTO employees (id, name, hire_date, salary)
VALUES
    (1, 'John Doe', TO_DATE('2025-01-01', 'YYYY-MM-DD'), 50000),
    (2, 'Jane Smith', TO_DATE('2025-01-02', 'YYYY-MM-DD'), 55000),
    (3, 'Alice Brown', TO_DATE('2025-01-03', 'YYYY-MM-DD'), 60000);
```

Option 3: `INSERT INTO` with `SELECT`

This approach inserts rows by selecting data from another table or using the `DUAL` table (Oracle-specific).

Insert using `SELECT` from `DUAL`:

```
INSERT INTO employees (id, name, hire_date, salary)
SELECT 1, 'John Doe', TO_DATE('2025-01-01', 'YYYY-MM-DD'), 50000 FROM dual
UNION ALL
SELECT 2, 'Jane Smith', TO_DATE('2025-01-02', 'YYYY-MM-DD'), 55000 FROM
dual UNION ALL
SELECT 3, 'Alice Brown', TO_DATE('2025-01-03', 'YYYY-MM-DD'), 60000 FROM
dual;
```

Insert by selecting from another table:

```
INSERT INTO employees (id, name, hire_date, salary)
SELECT id, name, hire_date, salary
FROM temp_employees;
```

Notes:

- Use **`TO_DATE`** in Oracle for inserting date values in the correct format.

Practice Example 1: Insert Multiple Rows Using Multiple `INSERT` Statements

Problem:
Insert the following rows into a table named `products`:

Product_ID	Product_Name	Category	Price
101	Laptop	Electronics	1000
102	Smartphone	Electronics	700
103	Coffee Maker	Appliances	80

Solution:

```
INSERT INTO products (Product_ID, Product_Name, Category, Price)
VALUES (101, 'Laptop', 'Electronics', 1000);

INSERT INTO products (Product_ID, Product_Name, Category, Price)
VALUES (102, 'Smartphone', 'Electronics', 700);

INSERT INTO products (Product_ID, Product_Name, Category, Price)
VALUES (103, 'Coffee Maker', 'Appliances', 80);
```

Practice Example 2: Insert Using Single `INSERT` with Multiple `VALUES`

Problem:
Insert the following data into a table named `departments`:

Department_ID	Department_Name	Location
1	Sales	New York
2	HR	Chicago
3	IT	San Francisco

Solution (for MySQL, PostgreSQL, or SQL Server):

```
INSERT INTO departments (Department_ID, Department_Name, Location)
VALUES
    (1, 'Sales', 'New York'),
    (2, 'HR', 'Chicago'),
    (3, 'IT', 'San Francisco');
```

Practice Example 3: Insert Using `SELECT` from `DUAL` (Oracle)

Problem:
Insert the following rows into a table named `students`:

Student_ID	Name	Enrollment_Date
1001	Alice Johnson	2025-01-05
1002	Bob Smith	2025-01-06
1003	Charlie Brown	2025-01-07

Solution:

```
INSERT INTO students (Student_ID, Name, Enrollment_Date)
SELECT 1001, 'Alice Johnson', TO_DATE('2025-01-05', 'YYYY-MM-DD') FROM dual
UNION ALL
SELECT 1002, 'Bob Smith', TO_DATE('2025-01-06', 'YYYY-MM-DD') FROM dual
UNION ALL
SELECT 1003, 'Charlie Brown', TO_DATE('2025-01-07', 'YYYY-MM-DD') FROM
dual;
```

Practice Example 4: Insert Data Selected from Another Table

Problem:
You have a table `backup_employees` with the following data:

Employee_ID	**Full_Name**	**Hire_Date**	**Salary**
201	Mary Adams	2024-05-10	50000
202	John Carter	2024-06-15	55000

Insert this data into the `employees` table.
Solution:
```
INSERT INTO employees (Employee_ID, Name, Hire_Date, Salary)
SELECT Employee_ID, Full_Name, Hire_Date, Salary
FROM backup_employees;
```

Practice Example 5: Insert into Table with Auto-Increment or Sequence
Problem:
Insert the following rows into a table `orders` with an auto-increment column `Order_ID`:

Customer_Name	**Order_Date**	**Total_Amount**
Alice	2025-01-03	150.75
Bob	2025-01-04	200.00

Solution (MySQL):
```
INSERT INTO orders (Customer_Name, Order_Date, Total_Amount)
VALUES
    ('Alice', '2025-01-03', 150.75),
    ('Bob', '2025-01-04', 200.00);
```

Solution (Oracle with Sequence):
```
INSERT INTO orders (Order_ID, Customer_Name, Order_Date, Total_Amount)
VALUES (order_seq.NEXTVAL, 'Alice', TO_DATE('2025-01-03', 'YYYY-MM-DD'),
150.75);

INSERT INTO orders (Order_ID, Customer_Name, Order_Date, Total_Amount)
VALUES (order_seq.NEXTVAL, 'Bob', TO_DATE('2025-01-04', 'YYYY-MM-DD'),
200.00);
```

Practice Example 6: Insert Using Subquery and Calculations
Problem:
You have a table `sales_data` with columns `Product_ID` and `Quantity_Sold`. Insert data into `sales_summary` where `Total_Revenue` is calculated as `Quantity_Sold * 20` (price per product).
Solution:
```
INSERT INTO sales_summary (Product_ID, Total_Revenue)
SELECT Product_ID, Quantity_Sold * 20
FROM sales_data;
```

TASK

Question 1: Insert Data into a Table
You have a table `books` with the following structure:

Column Name	**Data Type**
Book_ID	NUMBER
Title	VARCHAR2(100)
Author	VARCHAR2(100)
Price	NUMBER

Insert the following rows into the `books` table:

Book_ID	Title	Author	Price
1	The Great Gatsby	F. Scott	300
2	To Kill a Mockingbird	Harper Lee	350

Question 2: Insert Multiple Rows Using `SELECT`

Create a new table `employees_backup` with the same structure as the `employees` table. Insert all data from the `employees` table into `employees_backup` using the `SELECT` statement.

Question 3: Update Existing Data

Given a table `students` with the following columns:

Column Name	Data Type
Student_ID	NUMBER
Name	VARCHAR2(100)
Grade	NUMBER

Update the grade of the student with `Student_ID = 101` to `90`.

Question 4: Delete Specific Rows

In a table `products`, delete all rows where the `Price` is greater than `500`.

Question 5: Retrieve and Insert Data

Given two tables, `employees` and `departments`:

- The `employees` table has columns: `Employee_ID`, `Name`, `Department_ID`.
- The `departments` table has columns: `Department_ID`, `Department_Name`.

Insert data into a new table `employee_departments` (with the same columns as `employees` and `departments`) by combining data from both tables using a `SELECT` statement.