

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:

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.

- SQL can be used to incorporate new entries e.g, if the store is advancing some of its aspects.
- SQL is used for data retrieval by filtering and hence readily available product information.
- SQL is used to sort, filter and modify stored data and can also be used to store data within the database and for update of records.

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

- SQL plays a crucial role in web applications primarily for managing and querying data stored in relational databases. It allows developers to create, retrieve, update, and delete data efficiently, ensuring that web applications can handle dynamic content and user interactions seamlessly. SQL statements are used to communicate with the database server, enabling web applications to deliver personalized content, process transactions, and maintain data integrity across various user sessions and interactions. SQL generally forms the backbone of many web applications by providing a standardized language for database management and interaction.

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

- Retrieving Specific data: Allow web applications to retrieve data quickly and efficiently, even from large datasets.
- Organizes data for display: Sort, filter and modify data stored within the database.
- Update data as needed: Incorporate new entries and data points into the database tables as needed.

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 databases are designed to handle large datasets efficiently. They use indexing and query optimization techniques to minimize the time it takes to retrieve and manipulate data, ensuring that web applications can respond quickly to user requests.
- **Data Organization:** SQL databases enforce structured data organization through tables, rows, and columns. This organization facilitates efficient data storage and retrieval by allowing developers to define relationships between data entities using foreign keys and ensure data integrity with constraints.
- **Data Retrieval Capabilities:** SQL provides powerful querying capabilities through its declarative syntax. Developers can write complex queries using SELECT statements combined with filtering, sorting, and aggregation functions to retrieve specific subsets of data quickly and accurately based on application requirements.

1.5. List any 3 Database Management Systems.

- MySQL
- PostgreSQL
- MongoDB

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 fundamental structure in a relational database system where data is organized into rows and columns. Each row represents a single record or entity instance, while each column represents a specific attribute or field of that record. This structure is similar to a spreadsheet, where rows correspond to individual entries and columns represent different types of information. Both tables and spreadsheets organize data in a tabular format, facilitating easy storage, retrieval, and manipulation of structured data.

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

- **Columns** in a database table represent the different types of data that can be stored for each record. Each column has a defined data type, specifying the kind of data that can be stored in that column. For example, a "Name" column in a database table might have a data type of "Text," allowing it to store strings of characters "Chard Odhiambo"
- **Data types:** Data types are crucial in a database because they ensure data integrity, optimize storage, and provide efficient querying capabilities.
- **Text (or VARCHAR):** Used for storing alphanumeric characters, text data types can hold strings of variable length. They are suitable for storing data like names, addresses, or descriptions.
- **Number (or INTEGER, FLOAT):** Number data types are used for storing numeric values. They can be integers (whole numbers) or floating-point numbers (decimal numbers). These are used for quantities, measurements, or any numeric data that requires arithmetic operations.
- **Date (or TIMESTAMP):** Date data types store date and time values. They are essential for storing information related to events, schedules, or timestamps of when data was created or modified. Date data types often include time components for precise time tracking.

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:** Data types play a crucial role in a database because they ensure data integrity, optimize storage, by providing efficient querying capabilities.
- **Text (or VARCHAR):** Used for storing alphanumeric characters, text data types can hold strings of variable length. They are suitable for storing data like names, addresses, or descriptions.
- **Number (or INTEGER, FLOAT):** Number data types are used for storing numeric values. They can be integers (whole numbers) or floating-point numbers (decimal numbers). These are used for quantities, measurements, or any numeric data that requires arithmetic operations.
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when data was created or modified. Date data types often include time components for precise time tracking.

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.

- Consider information like expense amount, date, and category.
- List your identified data points in your document.

➤ **5 Data Points:**

- Date: Date when the expense occurred or when it was recorded.
- Expense amount: The amount of money spent for expense entry.
- Category: The category and type of the expense.
- Expense id: Describes the unique key for identifying the expenses.
- Payment method: The method used to make the payment.

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)

Column Name	Data Type
Expense_amount	DECIMAL
Date	DATE
Category	TEXT
Payment_method	TEXT
Expense_id	INT

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.

Expenses	
PK	<u>Expense ID</u> INT
	Expense_amount DECIMAL
	Date DATE
	Category TEXT
	Payment_method TEXT

Figure 1: Designed in draw.io