# Database Management System

**Associate Professor Dr. Raed Ibraheem Hamed**

**University of Human Development,**
**College of Science and Technology**

**2015 – 2016**

# 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 set permissions on tables, procedures, and views

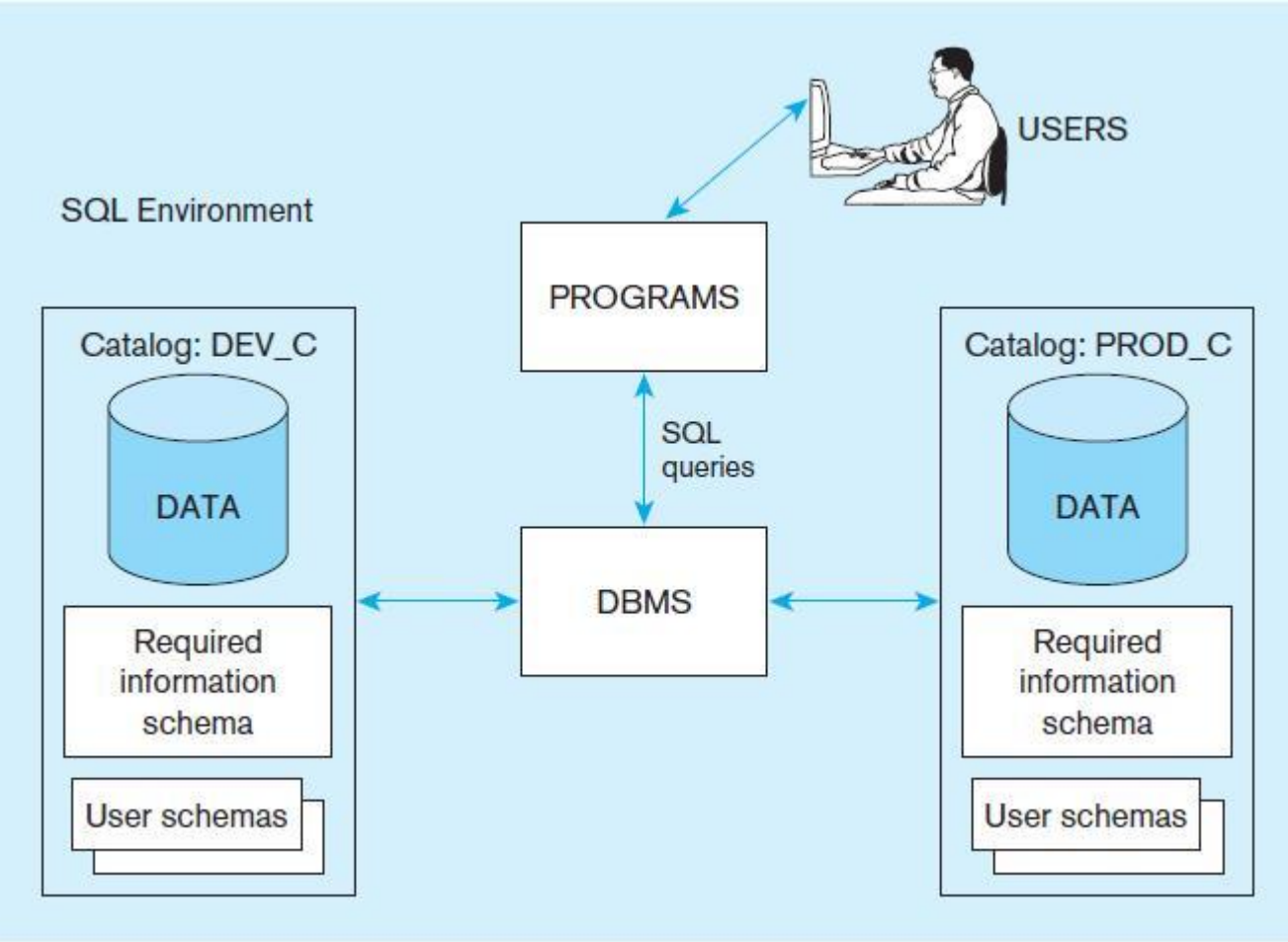
# Some of The Most Important SQL Commands

- **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

# SQL Environment

- **Catalog**
  - A set of schemas that constitute the description of a database
- **Schema**
  - The structure that contains descriptions of objects created by a user i.e. is the table name and its attributes: Product(PName, Price, Category, Manfacturer)
- **Data Definition Language (DDL)**
  - Commands that define a database, including creating, altering, and dropping tables and establishing constraints.
- **Data Manipulation Language (DML)**
  - Commands that maintain and query a database
- **Data Control Language (DCL)**
  - Commands that control a database, including administering privileges and processing data

A simplified schematic of a typical SQL environment, as described by the SQL



# Advantages of SQL

A. All major relational database management systems support by SQL

B. You can transfer all skills you have gained with SQL from one database to another

C. SQL lets you work with data at the logical level, only being concerned with the implementation details when you want to manipulate them.

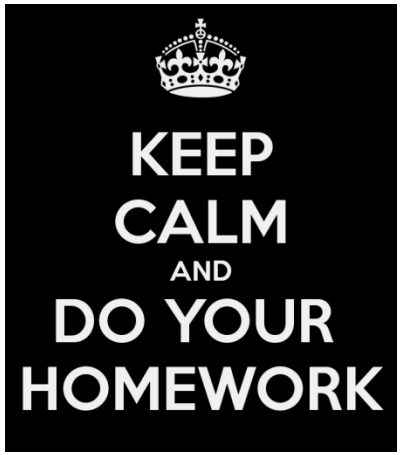
D. SQL gives us the power to access the contents of a database in a simple, powerful way

E. You can use SQL with many different kinds of database

F. This is simpler than learning how to access each type of database in a proprietary way

# Homework

**Please Do Your Homework on the subject of Different Types of Databases**



# SQL Statement and Syntax

AND / OR

```
SELECT column_name(s)
FROM table_name
WHERE condition
AND|OR condition
```

BETWEEN

```
SELECT column_name(s)
FROM table_name
WHERE column_name
BETWEEN value1 AND value2
```

# The SQL Query Language

Below is a selection table called "**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 |
| 6 | Blauer See Delikatessen | Hanna Moos | Forsterstr. 57 | Mannheim | 68306 | Germany |
| 7 | Blondel père et fils | Frédérique Citeaux | 24, place Kléber | Strasbourg | 67000 | France |
| 8 | Bólido Comidas preparadas | Martín Sommer | C/ Araquil, 67 | Madrid | 28023 | Spain |
| 9 | Bon app' | Laurence Lebihans | 12, rue des Bouchers | Marseille | 13008 | France |
| 10 | Bottom-Dollar Marketse | Elizabeth Lincoln | 23 Tsawassen Blvd. | Tsawassen | T2F 8M4 | Canada |
| 11 | B's Beverages | Victoria Ashworth | Fauntleroy Circus | London | EC2 5NT | UK |

# Example: SELECT * 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 |
| 6 | Blauer See Delikatessen | Hanna Moos | Forsterstr. 57 | Mannheim | 68306 | Germany |
| 7 | Blondel père et fils | Frédérique Citeaux | 24, place Kléber | Strasbourg | 67000 | France |
| 8 | Bólido Comidas preparadas | Martín Sommer | C/ Araquil, 67 | Madrid | 28023 | Spain |
| 9 | Bon app' | Laurence Lebihans | 12, rue des Bouchers | Marseille | 13008 | France |
| 10 | Bottom-Dollar Marketse | Elizabeth Lincoln | 23 Tsawassen Blvd. | Tsawassen | T2F 8M4 | Canada |
| 11 | B's Beverages | Victoria Ashworth | Fauntleroy Circus | London | EC2 5NT | UK |

SELECT * FROM Customers
WHERE Country='Mexico';

| 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 |

SELECT * FROM Customers
WHERE Country='Mexico' or PostalCode=12209;

| 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 |

# the SQL select statement

SELECT * FROM Customers
WHERE CustomerID=1;

Number of Records: 1

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

**The SQL SELECT DISTINCT Statement**

In a table, a column may contain many duplicate values; and sometimes you only want to list the different (distinct) values.
The DISTINCT keyword can be used to **return only distinct (different) values.**

SQL SELECT DISTINCT Syntax

SELECT DISTINCT *column_name*, *column_name*
FROM *table_name*;

# the SQL select statement

SELECT DISTINCT City FROM Customers;

| City |
| --- |
| Berlin |
| México D.F. |
| London |
| Luleå |
| Mannheim |
| Strasbourg |
| Madrid |
| Marseille |
| Tsawassen |

SELECT DISTINCT City, Country FROM Customers;

| City | Country |
| --- | --- |
| Berlin | Germany |
| México D.F. | Mexico |
| London | UK |
| Luleå | Sweden |
| Mannheim | Germany |
| Strasbourg | France |
| Madrid | Spain |
| Marseille | France |
| Tsawassen | Canada |

# The SQL AND & OR Operators

The AND operator displays a record if both the first condition AND the second condition are true.
The OR operator displays a record if either the first condition OR the second condition is true.

**AND Operator Example**

The following SQL statement selects all customers from the country "Germany" AND the city "Berlin", in the "Customers" table:

**Example**

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

# The SQL AND & OR Operators

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

**OR Operator Example**

The following SQL statement selects all customers from the city "Berlin" OR "München", in the "Customers" table:

**Example**

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

| 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 |

# The SQL AND & OR Operators

**Combining AND & OR**

You can also combine AND and OR (use parenthesis to form complex expressions).

The following SQL statement selects all customers from the country "Germany" AND the city must be equal to "Berlin" OR "München", in the "Customers" table:

## Example

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

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

# The SQL ORDER BY Keyword

The ORDER BY keyword is used to sort the result-set by one or more columns.
The ORDER BY keyword sorts the records in ascending order by default. To sort the records in a descending order, you can use the DESC keyword.

**SQL ORDER BY Syntax**

SELECT *column_name*, *column_name*
FROM *table_name*
ORDER BY *column_name* ASC|DESC, *column_name* ASC|DESC;

# The SQL ORDER BY Keyword

The following SQL statement selects all customers from the "Customers" table, sorted by the "Country" column:

**Example**

```
SELECT * FROM Customers
ORDER BY Country;
```

| 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 |
| 76 | Suprêmes délices | Pascale Cartrain | Boulevard Tirou, 255 | Charleroi | B-6000 | Belgium |
| 15 | Comércio Mineiro | Pedro Afonso | Av. dos Lusíadas, 23 | São Paulo | 05432-043 | Brazil |
| 21 | Familia Arquibaldo | Aria Cruz | Rua Orós, 92 | São Paulo | 05442-030 | Brazil |
| 31 | Gourmet Lanchonetes | André Fonseca | Av. Brasil, 442 | Campinas | 04876-786 | Brazil |

# The SQL ORDER BY Keyword

**ORDER BY DESC Example**

The following SQL statement selects all customers from the "Customers" table, sorted DESCENDING by the "Country" column:

## Example

```
SELECT * FROM Customers
ORDER BY Country DESC;
```

| CustomerID | CustomerName | ContactName | Address | City | PostalCode | Country |
|---|---|---|---|---|---|---|
| 33 | GROSELLA-Restaurante | Manuel Pereira | 5ª Ave. Los Palos Grandes | Caracas | 1081 | Venezuela |
| 35 | HILARIÓN-Abastos | Carlos Hernández | Carrera 22 con Ave. Carlos Soublette #8-35 | San Cristóbal | 5022 | Venezuela |
| 46 | LILA-Supermercado | Carlos González | Carrera 52 con Ave. Bolivar #65-98 Llano Largo | Barquisimeto | 3508 | Venezuela |
| 47 | LINO-Delicateses | Felipe Izquierdo | Ave. 5 de Mayo Porlamar | I. de Margarita | 4980 | Venezuela |
| 32 | Great Lakes Food Market | Howard Snyder | 2732 Baker Blvd. | Eugene | 97403 | USA |
| 36 | Hungry Coyote Import Store | Yoshi Latimer | City Center Plaza 516 Main St. | Elgin | 97827 | USA |
| 43 | Lazy K Kountry Store | John Steel | 12 Orchestra Terrace | Walla Walla | 99362 | USA |
| 45 | Let's Stop N Shop | Jaime Yorres | 87 Polk St. Suite 5 | San Francisco | 94117 | USA |
| 48 | Lonesome Pine Restaurant | Fran Wilson | 89 Chiaroscuro Rd. | Portland | 97219 | USA |

# The SQL ORDER BY Keyword

**ORDER BY Several Columns Example**

The following SQL statement selects all customers from the "Customers" table, sorted ascending by the "Country" and descending by the "CustomerName" column:

## Example

```
SELECT * FROM Customers
ORDER BY Country ASC,
 CustomerName DESC;
```

| CustomerID | CustomerName | ContactName | Address | City | PostalCode | Country |
|---|---|---|---|---|---|---|
| 64 | Rancho grande | Sergio Gutiérrez | Av. del Libertador 900 | Buenos Aires | 1010 | Argentina |
| 54 | Océano Atlántico Ltda. | Yvonne Moncada | Ing. Gustavo Moncada 8585 Piso 20-A | Buenos Aires | 1010 | Argentina |
| 12 | Cactus Comidas para llevar | Patricio Simpson | Cerrito 333 | Buenos Aires | 1010 | Argentina |
| 59 | Piccolo und mehr | Georg Pipps | Geislweg 14 | Salzburg | 5020 | Austria |
| 20 | Ernst Handel | Roland Mendel | Kirchgasse 6 | Graz | 8010 | Austria |
| 76 | Suprêmes délices | Pascale Cartrain | Boulevard Tirou, 255 | Charleroi | B-6000 | Belgium |
| 50 | Maison Dewey | Catherine Dewey | Rue Joseph-Bens 532 | Bruxelles | B-1180 | Belgium |
| 88 | Wellington Importadora | Paula Parente | Rua do Mercado, 12 | Resende | 08737-363 | Brazil |
| 81 | Tradição Hipermercados | Anabela Domingues | Av. Inês de Castro, 414 | São Paulo | 05634-030 | Brazil |
| 67 | Ricardo Adocicados | Janete Limeira | Av. Copacabana, 267 | Rio de Janeiro | 02389-890 | Brazil |
| 62 | Queen Cozinha | Lúcia Carvalho | Alameda dos Canàrios, 891 | São Paulo | 05487-020 | Brazil |

# SQL LIKE Operator Examples

The following SQL statement selects all customers with a City starting with the letter "s":

## Example

```
SELECT * FROM Customers
WHERE City LIKE 's%';
```

| CustomerID | CustomerName | ContactName | Address | City | PostalCode | Country |
|---|---|---|---|---|---|---|
| 7 | Blondel père et fils | Frédérique Citeaux | 24, place Kléber | Strasbourg | 67000 | France |
| 15 | Comércio Mineiro | Pedro Afonso | Av. dos Lusíadas, 23 | São Paulo | 05432-043 | Brazil |
| 21 | Familia Arquibaldo | Aria Cruz | Rua Orós, 92 | São Paulo | 05442-030 | Brazil |
| 30 | Godos Cocina Típica | José Pedro Freyre | C/ Romero, 33 | Sevilla | 41101 | Spain |
| 35 | HILARIÓN-Abastos | Carlos Hernández | Carrera 22 con Ave. Carlos Soublette #8-35 | San Cristóbal | 5022 | Venezuela |
| 45 | Let's Stop N Shop | Jaime Yorres | 87 Polk St. Suite 5 | San Francisco | 94117 | USA |
| 59 | Piccolo und mehr | Georg Pipps | Geislweg 14 | Salzburg | 5020 | Austria |
| 62 | Queen Cozinha | Lúcia Carvalho | Alameda dos Canàrios, 891 | São Paulo | 05487-020 | Brazil |

# SQL LIKE Operator Examples

The following SQL statement selects all customers with a Country containing the pattern "land":

**Example**

```
SELECT * FROM Customers
WHERE Country LIKE '%land%';
```

| CustomerID | CustomerName | ContactName | Address | City | PostalCode | Country |
|---|---|---|---|---|---|---|
| 14 | Chop-suey Chinese | Yang Wang | Hauptstr. 29 | Bern | 3012 | Switzerland |
| 37 | Hungry Owl All-Night Grocers | Patricia McKenna | 8 Johnstown Road | Cork | | Ireland |
| 68 | Richter Supermarkt | Michael Holz | Grenzacherweg 237 | Genève | 1203 | Switzerland |
| 87 | Wartian Herkku | Pirkko Koskitalo | Torikatu 38 | Oulu | 90110 | Finland |
| 90 | Wilman Kala | Matti Karttunen | Keskuskatu 45 | Helsinki | 21240 | Finland |
| 91 | Wolski | Zbyszek | ul. Filtrowa 68 | Walla | 01-012 | Poland |

# The SQL BETWEEN Operator

The BETWEEN operator selects values within a range. The values can be numbers, text, or dates.

**SQL BETWEEN Syntax**

SELECT *column_name(s)*
FROM *table_name*
WHERE *column_name* BETWEEN *value1* AND *value2;*

**"Products" table:**

| 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 | 1 | 2 | 48 - 6 oz jars | 22 |
| 5 | Chef Anton's Gumbo Mix | 1 | 2 | 36 boxes | 21.35 |

# The SQL BETWEEN Operator

The following SQL statement selects all products with a price BETWEEN 10 and 20:

**Example**

```
SELECT * FROM Products
WHERE Price BETWEEN 10 AND 20;
```

| 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 |

# NOT BETWEEN Operator Example

To display the products outside the range of the previous example, use NOT BETWEEN:

**Example**

```
SELECT * FROM Products
WHERE Price
NOT BETWEEN 10 AND 20;
```

| 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 |

# BETWEEN Operator with Text Value Example

The following SQL statement selects all products with a ProductName beginning with any of the letter BETWEEN 'C' and 'M':

**Example**

```
SELECT * FROM Products
WHERE ProductName
BETWEEN 'C' AND 'M';
```

| 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 |
| 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 |
| 10 | Ikura | 4 | 8 | 12 - 200 ml jars | 31 |
| 13 | Konbu | 6 | 8 | 2 kg box | 6 |
| 15 | Genen Shouyu | 6 | 2 | 24 - 250 ml bottles | 15.5 |
| 18 | Carnarvon Tigers | 7 | 8 | 16 kg pkg. | 62.5 |
| 22 | Gustaf's Knäckebröd | 9 | 5 | 24 - 500 g pkgs. | 21 |

# Thank You
???