2. Basic SQL Commands

SELECT Statement

Introduction to `SELECT`

The `SELECT` statement is fundamental in SQL, used to query data from one or more tables. It allows you to specify which columns you want to retrieve and can be used to filter and sort the results.

Retrieving data from a database

To retrieve all columns from a table, use `SELECT *`. To select specific columns, list them separated by commas.

```sql
-- Retrieve all columns from the Employees table
SELECT * FROM Employees;

-- Retrieve specific columns from the Employees table
SELECT FirstName, LastName FROM Employees;
```

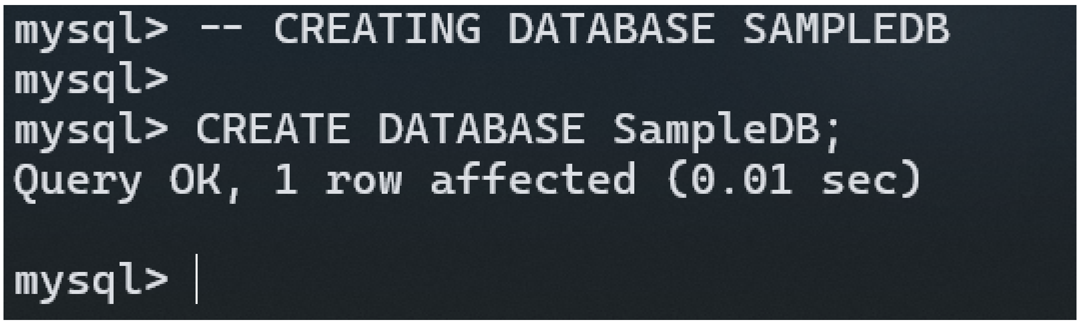
```
Note: To perform all the queries, we need a database and table where the data is
stored. This setup will enable us to practice all the SQL commands effectively.
Below, I will use SQL code to create a database, a table, and populate it with
sample data.

This will provide a practical environment for executing various SQL commands,
allowing you to test and understand how each command works.
```

Create the Database and Table

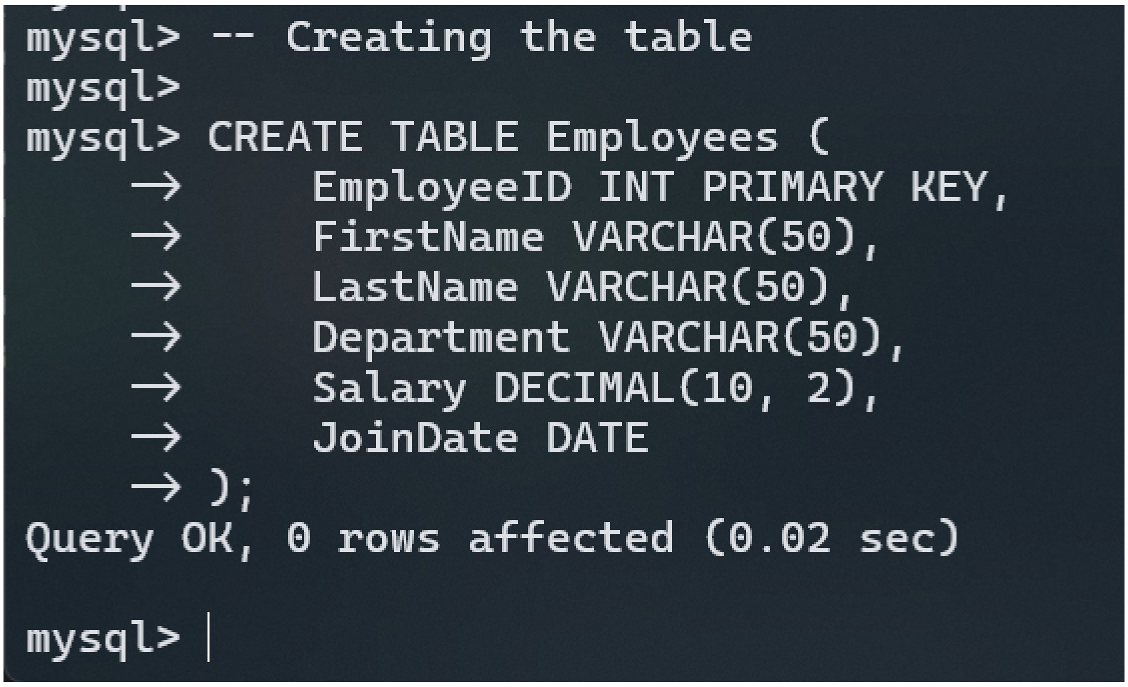
First, create a new database and then a table within it. You can copy and paste this code to set up the environment:

```sql
-- Create the database
CREATE DATABASE SampleDB;

-- Use the database
USE SampleDB;

-- Create the table
CREATE TABLE Employees (
    EmployeeID INT PRIMARY KEY,
    FirstName VARCHAR(50),
    LastName VARCHAR(50),
    Department VARCHAR(50),
    Salary DECIMAL(10, 2),
    JoinDate DATE
);

-- Insert sample data
INSERT INTO Employees (EmployeeID, FirstName, LastName, Department, Salary,
JoinDate)
VALUES
(1, 'John', 'Doe', 'HR', 50000, '2020-01-15'),
(2, 'Jane', 'Smith', 'IT', 60000, '2019-03-10'),
(3, 'Michael', 'Johnson', 'Finance', 75000, '2021-07-22'),
(4, 'Emily', 'Davis', 'IT', 65000, '2022-11-11'),
(5, 'James', 'Brown', 'HR', 45000, '2018-05-30');
```

The outputs shoud look like this after executing the commands :

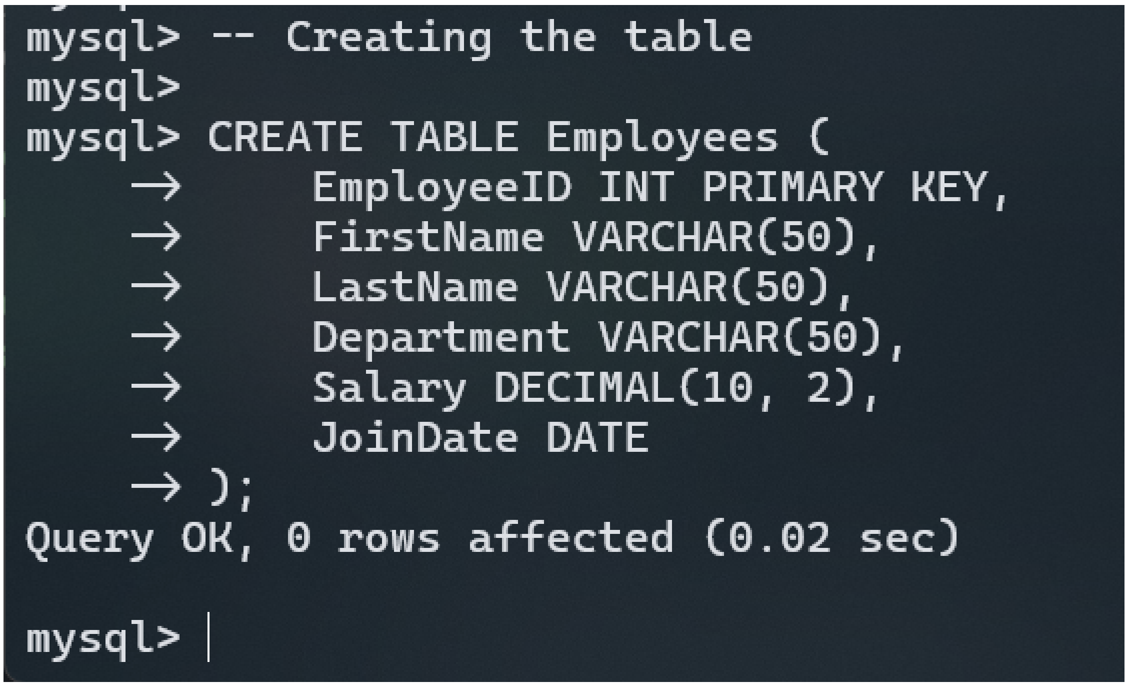


```
mysql> -- CREATING DATABASE SAMPLEDB
mysql>
mysql> CREATE DATABASE SampleDB;
Query OK, 1 row affected (0.01 sec)

mysql> |
```



```
mysql> -- Creating the table
mysql>
mysql> CREATE TABLE Employees (
    ->     EmployeeID INT PRIMARY KEY,
    ->     FirstName VARCHAR(50),
    ->     LastName VARCHAR(50),
    ->     Department VARCHAR(50),
    ->     Salary DECIMAL(10, 2),
    ->     JoinDate DATE
    -> );
Query OK, 0 rows affected (0.02 sec)

mysql> |
```

When writing SQL commands, especially for creating tables, it's often helpful to format your code with line breaks and indentation. This makes the code more readable and easier to debug.



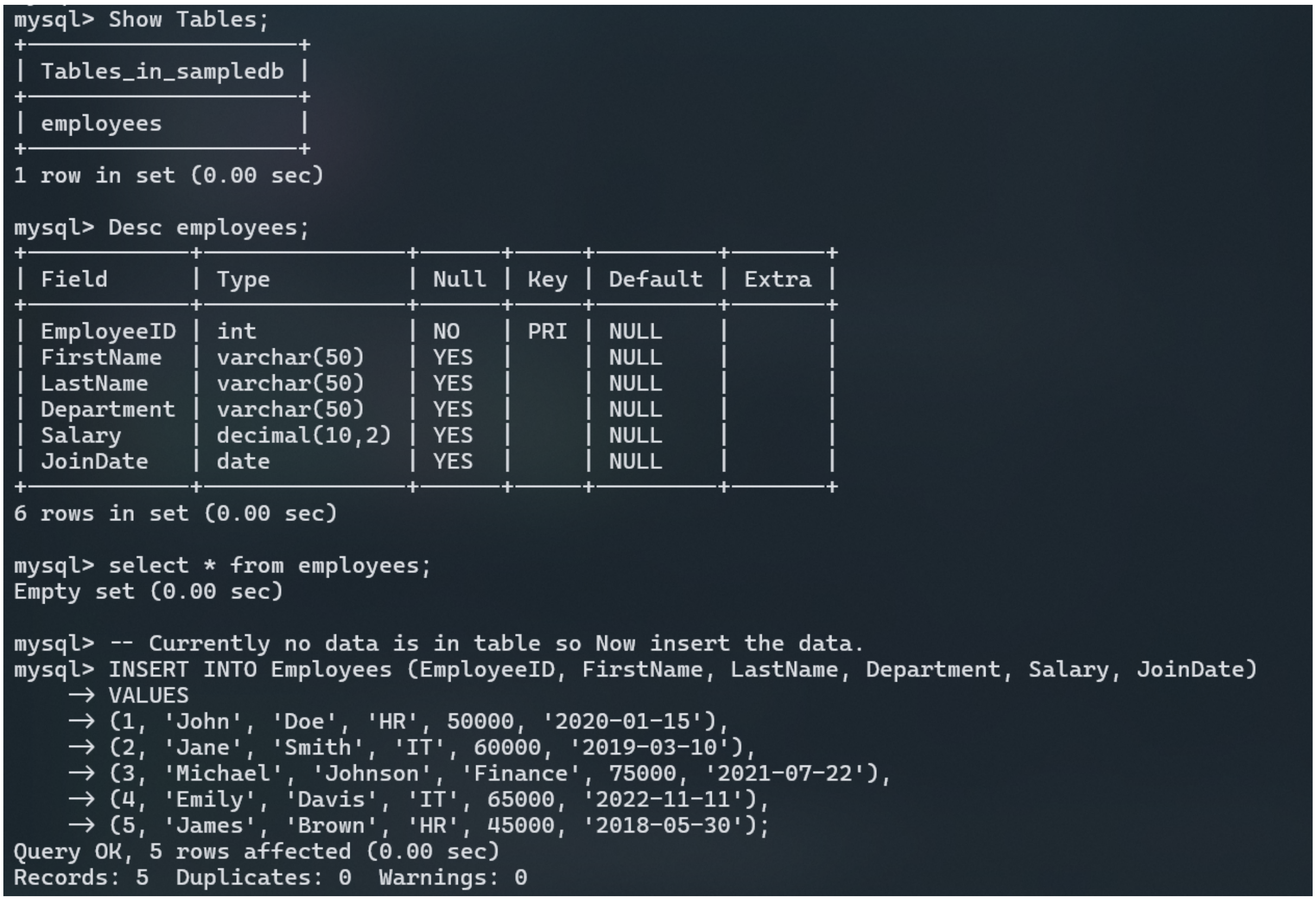
```
mysql> -- Creating the table
mysql>
mysql> CREATE TABLE Employees (
    ->     EmployeeID INT PRIMARY KEY,
    ->     FirstName VARCHAR(50),
    ->     LastName VARCHAR(50),
    ->     Department VARCHAR(50),
    ->     Salary DECIMAL(10, 2),
    ->     JoinDate DATE
    -> );
Query OK, 0 rows affected (0.02 sec)

mysql> |
```

In this formatted version, each column definition is on a new line. This clarity helps in several ways:

Readability: It's easier to see each column and its type, making the structure of the table clear at a glance. Debugging: If there's an error or typo, it's simpler to identify and fix it. Each part of the table definition is separate, so you can quickly locate and address issues.

Maintenance: When you need to modify the table structure later, having a well-organized format makes it easier to make changes and understand the existing structure.

Although you can write the entire command on a single line, it can become challenging to spot errors or understand the command, especially in more complex statements. Therefore, we recommend using a formatted approach for better clarity and ease of use.



```
mysql> Show Tables;
+----------------------+
| Tables_in_sampledb |
+----------------------+
| employees          |
+----------------------+
1 row in set (0.00 sec)

mysql> Desc employees;
+------------+---------------+------+-----+---------+-------+
| Field      | Type          | Null | Key | Default | Extra |
+------------+---------------+------+-----+---------+-------+
| EmployeeID | int           | NO   | PRI | NULL    |       |
| FirstName  | varchar(50)   | YES  |     | NULL    |       |
| LastName   | varchar(50)   | YES  |     | NULL    |       |
| Department | varchar(50)   | YES  |     | NULL    |       |
| Salary     | decimal(10,2) | YES  |     | NULL    |       |
| JoinDate   | date          | YES  |     | NULL    |       |
+------------+---------------+------+-----+---------+-------+
6 rows in set (0.00 sec)

mysql> select * from employees;
Empty set (0.00 sec)

mysql> -- Currently no data is in table so Now insert the data.
mysql> INSERT INTO Employees (EmployeeID, FirstName, LastName, Department, Salary, JoinDate)
    -> VALUES
    -> (1, 'John', 'Doe', 'HR', 50000, '2020-01-15'),
    -> (2, 'Jane', 'Smith', 'IT', 60000, '2019-03-10'),
    -> (3, 'Michael', 'Johnson', 'Finance', 75000, '2021-07-22'),
    -> (4, 'Emily', 'Davis', 'IT', 65000, '2022-11-11'),
    -> (5, 'James', 'Brown', 'HR', 45000, '2018-05-30');
Query OK, 5 rows affected (0.00 sec)
Records: 5  Duplicates: 0  Warnings: 0
```

SELECT DISTINCT

Removing duplicates from result sets

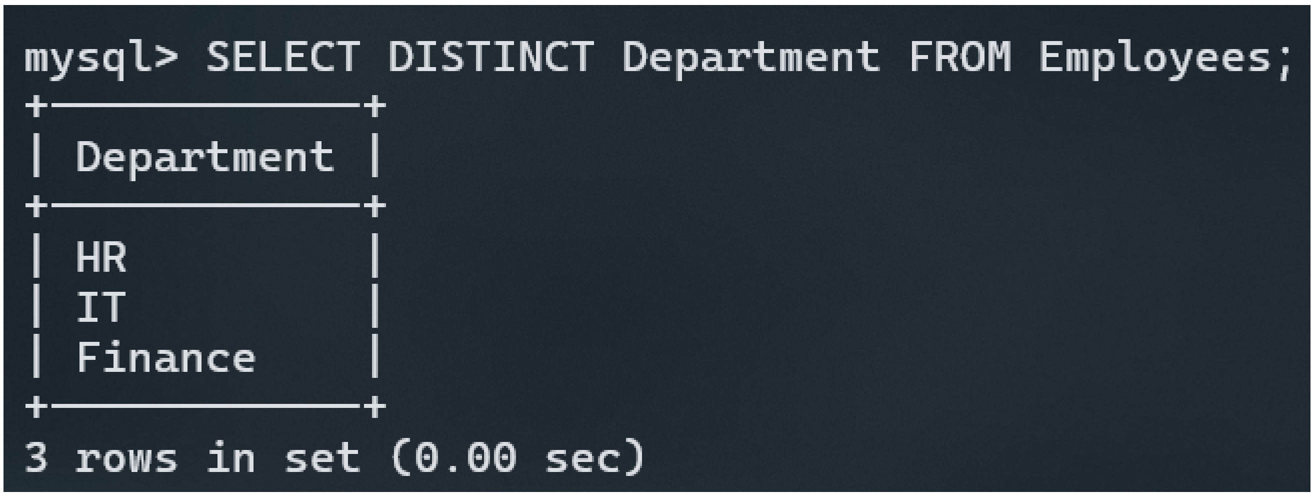
The `SELECT DISTINCT` statement ensures that only unique values are returned, eliminating duplicate rows from the results.

Example:

To get a list of unique departments:

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

Result:



```
mysql> SELECT DISTINCT Department FROM Employees;
+------------+
| Department |
+------------+
| HR         |
| IT         |
| Finance    |
+------------+
3 rows in set (0.00 sec)
```

WHERE Clause

Filtering results using `WHERE`

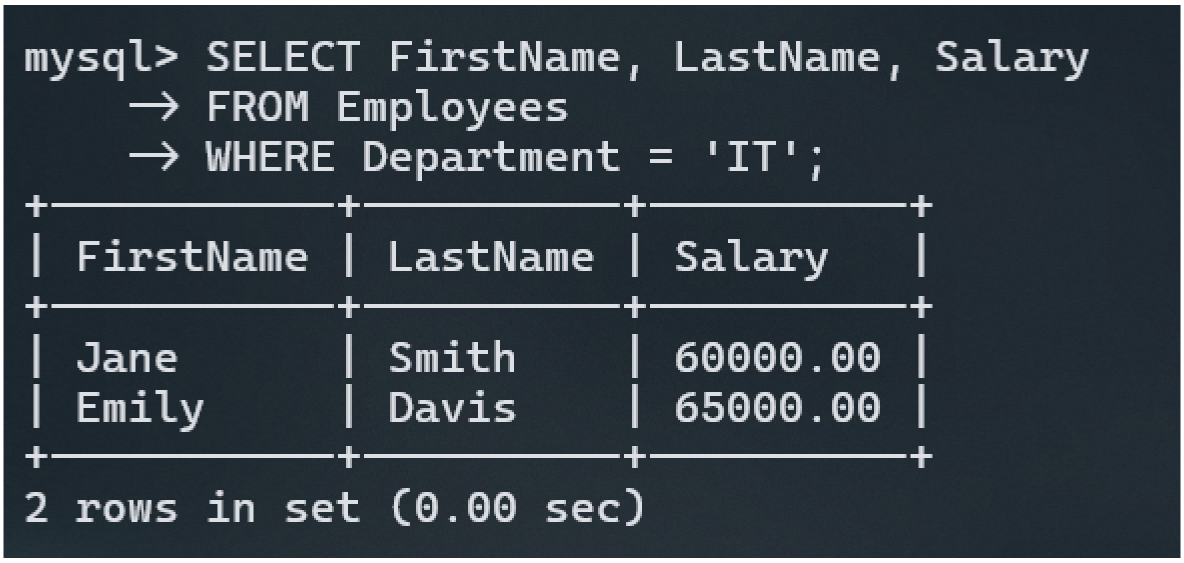
The `WHERE` clause filters records that meet specific criteria. It's used to specify the conditions for selecting rows.

Example:

- To find employees in the 'IT' department:

```
SELECT FirstName, LastName, Salary
FROM Employees
WHERE Department = 'IT';
```

Result:



```
mysql> SELECT FirstName, LastName, Salary
    -> FROM Employees
    -> WHERE Department = 'IT';
+-----------+----------+----------+
| FirstName | LastName | Salary   |
+-----------+----------+----------+
| Jane      | Smith    | 60000.00 |
| Emily     | Davis    | 65000.00 |
+-----------+----------+----------+
2 rows in set (0.00 sec)
```

Operators in `WHERE` Clause

You can use various operators to filter results:

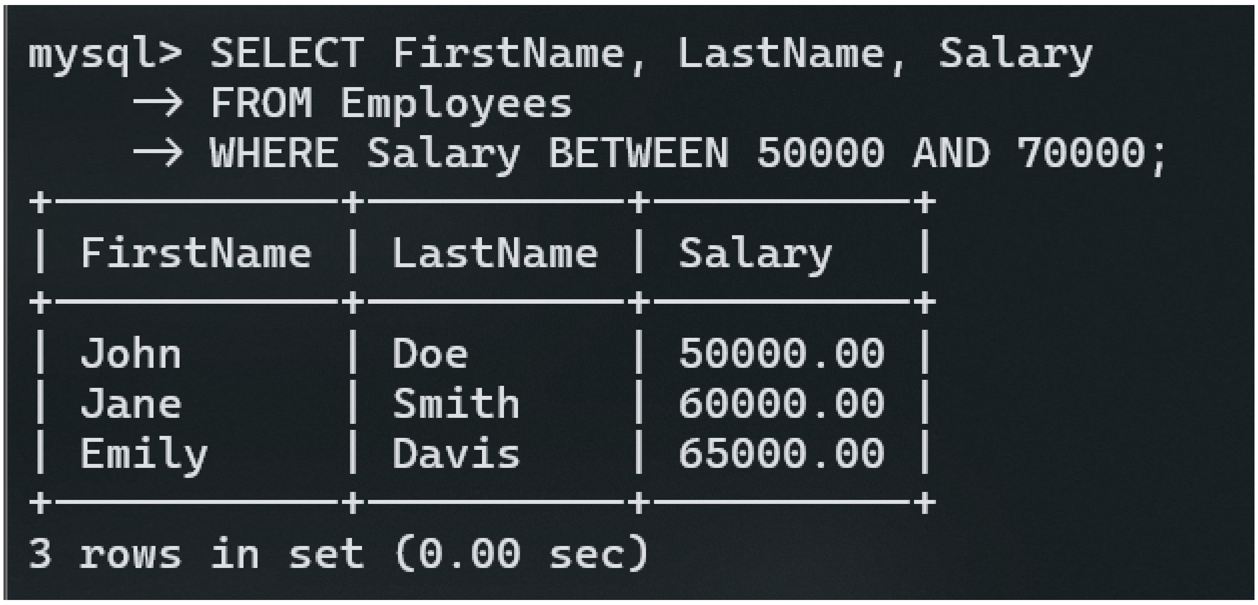
- `=` : Equal
- `>` : Greater than
- `<` : Less than
- `>=` : Greater than or equal
- `<=` : Less than or equal
- `<> or !=` : Not equal (We can choose any of them)
- `BETWEEN` : Between a certain range
- `LIKE` : Search for a pattern
- `IN` : Specify multiple possible values

Example:

- To find employees with a salary between 50000 and 70000:

```
SELECT FirstName, LastName, Salary
FROM Employees
WHERE Salary BETWEEN 50000 AND 70000;
```

Result:

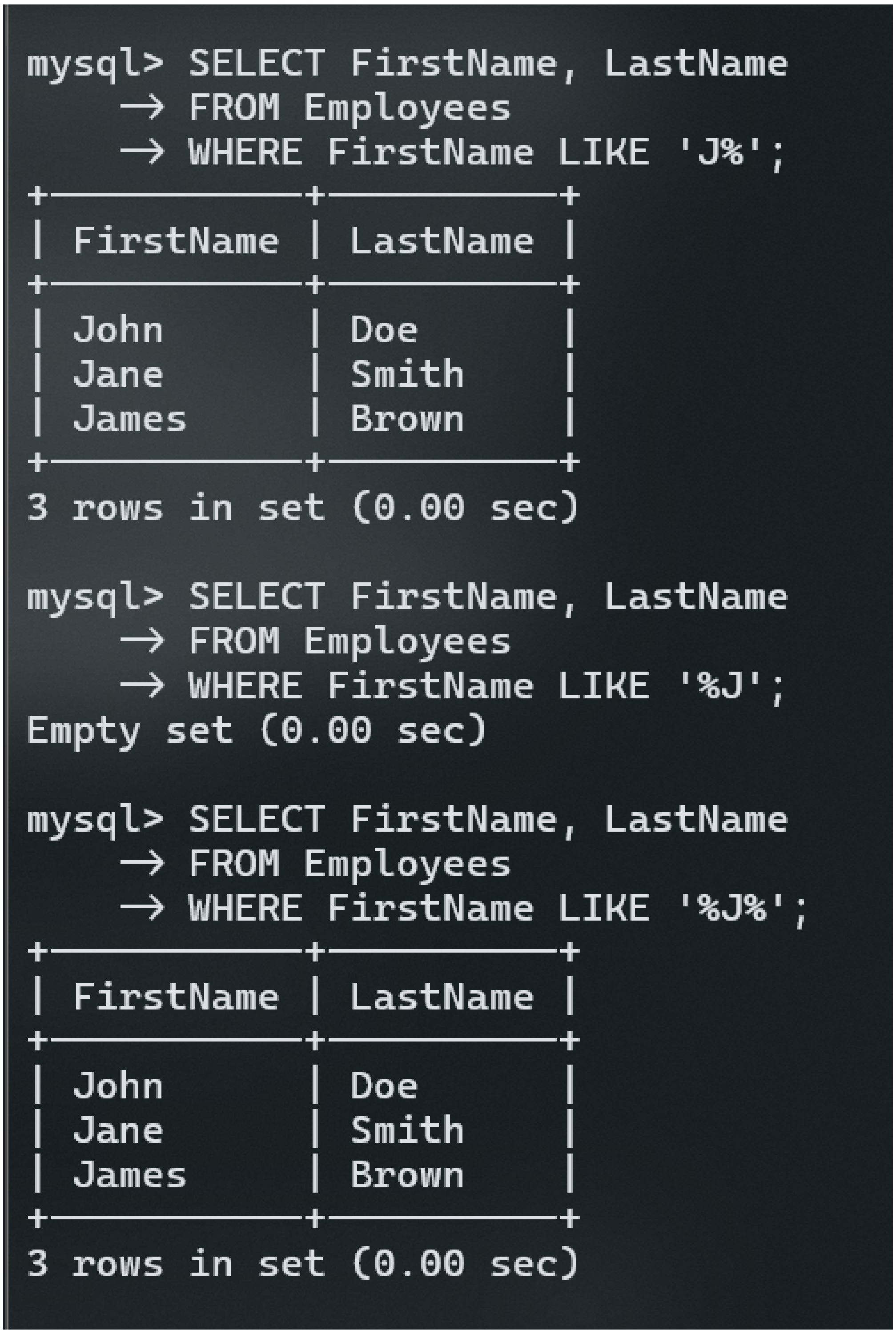


```
mysql> SELECT FirstName, LastName, Salary
    -> FROM Employees
    -> WHERE Salary BETWEEN 50000 AND 70000;
+-----------+----------+----------+
| FirstName | LastName | Salary   |
+-----------+----------+----------+
| John      | Doe      | 50000.00 |
| Jane      | Smith    | 60000.00 |
| Emily     | Davis    | 65000.00 |
+-----------+----------+----------+
3 rows in set (0.00 sec)
```

- To find employees whose names start with 'J':

```
SELECT FirstName, LastName
FROM Employees
WHERE FirstName LIKE 'J%';

-- To find the Names end with 'J' we will write `%j`  and for finding any
specific word or charecter in btw names we will write '%j%' .
```

Result:

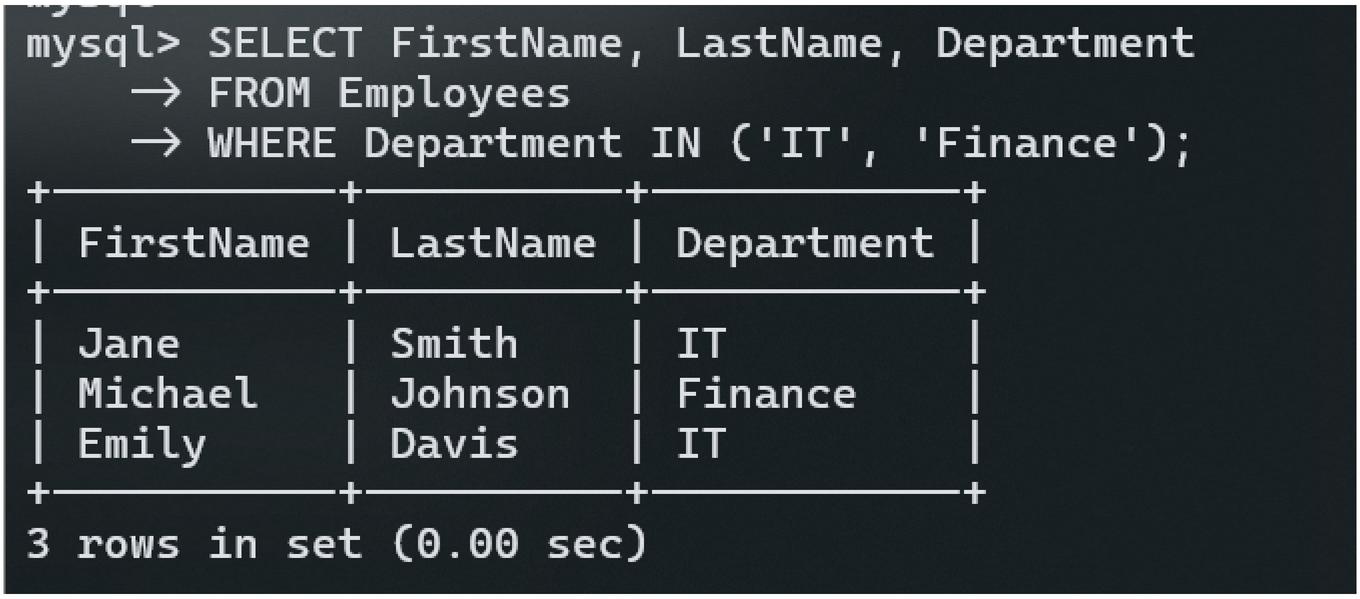


```
mysql> SELECT FirstName, LastName
    -> FROM Employees
    -> WHERE FirstName LIKE 'J%';
+-----------+----------+
| FirstName | LastName |
+-----------+----------+
| John      | Doe      |
| Jane      | Smith    |
| James     | Brown    |
+-----------+----------+
3 rows in set (0.00 sec)

mysql> SELECT FirstName, LastName
    -> FROM Employees
    -> WHERE FirstName LIKE '%J';
Empty set (0.00 sec)

mysql> SELECT FirstName, LastName
    -> FROM Employees
    -> WHERE FirstName LIKE '%J%';
+-----------+----------+
| FirstName | LastName |
+-----------+----------+
| John      | Doe      |
| Jane      | Smith    |
| James     | Brown    |
+-----------+----------+
3 rows in set (0.00 sec)
```

- To find employees in departments 'IT' or 'Finance':

```
SELECT FirstName, LastName, Department
FROM Employees
WHERE Department IN ('IT', 'Finance');
```

Result:



```
mysql> SELECT FirstName, LastName, Department
    -> FROM Employees
    -> WHERE Department IN ('IT', 'Finance');
+-----------+----------+------------+
| FirstName | LastName | Department |
+-----------+----------+------------+
| Jane      | Smith    | IT         |
| Michael   | Johnson  | Finance    |
| Emily     | Davis    | IT         |
+-----------+----------+------------+
3 rows in set (0.00 sec)
```

ORDER BY

Sorting results with `ORDER BY`

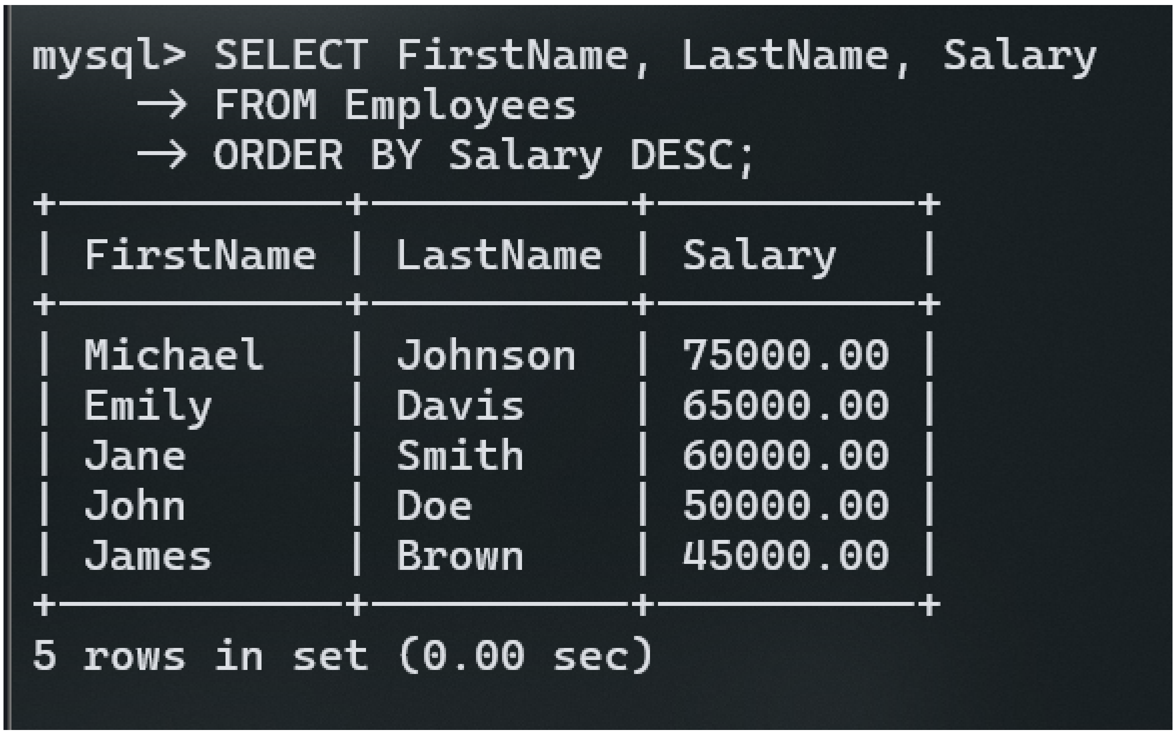
The `ORDER BY` clause sorts the result set based on one or more columns. You can sort in ascending (ASC) or descending (DESC) order.

Example:

- To sort employees by salary in descending order:

```
SELECT FirstName, LastName, Salary
FROM Employees
ORDER BY Salary DESC;
```

Result:



```
mysql> SELECT FirstName, LastName, Salary
    -> FROM Employees
    -> ORDER BY Salary DESC;
+-----------+----------+----------+
| FirstName | LastName | Salary   |
+-----------+----------+----------+
| Michael   | Johnson  | 75000.00 |
| Emily     | Davis    | 65000.00 |
| Jane      | Smith    | 60000.00 |
| John      | Doe      | 50000.00 |
| James     | Brown    | 45000.00 |
+-----------+----------+----------+
5 rows in set (0.00 sec)
```

AND, OR, NOT Operators

Combining multiple conditions with `AND`, `OR`, `NOT`

These logical operators are used in the `WHERE` clause to combine or negate conditions.

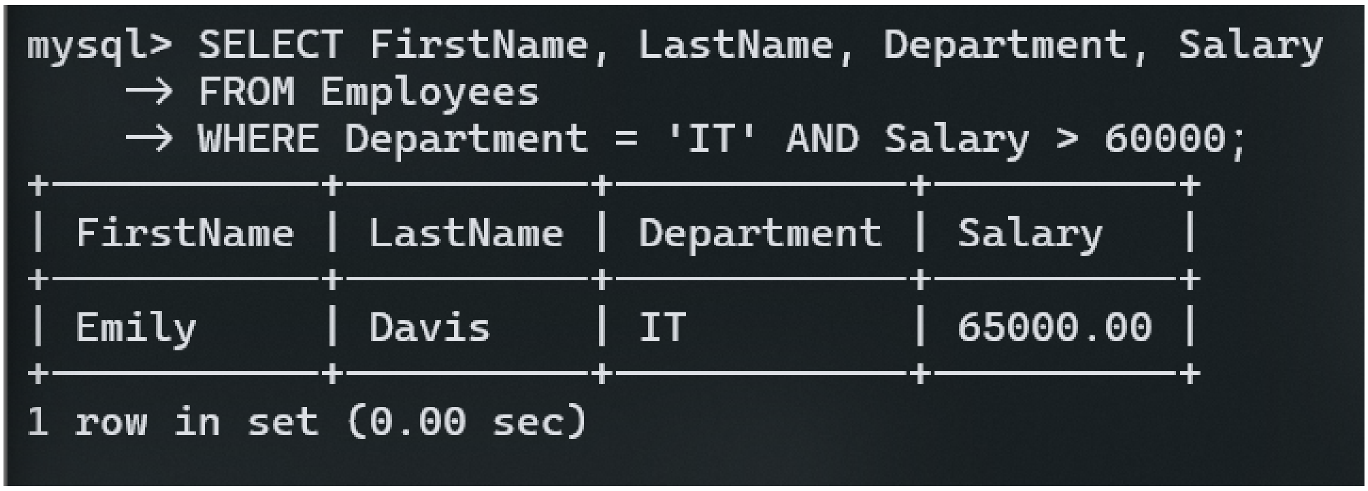
- `AND`: Requires both conditions to be true.
- `OR`: Requires at least one condition to be true.
- `NOT`: Negates a condition.

Example:

- To find employees in the 'IT' department with a salary greater than 60000:

```
SELECT FirstName, LastName, Department, Salary
FROM Employees
WHERE Department = 'IT' AND Salary > 60000;
```

Result:

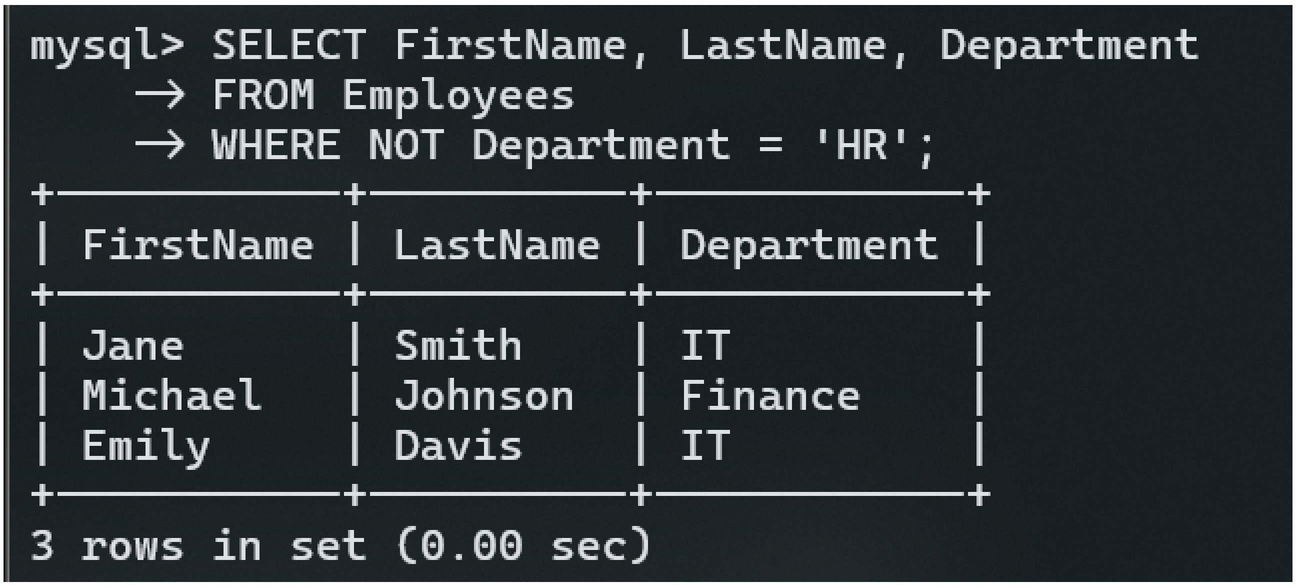


```
mysql> SELECT FirstName, LastName, Department, Salary
    -> FROM Employees
    -> WHERE Department = 'IT' AND Salary > 60000;
+-----------+----------+------------+----------+
| FirstName | LastName | Department | Salary   |
+-----------+----------+------------+----------+
| Emily     | Davis    | IT         | 65000.00 |
+-----------+----------+------------+----------+
1 row in set (0.00 sec)
```

- To find employees who are not in the 'HR' department:

```sql
SELECT FirstName, LastName, Department
FROM Employees
WHERE NOT Department = 'HR';
```

Result:



```
mysql> SELECT FirstName, LastName, Department
    -> FROM Employees
    -> WHERE NOT Department = 'HR';
+-----------+----------+------------+
| FirstName | LastName | Department |
+-----------+----------+------------+
| Jane      | Smith    | IT         |
| Michael   | Johnson  | Finance    |
| Emily     | Davis    | IT         |
+-----------+----------+------------+
3 rows in set (0.00 sec)
```

INSERT INTO

Inserting new data into a table

The `INSERT INTO` statement adds new rows to a table. You need to specify the columns and values for the new row.

Example:

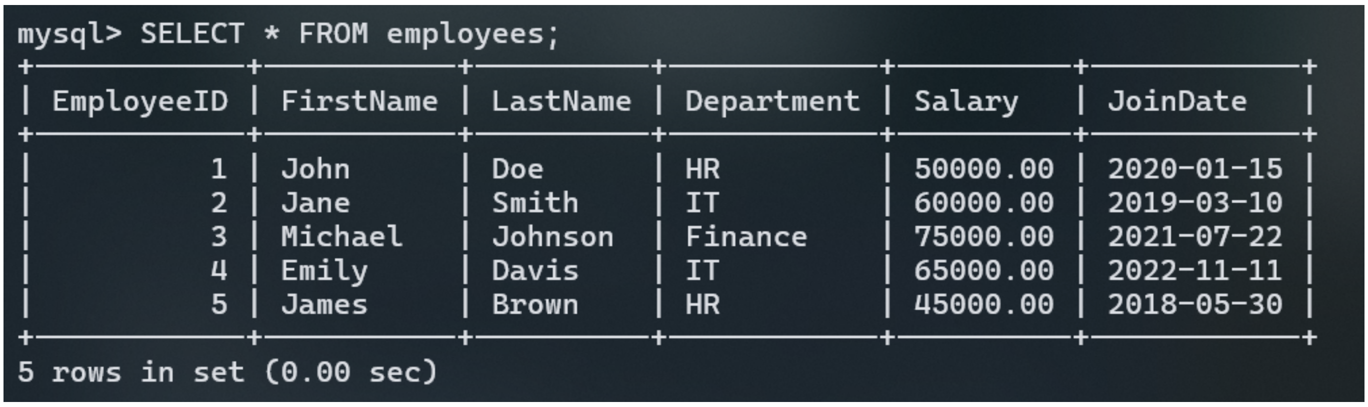
- To add a new employee:

```sql
INSERT INTO Employees (EmployeeID, FirstName, LastName, Department, Salary,
JoinDate)
VALUES (6, 'Robert', 'Wilson', 'Marketing', 55000, '2023-04-18');
```

Updated Table:

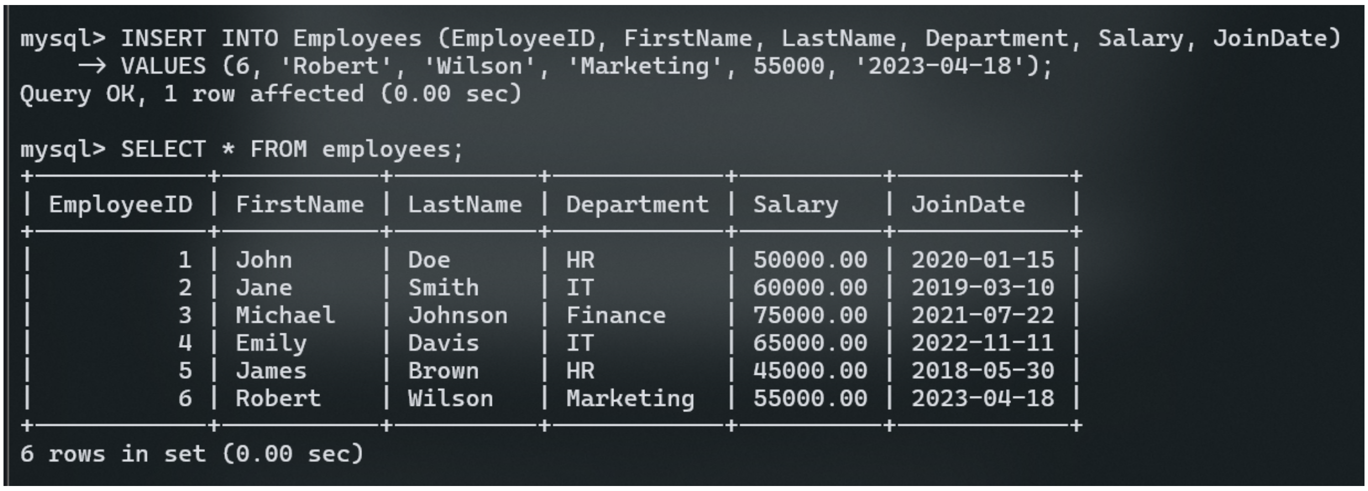
```sql
-- Write this to view full table

SELECT * FROM employees;
```

Before



```
mysql> SELECT * FROM employees;
+------------+-----------+----------+------------+----------+------------+
| EmployeeID | FirstName | LastName | Department | Salary   | JoinDate   |
+------------+-----------+----------+------------+----------+------------+
|          1 | John      | Doe      | HR         | 50000.00 | 2020-01-15 |
|          2 | Jane      | Smith    | IT         | 60000.00 | 2019-03-10 |
|          3 | Michael   | Johnson  | Finance    | 75000.00 | 2021-07-22 |
|          4 | Emily     | Davis    | IT         | 65000.00 | 2022-11-11 |
|          5 | James     | Brown    | HR         | 45000.00 | 2018-05-30 |
+------------+-----------+----------+------------+----------+------------+
5 rows in set (0.00 sec)
```

After



```
mysql> INSERT INTO Employees (EmployeeID, FirstName, LastName, Department, Salary, JoinDate)
    -> VALUES (6, 'Robert', 'Wilson', 'Marketing', 55000, '2023-04-18');
Query OK, 1 row affected (0.00 sec)

mysql> SELECT * FROM employees;
+------------+-----------+----------+------------+----------+------------+
| EmployeeID | FirstName | LastName | Department | Salary   | JoinDate   |
+------------+-----------+----------+------------+----------+------------+
|          1 | John      | Doe      | HR         | 50000.00 | 2020-01-15 |
|          2 | Jane      | Smith    | IT         | 60000.00 | 2019-03-10 |
|          3 | Michael   | Johnson  | Finance    | 75000.00 | 2021-07-22 |
|          4 | Emily     | Davis    | IT         | 65000.00 | 2022-11-11 |
|          5 | James     | Brown    | HR         | 45000.00 | 2018-05-30 |
|          6 | Robert    | Wilson   | Marketing  | 55000.00 | 2023-04-18 |
+------------+-----------+----------+------------+----------+------------+
6 rows in set (0.00 sec)
```

Note: A new record with EmployeeID 6 has been added.

NULL Values

Understanding and handling `NULL` values

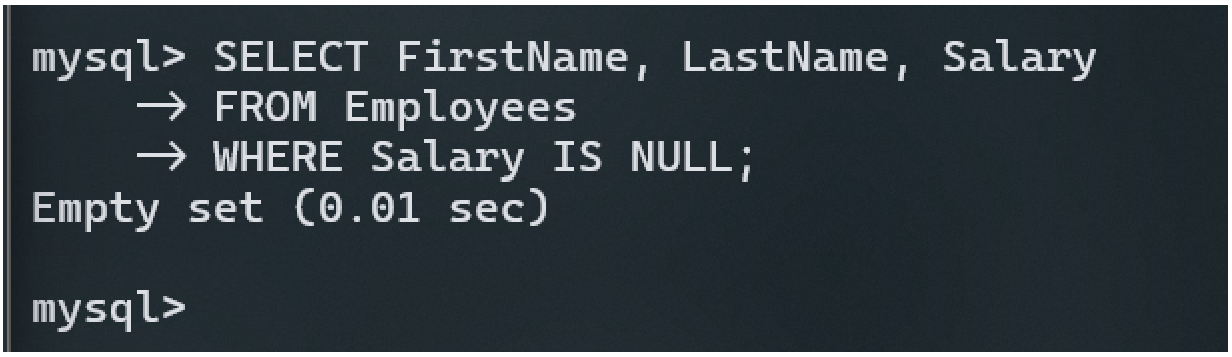
`NULL` indicates the absence of a value. It's not the same as an empty string or zero. Use `IS NULL` or `IS NOT NULL` to check for `NULL` values.

Example:

To find employees with a `NULL` salary (none exist in our example):

```
SELECT FirstName, LastName, Salary
FROM Employees
WHERE Salary IS NULL;
```

Result:



```
mysql> SELECT FirstName, LastName, Salary
    -> FROM Employees
    -> WHERE Salary IS NULL;
Empty set (0.01 sec)

mysql>
```

UPDATE Statement

Modifying existing data in a table

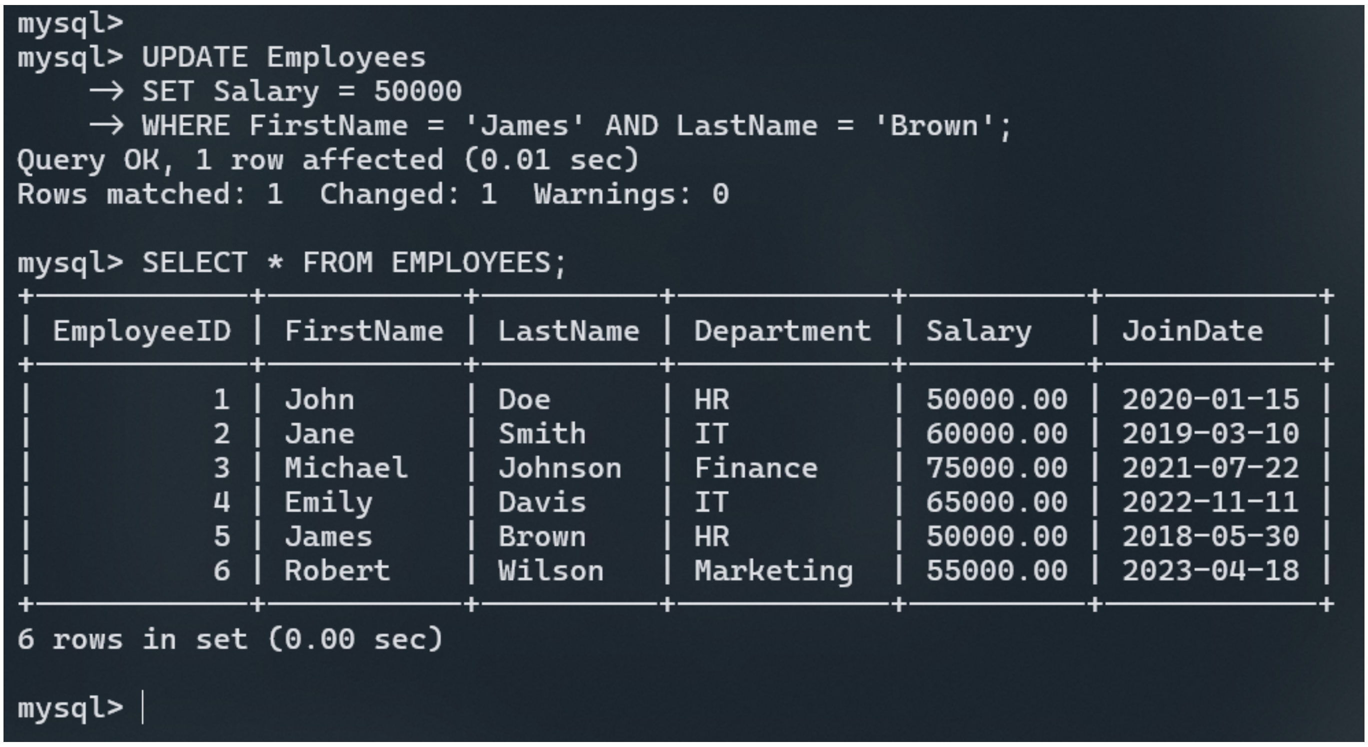
The `UPDATE` statement is used to change existing records. You must specify which rows to update and what new values to set.

Example:

To update the salary of 'James Brown':

```
UPDATE Employees
SET Salary = 50000
WHERE FirstName = 'James' AND LastName = 'Brown';
```

Updated Table:



```
mysql>
mysql> UPDATE Employees
    -> SET Salary = 50000
    -> WHERE FirstName = 'James' AND LastName = 'Brown';
Query OK, 1 row affected (0.01 sec)
Rows matched: 1  Changed: 1  Warnings: 0

mysql> SELECT * FROM EMPLOYEES;
+------------+-----------+----------+------------+----------+------------+
| EmployeeID | FirstName | LastName | Department | Salary   | JoinDate   |
+------------+-----------+----------+------------+----------+------------+
|          1 | John      | Doe      | HR         | 50000.00 | 2020-01-15 |
|          2 | Jane      | Smith    | IT         | 60000.00 | 2019-03-10 |
|          3 | Michael   | Johnson  | Finance    | 75000.00 | 2021-07-22 |
|          4 | Emily     | Davis    | IT         | 65000.00 | 2022-11-11 |
|          5 | James     | Brown    | HR         | 50000.00 | 2018-05-30 |
|          6 | Robert    | Wilson   | Marketing  | 55000.00 | 2023-04-18 |
+------------+-----------+----------+------------+----------+------------+
6 rows in set (0.00 sec)

mysql> |
```

DELETE Statement

Removing data from a table

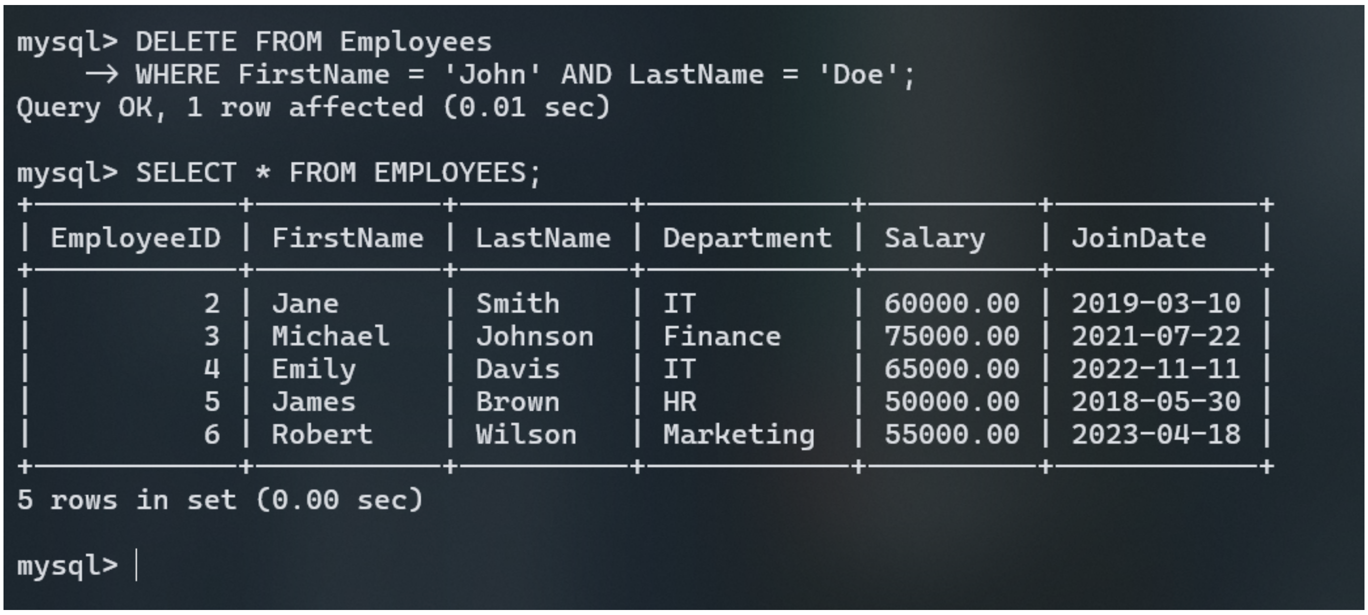
The `DELETE` statement is used to remove rows from a table. Be careful with `DELETE` as it permanently removes data.

Example:

To delete the record of 'John Doe':

```sql
DELETE FROM Employees
WHERE FirstName = 'John' AND LastName = 'Doe';
```

Updated Table:



```
mysql> DELETE FROM Employees
    -> WHERE FirstName = 'John' AND LastName = 'Doe';
Query OK, 1 row affected (0.01 sec)

mysql> SELECT * FROM EMPLOYEES;
+------------+-----------+----------+------------+----------+------------+
| EmployeeID | FirstName | LastName | Department | Salary   | JoinDate   |
+------------+-----------+----------+------------+----------+------------+
|          2 | Jane      | Smith    | IT         | 60000.00 | 2019-03-10 |
|          3 | Michael   | Johnson  | Finance    | 75000.00 | 2021-07-22 |
|          4 | Emily     | Davis    | IT         | 65000.00 | 2022-11-11 |
|          5 | James     | Brown    | HR         | 50000.00 | 2018-05-30 |
|          6 | Robert    | Wilson   | Marketing  | 55000.00 | 2023-04-18 |
+------------+-----------+----------+------------+----------+------------+
5 rows in set (0.00 sec)

mysql> 
```

SELECT TOP

Limiting the number of records

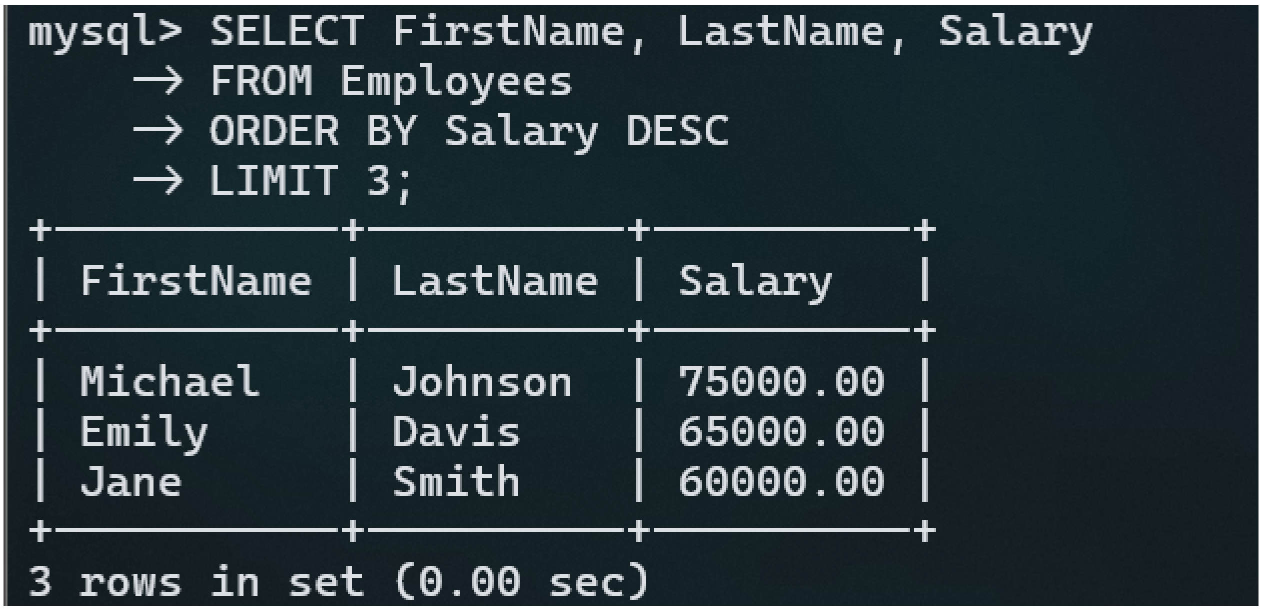
The `SELECT TOP` clause limits the number of rows returned in the result set. This is particularly useful for pagination or when you need a subset of data.

Example:

To get the top 3 highest salaries:

```
SELECT FirstName, LastName, Salary
FROM Employees
ORDER BY Salary DESC
LIMIT 3;
```

Result:



```
mysql> SELECT FirstName, LastName, Salary
    -> FROM Employees
    -> ORDER BY Salary DESC
    -> LIMIT 3;
+-----------+----------+----------+
| FirstName | LastName | Salary   |
+-----------+----------+----------+
| Michael   | Johnson  | 75000.00 |
| Emily     | Davis    | 65000.00 |
| Jane      | Smith    | 60000.00 |
+-----------+----------+----------+
3 rows in set (0.00 sec)
```

Well will Cover new topics in next Doc