Learning Objectives:

- Understand the structure and use of basic SELECT queries.
- Retrieving and Restricting data using the SQL SELECT statement.
- Apply SQL clauses to filter, sort, group, and manipulate data for efficient analysis.
- Identify the impact of operator precedence and null value handling in SQL queries.

Note: You cannot use any SQL clause other than SELECT, FROM, WHERE, ORDER BY. FROM clause can include one table only. All tasks will be performed on northwind schema.

LO1: Understand the structure and use of basic SELECT queries

Capabilities of SQL SELECT Statements

The **SELECT** statement is one of the most fundamental and frequently used commands in SQL. It is used to retrieve data from one or more tables in a database. With a **SELECT** statement you can use the following capabilities:

- **Projection**: Select the columns in a table that are returned by a query. Select as few or as many of the columns as required.
- **Selection**: Select the rows in a table that are returned by a query. Various criteria can be used to restrict the rows that are retrieved.
- **Joining**: Bring together data that is stored in different tables by specifying the link between them. SQL joins are covered in more detail in the next labs.

Structure of Basic SELECT Statement

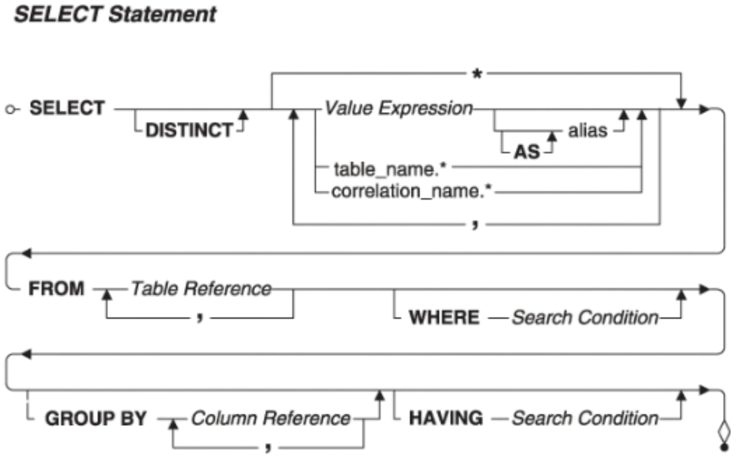


Figure 1:Structure Of Select Statement

In its simplest form, a SELECT statement must include the follow in:

- A **SELECT** clause, which specifies the columns to be - in this case, the Company Name field.
- A **FROM** clause, which identifies the table containing the columns that are listed in the SELECT statement.

Basic Syntax:

```
SELECT column1, column2, ...
FROM table_name;
```

WHERE Clause:

The WHERE clause filters rows based on specified conditions.

```
SELECT column1, column2
FROM table_name
WHERE condition;
```

Throughout this course, the words **keyword, *clause*: and *statement*** are used as follows:

- A **keyword** is a predefined word in SQL that has a specific meaning and function. Keywords are reserved words that are essential to creating valid SQL queries. For example, SELECT and FROM are keywords.
- A **clause** is a specific part of a SQL statement that performs a function. A clause can include one or more keywords, and it typically addresses a specific task, such as selecting data, filtering records, or sorting results. For example, SELECT name, cnic and so on is a clause.
- A **statement** in SQL is a complete SQL command that can perform an action or return a result. A statement is often made up of multiple clauses. A statement could be as simple as retrieving data from a table or as complex as updating or deleting records based on certain conditions.

Note:

- SQL statements are not case-sensitive.
- SQL statements can be entered on one or more lines.
- Keywords cannot be abbreviated or split across lines.
- Clauses are usually placed on separate lines.
- Indents are used to enhance readability.
- SQL statements can optionally be terminated by a semicolon (;). Semicolons are required when you execute multiple SQL statements.

Comparison and Logical Operators:

Comparison operators are used to compare two values in MySQL. They are often used in the WHERE clause of SQL statements. For example =, <>, >, >=, <=, <, IS NULL, IS NOT NULL, BETWEEN, IN, LIKE.

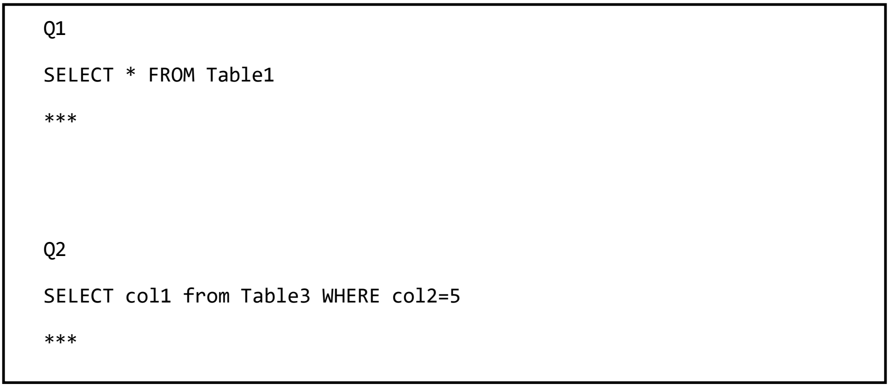
```
SELECT column1, column2
FROM table_name
WHERE column_name [Comparison Operator] value;
```

Logical operators are used to combine multiple conditions in a query. For example AND, OR, NOT.

```
SELECT column1, column2
FROM table_name
WHERE condition1 [Logical operators]condition2;
```

Format of Files Submission:

Write all the answers in a notepad file. Each Query should start with Q1, Q2 depending on Question No. After that you will write your query in one line, after that there should be three * and then there should be two blank lines. All SQL files should be formatted as below all over this semester.



```
Q1

SELECT * FROM Table1

***



Q2

SELECT col1 from Table3 WHERE col2=5

***
```

Figure 2:Format of File Submission

LO2: Retrieving and Restricting data using the SQL SELECT statement.

To understand the concepts of retrieving and restricting data, let’s start with a base table. We will then explore each scenario with examples.

Create Table

```
CREATE TABLE Employees (
    EmployeeId INT PRIMARY KEY,
    FullName VARCHAR(50),
    Department VARCHAR(50),
    Salary INT
);
```

Insert Data

```
INSERT INTO Employees (EmployeeId, FullName, Department, Salary)
VALUES
    (1, 'A', 'IT', 50000),
    (2, 'B', 'HR', 60000),
    (3, 'C', 'IT', 45000);
```

Retrieve All Data

Query:

```
SELECT * FROM Employees;
```

Output:

Employee Id	FullName	Department	Salary
1	A	IT	50000
2	B	HR	60000
3	C	IT	45000

Retrieve Specific Columns

Query:

```
SELECT FullName, Department
FROM Employees;
```

Output:

FullName	Department
A	IT
B	HR
C	IT

Filter Rows Using WHERE

Query:

```
SELECT FullName,Department
```

```
FROM Employees
WHERE Department = 'IT';
```

Output:

FullName	Department
A	IT
C	IT

Practice Task:

1. List the names of products which priced within range 25 to 98 (ProductName).
2. Which employees are fluent in French?(FullName)
3. List employees who have completed a degree in psychology(FirstName, LastName).
4. List the customers who are used to live in London (CustomerName,Country).
5. List all orders where the EmployeeID is assigned (OrderID, EmployeeID, ShipperID).
6. Retrieve suppliers with a SupplierID between 5 and 15 (SupplierName, SupplierID).
7. Retrieve products where the product contains the word "bottles"(ProductName).
8. Retrieve products where the ProductName starts with the letter "C"(ProductName ,Price).
9. List the products which are shipped in boxes. (ProductName)
10. List the cities of Germany from customer table.

Submission Requirements:

Submit the following files:

- P2Task.txt

LO3: Apply SQL clauses to filter, sort, group, and manipulate data for efficient analysis.

DISTINCT Clause

```
SELECT DISTINCT column_name
FROM table_name;
```

Query:

```
SELECT DISTINCT Department
FROM Employees;
```

Output:

Department
IT
HR

Filter Rows with Multiple Conditions

```
SELECT column_name
FROM table_name
ORDER BY column_name ASC;
```

Query:

```
SELECT FullName
FROM Employees
Order By FullName ASC;
```

Output:

FullName
A
B
C

Filter Rows with NULL Values

```
SELECT column_name
FROM table_name
WHERE column_name IS NULL;
```

Concatenate Columns

```
SELECT CONCAT(column1, ' ', column2) AS alias_name
FROM table_name;
```

Practice Tasks:

1. Our customers belong to how many unique countries(CountryList).
2. Find employees whose names contain the letter "A" but not at the start (FirstName, LastName).
3. Retrieve the suppliers sorted by their SupplierName in ascending order (SupplierName).
4. Retrieve shippers sorted alphabetically by name(ShipperName).
5. Retrieve all customers whose address contains 'Str.(CustomerName, Address).
6. Find products where the quantity mentions "kg" or "g"(ProductName, Unit).
7. List the IDs the orders where total quantity ordered exceeds 100 (OrderID).

Submission Requirements:

Submit the following files:

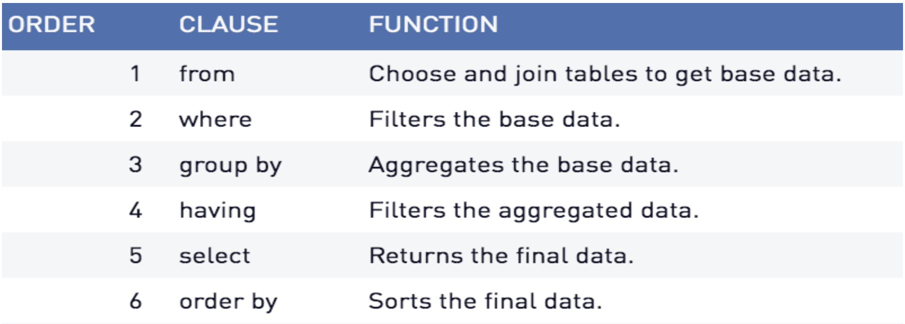
- P3Task.txt

LO4: Identify the impact of operator precedence and null value handling in SQL queries.

Table 1: Operators Precedence

Operator Type	Example	Precedence
Unary operators	NOT, !, -	1
Multiplication, division, modulo	*, /, %, DIV	2
Addition, subtraction	+, -	3
Comparison operators	=, <>, !=, <, <=, >, >=	4
Logical NOT	NOT	5

Logical AND	AND	6
Logical OR	OR	7



ORDER	CLAUSE	FUNCTION
1	from	Choose and join tables to get base data.
2	where	Filters the base data.
3	group by	Aggregates the base data.
4	having	Filters the aggregated data.
5	select	Returns the final data.
6	order by	Sorts the final data.

Practice Tasks:

Figure 3: Execution Order of SQL Statement

1. Identify at least one SQL statement in which precedence can affect the result of query.
2. Identify how the result of a mathematical expression on null value affect the result of a query.

Submission Requirements:

Submit the following files:

- P4Task.docx

HackerRank Tasks:

1. Japanese Cities' Attributes
2. Employee Salaries
3. Select All
4. Japanese Cities' Attributes
5. Employee Names
6. Select By ID
7. Weather Observation Station 1
8. Weather Observation Station 3
9. Weather Observation Station 4
10. Weather Observation Station 5

11. Higher Than 75 Marks
12. Revising the Select Query I

Submission Requirements On Eduko

1. Zip all the files of your tasks zip file name must be your registration number. e.g. 2024-CS-X:
    a. LO2
    b. LO3
    c. LO4