
SQL - (STRUCTURED QUERY LANGUAGE)

1: Introduction to SQL

1.1. Overview of SQL

1.1.1. History and Evolution

1.1.2. Importance of SQL

1.2. Relational Databases

- 1.2.1. Understanding Relational Data

- 1.2.2. Key Concepts: Tables, Rows, Columns, and Relationships

1.3. SQL Syntax Basics

- 1.3.1. SQL Statements

- 1.3.2. SQL Keywords

- 1.3.3. SQL Comments

2: SQL Data Manipulation

2.1. Querying Data

- 2.1.1. SELECT Statement

- 2.1.2. Filtering Data with WHERE Clause

- 2.1.3. Sorting Data with ORDER BY

- 2.1.4. Limiting Results with LIMIT

2.2. Filtering and Comparison Operators

- 2.2.1. Comparison Operators (=, <>, <, >, <=, >=)



- 2.2.2. Logical Operators (AND, OR, NOT)
- 2.2.3. BETWEEN and IN Operators

2.3. Working with Functions

- 2.3.1. Aggregate Functions (SUM, AVG, COUNT, MAX, MIN)
- 2.3.2. String Functions (CONCAT, LENGTH, SUBSTRING)
- 2.3.3. Date and Time Functions

3: SQL Data Definition

3.1. Creating and Modifying Tables

- 3.1.1. CREATE TABLE Statement
- 3.1.2. ALTER TABLE Statement
- 3.1.3. Dropping Tables with DROP TABLE

3.2. Data Types and Constraints

- 3.2.1. Numeric Data Types
- 3.2.2. Character Data Types
- 3.2.3. Date and Time Data Types
- 3.2.4. Primary Key and Foreign Key Constraints

4: SQL Data Manipulation and Transactions

4.1. Inserting Data

- 4.1.1. INSERT INTO Statement
- 4.1.2. Specifying Values and NULL
- 4.1.3. INSERT INTO SELECT Statement

4.2. Updating and Deleting Data

- 4.2.1. UPDATE Statement
- 4.2.2. DELETE Statement

4.3. Transactions and ACID Properties

- 4.3.1. Transaction Concepts
- 4.3.2. COMMIT and ROLLBACK
- 4.3.3. ACID Properties (Atomicity, Consistency, Isolation, Durability)

5: SQL Joins and Subqueries

5.1. Understanding Joins

- 5.1.1. INNER JOIN
- 5.1.2. LEFT JOIN (OUTER JOIN)
- 5.1.3. RIGHT JOIN (OUTER JOIN)
- 5.1.4. FULL OUTER JOIN

5.2. Subqueries

- 5.2.1. Subquery Syntax
- 5.2.2. Correlated Subqueries
- 5.2.3. Scalar Subqueries

6: SQL Views, Indexes, and Optimization

6.1. Creating and Managing Views

- 6.1.1. CREATE VIEW Statement

- 6.1.2. Updating Views
- 6.1.3. Dropping Views

6.2. Indexes and Performance Optimization

- 6.2.1. Index Types (B-tree, Hash, Bitmap)
- 6.2.2. Indexing Best Practices
- 6.2.3. Query Optimization Techniques

7: Advanced SQL Concepts

7.1. Stored Procedures and Functions

- 7.1.1. Creating and Executing Stored Procedures
- 7.1.2. User-Defined Functions

7.2. Triggers

- 7.2.1. Trigger Basics
- 7.2.2. Creating and Managing Triggers

8: SQL Security and Permissions

8.1. User Authentication and Authorization

- 8.1.1. User Roles and Privileges
- 8.1.2. GRANT and REVOKE Statements

8.2. SQL Injection and Prevention

- 8.2.1. Understanding SQL Injection
- 8.2.2. Mitigating SQL Injection Attacks

9: SQL Best Practices and Tips

9.1. SQL Coding Best Practices

- 9.1.1. Naming Conventions
- 9.1.2. Indentation and Formatting

9.2. Performance Tuning Strategies

- 9.2.1. Query Performance
- 9.2.2. Database Maintenance

10: Real-World Applications and Case Studies

10.1. Database Design Case Study

- 10.1.1. Requirements Analysis
- 10.1.2. Entity-Relationship Diagram (ERD)
- 10.1.3. Database Implementation

10.2. Practical SQL Projects

- 10.2.1. Building a Web Application with SQL
- 10.2.2. Data Warehousing with SQL

11: SQL in Big Data and NoSQL Environments

11.1. SQL in Big Data Ecosystems

- 11.1.1. SQL in Hadoop (Hive)
- 11.1.2. SQL in Spark (Spark SQL)

11.2. SQL in NoSQL Databases

- 11.2.1. SQL-like Querying in NoSQL (e.g., MongoDB)



- 11.2.2. SQL and NewSQL Databases

12: SQL and Cloud Databases (Optional)

12.1. Database as a Service (DBaaS)

- 12.1.1. Cloud Database Providers
- 12.1.2. Setting Up and Managing Cloud Databases

12.2. Migrating to the Cloud

- 12.2.1. Data Migration Strategies
- 12.2.2. Challenges and Considerations

13. Final Project and Course Review

- 14.1 Capstone Project: Students will work on a complex SQL project to apply their skills.
- 14.2 Course Review and Exam: A comprehensive review of key SQL concepts and an assessment to evaluate students' knowledge.