# Week 1: Introduction & Foundational Skills (Focus on Project Relevance)

This week, we'll be diving into the exciting world of SQL and databases! We'll explore what SQL is used for, how it benefits web applications, and the building blocks of databases: tables, columns, and data types. But most importantly, we'll get our hands dirty by creating a basic database structure for our upcoming Expense Tracker project!

## Learning Objectives:

Understand the purpose and applications of SQL, particularly for web applications.

Identify the fundamental components of a database: tables, columns, and data types.

Design a basic database schema for our Expense Tracker project.

Instructions

This assignment is designed to be completed in approximately 2 hours.

\*\*What you'll need:\*\*

Access to a computer with internet access

A text editor (Microsoft Word document)

Drawing software (e.g. Draw.io, visual paradigm) for the bonus question.

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## Submission:

Save your completed assignment as a document (e.g., .docx, pdf)

Submit your document through the designated course platform.

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## Part 1: Understanding SQL (30 minutes)

\*\*Question 1. Research\*\*

Use online resources like websites or PowerPoint slides.

\*\*1.1.\*\* In a single Word document, summarize your findings in a short paragraph (3-5 sentences).

Web Applications:

MySQL is a popular open-source RDBMS known for its ease of use and widespread adoption in web development. PostgreSQL offers advanced features and compliance with SQL standards, making it suitable for complex web applications. Microsoft SQL Server, a commercial RDBMS, is preferred in enterprise environments for its robust security features and seamless integration with other Microsoft products.

Imagine a dynamic website like an online store. How do you think SQL plays a role in managing data behind the scenes? Consider how product information, user accounts, and order details might be stored and accessed.

In a dynamic website like an online store, SQL plays a critical role in managing the data behind the scenes. Here are some key ways in which SQL is used:

1. Product Catalog Management: SQL is used to store and manage product information such as product names, descriptions, prices, and availability. This data is stored in tables within the database, and SQL queries are used to retrieve and display this information on the website.

2. User Account Management: SQL is used to store user account information such as usernames, passwords, email addresses, and shipping addresses. When a user creates an account or logs in, SQL queries are used to validate their credentials and retrieve their account information.

3. Order Processing: SQL is used to store order details such as order numbers, products purchased, quantities, prices, and shipping information. When a user places an order, SQL queries are used to insert this information into the database and update product availability.

4. Search Functionality: SQL queries are used to implement search functionality on the website, allowing users to search for products based on keywords, categories, or other criteria. These queries retrieve relevant product information from the database and display it to the user.

\*\*1.2.\*\* Write a short explanation (3-5 sentences) in your document about the role of SQL in web applications.

SQL is essential for managing data in web applications like online stores. It allows for the creation, retrieval, updating, and deletion of data in the database, ensuring efficient storage and retrieval of product information, user accounts, and order details. SQL queries are used to retrieve specific data based on user input, update or delete records as necessary, and enforce data integrity to maintain the accuracy and consistency of information stored in the database.

\*\*1.3.\*\* List 3 benefits of using SQL for web applications.

**Efficient Data Management:** SQL excels at storing, retrieving, and manipulating large amounts of data.

**Scalability:** SQL databases can handle growing data volumes as your web application scales. This makes SQL suitable for applications that expect an increase in users or data over time.

**Standardization and Portability:** SQL is a widely used and standardized language. This means that developers familiar with SQL can easily work on different web applications using various relational databases.

\*\*1.4.\*\* Think about efficiency, data organization, and data retrieval capabilities. Briefly explain each benefit in your document (1-2 sentences per benefit).

**Efficiency:** SQL allows for optimized storage and retrieval of large datasets commonly used in web applications. This translates to faster loading times and improved user experience.

**Data Organization:** SQL enforces a structured data schema, making it easier to organize and manage complex information within a web application. This simplifies data maintenance and reduces errors.

**Data Retrieval Capabilities:** SQL provides a powerful query language (SQL) for efficient data retrieval. You can easily search, filter, and sort through large datasets to find specific information relevant to user requests in a web application.

\*\*1.5.\*\* List any 3 Database Management Systems.

MySQL.

PostgreSQL.

Microsoft SQL Server.

## Part 2: Database Fundamentals (45 minutes)

\*\*Question 2.1: Tables\*\*

Think about how data is organized in rows and columns.

In your document, define a database table and explain its similarity to a spreadsheet (2-3 sentences).

A database table is a structured collection of data organized into rows and columns, similar to a spreadsheet. Each row represents a record or entry, while each column represents a specific attribute or field. Both database tables and spreadsheets allow for easy organization, manipulation, and retrieval of data in a tabular format.

\*\*Question 2.2: Columns\*\*

Consider different types of data like text, numbers, and dates.

Define "columns" and provide an example with an explanation (2-3 sentences) in your document.

Within a database table, columns represent specific categories of data for each record. Imagine a table like a spreadsheet; columns are the vertical headings defining the type of information stored in each cell of that column. For example, in a table storing customer information, you might have columns named "customer id," "name," "email," and "phone number." Each row (record) would then contain the specific details for an individual customer under each of those categories.

Data Types: Why are data types important in a database? Briefly explain 3 common data types (e.g., Text, Number, Date).

Data types are important in a database because they define the kind of data that can be stored in a particular column of a table. By specifying data types, databases ensure data integrity, accuracy, and efficiency in storage and retrieval operations.

Integer: An integer data type is used to store whole numbers without decimal points. It is commonly used for representing numerical values such as IDs, quantities, or counts.

Varchar: Varchar (Variable Character) is a data type used to store alphanumeric characters of variable length. It is ideal for storing text data like names, addresses, or descriptions.

Date: The date data type is used to store calendar dates in a specific format. It allows for easy manipulation and comparison of dates, making it useful for tracking events, scheduling tasks, or storing timestamps.

\*\*Question 2.3: Data Types\*\*

Think about how data types ensure data integrity and efficient storage.

Explain the importance of data types and provide brief explanations of 3 common types (2-3 sentences each) in your document.

Data types are crucial for ensuring data integrity and efficient storage in SQL databases. They define the format and range of values a column can hold, offering several benefits:

* Data Integrity: Data types prevent invalid data from entering the database. For example, an "age" column defined as an integer would reject values like "twenty-five" or negative numbers, ensuring data consistency and accuracy.
* Efficient Storage: Data types allow the database to allocate the optimal amount of space for each value. Storing a name in a short text format uses less space compared to a generic text field that could hold much larger data. This optimizes storage efficiency.

## Part 3: Expense Tracker Database Design (45 minutes)

\*\*3.1. Planning:\*\*

We'll be building an Expense Tracker application. What kind of data do you think we'll need to track? List at least 5 data points relevant to our project.

Expense Category

Expense Amount

Date of Expense

Payment Method

Description/Notes: Providing a brief description or notes for each expense transaction can help users remember the purpose of the expense, additional details, or any relevant information associated with the transaction.

\* Consider information like expense amount, date, and category.

\* List your identified data points in your document.

\*\*3.2. Tables:\*\*

Considering the data points you listed, design a basic database schema with one main table (likely named "Expenses").

\* Define the columns needed for this table.

\* Assign appropriate data types to each column based on the kind of data it will hold. (e.g., amount: number, date: date, category: text)

In your document, create a table structure that includes:

\* Table name (e.g., Expenses)

\* Column names (e.g., expense\_id, amount, date, category)

\* Data type for each column (e.g., INT, DECIMAL, DATE, TEXT)

## Bonus:

Sketch a simple Entity Relational Diagram (ERD) of your table structure, including column names and data types.

Use drawing software or a simple table format to visually represent your schema.

\*\* Remember: There might be multiple ways to design your database schema. The goal is to understand the concepts and create a logical structure to store our expense tracking data.

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