

Database fundamentals Part 2

MEC Academy



Agenda

- What is SQL?
- What Can SQL do?
- SQL Syntax.
- DDL Commands
- DML Commands

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.

Is SQL Standard ?

- SQL is a Standard - BUT....
- Although SQL is an ANSI/ISO standard, there are different versions of the SQL language.
- However, to be compliant with the ANSI standard, they all support at least the major commands (such as SELECT, UPDATE, DELETE, INSERT, WHERE) in a similar manner.

Using SQL in Your Web Site

- To build a web site that shows data from a database, you will need:
- An RDBMS database program (i.e., MS Access, SQL Server, MySQL):
 - To use a server-side scripting language, like PHP or ASP.
 - To use SQL to get the data you want.
 - To use HTML / CSS to style the page.
- What is RDBMS?
 - RDBMS stands for Relational Database Management System.
 - RDBMS is the basis for SQL, and for all modern database systems such as MS SQL Server, IBM DB2, Oracle, MySQL, and Microsoft Access.
 - The data in RDBMS is stored in database objects called tables.
 - A table is a collection of related data entries, and it consists of columns and rows.

SQL Syntax

Database Tables

- A database most often contains one or more tables.
- Each table is identified by a name (e.g., "Customers" or "Orders").
- Tables contain records (rows) with data.

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
1	Alfreds Futterkiste	Maria Anders	Obere Str. 57	Berlin	12209	Germany
2	Ana Trujillo Emparedados y helados	Ana Trujillo	Avda. de la Constitución 2222	México D.F.	05021	Mexico
3	Antonio Moreno Taquería	Antonio Moreno	Mataderos 2312	México D.F.	05023	Mexico
4	Around the Horn	Thomas Hardy	120 Hanover Sq.	London	WA1 1DP	UK
5	Berglunds snabbköp	Christina Berglund	Berguvsvägen 8	Luleå	S-958 22	Sweden

- The table above contains **five records** (one for each customer) and **seven columns** (CustomerID, CustomerName, ContactName, Address, City, PostalCode, and Country).

SQL Statements

- Most of the actions you need to perform on a database are done with SQL statements.
- The following SQL statement selects all the records in the "Customers" table:
- `SELECT * FROM Customers;`
- Now ; we will teach you all about the different **SQL statements**.
- Keep in Mind That...
 - SQL keywords are **NOT** case sensitive: select is the same as SELECT
- **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.**

The Most Important SQL Commands

- **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
- **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

SQL Create Database Statement

- To create a new database in SQL, you typically use the **CREATE DATABASE** statement.

Here's the basic syntax:

```
CREATE DATABASE database_name;
```

- Where **database_name** is the name you want to give to your new database.
- Example:-

```
CREATE DATABASE my_database;
```

SQL Drop Database Statement

- To drop a new database in SQL, you typically use the **DROP DATABASE** statement.

Here's the basic syntax:

```
DROP DATABASE database_name;
```

- Where **database_name** is the name of the database you want to delete.

- Example:-

```
DROP DATABASE my_database;
```

SQL Create Table Command

- The **CREATE TABLE** command in SQL is used to create a new table in a relational database.

Here's the basic syntax:

```
CREATE TABLE table_name (  
    column1 datatype [constraints],  
    column2 datatype [constraints],  
    ...  
    columnN datatype [constraints]  
);
```

- **table_name** is the name of the table you want to create.
- **column1, column2, ..., columnN** are the names of the columns in the table.
- **datatype** specifies the data type for each column.
- **[constraints]** are optional constraints that can be applied to each column, such as NOT NULL, UNIQUE, PRIMARY KEY, FOREIGN KEY, etc.

SQL Create Table Command Example

```
1 CREATE TABLE users (  
2   id INTEGER PRIMARY KEY NOT NULL AUTO_INCREMENT,  
3   email VARCHAR(255) NOT NULL,  
4   `password` VARCHAR(255) NOT NULL,  
5   phone_number VARCHAR(15),  
6   created TIMESTAMP NOT NULL DEFAULT NOW()  
7 );  
8
```

SQL Drop Table Command

- The **DROP TABLE** statement in SQL is used to delete an existing table and all its data from the database. Here's the basic syntax:

```
DROP TABLE table_name;
```

- Where **table_name** is the name of the table you want to delete.
- It's important to exercise caution when using DROP TABLE because **it permanently deletes** the table and all its data, and this action cannot be undone.

- Example:-

```
DROP TABLE employees;
```

SQL **Alter Table** Command

- The **ALTER TABLE** statement in SQL is used to modify an existing table structure. It can be used to add, modify, or drop columns, as well as add or drop constraints.
- Here's the basic syntax:

```
ALTER TABLE table_name  
    action;
```

- Where **table_name** is the name of the table you want to modify, and action specifies the alteration you want to perform. Some common actions include:

SQL **Alter Table** Command

Some common actions include:

1. Adding a column:

```
sql

ALTER TABLE table_name
ADD column_name datatype [constraints];
```

2. Dropping a column:

```
sql

ALTER TABLE table_name
DROP COLUMN column_name;
```

3. Modifying a column (for example, changing its data type):

```
sql

ALTER TABLE table_name
ALTER COLUMN column_name new_datatype;
```

4. Adding a constraint:

```
sql

ALTER TABLE table_name
ADD CONSTRAINT constraint_name constraint_definition;
```

5. Dropping a constraint:

```
sql

ALTER TABLE table_name
DROP CONSTRAINT constraint_name;
```


SQL **Alter Table** Command Example

- Adding a new column `age` of type `INT` to the table `employees`:

```
sql

ALTER TABLE employees
ADD age INT;
```

- Dropping the column `age` from the table `employees`:

```
sql

ALTER TABLE employees
DROP COLUMN age;
```

- Modifying the data type of the column `email` from `VARCHAR(100)` to `VARCHAR(255)` in the table `employees`:

```
sql

ALTER TABLE employees
ALTER COLUMN email VARCHAR(255);
```

- Adding a new constraint named `fk_department_id` as a foreign key constraint in the table `employees`, referencing the `department_id` column in the `departments` table:

```
sql

ALTER TABLE employees
ADD CONSTRAINT fk_department_id
FOREIGN KEY (department_id)
REFERENCES departments (department_id);
```

- Dropping the constraint named `fk_department_id` from the table `employees`:

```
sql

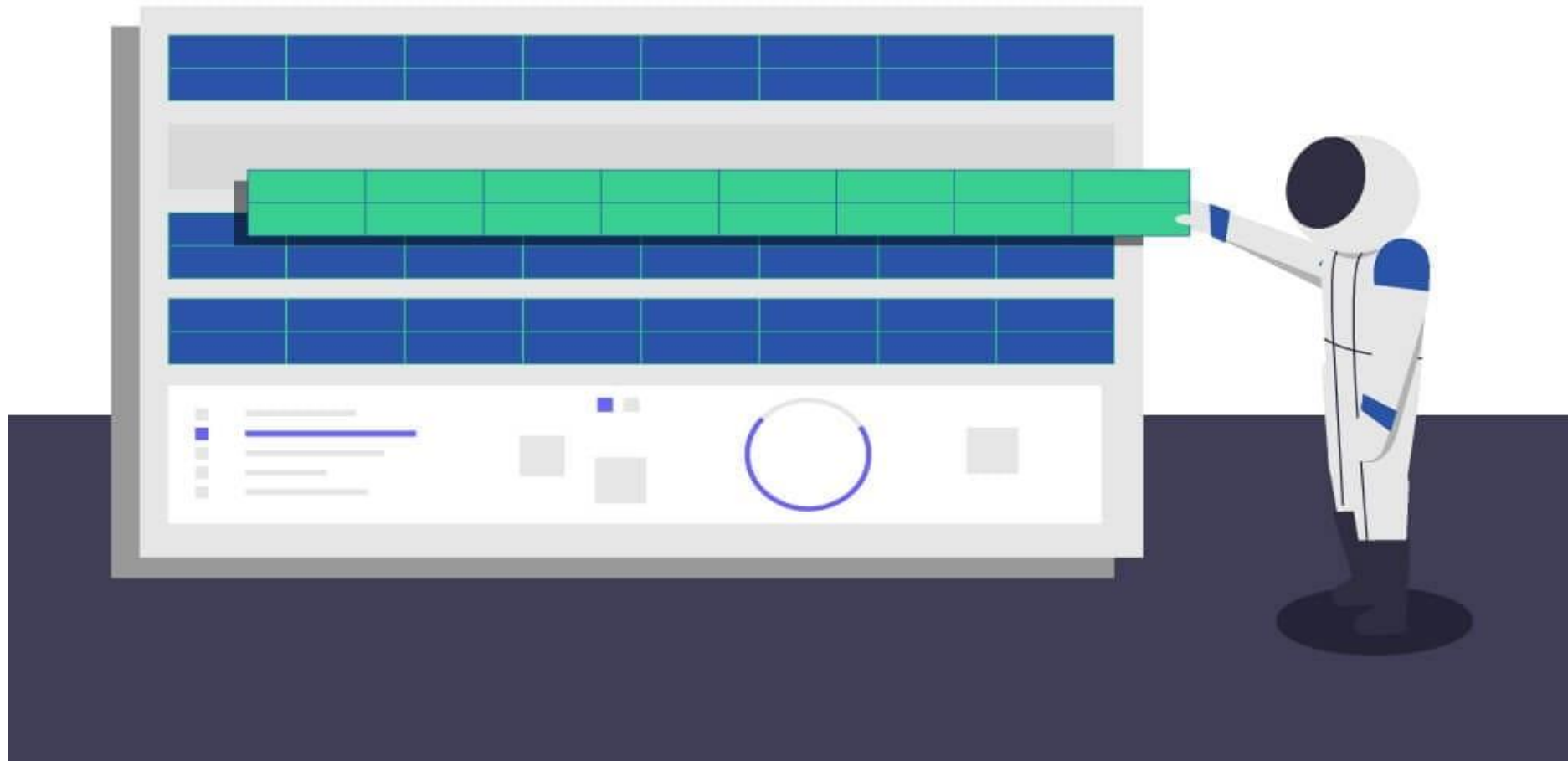
ALTER TABLE employees
DROP CONSTRAINT fk_department_id;
```

SQL Rename Table Command

- To rename a table in SQL, you typically use the **ALTER TABLE** statement with the **RENAME TO** clause.
- Here's the basic syntax:

```
ALTER TABLE old_table_name  
RENAME TO new_table_name;
```

INSERT INTO Statement



SQL INSERT INTO Statement

- The INSERT INTO statement is used to **insert new records** in a table.
- INSERT INTO **Syntax**:
- It is possible to write the INSERT INTO statement **in two ways**:

1. Specify **both** the **column names** and the **values** to be inserted:

```
INSERT INTO table_name (column1, column2, column3, ...)
VALUES (value1, value2, value3, ...);
```


2. If you are **adding values for all the columns of the table**, you do not need to specify the column names in the SQL query. However, **make sure the order of the values is in the same order as the columns in the table**. Here, the INSERT INTO syntax would be as follows:

```
INSERT INTO table_name
VALUES (value1, value2, value3, ...);
```

SQL INSERT INTO Statement example

- Below is a selection from the "Customers" table in the Northwind sample database:

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
89	White Clover Markets	Karl Jablonski	305 - 14th Ave. S. Suite 3B	Seattle	98128	USA
90	Wilman Kala	Matti Karttunen	Keskuskatu 45	Helsinki	21240	Finland
91	Wolski	Zbyszek	ul. Filtrowa 68	Walla	01-012	Poland
92	Cardinal	Tom B. Erichsen	Skagen 21	Stavanger	4006	Norway

- 
- The following SQL statement inserts a new record in the "Customers" table:


```
INSERT INTO Customers (CustomerName, ContactName, Address, City, PostalCode, Country)  
VALUES ('Cardinal', 'Tom B. Erichsen', 'Skagen 21', 'Stavanger', '4006', 'Norway');
```

Insert Data Only in Specified Columns

- It is also possible to **only insert data in specific columns**.
- The following SQL statement will insert a new record, but only insert data in the "CustomerName", "City", and "Country" columns (CustomerID will be updated automatically):

```
INSERT INTO Customers (CustomerName, City, Country)
VALUES ('Cardinal', 'Stavanger', 'Norway');
```

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
89	White Clover Markets	Karl Jablonski	305 - 14th Ave. S. Suite 3B	Seattle	98128	USA
90	Wilman Kala	Matti Karttunen	Keskuskatu 45	Helsinki	21240	Finland
91	Wolski	Zbyszek	ul. Filtrowa 68	Walla	01-012	Poland
92	Cardinal	null	null	Stavanger	null	Norway



SQL NULL Values

- What is a NULL Value?
 - A field with a NULL value is a field with **no value**.
 - If a field in a table is optional, it is possible to insert a new record or update a record without adding a value to this field. Then, the field will be saved with a NULL value.
- Note:
 - A NULL value is **different from a zero value** or a field that contains spaces.
 - A field with a NULL value is one that has been left blank during record creation!
- How to Test for NULL Values?
 - It is not possible to test for NULL values with comparison operators, such as =, <, or <>.
 - We will have to use the **IS NULL** and **IS NOT NULL** operators instead.

SQL NULL Values...

- IS NULL Syntax

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

- IS NOT NULL Syntax

```
SELECT column_names  
FROM table_name  
WHERE column_name IS NOT NULL;
```


Tablename	Records
<u>Customers</u>	91
<u>Categories</u>	8
<u>Employees</u>	10
<u>OrderDetails</u>	518
<u>Orders</u>	196
<u>Products</u>	77
<u>Shippers</u>	3
<u>Suppliers</u>	29

SQL NULL operators ... examples

- The IS NULL Operator

- The IS NULL operator is used to test for empty values (NULL values).
- The following SQL lists all customers with a NULL value in the "Address" field:

```
SELECT CustomerName, ContactName, Address  
FROM Customers  
WHERE Address IS NULL;
```

Result:

No result.

Tablename	Records
<u>Customers</u>	91
<u>Categories</u>	8
<u>Employees</u>	10
<u>OrderDetails</u>	518
<u>Orders</u>	196
<u>Products</u>	77
<u>Shippers</u>	3
<u>Suppliers</u>	29

SQL NULL operators ... examples

- The IS NOT NULL Operator
- The IS NOT NULL operator is used to test for non-empty values (NOT NULL values).
- The following SQL lists all customers with a value in the "Address" field:

```
SELECT CustomerName, ContactName, Address  
FROM Customers  
WHERE Address IS NOT NULL;
```

Result:

Number of Records: 91

CustomerName	ContactName	Address
Alfreds Futterkiste	Maria Anders	Obere Str. 57
Ana Trujillo Emparedados y helados	Ana Trujillo	Avda. de la Constitución 2222
Antonio Moreno Taquería	Antonio Moreno	Mataderos 2312

SQL **UPDATE** Statement



SQL UPDATE Statement

- The UPDATE statement is used to **modify the existing records** in a table.
- UPDATE **Syntax:**

```
UPDATE table_name  
SET column1 = value1, column2 = value2, ...  
WHERE condition;
```

Note :

- The **WHERE** clause specifies which record(s) that should be updated. If you omit the WHERE clause, all records in the table will be updated!

SQL UPDATE Statement example

- The following SQL statement updates the first customer (CustomerID = 1) with a new contact person and a new city.

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
1	Alfreds Futterkiste	Alfred Schmidt	Obere Str. 57	Frankfurt	12209	Germany
2	Ana Trujillo Emparedados y helados	Ana Trujillo	Avda. de la Constitución 2222	México D.F.	05021	Mexico
3	Antonio Moreno Taquería	Antonio Moreno	Mataderos 2312	México D.F.	05023	Mexico
4	Around the Horn	Thomas Hardy	120 Hanover Sq.	London	WA1 1DP	UK

```
UPDATE Customers
SET ContactName = 'Alfred Schmidt', City= 'Frankfurt'
WHERE CustomerID = 1;
```

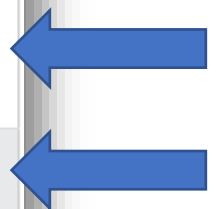
UPDATE Multiple Records

Be careful when updating records. If you omit the WHERE clause, ALL records will be updated!

- It is the **WHERE** clause that determines how many records will be updated.
- The following SQL statement will update the ContactName to "Juan" for all records where country is "Mexico":

```
UPDATE Customers  
SET ContactName='Juan'  
WHERE Country='Mexico';
```

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
1	Alfreds Futterkiste	Alfred Schmidt	Obere Str. 57	Frankfurt	12209	Germany
2	Ana Trujillo Emparedados y helados	Juan	Avda. de la Constitución 2222	México D.F.	05021	Mexico
3	Antonio Moreno Taquería	Juan	Mataderos 2312	México D.F.	05023	Mexico



SQL DELETE Statement

- The DELETE statement is used to delete existing records in a table.

- DELETE Syntax:

`DELETE FROM table_name WHERE condition;`

- Note:

- Be careful when deleting records in a table! Notice the WHERE clause in the DELETE statement.
- The WHERE clause specifies which record(s) should be deleted.
- If you omit the WHERE clause, all records in the table will be deleted!

SQL DELETE Statement example

- The following SQL statement deletes the customer "Alfreds Futterkiste" from the "Customers" table:

```
DELETE FROM Customers WHERE CustomerName='Alfreds Futterkiste';
```

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
2	Ana Trujillo Emparedados y helados	Ana Trujillo	Avda. de la Constitución 2222	México D.F.	05021	Mexico
3	Antonio Moreno Taquería	Antonio Moreno	Mataderos 2312	México D.F.	05023	Mexico
4	Around the Horn	Thomas Hardy	120 Hanover Sq.	London	WA1 1DP	UK

SQL DELETE ALL records

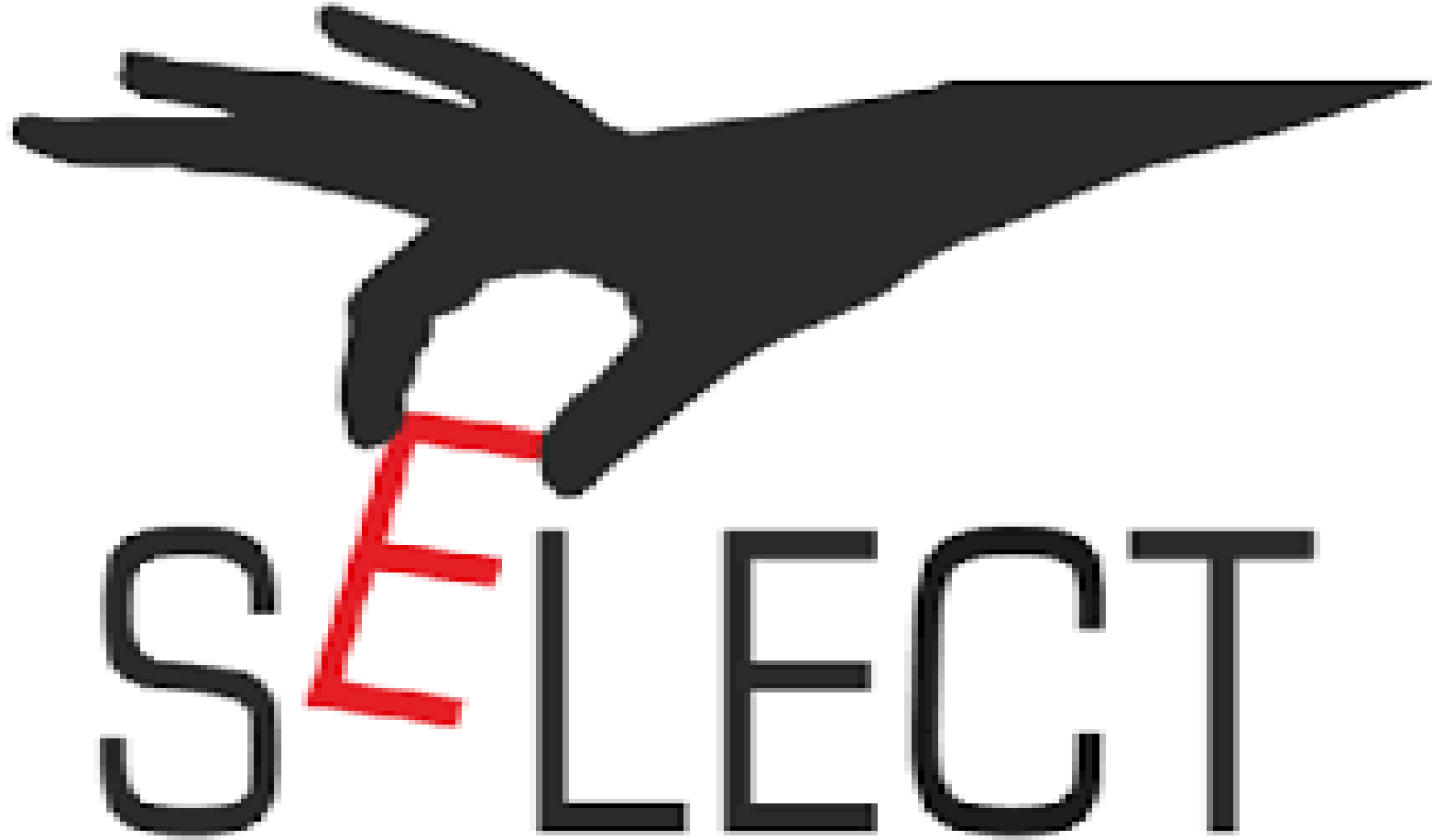
- Delete All Records
- It is possible to delete all rows in a table without deleting the table. This means that the table structure, attributes, and indexes will be intact:
- **DELETE FROM** table_name;
- Example : **DELETE FROM** Customers;

Result:

You have made changes to the database. Rows affected: 92

Your Database:

Tablename	Records
<u>Customers</u>	0
<u>Categories</u>	8
<u>Employees</u>	10
<u>OrderDetails</u>	518
<u>Orders</u>	196
<u>Products</u>	77
<u>Shippers</u>	3
<u>Suppliers</u>	29



SQL **SELECT** Statement

- The **SELECT** statement is used to select data from a database.
- The data returned is stored in a result table, called the result-set.
- **SELECT Syntax :**
 - **SELECT** column1, column2, ...
 - **FROM** table_name;
- Here, column1, column2, ... are the **field names** of the table you want to select data from.
- If you want to select all the fields available in the table, use the following syntax:
 - **SELECT * FROM** table_name;

SQL **SELECT** Statement...

example:

- **Ex1:** write the select statement which select the **Customer Name** and its **City** from the "Customers" table
➤ **SELECT** CustomerName, City **FROM** Customers;

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
1	Alfreds Futterkiste	Maria Anders	Obere Str. 57	Berlin	12209	Germany
2	Ana Trujillo Emparedados y helados	Ana Trujillo	Avda. de la Constitución 2222	México D.F.	05021	Mexico
3	Antonio Moreno Taquería	Antonio Moreno	Mataderos 2312	México D.F.	05023	Mexico
4	Around the Horn	Thomas Hardy	120 Hanover Sq.	London	WA1 1DP	UK
5	Berglunds snabbköp	Christina Berglund	Berguvsvägen 8	Luleå	S-958 22	Sweden

- **Ex2:** write the select statement which select **all data about Customer** stored in "Customers" table
➤ **SELECT** * **FROM** Customers;

SQL SELECT DISTINCT Statement...

- The SELECT DISTINCT statement is used to return only distinct (different) values.
- Inside a table, a column often contains many duplicate values; and sometimes you only want to list the different (distinct) values.

- **SELECT DISTINCT Syntax**

➤ **SELECT DISTINCT** column1, column2, ...
FROM table_name;

Number of Records: 91	
Country	
Germany	
Mexico	
Mexico	

Number of Records: 21	
Country	
Germany	
Mexico	
UK	

- **Ex:** selects all (including the duplicates) values from the "Country" column in the "Customers" table:
➤ **SELECT** Country **FROM** Customers;
- **Ex:** selects only the DISTINCT values from the "Country" column in the "Customers" table:
➤ **SELECT DISTINCT** Country **FROM** Customers;

SQL WHERE Clause

- The **WHERE** clause is used to **filter records**.
- It is used to **extract only** those records that fulfill a specified condition.
- **WHERE Syntax**
 - **SELECT** column1, column2, ...
FROM table_name
WHERE **condition**;
- Note: The WHERE clause is not only used in SELECT statements, but also in UPDATE, DELETE, etc.!
- **Ex:** write SQL statement to **selects all the customers from the country "Mexico"**, in the "Customers" table:
 - **SELECT * FROM** Customers
WHERE Country='Mexico';

Operators in The WHERE Clause

Operator	Description	
=	Equal	<pre>SELECT * FROM Products WHERE Price = 18;</pre>
>	Greater than	<pre>SELECT * FROM Products WHERE Price > 30;</pre>
<	Less than	<pre>SELECT * FROM Products WHERE Price < 30;</pre>
>=	Greater than or equal	<pre>SELECT * FROM Products WHERE Price >= 30;</pre>
<=	Less than or equal	<pre>SELECT * FROM Products WHERE Price <= 30;</pre>
<>	Not equal. Note: In some versions of SQL this operator may be written as !=	
BETWEEN	Between a certain range	<pre>SELECT * FROM Products WHERE Price BETWEEN 50 AND 60;</pre>
LIKE	Search for a pattern	<pre>SELECT * FROM Customers WHERE City LIKE 's%';</pre> <div>All countries start with S</div>
IN	To specify multiple possible values for a column	<pre>SELECT * FROM Customers WHERE City IN ('Paris','London');</pre>

Customer table

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
1	Alfreds Futterkiste	Maria Anders	Obere Str. 57	Berlin	12209	Germany
2	Ana Trujillo Emparedados y helados	Ana Trujillo	Avda. de la Constitución 2222	México D.F.	05021	Mexico
3	Antonio Moreno Taquería	Antonio Moreno	Mataderos 2312	México D.F.	05023	Mexico
4	Around the Horn	Thomas Hardy	120 Hanover Sq.	London	WA1 1DP	UK
5	Berglunds snabbköp	Christina Berglund	Berguvsvägen 8	Luleå	S-958 22	Sweden
6	Blauer See Delikatessen	Hanna Moos	Forsterstr. 57	Mannheim	68306	Germany
7	Blondel père et	Frédérique	24, place	Strasbourg	67000	France

SQL AND, OR and NOT Operators

- The WHERE clause can be combined with AND, OR, and NOT operators.
- The AND and OR operators are used to filter records based on more than one condition:
 - The AND operator displays a record if all the conditions separated by AND are TRUE.
 - The OR operator displays a record if any of the conditions separated by OR is TRUE.
 - The NOT operator displays a record if the condition(s) is NOT TRUE.

SQL **AND**, **OR** and **NOT** Operators...

- **AND** Syntax

- **SELECT** *column1, column2, ...*
FROM *table_name*
WHERE *condition1 AND condition2 AND condition3 ...;*

- **Ex:** write SQL statement that selects all fields from "Customers" where country is "Germany" AND city is "Berlin":

- **SELECT** * **FROM** Customers
WHERE Country='Germany' **AND** City='Berlin';

Number of Records: 1

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
1	Alfreds Futterkiste	Maria Anders	Obere Str. 57	Berlin	12209	Germany

SQL AND, OR and NOT Operators...

- OR Syntax

- `SELECT column1, column2, ...`
`FROM table_name`
`WHERE condition1 OR condition2 OR condition3 ...;`

- **Ex:** type SQL statement selects all fields from "Customers" where city is "Berlin" OR "München":

- `SELECT * FROM Customers`
`WHERE City='Berlin' OR City='München';`

Number of Records: 2

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
1	Alfreds Futterkiste	Maria Anders	Obere Str. 57	Berlin	12209	Germany
25	Frankenversand	Peter Franken	Berliner Platz 43	München	80805	Germany

SQL AND, OR and NOT Operators...

- **NOT** Syntax

- `SELECT column1, column2, ...
FROM table_name
WHERE NOT condition;`

- **Ex:** type SQL statement selects all fields from "Customers" where country is NOT "Germany":

- `SELECT * FROM Customers
WHERE NOT Country='Germany';`

Number of Records: 80

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
2	Ana Trujillo Emparedados y helados	Ana Trujillo	Avda. de la Constitución 2222	México D.F.	05021	Mexico
3	Antonio Moreno Taquería	Antonio Moreno	Mataderos 2312	México D.F.	05023	Mexico
4	Around the Horn	Thomas Hardy	120 Hanover Sq.	London	WA1 1DP	UK

Combining AND, OR and NOT

- **Ex:** The following SQL statement selects all fields from "Customers" where **country** is "**Germany**" AND **city** must be "**Berlin**" OR "**München**" (use parenthesis to form complex expressions):

```
➤ SELECT * FROM Customers  
WHERE Country='Germany' AND (City='Berlin' OR City='München');
```

Number of Records: 2

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
1	Alfreds Futterkiste	Maria Anders	Obere Str. 57	Berlin	12209	Germany
25	Frankenversand	Peter Franken	Berliner Platz 43	München	80805	Germany

- **Ex:** The following SQL statement selects all fields from "Customers" where country is NOT "Germany" and NOT "USA":

```
➤ SELECT * FROM Customers  
WHERE NOT Country='Germany' AND NOT Country='USA';
```


Number of Records: 67

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
2	Ana Trujillo Emparedados y helados	Ana Trujillo	Avda. de la Constitución 2222	México D.F.	05021	Mexico
3	Antonio Moreno Taquería	Antonio Moreno	Mataderos 2312	México D.F.	05023	Mexico
4	Around the Horn	Thomas Hardy	120 Hanover Sq.	London	WA1 1DP	UK

SQL ORDER BY Keyword

- The **ORDER BY** keyword is **used to sort the result-set** in ascending or descending order.
- The **ORDER BY** keyword sorts the **records in ascending order by default**. (from A to Z or 1 to 10)
- To sort the records in descending order, use the DESC keyword.
- **ORDER BY Syntax:**
 - **SELECT** *column1, column2, ...*
FROM *table_name*
ORDER BY *column1, column2, ... ASC|DESC*;
- **Ex:** The following SQL statement selects all customers from the "Customers" table, sorted by the "Country" column:
 - **SELECT * FROM Customers ORDER BY Country;**

Number of Records: 91



CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
12	Cactus Comidas para llevar	Patricio Simpson	Cerrito 333	Buenos Aires	1010	Argentina
54	Océano Atlántico Ltda.	Yvonne Moncada	Ing. Gustavo Moncada 8585 Piso 20-A	Buenos Aires	1010	Argentina
64	Rancho grande	Sergio Gutiérrez	Av. del Libertador 900	Buenos Aires	1010	Argentina
20	Ernst Handel	Roland Mendel	Kirchgasse 6	Graz	8010	Austria
59	Piccolo und mehr	Georg Pipps	Geislweg 14	Salzburg	5020	Austria
50	Maison Dewey	Catherine Dewey	Rue Joseph-Bens 532	Bruxelles	B-1180	Belgium

SELECT TOP command



The SQL **LIMIT** clause

- To return a **specific number of records** use **limit** clause.
- The LIMIT clause is useful on large tables with thousands of records.
- Returning a large number of records can impact performance.
- **Note:**
 - Not all database systems support the SELECT TOP clause.
 - **MySQL** supports the **LIMIT** clause to select a limited number of records.

LIMIT Clause...

- MySQL Syntax:

```
SELECT column_name(s)  
FROM table_name  
WHERE condition  
LIMIT number;
```

LIMIT...

examples

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
1	Alfreds Futterkiste	Maria Anders	Obere Str. 57	Berlin	12209	Germany
2	Ana Trujillo Emparedados y helados	Ana Trujillo	Avda. de la Constitución 2222	México D.F.	05021	Mexico
3	Antonio Moreno Taquería	Antonio Moreno	Mataderos 2312	México D.F.	05023	Mexico
4	Around the Horn	Thomas Hardy	120 Hanover Sq.	London	WA1 1DP	UK

- The following SQL statement **selects the first three records** from the "Customers" table (for MySQL):
 - SELECT * FROM Customers LIMIT 3;**

Result:

Number of Records: 3

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
1	Alfreds Futterkiste	Maria Anders	Obere Str. 57	Berlin	12209	Germany
2	Ana Trujillo Emparedados y helados	Ana Trujillo	Avda. de la Constitución 2222	México D.F.	05021	Mexico
3	Antonio Moreno Taquería	Antonio Moreno	Mataderos 2312	México D.F.	05023	Mexico

SQL MIN and MAX Functions



SQL MIN() and MAX() Functions

- The **MIN()** function returns the **smallest value** of the selected column.
- The **MAX()** function returns the **largest value** of the selected.

- **MIN() Syntax**

- **SELECT** MIN(column_name)
FROM table_name
WHERE condition;

ProductID	ProductName	SupplierID	CategoryID	Unit	Price
1	Chais	1	1	10 boxes x 20 bags	18
2	Chang	1	1	24 - 12 oz bottles	19
3	Aniseed Syrup	1	2	12 - 550 ml bottles	10
4	Chef Anton's Cajun Seasoning	2	2	48 - 6 oz jars	22
5	Chef Anton's Gumbo Mix	2	2	36 boxes	21.35

- Ex: The following SQL statement finds **the price of the cheapest product**:
 - **SELECT** MIN(Price) AS **SmallestPrice**
FROM Products;

Result:

Number of Records: 1

SmallestPrice

2.5

SQL MIN() and MAX() Functions

- MAX() Syntax

- `SELECT MAX(column_name)`
`FROM table_name`
`WHERE condition;`

ProductID	ProductName	SupplierID	CategoryID	Unit	Price
1	Chais	1	1	10 boxes x 20 bags	18
2	Chang	1	1	24 - 12 oz bottles	19
3	Aniseed Syrup	1	2	12 - 550 ml bottles	10
4	Chef Anton's Cajun Seasoning	2	2	48 - 6 oz jars	22
5	Chef Anton's Gumbo Mix	2	2	36 boxes	21.35

- Ex: The following SQL statement finds the price of the cheapest product:
 - `SELECT MAX(Price) AS LargestPrice`
`FROM Products;`

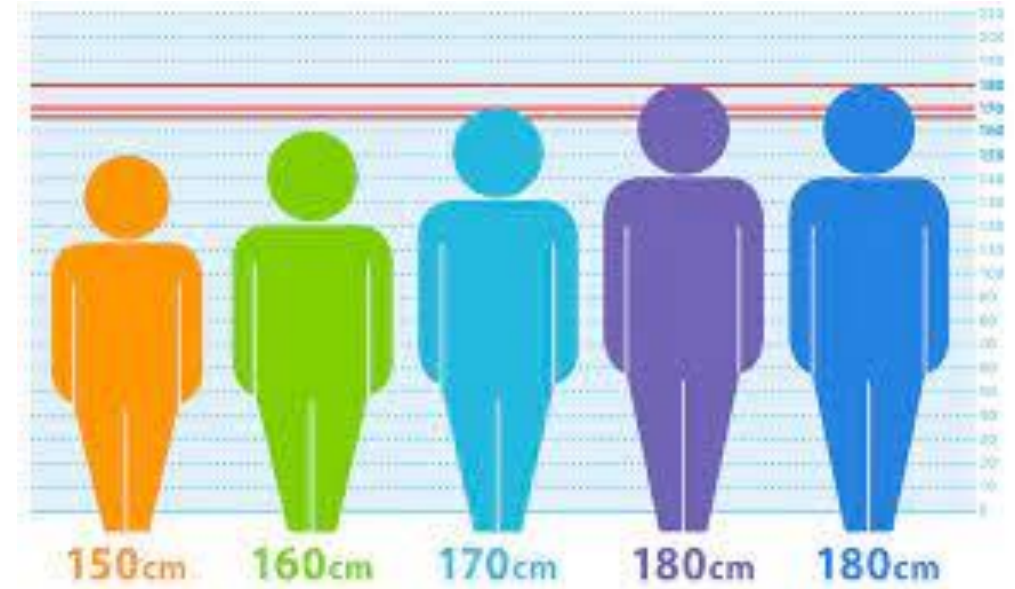
Result:

Number of Records: 1

LargestPrice

263.5

SQL COUNT(), AVG() and SUM() Functions



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SQL COUNT(), AVG() and SUM() Functions

- The COUNT() function returns the number of rows that matches a specified criterion.
- COUNT() Syntax
 - `SELECT COUNT(column_name)`
`FROM table_name`
`WHERE condition;`
- Ex: The following SQL statement finds the number of products:
 - `SELECT COUNT(ProductID)`
`FROM Products;`

Your Database:

Tablename	Records
<u>Customers</u>	0
<u>Categories</u>	8
<u>Employees</u>	10
<u>OrderDetails</u>	518
<u>Orders</u>	196
<u>Products</u>	77
<u>Shippers</u>	3
<u>Suppliers</u>	29

Result:

Number of Records: 1

COUNT(ProductID)

77

SQL COUNT(), AVG() and SUM() Functions

- The AVG() function returns the average value of a numeric column.
- AVG() Syntax
 - `SELECT AVG(column_name)`
`FROM table_name`
`WHERE condition;`
- Ex: The following SQL statement finds the average price of all products:
 - `SELECT AVG(Price)`
`FROM Products;`

Your Database:

Tablename	Records
<u>Customers</u>	0
<u>Categories</u>	8
<u>Employees</u>	10
<u>OrderDetails</u>	518
<u>Orders</u>	196
<u>Products</u>	77
<u>Shippers</u>	3
<u>Suppliers</u>	29

Result:

Number of Records: 1

AVG(Price)

28.866363636363637

SQL COUNT(), AVG() and SUM() Functions

- The SUM() function returns the total sum of a numeric column.

- SUM() Syntax

- `SELECT SUM(column_name)`
`FROM table_name`
`WHERE condition;`

- Ex: The following SQL statement finds the sum of the "Quantity" field in the "OrderDetails" table:

- `SELECT SUM(Quantity)`
`FROM OrderDetails;`

OrderDetailID	OrderID	ProductID	Quantity
1	10248	11	12
2	10248	42	10
3	10248	72	5
4	10249	14	9
5	10249	51	40

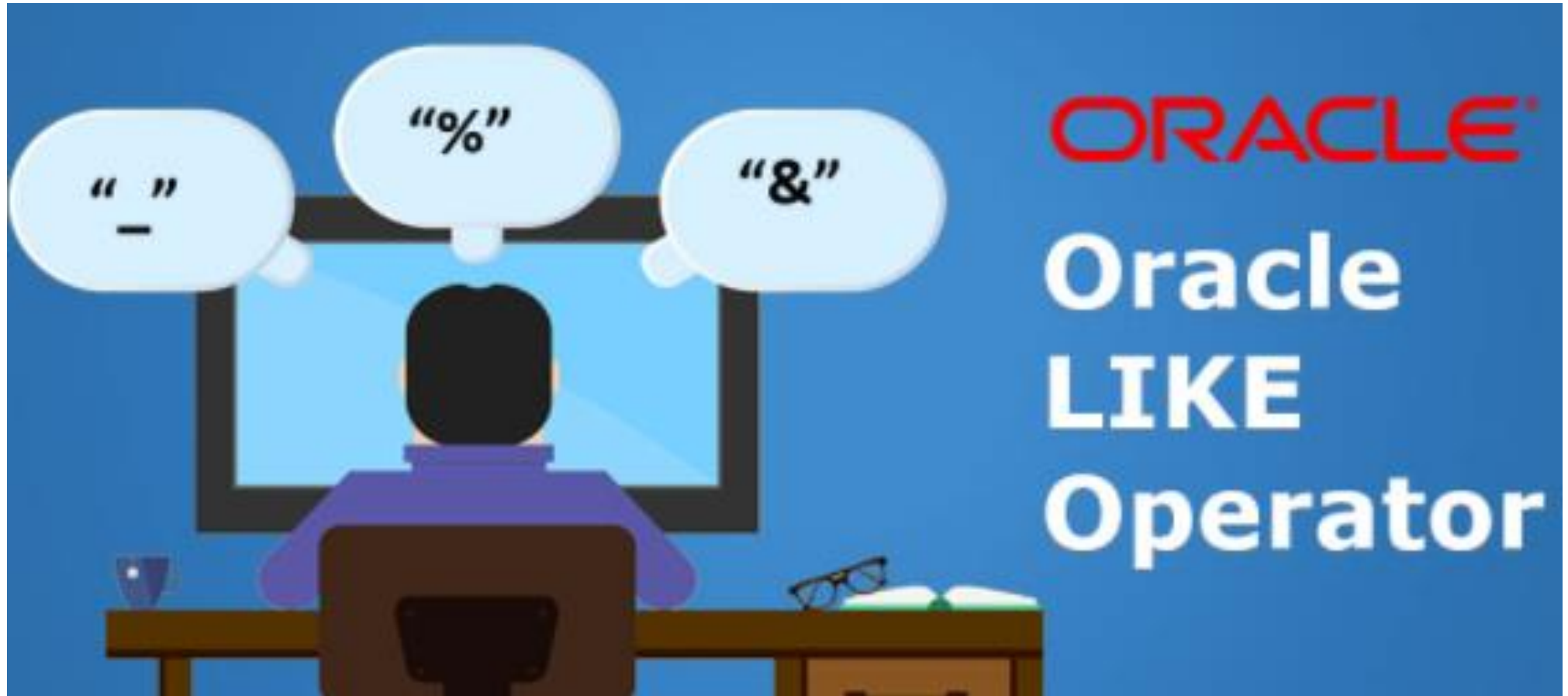
Result:

Number of Records: 1

SUM(Quantity)

12743

SQL LIKE Operator



SQL LIKE Operator

- **LIKE** operator is used in a **WHERE** clause to search for a specified pattern in a column.
- There are two wildcards often used in conjunction with the **LIKE** operator:
- The **percent** sign (%) represents zero, one, or multiple characters
- The **underscore** sign (__) represents one, single character
- LIKE Syntax
 - **SELECT** column1, column2, ...
 - **FROM** table_name
 - **WHERE** columnN **LIKE** pattern;
- **Tip:** You can also combine any number of conditions using **AND** or **OR** operators.

SQL LIKE Operator...

- Here are some examples showing different LIKE operators with '%' and '_' wildcards:

LIKE Operator	Description
WHERE CustomerName LIKE 'a%'	Finds any values that start with "a"
WHERE CustomerName LIKE '%a'	Finds any values that end with "a"
WHERE CustomerName LIKE '%or%'	Finds any values that have "or" in any position
WHERE CustomerName LIKE '_r%'	Finds any values that have "r" in the second position
WHERE CustomerName LIKE 'a_%'	Finds any values that start with "a" and are at least 2 characters in length
WHERE CustomerName LIKE 'a__%'	Finds any values that start with "a" and are at least 3 characters in length
WHERE ContactName LIKE 'a%o'	Finds any values that start with "a" and ends with "o"

SQL LIKE Operator...

- Ex: The following SQL statement selects all customers with a CustomerName starting with "a":
 - **SELECT** * **FROM** Customers
WHERE CustomerName **LIKE** 'a%';

Result:

Number of Records: 4

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
1	Alfreds Futterkiste	Maria Anders	Obere Str. 57	Berlin	12209	Germany
2	Ana Trujillo Emparedados y helados	Ana Trujillo	Avda. de la Constitución 2222	México D.F.	05021	Mexico
3	Antonio Moreno Taquería	Antonio Moreno	Mataderos 2312	México D.F.	05023	Mexico
4	Around the Horn	Thomas Hardy	120 Hanover Sq.	London	WA1 1DP	UK

SQL LIKE Operator...

- Ex: The following SQL statement selects all customers with a CustomerName ending with "a":
 - `SELECT * FROM Customers`
`WHERE CustomerName LIKE '%a';`

Result:

Number of Records: 7

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
3	Antonio Moreno Taquería	Antonio Moreno	Mataderos 2312	México D.F.	05023	Mexico
13	Centro comercial Moctezuma	Francisco Chang	Sierras de Granada 9993	México D.F.	05022	Mexico
30	Godos Cocina Típica	José Pedro Freyre	C/ Romero, 33	Sevilla	41101	Spain

SQL LIKE Operator...

- Ex: The following SQL statement selects all customers with a CustomerName that have "or" in any position:"a":
 - `SELECT * FROM Customers
WHERE CustomerName LIKE '%or%';`

Result:

Number of Records: 11

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
3	Antonio Moreno Taquería	Antonio Moreno	Mataderos 2312	México D.F.	05023	Mexico
4	Around the Horn	Thomas Hardy	120 Hanover Sq.	London	WA1 1DP	UK
36	Hungry Coyote Import Store	Yoshi Latimer	City Center Plaza 516 Main St.	Elgin	97827	USA

SQL LIKE Operator...

- Ex: The following SQL statement selects all customers with a CustomerName that have "r" in the second position:
 - `SELECT * FROM Customers
WHERE CustomerName LIKE '_r%';`

Result:

Number of Records: 11

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
4	Around the Horn	Thomas Hardy	120 Hanover Sq.	London	WA1 1DP	UK
17	Drachenblut Delikatessend	Sven Ottlieb	Walserweg 21	Aachen	52066	Germany
20	Ernst Handel	Roland Mendel	Kirchgasse 6	Graz	8010	Austria

SQL LIKE Operator...

- Ex: The following SQL statement selects all customers with a ContactName that starts with "a" and ends with "o":
- `SELECT * FROM Customers
WHERE CustomerName LIKE 'a%o' ;`

Result:

Number of Records: 3

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
2	Ana Trujillo Emparedados y helados	Ana Trujillo	Avda. de la Constitución 2222	México D.F.	05021	Mexico
3	Antonio Moreno Taquería	Antonio Moreno	Mataderos 2312	México D.F.	05023	Mexico
69	Romero y tomillo	Alejandra Camino	Gran Vía, 1	Madrid	28001	Spain

SQL IN Operator



SQL **IN** Operator

- The **IN** operator allows you to specify multiple values in a WHERE clause.
- The IN operator is a shorthand for multiple **OR** conditions.
- IN Syntax
 - `SELECT column_name(s)
FROM table_name
WHERE column_name IN (value1, value2, ...);`
- Or
 - `SELECT column_name(s)
FROM table_name
WHERE column_name IN (SELECT STATEMENT);`

SQL **IN** Operator example

- The **IN** The following SQL statement selects **all customers that are located in "Germany", "France" or "UK"**:
 - **SELECT** * **FROM** Customers
WHERE Country **IN** ('Germany', 'France', 'UK');

Result:

Number of Records: 29

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
1	Alfreds Futterkiste	Maria Anders	Obere Str. 57	Berlin	12209	Germany
4	Around the Horn	Thomas Hardy	120 Hanover Sq.	London	WA1 1DP	UK
6	Blauer See Delikatessen	Hanna Moos	Forsterstr. 57	Mannheim	68306	Germany
7	Blondel père et fils	Frédérique Citeaux	24, place Kléber	Strasbourg	67000	France
9	Bon app'	Laurence Lebihans	12, rue des Bouchers	Marseille	13008	France
11	B's Beverages	Victoria Ashworth	Fauntleroy Circus	London	EC2 5NT	UK

SQL **IN** Operator example

- The following SQL statement selects all customers that are **NOT** located in "Germany", "France" or "UK":
 - **SELECT** * **FROM** Customers
WHERE Country **NOT IN** ('Germany', 'France', 'UK');

Result:

Number of Records: 62

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
2	Ana Trujillo Emparedados y helados	Ana Trujillo	Avda. de la Constitución 2222	México D.F.	05021	Mexico
3	Antonio Moreno Taquería	Antonio Moreno	Mataderos 2312	México D.F.	05023	Mexico
5	Berglunds snabbköp	Christina Berglund	Berguvsvägen 8	Luleå	S-958 22	Sweden
8	Bólido Comidas preparadas	Martín Sommer	C/ Araquil, 67	Madrid	28023	Spain
10	Bottom-Dollar Marketse	Elizabeth Lincoln	23 Tsawassen Blvd.	Tsawassen	T2F 8M4	Canada
12	Cactus Comidas para llevar	Patricio Simpson	Cerrito 333	Buenos Aires	1010	Argentina

SQL BETWEEN Operator



SQL BETWEEN Operator

- The BETWEEN operator **selects values within a given range**. The values can be numbers, text, or dates.
- The BETWEEN operator is **inclusive**: *begin and end values are included*.
- **BETWEEN Syntax**
 - **SELECT** column_name(s)
FROM table_name
WHERE column_name **BETWEEN** value1 **AND** value2;

SQL BETWEEN Operator

example

- The following SQL statement selects all products with a price between 10 and 20:
 - SELECT** * **FROM** Products
 - WHERE** Price **BETWEEN** 10 **AND** 20;

Result:

Number of Records: 29

ProductID	ProductName	SupplierID	CategoryID	Unit	Price
1	Chais	1	1	10 boxes x 20 bags	18
2	Chang	1	1	24 - 12 oz bottles	19
3	Aniseed Syrup	1	2	12 - 550 ml bottles	10
15	Genen Shouyu	6	2	24 - 250 ml bottles	15.5
16	Pavlova	7	3	32 - 500 g boxes	17.45
21	Sir Rodney's Scones	8	3	24 pkgs. x 4 pieces	10
25	NuNuCa Nuß-Nougat-Creme	11	3	20 - 450 g glasses	14

NOT BETWEEN

example

- To display the products outside the range of the previous example, use NOT BETWEEN:
 - **SELECT** * **FROM** Products
WHERE Price **NOT BETWEEN** 10 **AND** 20;

Number of Records: 48

ProductID	ProductName	SupplierID	CategoryID	Unit	Price
4	Chef Anton's Cajun Seasoning	2	2	48 - 6 oz jars	22
5	Chef Anton's Gumbo Mix	2	2	36 boxes	21.35
6	Grandma's Boysenberry Spread	3	2	12 - 8 oz jars	25
7	Uncle Bob's Organic Dried Pears	3	7	12 - 1 lb pkgs.	30
8	Northwoods Cranberry Sauce	3	2	12 - 12 oz jars	40
9	Mishi Kobe Niku	4	6	18 - 500 g pkgs.	97
10	Ikura	4	8	12 - 200 ml jars	31
11	Queso Cabrales	5	4	1 kg pkg.	21
12	Queso Manchego La Pastora	5	4	10 - 500 g pkgs.	38
13	Konbu	6	8	2 kg box	6

BETWEEN with IN

example

- The following SQL statement selects all products with a price between 10 and 20. In addition; do not show products with a CategoryID of 1,2, or 3:
 - SELECT** * **FROM** Products
WHERE Price **BETWEEN** 10 **AND** 20;
AND CategoryID **NOT IN** (1,2,3);

Number of Records: 9

ProductID	ProductName	SupplierID	CategoryID	Unit	Price
31	Gorgonzola Telino	14	4	12 - 100 g pkgs	12.5
36	Inlagd Sill	17	8	24 - 250 g jars	19
40	Boston Crab Meat	19	8	24 - 4 oz tins	18.4
42	Singaporean Hokkien Fried Mee	20	5	32 - 1 kg pkgs.	14
46	Spegesild	21	8	4 - 450 g glasses	12
57	Ravioli Angelo	26	5	24 - 250 g pkgs.	19.5
58	Escargots de Bourgogne	27	8	24 pieces	13.25

BETWEEN Text Values

example

- The following SQL statement selects all products with a **ProductName** between Carnarvon Tigers and Mozzarella di Giovanni:
 - SELECT** * FROM Products
WHERE ProductName **BETWEEN** 'Carnarvon Tigers' **AND** 'Mozzarella di Giovanni'
ORDER BY ProductName;

Result:

Number of Records: 37

ProductID	ProductName	SupplierID	CategoryID	Unit	Price
18	Carnarvon Tigers	7	8	16 kg pkg.	62.5
1	Chais	1	1	10 boxes x 20 bags	18
2	Chang	1	1	24 - 12 oz bottles	19
39	Chartreuse verte	18	1	750 cc per bottle	18
4	Chef Anton's Cajun Seasoning	2	2	48 - 6 oz jars	22
5	Chef Anton's Gumbo Mix	2	2	36 boxes	21.35
48	Chocolade	22	3	10 pkgs.	12.75

BETWEEN Dates

example

- The following SQL statement selects all orders with an OrderDate between '01-July-1996' and '31-July-1996':
 - **SELECT** * **FROM** Orders
WHERE OrderDate **BETWEEN** #07/01/1996# **AND** #07/31/1996#;

Result:

Number of Records: 22

OrderID	CustomerID	EmployeeID	OrderDate	ShipperID
10248	90	5	7/4/1996	3
10249	81	6	7/5/1996	1
10250	34	4	7/8/1996	2
10251	84	3	7/8/1996	1
10252	76	4	7/9/1996	2
10253	34	3	7/10/1996	2
10254	14	5	7/11/1996	2
10255	68	9	7/12/1996	3

SQL Aliases



SQL Aliases

- SQL aliases are used to give a **table**, or a **column** in a table, a **temporary name**.
- Aliases are often used **to make column names more readable**.
- An alias only exists for the duration of that query.
- An alias is created with the **AS** keyword.
- Alias Column Syntax
 - `SELECT column_name AS alias_name
FROM table_name;`
- Alias Table Syntax
 - `SELECT column_name(s)
FROM table_name AS alias_name;`

SQL Aliases example

- The following SQL statement creates two aliases, one for the CustomerID column and one for the CustomerName column:
 - **SELECT** CustomerID **AS** **ID**, CustomerName **AS** **Customer**
FROM Customers;

Result:

Number of Records: 91

ID	Customer
1	Alfreds Futterkiste
2	Ana Trujillo Emparedados y helados
3	Antonio Moreno Taquería
4	Around the Horn
5	Berglunds snabbköp
6	Blauer See Delikatessen
7	Blondel père et fils

SQL Aliases example

- The following SQL statement creates two aliases, one for the CustomerName column and one for the ContactName column.
- **Note:** It requires **double quotation** marks or **square brackets** if the **alias name contains spaces**
 - **SELECT** CustomerName **AS** Customer, ContactName **AS** [Contact Person]
FROM Customers;

Result:

Number of Records: 91

Customer	Contact Person
Alfreds Futterkiste	Maria Anders
Ana Trujillo Emparedados y helados	Ana Trujillo
Antonio Moreno Taquería	Antonio Moreno
Around the Horn	Thomas Hardy

SQL Aliases example

- The following SQL statement creates an alias named "Address" that combine four columns (Address, PostalCode, City and Country):
 - `SELECT CustomerName, Address + ', ' + PostalCode + ' ' + City + ', ' + Country AS Address
FROM Customers;`

Result:

Number of Records: 91

CustomerName	Address
Alfreds Futterkiste	Obere Str. 57, 12209 Berlin, Germany
Ana Trujillo Emparedados y helados	Avda. de la Constitución 2222, 05021 México D.F., Mexico
Antonio Moreno Taquería	Mataderos 2312, 05023 México D.F., Mexico
Around the Horn	120 Hanover Sq., WA1 1DP London, UK
Berglunds snabbköp	Berguvsvägen 8, S-958 22 Luleå, Sweden

SQL Aliases

- Aliases can be useful when:
 - There are more than one table involved in a query
 - Functions are used in the query
 - Column names are big or not very readable
 - Two or more columns are combined together

SQL JOIN

Natural Join SQL



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SQL JOINS

- A JOIN clause is **used to combine rows from two or more tables**, based on a related column between them.
 - Let's look at a selection from the "Orders" table:

OrderID	CustomerID	OrderDate
10308	2	1996-09-18
10309	37	1996-09-19
10310	77	1996-09-20

- Then look at a selection from the "Customers" table:

CustomerID	CustomerName	ContactName	Country
1	Alfreds Futterkiste	Maria Anders	Germany
2	Ana Trujillo Emparedados y helados	Ana Trujillo	Mexico
3	Antonio Moreno Taquería	Antonio Moreno	Mexico

SQL JOINS...

- Notice that the "CustomerID" column in the "Orders" table refers to the "CustomerID" in the "Customers" table. The relationship between the two tables above is the "CustomerID" column.
- Then, we can create the following SQL statement (that contains a JOIN), that **selects records that have matching values in both tables**:
 - **SELECT** Orders.OrderID, Customers.CustomerName, Orders.OrderDate
FROM Orders
JOIN Customers **ON** Orders.CustomerID=Customers.CustomerID;

OrderID	CustomerName	OrderDate
10308	Ana Trujillo Emparedados y helados	9/18/1996
10365	Antonio Moreno Taquería	11/27/1996
10383	Around the Horn	12/16/1996
10355	Around the Horn	11/15/1996
10278	Berglunds snabbköp	8/12/1996

Any Questions ?

Assignment

- ☐ Create Database for the erd and mapping diagram of previous session.
- ☐ Insert data into all tables.
- ☐ Select course name and course teacher name where course fee more than 2000.
- ☐ Count the number of students that enroll on specific course.
- ☐ Select students where their names contain 'med' .
- ☐ Update courses fee , increase the fee by 5% when fees are less than 1500.
- ☐ Delete chairman of id=3.
- ☐ Note: store the written commands in text file with sql extension.

Thank you