**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.

Answer

SQL plays a critical role in managing data for dynamic websites like online stores. It stores, retrieves, and manipulates information related to products, user accounts, and order details efficiently. Product information, such as names, prices, and descriptions, is stored in SQL databases, enabling seamless browsing and searching. User accounts, including login credentials and personal details, are securely managed through SQL queries. Additionally, order details are tracked and updated in real-time, ensuring accurate order processing and inventory management.

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

SQL plays a vital role in web applications by managing and organizing data efficiently. It stores, retrieves, and updates information such as user accounts, product details, and transaction records. This allows dynamic websites, like online stores, to provide real-time data interactions, ensuring smooth user experiences. SQL's ability to handle complex queries and maintain data integrity makes it essential for the functionality and reliability of web applications.

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

1. Data Management Efficiency: SQL allows for efficient storage, retrieval, and manipulation of data, enabling web applications to handle large volumes of information seamlessly.

2. Data Integrity and Security: SQL ensures data integrity through constraints and supports robust security measures, such as access controls and permissions, to protect sensitive information.

3. Scalability and Performance: SQL databases are designed to scale with the application's needs, maintaining high performance even as the amount of data and number of users grow.

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

**1. Data Management Efficiency**: SQL provides efficient mechanisms for storing, retrieving, and manipulating data, enabling web applications to handle large volumes of information seamlessly, ensuring smooth performance and user experience.

**2. Data Integrity and Security**: SQL ensures data integrity through the use of constraints and supports robust security measures, such as access controls and permissions, protecting sensitive information from unauthorized access and ensuring reliable data management.

**3. Scalability and Performance**: SQL databases are designed to scale with the needs of the application, maintaining high performance even as the amount of data and number of users grow, ensuring the application remains responsive and efficient under increased load.

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

**MySQL**

**PostgreSQL**

**Oracle Database**

**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 set of data organized in rows and columns. Each row represents a unique record, and each column represents a specific attribute of that record. This structure is similar to a spreadsheet, where data is also arranged in rows and columns, making it easy to manage and retrieve information efficiently.

**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, also known as fields, represent the attributes or properties of the data stored in a database table. Each column contains a specific type of data, such as text, numbers, or dates. For example, in a table storing customer information, columns might include "CustomerName" (text), "CustomerID" (number), and "JoinDate" (date).

**Data Types**

Data types are important in a database because they define the kind of data that can be stored in each column, ensuring data integrity and optimizing storage. Three common data types are:

1. **Text**: Stores alphanumeric characters. Example: "CustomerName" can store names like "John Doe".
2. **Number**: Stores numerical values. Example: "CustomerID" can store values like 12345.
3. **Date**: Stores date and time values. Example: "JoinDate" can store values like "2023-01-15".

**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 in databases as they ensure data integrity and efficient storage. By defining specific data types for each column, databases can prevent incorrect data entry and optimize storage space. This leads to better performance and reliability of the database system.

**Importance of Data Types**

Data types are crucial in databases as they ensure data integrity and efficient storage. By defining specific data types for each column, databases can prevent incorrect data entry and optimize storage space. This leads to better performance and reliability of the database system.

**Common Data Types**

1. **Text**: Text data types store alphanumeric characters, which are used for names, addresses, and other string data. They ensure that only valid characters are stored, preventing numerical or date data from being mistakenly entered.
2. **Number**: Number data types store numerical values, which can be used for calculations and quantitative analysis. They ensure that only valid numerical data is stored, preventing text or date data from being entered and maintaining numerical integrity for operations.
3. **Date**: Date data types store dates and times, which are essential for scheduling, logging, and time-based calculations. They ensure that only valid date and time formats are entered, preventing invalid or incorrectly formatted date entries, which helps in maintaining chronological data integrity.

**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.
* Expense Amount: The monetary value of each expense.
* Date: The date when the expense occurred.
* Category: The type of expense, such as food, transportation, or entertainment.
* Description: A brief description of the expense for additional context.
* Payment Method: The method used to pay for the expense, such as cash, credit card, or bank transfer.

**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.