**2. INTRODUCTION TO SQL**

* **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
* **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.
* Note: Most of the SQL database programs also have their own proprietary extensions in addition to the SQL standard!
* **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
* 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.
* Look at the "Customers" table:
* SELECT \* FROM Customers;
* Every table is broken up into smaller entities called fields.
* The fields in the Customers table consist of CustomerID, CustomerName, ContactName, Address, City, PostalCode and Country.
* A field is a column in a table that is designed to maintain specific information about every record in the table.
* A record, also called a row, is each individual entry that exists in a table.
* For example, there are 91 records in the above Customers table.
* A record is a horizontal entity in a table.
* A column is a vertical entity in a table that contains all information associated with a specific field in a table.

In a relational database,

* tables are structured entities that store data in rows and columns.
* To initiate a new query, one typically selects
* a specific database and defines its schema.
* Unlike the flexibility of directly inputting data in Excel,
* a database requires a predefined structure where
* data types and column specifications must be declared beforehand.

Taking the example of storing data

* a database, the process involves
* specifying the number of columns,
* their names, and
* data types.
* For instance, in a database, one might
* create a table named "orders" with
* columns such as "orderID," "orderDate," and "productName."

Each row in this table

* represents a distinct order,

While the columns serve as

* attributes for that order.

The structure ensures a

* standardized format for
* organizing and querying the data.
* The order information, which was originally stored in Excel,
* is now structured into rows and columns within the "orders" table in the database,
* allowing for efficient data management and retrieval.
* **SQL Syntax**
* **SQL Statements**
* Most of the actions you need to perform on a database are done with SQL statements.
* SQL statements consists of keywords that are easy to understand.
* The following SQL statement returns all records from a table named "Customers":
* Select all records from the Customers table:
* SELECT \* FROM Customers;
* **Database Tables**
* A database most often contains one or more tables.
* Each table is identified by a name (e.g. "Customers" or "Orders"), and contain records (rows) with data.
* we will use the well-known Northwind sample database (included in MS Access and MS SQL Server).
* Below is a selection from the [**Customers**](https://www.w3schools.com/sql/trysql.asp?filename=trysql_customers) table used in the 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 |
| * 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).
* **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.
* In this tutorial, we will use semicolon at the end of each SQL statement.
* 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

**CREATE TABLE**

Firstly, the process of creating a table in a database involves using a SQL query,

* such as "CREATE TABLE." In this context, let's consider the
* creation of a table named "Amazon\_orders."
* The definition of this table requires specifying the
* attributes or columns and their corresponding data types.

For instance, the

* first column is designated as "orderID" and is
* assigned the data type "integer" to accommodate whole numbers.
* The second column, "orderDate," is set to the
* data type "date" to store date values.
* In this case, the format is specified as "YYYYMMDD."
* Moving on to the "product\_name" column, it is defined as
* a "varchar" (variable character) data type with a
* maximum length of 50 characters,
* representing a string format suitable for storing product names.

VARCHAR CONSTRAINTS:

If, for instance, your product name is "Varchar(5)," and you attempt to

* input a different product name, such as "Baby Milk,"
* which has a total length of 9 characters,
* it becomes crucial to consider the data type constraints.
* In this scenario, the data type specified for the
* product name is "varchar(5),"
* indicating a maximum length of 5 characters. Consequently, attempting
* to insert "Baby Milk" would result in an error,
* as it exceeds the specified length limit. Therefore, it is
* imperative to carefully define and adhere to the designated length to ensure that all product names align with the specified constraints.
* The "total\_price" column,
* intended for numerical values,
* is designated as "integer" data type for whole numbers. However,
* recognizing the potential for decimal values,
* an alternative option is presented using the "decimal" data type. In this example,
* the precision is set to allow for a total length of 5, with 2 decimal places.
* Lastly, the "payment\_method" column,
* designated for alphanumeric characters,
* is specified as "varchar" with a maximum length of 20 characters.
* **In essence, this SQL statement informs the database system**
* to create a table named "Amazon\_orders" with the defined columns and data types: "orderID" (integer), "orderDate" (date), "product\_name" (varchar), "total\_price" (decimal or integer), and "payment\_method" (varchar). After formulating this query, it is executed to initialize the table structure in the database.

